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Faculdade de Saúde Pública
Universidade de São Paulo

Lesões por Esforços Repetitivos (LER)
ou
Distúrbios Osteomusculares Relacionados ao Trabalho(DORT)

ATUALIZAÇÃO BIBLIOGRÁFICA: 1994-1998

Solicitação:
COSAT - Coordenação de Saúde do Trabalhador do Ministério da Saúde

São Paulo
1998

Preparado por

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APRESENTAÇÃO

A Biblioteca/CIR da Faculdade de Saúde Pública/USP, por solicitação da COSAT – Coordenadoria de Saúde do Trabalhador do Ministério da Saúde, elaborou uma atualização bibliográfica na área de **Lesões por Esforços Repetitivos (LER) / Distúrbios Osteomusculares Relacionados ao Trabalho (DORT)**, com a finalidade de garantir aos especialistas atualidade, consistência e qualidade nas ações desenvolvidas.

Durante a realização do trabalho percebeu-se a importância que as informações, atualizadas continuamente, podem representar para aqueles que desejam pesquisar e encaminhar soluções aos problemas de LER/DORT, na população. Portanto, a presente bibliografia tem seu valor imediato, mas se de fato for importante mantê-la há que se estudar outras alternativas para sua manutenção, sobretudo hoje frente às facilidades eletrônicas e a rede Internet.

Para concluir, deve-se reforçar que a equipe responsável pela presente bibliografia procurou fazer um trabalho exaustivo, mas selecionando as citações mais relevantes. Espera-se que este esforço seja recompensado.

Profa. Dra. Maria Teresinha Dias de Andrade
Diretora da Biblioteca/CIR - FSP/USP

CARACTERIZAÇÃO DA TEMÁTICA

As LER/DORT, por definição, são um fenômeno relacionado ao trabalho, caracterizado pela ocorrência de vários sintomas concomitantes ou não, tais como dor, parestesia, sensação de peso, fadiga, de aparecimento insidioso, geralmente nos membros superiores. Entidades neuro-ortopédicas definidas como tenossinovites, sinovites, compressões de nervos periféricos podem ser identificadas ou não. Freqüentemente são causa de incapacidade laboral temporária ou permanente.

São resultado da superutilização das estruturas anatômicas do sistema osteomuscular e da falta de tempo de sua recuperação.

♦ Outras Nomenclaturas

LER/DORT são termos utilizados como sinônimos de Lesões por Traumas Cumulativos, Distúrbios Cervicobraquiais Ocupacionais, Síndrome Ocupacional do "Overuse". Cada denominação tem relação com a história do processo de reconhecimento da doença como ocupacional nos diferentes países.

A tendência mundial no meio científico atual é substituir as antigas denominações por *Work Related Musculoskeletal Disorders (WRMD),* cuja tradução no Brasil foi Distúrbios Osteomusculares Relacionados ao Trabalho (DORT).

♦ Fatores de Risco

Não há uma causa única e determinada para a ocorrência de LER/DORT. A literatura mostra que vários são os fatores existentes no trabalho que podem concorrer para a ocorrência de LER/DORT. São eles: repetitividade de movimentos, manutenção de posturas inadequadas por tempo prolongado, esforço físico, invariabilidade de tarefas, pressão mecânica sobre determinados segmentos do corpo, trabalho muscular estático, choques e impactos, vibração, frio e fatores organizacionais.

Para que os fatores acima possam ser considerados de risco para a ocorrência de LER/DORT é importante que se observe a sua intensidade, duração e freqüência.

Ressaltamos a importância da organização do trabalho caracterizada pela exigência de ritmo intenso de trabalho, pelo conteúdo pobre das tarefas, pela existência de pressão, autoritarismo das chefias, mecanismos de avaliação, punição e controle da produção dos trabalhadores em busca da produtividade, desconsiderando a diversidade própria do homem.

♦ **Processo de Reconhecimento das LER/DORT como Doença Ocupacional no Brasil : Situação Atual.**

Os registros de vários países demonstram o alto contingente de trabalhadores atingidos pelas LER/DORT. Alguns deles enfrentaram e enfrentam ainda epidemias de LER/DORT.

No Brasil, a partir de 1987, quando a doença passou a ser reconhecida como ocupacional pela Previdência Social, os registros de casos aumentam a cada ano, passando a ser as mais prevalentes entre as doenças ocupacionais, segundo informações daquela instituição.

A seguir citamos fatores apontados como explicativos para o aumento ininterrupto das LER/DORT no Brasil : E por que se observa esse aumento ininterrupto?

- intensificação do trabalho e de outras características da organização do trabalho predisponentes para a ocorrência de LER/DORT;
- aumento da expressão social dos acometidos, que acabam tendo maior poder de pressão sobre os órgãos públicos e empresas para que tomem providências quanto à prevenção, assistência, reabilitação, indenização e legislação;
- aumento do número de trabalhadores acometidos e diversidade dos ramos de atividades nos quais se encontram inseridos;
- disseminação do problema em larga escala entre categorias profissionais da classe média;
- ampliação dos canais de informações facilitando o diagnóstico e notificação;
- ampliação de espaço social para a manifestação de pessoas com dor crônica.

Em 6 de agosto de 1987, atendendo à reivindicação dos sindicatos, o Ministério da Previdência Social publicou a Portaria 4062, que reconheceu a tenossinovite do digitador como doença ocupacional.

No aspecto preventivo, em 23 de novembro de 1990, o Ministério do Trabalho publicou a Norma Regulamentadora número 17, onde fixa normas e limites para as empresas onde há postos de trabalho que exigem esforços repetitivos, ritmo acelerado e posturas inadequadas.

Em 1991, o então Ministério unificado do Trabalho e da Previdência Social publicou a Norma Técnica de LER, que incorporava conhecimentos de literatura e da prática dos profissionais de saúde do país, incluindo várias entidades neuro-ortopédicas como LER e ampliando as categorias profissionais passíveis de acometimento.

No entanto, se há uma distância entre o conhecimento e a legislação, há leis que são cumpridas e outras que são simplesmente ignoradas. Neste caso, embora houvesse a Portaria 4062 citada anteriormente e a Norma Técnica de 1991, na prática somente os digitadores conseguiam ter seus casos reconhecidos como ocupacionais.

Assim, em 1992, após eventos públicos de informações e discussões, as Secretarias de Estado da Saúde de São Paulo e de Minas Gerais publicaram a Norma Técnica sobre LER, cuja elaboração envolveu a sociedade civil, representantes de trabalhadores, empregadores, poder público e universidades.

Essa Norma Técnica teve o grande mérito de ter envolvido amplos setores sociais na sua elaboração e ter sido o resultado de um "consenso social". Em 1993 a Previdência Social atualizou sua Norma de 1991, incorporando conceitos consensuais que haviam se estabelecido e dando cobertura ampla aos acometidos.

Em 1996, a Previdência Social iniciou uma revisão da Norma de 1993, com o objetivo de cortar gastos. Constituiu uma comissão exclusiva de médicos oriundos da perícia do INSS, do setor Saúde e Trabalho, da universidade.

Após protesto do movimento sindical resolveu abrir a comissão para a participação de médicos indicados pelas centrais sindicais.

A última versão, publicada no dia 20 de agosto de 1998, contém duas seções. A primeira delas, de atualização científica sobre o assunto e a segunda seção, que trata dos benefícios propriamente ditos e critérios de concessão, ao contrário da primeira, foi escrita exclusivamente pela Previdência Social. Restringe os benefícios.

O breve relato histórico acima do reconhecimento das LER/DORT no Brasil dá uma idéia das influências sócio-econômico-culturais no processo de reconhecimento de doenças

ocupacionais: a importância da mobilização dos principais interessados, os trabalhadores acometidos, suas conquistas e perdas.

♦ **Desafios**

A complexidade do fenômeno das LER/DORT se deve à heterogeneidade do quadro clínico, à dificuldade diagnóstico em alguns casos, às influências sócio-econômicas no reconhecimento como doença ocupacional, as repercussões psicossociais, aos conflitos de interesses, à dificuldade de tratamento e reabilitação.

Assim, o enfrentamento desse problema de saúde pública é um desafio colocado aos empregadores, aos trabalhadores e suas representações sindicais, à universidade, aos serviços de saúde e ao poder público.

Maria Maeno Settimi

Agradecimentos a

Emília Câmara Santana
e
Lilian Magalhães

INFORMAÇÕES SOBRE A BIBLIOGRAFIA APRESENTADA

♦ **Estratégia de Busca**

No que cabe à recuperação da informação bibliográfica, uma característica a ser destacada é a abrangência de áreas onde se pode encontrar documentos sobre LER/DORT, ou seja, a multidisciplinariedade do assunto. Não só na área médica se encontra literatura sobre o tema, mas nas áreas de sociologia, psicologia, administração em saúde, saúde ocupacional, educação em saúde, ergonomia etc.

Desta forma, foram pesquisados os termos específicos de cada área para serem estabelecidas estratégias de busca que garantissem uma recuperação eficiente e, sobretudo, que fosse eficaz. Alguns exemplos podem ser dados quanto à complexidade de rastrear documentos sobre o assunto: no catálogo online (ACERVO) da Biblioteca/CIR, LER aparece com os descritores "*doenças ocupacionais*" e "*traumatismo por distensão repetida*" , na base de dados LILACS (BIREME) como " *transtornos traumáticos cumulativos*". Nas bases internacionais o termo "*cumulative trauma disorders"* aparece com maior freqüência, embora se verifique artigos indexados como "*carpal tunnel syndrome*", os quais não trazem o descritor "*cumulative trauma disorders*".

O período abrangido para a recuperação da informação foi de 5 anos, de 1994 a 1998 embora, para a literatura nacional e latino-americana, o período tenha sido ampliado, incluindo a literatura a partir de 1990.

♦ **Fontes de Dados Pesquisadas**

Base de Dados ACERVO (Catálogo *Online*) – livros, teses e documentos similares do acervo da Biblioteca/CIR da FSP/USP

Banco de Dados **DEDALUS**– acervo das Bibliotecas da USP

HIGEIA, base de dados produzida pela Biblioteca/CIR que abrange a produção do corpo docente e teses defendidas da FSP e artigos da Revista de Saúde Pública.

LILACS – base de dados da BIREME que cobre a literatura convencional e não-convencional na área da saúde, produzida na América Latina e Caribe.

MEDLINE – base de dados da *National Library of Medicine* (Estados Unidos) que indexa artigos publicados em cerca de 3.700 revistas internacionais na área de medicina e assuntos correlatos.

SOCIOFILE – base de dados editada pela *Cambridge Scientific Abstracts* que divulga artigos e outros documentos, em nível internacional (55 países), relacionados aos aspectos sociais de doenças, entre outros assuntos.

ERIC (*Educational Resources Information Center*) – base de dados do US Department of Education, que indexa artigos internacionais relativos à educação em toda sua abrangência, inclusive a educação em saúde.

CIS -ILO - base de dados produzida pela *International Occupational Safety and Health Information Centre*, da Organização Internacional do Trabalho, que indexa artigos, livros, capítulos de livros, teses e eventosda área de segurança e saúde ocupacional:

NIOSHTIC - base de dados produzida pela *US National Institute for Occupational Safety and Health*, que abrange a área de saúde ocupacional, divulgando documentos de vários tipos, inclusive os não convencionais.

PsycLIT (*Psychological Literature*) – base de dados desenvolvida pela *American Psychological Association* que divulga literatura relevante publicada internacionalmente na área psicologia, para abordagem de aspectos psicológicos para LER.

CURRENT CONTENTS – base de dados do *Institute for Scientific Information* (ISI), que indexa cerca de 7 mil títulos de periódicos internacionais, de todas as áreas do conhecimento, com cerca de 16 mil itens entre artigos e livros .

EXCERPTA MEDICA. *Section 35: Occupational Health and Industrial Medicine, publicada pela Elsevier Science B.V.*, Amsterdam, que divulga uma coleção de cerca de 3.600 títulos de periódicos internacionais da área biomédica.

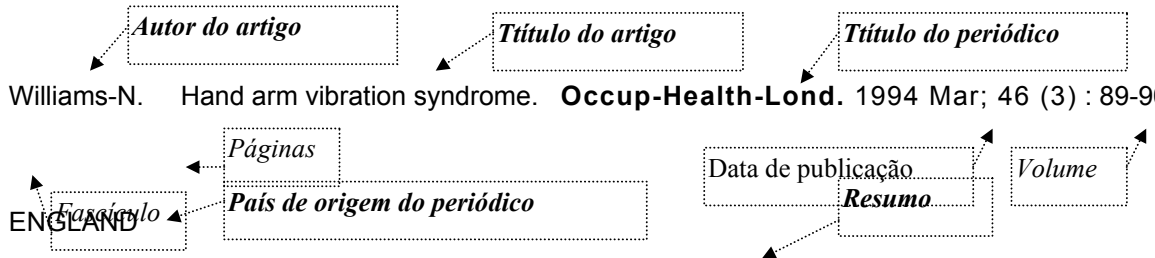
ERGONOMICS ABSTRACTS, bibliografia publicada pelo *Ergonomics Information Analysis Centre, the University of Birmingham – UK*, que divulga uma seleção de resumos da literatura internacional sobre influências do ambiente de trabalho no homem.

INTERNET – rastreamento de documentos eletrônicos e "*sites*" de interesse para LER/DORT , disponíveis para consulta até setembro/98.

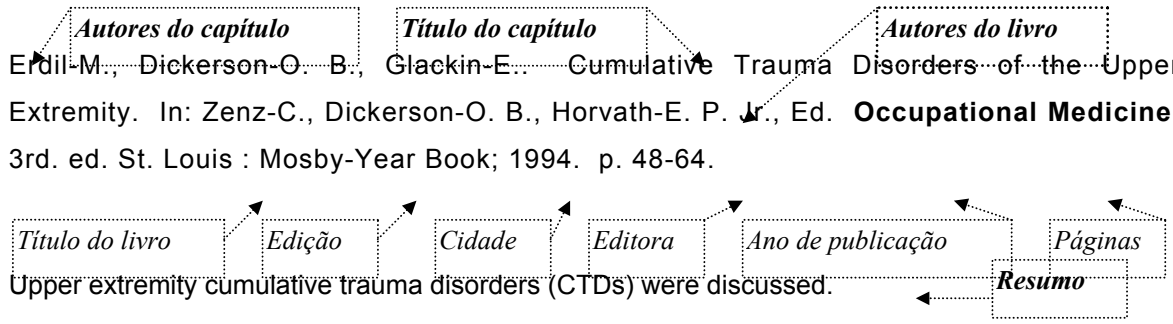
♦ **Organização das Citações**

As citações sobre LER/DORT estão organizadas de acordo com as especificações da temática (qualificadores do Medical Subject Headings (MeSH) da National Library of Medicine e dos Descritores em Ciências da Saúde (DeCS) da BIREME), relacionadas no índice deste trabalho[1]. As publicações citadas são principalmente, artigos de periódicos, livros e teses. As citações obtidas das bases de dados internacionais aparecem em inglês, com a indicação do país de origem do periódico, quando disponível. As citações são acompanhadas dos respectivos resumos, sempre que estiverem presentes nas bases de dados. Seguem exemplos de citação:

- **Artigo de periódico**



- **Capítulo de Livro**



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[1] ***Paras as citações que abrangem mais que um aspecto, foi priorizado apenas o primeiro. Exemplo: um artigo sobre aspectos epidemiológicos que aborda também aspectos sociais e/ou econômicos, aparece no item " Epidemiologia". Em casos de difícil decisão, as citações aparecem repetidas.***

♦ Como Obter Cópias

Cópias dos documentos citados podem ser obtidas através de:

1. Serviços de Bibliotecas, sobretudo os vinculados a instituições acadêmicas;
2. Do Programa COMUT do IBICT (Brasília)
3. Do SCAD, Serviço Cooperativo de Acesso ao Documento da BIREME, mediante pagamento de taxa;
4. Do serviço de Comutação Bibliográfica da Biblioteca/CIR da FSP/USP, mediante pagamento de taxa. A solicitação poderá ser por:

♦ FAX /FONE (011)-30641462

♦ acesso@fsp.usp.br

♦ cópias eletrônicas (via ARIEL) no. 143.107.155.162

Custo aproximado para atendimento

	Artigos encontrados em bibliotecas brasileiras	**Artigos encontrados no Exterior**
Via correio ou Internet*	R$ 4,50 o artigo (até 5 páginas)	R$ 18,00 o artigo (até 10 páginas)
Via FAX	R$ 13,50 o artigo (até 5 páginas)	R$ 25,00 o artigo (até 10 páginas)

- Para Bibliotecas com o Programa ARIEL

Documento elaborado por Maria Maeno Settimi, com base no texto preparatório da Oficina do Comitê Assessor de LER do Ministério da Saúde, realizado no dia 20/11/98. Agradecimentos à Emília Câmara Santana e Lilian Magalhães.

ASPECTOS ECONÔMICOS

1998

Hashemi-L, Webster-BS, Clancy-EA, Courtney-TK. Length of disability and cost of work-related musculoskeletal disorders of the upper extremity. **J-Occup-Environ-Med.** 1998 Mar; 40(3): 261-269

UNITED-STATES

There is little information on the length of disability (LOD) reported for work-related musculoskeletal disorders of the upper extremity (WMSDUE). For this study, LOD, cost, and the relationship between LOD and cost were derived from a large workers' compensation company's claims data for 1994 WMSDUE (n = 21,338). The average LOD was 87 days, with a median of zero days. For those claims with at least one day of compensable disability (25.2%), the average and median LOD were 294 and 99 days, respectively. The distribution of cost was skewed, with the average cost of a claim being 13 times higher than its median. Approximately 60% of the claims cost $1000 or less. Additionally, the 6.8% of the claims with an LOD greater than one year accounted for 59.9% of the cost and 75% of the total disability days. The majority of WMSDUE claimants did not lose sufficient time to qualify for indemnity. For those who did receive lost time wages, a disability duration of more than three months was typical.

1997

Bonzani-PJ, Millender-L, Keelan-B, Mangieri-MG. Factors prolonging disability in work-related cumulative trauma disorders. **J-Hand-Surg-Am.** 1997 Jan; 22 (1): 30-34.

UNITED-STATES

Workers' compensation costs for management of soft tissue disorders continue to increase. The complexity of medical management of these cases has increased due to social factors. The purpose of this study is to improve the physician's ability to recognize nonmedical issues that prevent a rapid return to employment. A classification system is presented that will allow the clinician to identify administrative and pyschosocial issues that prolong disability. Additionally, the patients' job demands were classified by known ergonomic risk factors. The system was applied retrospectively to 50 random cases referred to two occupational hand clinics over a 1-year period. The results indicated that the psychosocial classification of the patient and the current employment status are the most important factors in prolonging disability workers.

Grayzel-EF, Finegan-AM, Ponchak-RE. The value of in-house physical therapy. **J-Occup-Environ-Med.** 1997 Apr; 39 (4): 344-346.

UNITED-STATES

This article describes the benefits of an in-house physical therapy pilot program. The program was initiated in 1994 to improve employees' functional capacity after occupational and nonoccupational musculoskeletal injury, shorten total disability time, use restrictive duty more productively, and reduce total disability costs. The pilot program's initial success led to the establishment of a permanent program.

Katz-JN, Keller-RB, Fossel-AH, Punnett-L, Bessette-L, Simmons-BP, Mooney-N. Predictors of return to work following carpal tunnel release [see comments]. **Am-J-Ind-Med.** 1997 Jan; 31 (1): 85-91

UNITED-STATES

Little is known about factors that predict return to work following carpal tunnel release. Patients enrolled in a prospective, community-based study of carpal tunnel syndrome in Maine were evaluated with standardized questionnaires preoperatively and 6 months following carpal tunnel release. Univariate and multivariate analyses were performed to identify baseline factors associated with work disability 6 months following surgery. Thirty-one of 135 patients (23%) were out of work because of CTS 6 months following surgery. The predominant preoperative variables associated with work absence due to CTS 6 months postoperatively in logistic regression analyses were Workers' Compensation, work absence preoperatively, and worse mental health status ($p <$ or $= 0.01$ for each). In analyses that considered postoperative as well as preoperative variables, persistence of symptoms following surgery was the most striking predictor of failure to return to work due to CTS ($p < 0.0001$). Preoperative correlates of less complete relief of symptoms in multivariate models included involvement of an attorney, milder preoperative symptom severity, preoperative work absence ($p < 0.005$ for each) and exposure to hand intensive work ($p = 0.04$). These data indicate that economic and psychosocial variables have a strong influence upon both return to work and the extent of symptom relief 6 months following surgery for carpal tunnel syndrome.

Liskiewicz-ST, Kerschbaum-WE. Cumulative trauma disorders: an ergonomic approach for prevention**. J-Dent-Hyg.** 1997 Summer; 71(4): 162-167

UNITED-STATES

Clinical practice can place the dental hygienist at risk of acquiring cumulative trauma disorders (CTD). This article describes causative factors of CTD and suggests implementation of ergonomic intervention--by way of clinical and environmental factors--as a method of preventing and/or reducing CTD in the workplace. Included is a chronology of the rehabilitation process of a dental hygienist who has been disabled by CTD. Observing this clinician's re-training process, which included utilizing an ergonomically designed operator chair, arm and wrist supports, and modification of operator positioning, prompted an investigation into strategies to prevent CTD. Ergonomic design and protective operator techniques in dental hygiene practice may be key to preventing and/or reducing CTD occurrence.

1996

Bracci-C., Bottazzi- M. Insurance Coverage for Repetitive Strain Injuries of the Upper Limbs (In Italian.). **Medicina del Lavoro** 1996; 87 (6): 773-777.

A brief outline is given of the current status of the insurance ‘coverage’ provided by INAIL for WMSDs. In breach of a specific European Union recommendation, in Italy various WMSDs can be recognised as occupational only based upon sentence No 179/88 of the Constitutional Court, since such disorders are not included in the list attached to DPR law 336/94. At present, during the period 1990-95, INAIL awarded indemnities in only a handful of cases. Details are provided concerning the evidence that must be submitted in the specific case of claims pertaining to suspected occupational diseases. The authors discuss the problems associated with quantifying injuries for the purposes of claiming indemnities for work-related musculo-skeletal disorders.

Millender-LH, Tromanhauser-SG, Gaynor-S. A team approach to reduce disability in work-related disorders. **Orthop-Clin-North-Am.** 1996 Oct; 27(4): 669-77

UNITED-STATES

Work-related disorders require a multidisciplinary approach. One must understand musculoskeletal disorders, job issues, and psychosocial issues that prolong disability. This introductory article presents an overview of the approaches to management that will be detailed in the articles that follow.

Mitchell-CS. Outcome studies in industry: Cost-effectiveness of cumulative trauma disorder prevention. **American Journal of Industrial Medicine** 1996 Jun; 29 (6): 689-696

UNITED-STATES

Cost-effectiveness analysis (CEA) is a method for choosing between alternative strategies to achieve a specified outcome in an environment of limited resources. This paper discusses the use of CEA in evaluating prevention strategies in industrial settings, using cumulative trauma disorder (CTD) prevention programs as an example. Methodologic issues in designing studies of cost-effectiveness for preventive interventions are discussed. A decision analysis model of a CTD prevention program is described as a means of studying the program's cost-effectiveness. The relationship between CEA and outcomes research, and the strengths and limitations of CEA in evaluating occupational health prevention programs is considered. (C) 1996 Wiley-Liss, Inc

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Nelson-EC, Batalden-PB, Plume-SK, Mohr-JJ. Improving health care, Part 2: A clinical improvement worksheet and users' manual. **Jt-Comm-J-Qual-Improv.** 1996 Aug; 22(8): 531-48

UNITED-STATES

BACKGROUND: Small tests of change can be conducted in everyday clinical practice, thereby turning the health care delivery team into reflective practitioners who can learn from, and improve on, their work. CLINICAL IMPROVEMENT WORKSHEET AND USERS' MANUAL--CASE STUDY: The worksheet has been designed as a simple tool for applying clinical improvement to the core clinical delivery process. A carpal tunnel surgery (CTS) team was formed to improve outcomes and reduce costs for patients and to promote improvements in quality and value. The team wanted to

determine if surgical patients treated with local anesthesia in an ambulatory setting have superior satisfaction with care, comparable clinical and functional outcomes, and lower medical (and social) costs. For the first time, standardized assessments of patient case mix, treatment processes, and health outcomes were designed into the delivery process by gathering data from the patient and from the surgeon presurgery and 4 weeks and 12 weeks postsurgery. Results for the first 49 of 50 to 100 consecutive patients show improved outcomes and reductions in costs, from $937 to $405 per patient. LESSONS LEARNED: Even though CTS was selected to be a quick and noncontroversial opportunity, considerable effort had to be expended to ensure that all clinicians and other affected staff would understand and support "the new way". RECOMMENDATIONS: "Ramp up" improvements as time passes, more and more change trials are conducted and their complexity increases. To ease implementation of changes, teams can diagram core process "components" and attach measures, use flowcharts to plan and monitor implementation and use change management thinking to help sharpen the plan and anticipate problems.

1995

Bjerkedal-T, Wergeland-E. Disability pensions because of musculoskeletal diseases among women of different occupations. **Tidsskr-Nor-Laegeforen.** 1995 Nov 20; 115(28): 3522-3527

NORWAY

Altogether 9,516 women, 16-67 years of age, were granted a disability pension in Norway in 1993. Musculoskeletal disease was registered as the main diagnosis for 3,730. Employment status is known for 3,125 of these 3,730 women. Analyses, based on age standardized incidence rates--SIR's, pointed to shop assistants, practical nurses and charladies as the three major occupational groups with high risk of being disability pensioned because of musculoskeletal disease. These three occupations accounted for more than one third of all women in paid employment who were granted a disability pension for musculoskeletal disease 1993. Compensation will amount to about NOK 600 million before these women reach the normal retirement age of 67 years. Prevention of musculoskeletal diseases in the labour force would appear to be potentially cost-effective. So far, prevention of work-related musculoskeletal diseases has focused mainly on the technical ergonomic aspects of the working conditions. It is recommended that more attention be given to organizational aspects, such as daily hours of work, the timing and duration of breaks, work pace and potential to influence one's own work situation.

Fogleman-M, Brogmus-G. Computer mouse use and cumulative trauma disorders of the upper extremities. **Ergonomics** 1995 Dec; 38(12): 2465-2475

ENGLAND

The computer mouse is now present in virtually every office environment because of the recent adoption of the graphical user interface. However, Karlqvist et al. (1994) pointed out that there still remains a paucity of work on the musculoskeletal problems associated specifically with computer mouse use. Likewise, there have been no published data on the magnitude of upper extremity musculoskeletal disorders associated with computer mouse use. In order to ascertain this magnitude, claims data from the Liberty Mutual Group were reviewed for the years 1986 to 1993, inclusive. Count, total cost and average cost per claim for all claims associated with computer use and computer mouse use were determined for the years in question. It was concluded that although there are few claims related to computer mouse use, it appears to be a growing problem, and therefore, perhaps, deserves more research and intervention attention. However, the present magnitude is less than for other musculoskeletal disorders.

Higgs-PE, Edwards-D, Martin-DS, Weeks-PM. Carpal tunnel surgery outcomes in workers: effect of workers' compensation status. **J-Hand-Surg-Am.** 1995 May; 20(3): 354-60

UNITED-STATES

One hundred thirteen workers' compensation and 53 non-workers' compensation patients who had undergone open carpal tunnel release were queried about job status and the presence or absence of residual symptoms of numbness, pain, or nocturnal awakening an average of 42 months postoperatively. Thirty-nine non-workers' compensation subjects were at their original jobs as compared to only 53 workers' compensation subjects. Seventeen of the workers' compensation

subjects were unemployed versus two non-workers' compensation subjects. These differences were significant. Of patients changing jobs, 39 workers' compensation subjects and 2 non-workers' compensation subjects attributed their job change to symptoms of carpal tunnel syndrome. Residual symptoms were significantly more common in workers' compensation compared to non-workers' compensation subjects, with 92 of the former and 26 of the latter subjects reporting some residual symptoms.

Himmelstein-JS, Feuerstein-M, Stanek-EJ-3rd, Koyamatsu-K, Pransky-GS, Morgan-W, Anderson-KO. Work-related upper-extremity disorders and work disability: clinical and psychosocial presentation. **J-Occup-Environ-Med.** 1995 Nov; 37(11): 1278-1286

UNITED-STATES

Work-related upper-extremity disorders (WRUEDs) are an increasingly common cause of work-related symptoms and disability. Although most upper-extremity disorders are acute and self-limited, a small percentage of workers with symptoms go on to permanent disability and account for the majority of costs associated with these conditions. Little is known, however, about this progression from symptoms to disability and how it might be prevented. In this study, we evaluate the demographic, vocational, medical, and psychosocial characteristics of patients with WRUEDs and examine several hypotheses regarding the differences between working and work-disabled patients. One hundred twenty-four consecutive patients were evaluated in a clinic specializing in occupational upper-extremity disorders. Patients currently working (n = 55) and work-disabled patients (n = 59) were similar with regard to age, gender, and reported job demands. The work-disabled group reported less time on the job, more surgeries, a higher frequency of acute antecedent trauma, and more commonly had "indeterminate" musculoskeletal diagnoses. They also reported higher pain levels, more anger with their employer, and a greater psychological response or reactivity to pain. These findings, though cross-sectional in nature, suggest that, in addition to medical management, more aggressive approaches to pain control, prevention of unnecessary surgery, directed efforts to improve patients' abilities to manage residual pain and distress, and attention to employer-employee conflicts may be important in preventing the development of prolonged work disability in this population.

Palmer-DH, Hanrahan-LP. Social and economic costs of carpal tunnel surgery. **Instr-Course-Lect.** 1995; 44: 167-72

UNITED-STATES

In conclusion, we estimate the incidence of carpal tunnel surgery to be between 400,000 and 500,000 cases annually in the United States, with economic costs in excess of $2 billion per year. The costs incurred in workers' compensation cases are almost three times those of other workers and five times those of nonworkers. Despite an increase in medial costs for endoscopic carpal tunnel release, the procedure has a potential to decrease overall costs by lowering productivity and wage reimbursement losses. With better surveillance and data collection systems, workers at risk can be identified and the incidence of occupational carpal tunnel syndrome reduced through appropriate worksite intervention.

Quintner-JL. The Australian RSI debate: stereotyping and medicine. **Disabil-Rehabil.** 1995 Jul; 17(5): 256-62

ENGLAND

The vehement scientific debate which took place in Australia in the 1980s over the epidemic of the chronic cervicobrachial pain syndrome known as repetition strain injury (RSI) was remarkable for the accompanying social commentary offered by many of the medical participants. This commentary was to have a profound effect on relationships between individual doctors and their patients with RSI. It reflected and reinforced the prevailing stereotypes within Australian society, not only of working women, but also of recipients of workers' compensation payments. On the other hand, some of the medical responses to the epidemic were severely criticized by social scientists who analysed the epidemic. In the process of such criticism, a number of stereotypes of doctors were also reinforced.

1994

Adams-ML, Franklin-GM, Barnhart-S. Outcome of carpal tunnel surgery in Washington State workers' compensation. **Am-J-Ind-Med.** 1994 Apr; 25(4): 527-36

UNITED-STATES

All cases of occupational carpal tunnel syndrome (OCTS) who received surgery for this condition in the Washington State workers' compensation system were identified using claim and physician billing databases. One hundred ninety-one incident surgical cases were identified between July 1, 1987 and December 31, 1987, and were followed up a mean of 3 years postoperatively for clinical, disability, and return to work outcomes. Medical record and claim file review was required for clinical and employment information. The mean age of all patients was 36.6 years, 48% were female, and 40% received bilateral surgery. The mean time from claim filing to surgery was 187 days. Ninety-eight percent of cases met the National Institute for Occupational Safety and Health (NIOSH) case definition for OCTS. Relief of pain was complete or modest in 86% (124/145) and only 14% of cases reported no improvement in symptoms. Mean duration of disability (time loss) postoperatively was nearly 4 months, and 8% of cases exceeded 1 year of time loss. The majority of cases returned to their same job (67%) or to a different job (15%). Workers in high risk occupations were less likely to return to the same job after CTS surgery compared to those in lower risk occupations (61% vs. 75%, p = 0.08). In this population, no association was seen between any outcome and age, gender, marital status, or baseline wage. Duration of disability was not significantly related to preoperative severity of OCTS or to more specific case criteria for this condition.(ABSTRACT TRUNCATED AT 250 WORDS)

Dahl-S, Jepsen-JR. Reported occupational diseases. A 5-year follow-up study from the county of Ribe. **Ugeskr-Laeger.** 1994 May 9; 156(19): 2902-7

DENMARK

The present study sought to examine the health-related, work-related, social and economic consequences of occupational disorders. The survey included 503 patients and was undertaken approximately five years after the disease was notified to the Registry of Occupational Diseases (Danish Working Environment services). The response rate was 80% with women accounting for 56% of the responding group. The mean age was 39.5 years. More than half of all respondents were unskilled workers. White-collar workers and civil servants constituted 14%. Musculo-skeletal disorders were the most frequently diagnosed condition. Forty percent of the occupational diseases were reported in the year in which symptoms arose, while 21% of the patients had been symptomatic for more than six years before the disease was notified. The study indicates that many patients' occupational diseases caused them significant social and medical consequences. During their often protracted illnesses, patients underwent numerous medical examinations and additionally contacted several agencies other than health care providers. Economic consequences for the patient were considerable: reduced earning capacity and expenses were only partially offset by the workers' compensation system. The impact on the health care system was also considerable: occupational disease sufferers averaged one week of hospitalization and 18 visits to a general practitioner or specialist.

Korrick-AS, Rest-KM, Davis-LK, Christiani-DC. Use of state workers' compensation data for occupational carpal tunnel syndrome surveillance: a feasibility study in Massachusetts. **Am-J-Ind-Med.** 1994 Jun; 25(6): 837-50

UNITED-STATES

The purpose of this study was to determine the feasibility of using Massachusetts workers' compensation data for passive surveillance of occupational carpal tunnel syndrome (OCTS). Workers' compensation claims for OCTS (n = 358) and for possible cases of OCTS (n = 1,121) active during the first 6 months of 1989 were identified. The availability and distribution of demographic and employment descriptors were assessed. Medical records on a sample of the claims were reviewed to validate the diagnosis of OCTS. Age, gender, and occupation were available for less than 47% of the reported cases of OCTS. The majority (88%) of cases on whom medical record review was performed had a physician's diagnosis of carpal tunnel syndrome (CTS), and most of this group had confirmatory nerve conduction studies or electromyography. However, there were fundamental limitations to workers' compensation based disease surveillance in Massachusetts, including underascertainment of cases, potential ascertainment biases,

delayed case reporting, limited access to specific diagnostic information, and incomplete and sometimes inaccurate information. These limitations are likely to be applicable in many, if not most, states and must be made clear in any analyses based on workers' compensation data.

Webster-BS, Snook-SH. The cost of compensable upper extremity cumulative trauma disorders. **J-Occup-Med**. 1994 Jul; 36(7): 713-7

UNITED-STATES

There is little information available of the costs of upper extremity cumulative trauma disorders. Cost data were collected from computerized records of the Liberty Mutual Insurance Company for upper extremity cumulative trauma disorder workers' compensation claims (N = 6,067) and for all claims (N = 731,087) initiated from 45 states during 1989. The data were not analyzed until July 1992, allowing more accurate "closing cost" data to be used in the analysis. Upper extremity cumulative trauma disorder cases represented 0.83% of all claims and 1.64% of all claims costs. The mean cost per case for upper extremity cumulative trauma disorders was $8070; median cost per case was $824. Medical costs represented 32.9% of the total costs; indemnity costs were 65.1%. The total compensable cost for upper extremity cumulative trauma disorders in the United States was estimated to be $563 million.

Whaley-KE. Foam products plant institutes policies for reducing repetitive motion illnesses. **Occup-Health-Saf.** 1994 May; 63(5): 68-71

UNITED-STATES

ASPECTOS GERAIS

1998

Couto-H.A, Nicoletti- S.J., Lech-O, Organizadores. **Como gerenciar a questão da LER/DORT.** Belo Horizonte: Ergo, 1998.

BRASIL

Fonseca-A. G. Lesões por esforco repetitivo**.** **Rev. Bras. Med**. 1998; 55 (6):373-380.

BRASIL

Miranda-C. F. **Introdução à saúde no trabalho**. São Paulo: Atheneu; 1998. Lesões por esforços repetitivos - LER. p. 71-76

BRASIL

Pires do Rio-R. **LER: ciência e lei**. Belo Horizonte: Health, 1998.

BRASIL

1997

Erdil-M., Dickerson-O.B., eds. **Cumulative trauma disorders - Prevention, evaluation and treatment**. New York : Van Nostrand Reinhold; 1997.

Manual on the diagnosis, treatment and prevention of cumulative trauma disorders (CTDs). Contents include: introduction to the definition and history of CTDs, disease prevalence and costs, and causation controversies; CTDs of the upper extremities (determining the work-relatedness of carpal tunnel syndrome; management of CTDs with physical therapy; surgical evaluation and treatment of peripheral nerve entrapment syndromes; screening and medical surveillance; whole-body and segmental human vibration; video display workstations; ergonomic analysis and the ergonomic safety programme; disability assessment); low back pain (diagnosis and medical management; ergonomic considerations for manual handling); regulatory issues

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Indesteege-B., Malchaire-J. **Musculoskeletal disorders: risk analysis (In French).** Brussels: Institut National de Recherche sur les Conditions de Travail; 1997.

This book is divided ito three parts. The first part presents data from the leterature: definition and description of musculoskeletal disorders of the upper limbs, risk factors etc. The second part considers an analysis method in three stages: trace, observe and quantify risks. The third part is a practical example. There is also a checklist and questionnaire. This book is also published in Dutch.

Lima- M.E A ; Araujo-J.N.G de; Lima, F.P.A ; orgs**. L.E.R: dimensoes ergonômicas e psicossociais.** Belo Horizonte: Health, 1997. 361p.

BRASIL

Nordin-M., Andersson-G.B.J., Pope-M.H. **Musculoskeletal disorders in the workplace: principles and practice.** St. Louis, Missouri : Mosby, 1997.

There have been great advances in the prevention, treatment, and rehabilitation of work-related musculoskeletal disorders throughout the industrialized world. Because every sector of the economy is undergoing changes and adjustments and the healthcare delivery system itself is under scrutiny, a comprehensive analysis of the nature of work-related musculoskeletal disorders is needed. Provided in this text is information about ergonomics and a segmental evaluation of recommended approaches for clinical evaluation and patient care for a broad spectrum of healthcare providers working in the area of occupational medicine. Work-related musculoskeletal disorders are very costly to the economy. Good ergonomics and prevention strategies of other kinds will save money in the long run. Each chapter of the book provides insight into the implications of work-related musculoskeletal disorders for the patient and the healthcare team of physicians, therapists, and ergonomists. The information presented complements the broad-spectrum textbooks by focusing exclusively on the work-related aspects of musculoskeletal disorders. The clinical evaluation and treatment information looks at disorders identified as common-site injuries from epidemiologic studies and discusses treatment options in terms of return to work and workplace adaptation. Experts in each area have written about the latest advances in their specialties with specific reference to the workplace, and each chapter draws on research studies at universities and medical centres across the United States and Europe.

Vallinmaki-J. When the mouse becomes a pest. **Work Health Safety** 1997 : 18-19.

The pain in my hand is excruciating, says one sufferer. The ache in my forearm keeps me awake at night, says another. Routine tasks like carrying a shopping bag or dusting the house can be agony for patients suffering mouse injury.

1996

Bradley-W. Management and Prevention of on the Job Injuries. **AAOHN Journal** Aug. 1996; 44 (8) : 402-405.

The experience of the Health Services Department in applying a proactive, total quality management strategy for the prevention of cumulative trauma disorders (CTD) was presented. The company was an electric transmission and distribution utility in Southwest Florida. Awareness of CTDs began when an employee was diagnosed with carpal tunnel syndrome in 1990. From 1991 to 1992, five additional employees were diagnosed with CTDs, resulting in lost time from work and necessary medical care. An assessment of the worksite revealed lack of employee awareness of methods of avoiding CTD such as proper posture and the necessity of taking breaks from repetitive work; the assessment additionally revealed lack of attention to proper ergonomic working conditions. Employees were enrolled in Working Well programs to teach body mechanics and how to work with computers without causing CTD. Worksites were evaluated by an ergonomic specialist and modifications were made. To evaluate the effectiveness of the program, an evaluation compared the two years prior to initiation of the Working Well program to the two years following the start of the program. In the two years prior to the Working Well program six employees suffered severe CTD necessitating surgery and long term therapy. In the two years since initiation of the Working Well program 35 cases of potential CTD were reported before any nerve involvement occurred; all were referred to prevention counseling and none required the care of a medical

specialist. The author concludes that this experience demonstrates the potential for reducing health care costs, improving employee health, and preventing employee pain and suffering by building awareness and taking action to improve working conditions.

Habes-D.J. Upper extremity cumulative trauma disorders: current trends. In: Bhattacharya-A., McGlothlin-J.D. **Occupational ergonomics: theory and applications.** New York: Marcel Dekker; 1996.

UNITED STATES

Iselin-F., Laroudie-S., Peze-M., Thetio-M. From carpal tunnel to musculoskeletal disorders: a multidisciplinary approach from one universal pathology. **Performances Humaines & Techniques** 1996; 82 : 10-17.

Mood-S.D., Sauter-S.L., eds. **Beyond biomechanics - Psychosocial aspects of musculoskeletal disorders in office work.** Hampshire : Taylor and Francis; 1996.

AB : This book comprises a series of papers concerning the interaction between psychosocial and physical factors in the occurrence of musculoskeletal diseases in office work. Theoretical models and mechanisms are presented and issues for management, prevention and further research are discussed. Papers include: an ecological model of musculoskeletal disorders in office work; work organization, stress and cumulative trauma disorders (CTDs); effects of psychological demand and stress on neuromuscular function; pathophysiology of CTDs; a psychosocial view of cumulative trauma disorders and implications for occupational health and prevention; a cognitive-behavioural perspective on pain in CTDs; workstyle and the prevention, evaluation and rehabilitation of upper-extremity disorders; psychosocial epidemiology in CTD research.

Pujol-M.; Soulat-J. Muscular, articular and periarticular occupational overuse syndrome. In: **Encyclopédie médico-chirurgicale. Toxicologie-Pathologie professionnelle.** 1st Quarter 1996, 110th issue. 6p.

AB : Main contents of this information note on occupational overuse syndrome: theoretical overview; general aspects (terminology; study methods; frequency; aetiopathology; affected side; types of injuries); overuse syndrome of the upper limb (cervico-thoracic syndrome; shoulder diseases (including risk occupations or occupational environments, rotator cuff syndrome; shoulder tunnel neuropathies); elbow diseases; wrist and hand diseases (wrist tunnel syndromes); overuse syndrome of the lower limb (diseases scheduled in France: schedules 57 and 79); overuse syndrome of the spine (compensation, prevention).

Stanek-E. J, Pransky-G. Unilateral vs. Bilateral Carpal Tunnel: Challenges and Approaches**.** **American Journal of Industrial Medicine** Jun. 1996; 29 (6) : 669-678.

The role of various influences on the outcomes for carpal tunnel syndrome (CTS) was considered. Based on a review of the current literature, the usual analytical approach examined the hand instead of the patient as the subject of the analysis; this limited understanding of the functional impact of CTS. Studies which used subjects with CTS in only one extremity and used the unaffected extremity as a control have been based on the premise that the unaffected extremity will not develop the condition. Treatment itself may have an effect on the previously unaffected extremity. In some studies, results were analyzed by extremity. Several factors were identified which appear to be associated with the occurrence or the progression of CTS. In a review of 98 patients with bilateral disease, two or more hand specific or upper extremity specific conditions were identified in 34%. Hand specific conditions were noted in 24% and upper extremity specific diagnoses in 14%. Of 115 patients with unilateral CTS at the start, 30% had an additional hand or extremity condition besides the primary CTS affected hand, with 13% having additional difficulties in the unaffected hand. The authors developed models for hand specific response variables, for including systemic factors, for including hand specific factors, and to incorporate treatment for a hand specific outcome. The advantages of including all these aspects into the model are that it provides a more rational approach to research and care of extremity disorders. This allows researchers to address a wider scope of patients and outcomes. They stress the need for more extensive collection of data.

1995

[Anonymous]. **Cumulative Trauma Disorders in the Workplace.**. Cincinnati, Ohio : Education and Information Division, NIOSH, U.S. Department of Health and Human Services; 1995. DHHS (NIOSH) Publication No. 95-119

This publication provided a compilation of materials describing research conducted by NIOSH on cumulative trauma disorders in the workplace. Selected references, both NIOSH and nonNIOSH, were provided, concentrating on NIOSH activities in preventing work related musculoskeletal disorders, prevention and intervention research at NIOSH for work related musculoskeletal disorders, comments to the Department of Labor on the OSHA proposed rule on ergonomic safety and health management, a manual for musculoskeletal diseases of the upper limbs, a review of physical exercises recommended for video display tube operators, management of upper extremity cumulative trauma disorders, ergonomics and prevention of musculoskeletal injuries, and carpal tunnel syndrome. A bibliography of NIOSH publications on cumulative trauma disorders in the workplace was provided, including numbered publications, testimony, journal articles, grant reports, contract reports, and health hazard evaluations. NonNiosh references were also listed.

Couto-H.A. Os membros superiores no trabalho e ergonomia das ferramenta. In: Couto-H. **Ergonomia aplicada ao trabalho.** Belo Horizonte: Ergo, l995; p.15-85

BRASIL

Herington-T.N.; Morse-L.H. **Occupational injuries - Evaluation, management and prevention**. St. Louis, Missouri : Mosby-Year Book; 1995.

UNITED-STATES

Contents of this manual includes: epidemiology of work injury; occupational health care and workers' compensation; operation of an occupational health clinic; administrative aspects; legal and ethical issues in occupational medicine; management of disorders of the hand, shoulder, elbow, neck, spine, knee, foot, brain, eyes and skin; management of burns, respiratory injuries, and chest and abdominal pain; patient management; pain management; injuries related to repetitive motion, chemical exposures, temperature, noise, vibration, radiation, electricity and lightning; building-related and infectious disorders; injuries to divers and compressed air workers; psychiatric issues; resources for the physician treating injured workers; personal protective equipment; ergonomics; vocational rehabilitation; drug testing.

Herington-T. N., Morse-L. H.. Cumulative Trauma/Repetitive Motion Injuries Occupational Injuries. In: Herington-T N., Morse-L. H., Ed. **Evaluation, Management, and Prevention**. St. Louis, Missouri : Mosby-Year Book; 1995.

This chapter discussed repetitive motion injury, focusing primarily on keyboard use as the prototype for the ailment in this decade. Diseases of weavers caused by repetitive motion were reported as early as 1713. Keys to the medical history are critical in order to arrive at the correct diagnosis, but also to determine whether the malady is work related. Keys to the physical examination include observation, range of motion testing, palpation for tenderness, measuring muscle strength, sensory evaluations, testing of reflexes and provocative testing. For severe symptoms physical therapy, hand therapy or occupational therapy may be useful. The authors stress that surgery is very rarely needed and frequently harmful. Workplace intervention must occur as an integral part of medical management if treatment is to succeed. Workstation interventions in the typical office include raising or lowering work surfaces and providing lumber support pillows, foot rests, document holders, adjustable keyboard trays, wrist rests, copy stands, mouse nests, electric staplers, and telephone headsets. Work task intervention seeks to modify or eliminate deleterious activities, work practice intervention addresses individual work habits. Common injuries include tendonitis, nerve entrapment syndromes, muscle pain and spasm syndrome, degenerative joint disease, and thoracic outlet syndrome. Associated conditions with repetitive motion injury include depression and reflex sympathetic dystrophy syndrome. Case studies were presented of a member of a secretarial pool, an assistant manager of a large chain supermarket, a newspaper journalist, a kitchen worker, and a warehouse worker.

Hoppmann-R.A., Reid-R.R. Musculoskeletal problems of performing artists. **Curr. Opin. Rheumatol.** 1995; 7 (2) : 147-150.

Within the new field of performing arts medicine is an active group of researchers and clinicians who are dedicated to advancing our understanding of musculoskeletal problems of performers. Among these problems are those of the upper extremity in instrumental musicians such as overuse syndrome, entrapment neuropathies, focal dystonia, osteoarthritis, and problems related to joint hypermobility. The epidemiology of these problems is presented as well as results of recent studies investigating their etiology as they relate to musicians. A brief discussion of the treatment of injured musicians also is included.

Huppes-G., Bruning-M. Repetitive work and RSI (In Dutch) **Tijdschrift voor Ergonomie** 1995; 20 (3) : 15-19.

Kuorinka-I. et al. **Work related musculoskeletal disorders (WMSDs): a reference book for prevention.** London: Taylor & Francis; 1995.

This book contains scientific information that will help prevent WMSDs. It has been produced at the request of the Institut de Recherche en Santé et en Securité du Travail du Quebec (Quebec Institute on Occupational Health and Safety), which decided in 1991 to launch various activities to prevent WMSDs in the province of Quebec. The project included the creation of an important database on WMSDs research, and was financed and supported by the IRSST. Part of the strategy was to invite an international expert group to prepare a scientific evaluation of WMSDs to back up other activities (including the possibility of preparing guidelines for industry). The iniciative, originated by the ergonomics group of the National Recherche Council of Canada gained support from other parts of Canada. The scientific evaluation prepared by the international expert group forms the essence of this book. The expert group's goal was twofold. The first objective was to examine the work relatedness of WMSDs in the light of the existing literature. The second objective was to explore and synthesize information, avenues and approaches that could help in the prevention of WMSDs. While the literature is not solid on all aspects of the problem, analogies from other areas of safety and health have been used to illustrate other approaches.

Linder-M.I. Gave My Employer a Chicken that Had No Bone: Joint Firm-State Responsibility for Line-Speed-Related Occupational Injuries Case Western. **Reserve Law Review**, 1995;. 46 (1) : 33-143.

The author presents the various concerns of the meat processing industry worker as they relate primarily to the processing of chickens and chicken parts. In the poultry processing industry, workers are exposed to unsanitary conditions, forced to work in small spaces with sharp instruments, and perform work which requires the repetitive use of the hands and muscles. These conditions produce excess levels of cuts and abrasions and repetitive cumulative trauma disorders in these workers. According to Bureau of Labor Statistics data for 1992, meat packing and poultry slaughtering and processing facilities ranked first and third in incidence rates of disorders associated with repeated trauma; 1,395.6 and 693.4 per 10,000 fulltime workers, respectively. The effect of the production process, in particular line speed, on workplace health and safety; the lack of worker control of the production process; and the lack of adequate government regulations to protect the workers were discussed. The legislative history of national poultry processing regulation, and a detailed analysis of the evolution and consequences for workers and consumers of the US Department of Agriculture's policies and line speed regulations were presented. OSHA's role in controlling line speeds and holding employers responsible for providing workers with safe employment were also discussed.

Littlejohn-G.O. Key issues in repetitive strain injury. **Musculoskelet. Pain.** 1995; 3 (2) : 25-33.

Objective: To examine the nomenclature, clinical features, pathophysiology, management, outcome and prevention of the 'RSI' construct with particular reference to that of fibromyalgia syndrome. Findings and conclusion: The condition known as 'RSI' is characterized by regional pain and hyperalgesia and other clinical features also seen in generalized fibromyalgia syndrome. The

condition is not caused by ongoing tissue damage, is always potentially reversible and like other chronic pain syndromes is influenced by societal and personal factors more than the initial triggering physical and nociceptive factors.

National Institute for Occupational Safety and Health. NIOSH. **Cumulative trauma disorders in the workplace: bibliography**. Cincinati, Ohio: DHHS (NIOSH); 1995. Publication nº 95-119.

This publication is divided into two parts. Part I includes complete or partial copies of NIOSH and non NIOSH references on cumulative trauma disorders (CTDs). These references were selected to provide a summary of NIOSH research and policy, and to provide CTD information of general interest to the reader. The titles of the references in Part I are listed in the Contents (page iii). Part II contains a comprehensive bibliography of NIOSH documents on cumulative trauma disorders (Part II.A), as well as a brief listing of selected non-NIOSH references (part II.B).

Rice-A. **Breaking point - a guide to preventing occupational overuse syndrome.** London: Pluto Press; 1995.

The manual is aimed directly at workers. Contents include: definition, symptoms and classification of overuse (those affecting tendons, nerves, muscles; vibration-induce injuries); causes (force, frequency and duration of movement, posture, contributing factors; types of activity at risk; persons at particular risk - tall and short people, women); problem assessment (health survey, workplace assessment); prevention (work design, work organization, role of safety representatives); treatment and compesation; role of trade unions. The appendices include a model health questionnaire and a model workplace check list.

Rosenberg N.L. **Occupational and environmental neurology**. Boston : Butterworth-Heinemann; 1995.

Contents of this manual: overview of occupational neurology; recognition and evaluation of work-related neurologic disorders; determination of causality and the impairment rating process; neurotoxicity of organic solvents; neurobehavioural disorders in workers; paroxysmal disorders and occupational neurology; movement disorders; chemically induced toxic neuropathy; cumulative trauma disorders; brain and spinal cord injuries in the workplace; work-related low back pain; neurologic disorders in performing artists; occupational and environmental exposures and the risk of developing "naturally occurring" neurologic disorders.

1994

Adorno-R.F., Castro-A.L., Faria-M. M; Zioni-F. Mulher, mulher: saúde, trabalho, cotidiano. In: Alves-P.C., Minayo-M.C. **Saúde e doença: um olhar antropológico**. Rio de Janeiro : Fiocruz; 1994. p.141-52.

Aborda um problema das sociedades industriais complexas que vem sendo delimitado como uma questão de Saúde Pública e que tem sua origem na forma de organização do trabalho - a lesão por esforço repetitivo - procurando lançar o olhar sobre as particularidades do cotidiano de mulheres lesadas (AU).

Bundesanstalt für Arbeitsmedizin. **Medical aspects of modern office work.** Germany : Wirtschaftsverlag NW; 1994.

Proceedings of a workshop in Germany, held on 10 September 1994. The subjects covered were: visual strain by work on computers, electromagnetic fields, harmful substances, noise, lighting and climate in the office, the problems of sedentary work, subjectively perceived stress caused by work on computers, the causes and symptoms of the sick building syndrome, the occurrence of musculoskeletal diseases, tasks and workload in the modern office.

Erdil-M., Dickerson-O. B., Glackin-E.. Cumulative Trauma Disorders of the Upper Extremity. In: Zenz-C., Dickerson-O. B., Horvath-E. P. Jr., Ed. **Occupational Medicine**. 3rd. Ed. St. Louis : Mosby-Year Book; 1994. P. 48-64.

Upper extremity cumulative trauma disorders (CTDs) were discussed. The epidemiological aspects of the CTD problem were summarized. The results of studies examining occupational risk factors

for CTDs and carpal tunnel syndrome (CTS) were considered. Jobs involving highly repetitive arm and wrist motions, especially those requiring high force exertion, were found to significantly increase the risk of CTDs, including CTS. Repetitive wrist or finger movements with loading of tendons in the carpal tunnel, forceful contraction of these tendons, extreme wrist flexion or extension, awkward postures or pinch, mechanical stress to the median nerve at the base of the palm, vibration, and poorly fitting gloves have been suggested as occupational risk factors for CTS. CTS was reviewed, including nonoccupational risk factors for CTS, clinical symptoms of CTS, diagnosing CTS, surgical and nonsurgical treatments for CTS, and ergonomic and other strategies for preventing CTS. Other CTDs were discussed, including tendinitis and tenosynovitis, epicondylitis, bicipital or rotator cuff tendinitis, ganglionic cyst, pronator syndrome, cubital syndrome, ulnar neuropathy at Guyons Canal, supinator or posterior interosseous nerve syndrome, and thoracic outlet syndrome.

Korrick-S. A., Rest-K. M., Davis-L. K., Christiani-D. C. Use of State Workers' Compensation Data for Occupational Carpal Tunnel Syndrome Surveillance: A Feasibility Study in Massachusetts. **American Journal of Industrial Medicine** Jun. 1994; 25 (6) : 837-850.

The feasibility of using Massachusetts worker' compensation data for passive surveillance of occupational carpal tunnel syndrome (OCTS) was examined. Massachusetts requires all private sector and some public sector employers to maintain workers' compensation insurance coverage. Compensation claims that were active during the first half of 1989 were identified for inclusion in the study. Among the total of 2,451 claims, there were 358 cases with a carpal tunnel syndrome (CTS) code attached. At the time of the study the employer's first report of injury was the only source of data concerning birth, gender, and occupation in the computerized data. The data indicated that a relatively young population was affected by OCTS. The morbidity, lost productivity, and medical costs associated with OCTS were felt to be substantial. The majority of the cases in this study, 88%, had a physician's diagnosis of CTS, and most had confirmatory nerve conduction studies or electromyography. Fundamental limitations in the data were noted including under ascertainment of cases, potential ascertainment biases, delayed case reported, limited access to specific diagnostic information, and incomplete and sometimes inaccurate information. The authors conclude that these limitations are likely to be applicable to many states and must be made clear where analyses are performed using workers' compensation data as a basis for the study.

Owen-R.D. Carpal tunnel syndrome: A products liability prospective. **Ergonomics** Mar. 1994, 37:(3): 449-476.

Information is provided on the evaluation and litigation of product liability cases involving carpal tunnel syndrome (CTS) in the USA. The history of CTS is outlined followed by medical aspects, factors combining to produce CTS (physical environment, ergonomic exposure) and remediation techniques. The current state of litigation relative to CTS is then discussed including the duty of manufacturers to design, produce and distribute safe products and to provide warning notices where necessary.

1993

Assunção-AA.; Rocha-L.E. Agora... até namorar fica difícil: uma históia de lesões por esforços repetitivos. In: Rocha-L.E., Rigotto-R.M., Buschinelli-J.T.P, Orgs. **Isto é trabalho de gente?.** São Paulo: Vozes; 1993. p.461-493

BRASIL

1991

Couto-H. **Tenossinovite e outras lesões por traumas cumulativos dos membros superiores de origem ocupacional.** Belo Horizonte: Ergo; 1991.

BRASIL

ASPECTOS LEGAIS

1997

Mullens-SU, Cassvan-A, Weiss-LD, Weiss-JM, Rook-JL. Medicolegal issues in cumulative trauma disorders. **Cumulative Trauma Disorders** 1997; 223-234

1996

Hadler-N.M. A keyboard for "Daubert". **Journal of Occupational and Environmental Medicine** May 1996; 38 (5) : 469-476.

This editorial examines the use of scientific and clinical evidence relating to the health hazards of keyboard use. The title refers to a case (Daubert versus Merrel Dow Pharmaceuticals Inc.) that the US Supreme Court sent back to a lower court for rehearing. The plaintiff had asserted that keyboard work was hazardous. Clinical experience and common experience confute the assertion that operating a keyboard is hazardous. The "cumulative trauma disorder" hypothesis is discussed, with particular reference to carpal tunnel syndrome and regional arm pain. Published studies provide compelling scientific evidence to support the assertion that no pattern of keyboard usage studied increases the likelihood of suffering either of these diseases.

Teyssier-Cotte-C. Peri-articulatory disabilities recognized to be of professional origin in three ward auxiliaries. **Arch. Mal. Prof. Med. Trav.** 1996; 57 (4) : 264-266.

Three ward auxiliaries working in institutions or different health care organizations were refused recognition of the professional disabilities for carpal tunnel syndrome and elbow tendinosis. The French Social Security Court ordered a court assessor to describe the professional movement sand ascertain if the victims regularly carried out or not the movements listed in Table 57 of the Professional Disabilities Schedules. The movements and postures made by the ward auxiliaries carrying out different duties were directly observed, recorded on a videoscope and analyzed. The time taken for each of these duties was established with the help of the head nurses and the auxiliaries in question. The ward auxiliaries carried out the movements listed Table 57 of the Professional Disabilities Schedules. These movements were regularly repeated during the different activities, some of them requiring force and all being executed under a time constraint, during respectively 28, 30 and 39 hours per week. At the present time, there are no data available to provide na answer to the question of the existence of a thershold or a minimum period of time below which these pathologies would not be likely to appear. A judgment recognizing the professional nature of these pathologies was given for each of the cases.

1995

Barker-K.L. Repetitive strain injury: A review of the legal issues. **Physiotherapy** 1995; 81 (2) : 103-106.

The number of cases of work related upper limb disorder, or repetitive strain injury(RSI), coming before the courts has increased dramatically over the last few years. Recent judgements, particularly that of Judge Presser in the Mughal case, have highlighted the complex nature of the complaint and the difficulties in proving a cause /effect relationship in alleged work-related disorders. This paper reviews the legal issues surrounding RSI and the problems associated with the different nomenclature for upper limb disorders. The statutory duties of the employer and the legal issues associated with recent changes to the health and safety legislation, and the conduct of litigation brought by those who believe they have sustained such an injury through their work are also considered. Finally, some of the arguments that are likely to be advanced by both the plaintiff and defendant in any such case are presented.

Turner-W. Assessable disability and the occupational overuse syndrome. **The Journal of Occupational Health and Safety - Australia and New Zealand** Apr. 1995; 11 (2) : 153-156.

Medico-legal issues concerning the presence or absence of assessable disability arising from occupational overuse syndrome are discussed with reference to the New Zealand Accident Compensation Act 1982. The Accident Compensation Corporation has moderated its position of non-acceptance, so that patients with an incapacity to work through a partial permanent disability are now eligible for lump sum compensation under the 1982 Act. The medico-legal decisions which

led to this change are outlined and the role of medical practitioners in disability assessments is discussed.

ASPECTOS SOCIAIS

1997

Ribeiro-H.P. Repetition Strain Injury (RSI): An Emblematic Illness; Lesoes por esforcos repetitivos (LER): uma doenca emblematica. **Cadernos-de-Saude-Publica** 1997; 13 (2 Suplemento) : 85-93.

Brasil

Muscular-skeletal disorders of the upper limbs resulting from work involving repetition strain are now the most frequent work-related diseases in early- or late-industrialized countries. Here, it is argued that these work-related diseases are symbolic illnesses revealing the contradictions & social pathogenesis of the new cycle of development & crisis in capitalist production. Noting social & historical dimensions of this process, interventions suggested by labor engineering, ergonomics, & clinical medicine in the prevention, diagnosis, treatment, & rehabilitation of these postmodern illnesses are found to be ineffective. Because the use of technological innovations & new forms of work management are defined according to the exclusive interests of capital, a growing contingent of young workers (mainly female) are losing or under threat of losing their health & work capacity. It is concluded that the solution to the issue of repetition strain must be political & collective. 24 References. Adapted from the source document.

Rosenstock-L. **The Science of Occupational Musculoskeletal Disorders.** Cincinati, Ohio : NIOSH, U.S. Department of Health and Human Services; 1997. Publication No. 97-142.

This report of written testimony to the House of Representatives concerned the magnitude and scope of the problem of work related musculoskeletal disorders (MSDs) and two decades of experience and research amassed by NIOSH in this area of study. Musculoskeletal disorders have been among the most prevalent medical problems among workers in the United States, affecting 7% of the general population. The Bureau of Labor Statistics Annual Survey of Occupational Injuries and Illnesses indicated that in 1995, 62% of all illness cases were due to disorders associated with repeated trauma, excluding low back disorders. In 1994 approximately 32% or 705,800 cases were the result of overexertion or repetitive motion. Estimated annual costs of such injuries range from 13 to 20 billion dollars. Some examples were provided of research findings concerned with low back disorders, disorders of the neck and shoulders, and disorders of the hand, wrist and elbow. Information was provided concerning various factors such as the length and intensity of exposure and the significance of psychological factors. NIOSH has been using a public health approach to spread understanding and preventive methods so that the incidence and severity of work related musculoskeletal disorders will be reduced.

1996

Arnetz-Bengt-B. Causes of Change in the Health of Populations: A Biopsychosocial Viewpoint. **Social-Science-and-Medicine** 1996 Sep; 43 (5) : 605-608.

Argues that traditional views of disease mechanisms are insufficient to understand the recent phenomena of musculoskeletal & “new age” disorders or environmental illnesses that represent dramatic changes in the pattern of diseases. In this context, a biopsychosocial viewpoint is adopted to examine the major factors that may contribute to the shift in the health of populations. Secondary empirical data suggests a link between the psychosocial environment, including unemployment & cardiovascular disease; underutilization in the workplace & musculoskeletal disorders; & exposure to electric & magnetic fields & illness. It is argued that the psychosocial work environment, where stress levels are heightened & job insecurity is increased, influence changes in population health. 31 References. Adapted from the source document.

Brogmus-G.E., Sorok-G.S., Webster-B.S. Recent trends in work-related cumulative trauma disorders of the upper extremities in the United States: An evaluation of possible reasons. **Journal of Occupational and Environmental Medicine** Apr. 1996; 38 (4) : 401-411.

AB : This study discusses the upward trends of cumulative trauma disorders of the upper extremities (CTDUEs) in US industry. Various aspects are examined and a possible explanation is offered: As people with the symptoms of CTDUEs have learned of the compensability of their disorders, they make claims. As more claims are made, more jurisdictions recognize these kinds of claims as work related and compensable. As more people with CTDUEs symptoms realize that they can be compensated, a peak phenomenon (followed by a levelling-off of reporting) may be recognized in the trend as it has previously been reported in Australia and in USA. Special consideration supporting this explanation is given to specific job classes.

Cahill-J. Psychosocial Aspects of Interventions in Occupational Safety and Health. **American Journal of Industrial Medicine**, Apr. 1996; 29 (4) : 308-313.

Increased attention to psychosocial hazards as targets of occupational health and safety interventions was proposed. Measurable psychosocial factors have been linked to negative psychological and physiological consequences and to physical health hazards. Economic trends, including declining wages, fewer manufacturing jobs, increased work hours, reduced unionization rates and poor implementation of technological changes, indicated that more jobs will have psychosocial hazards. Downward pressure on salaries has resulted from the shift from a manufacturing based to a service based economy. Psychosocial hazards resulting from reduced wages included increased working hours, more families with two or more wage earners and less leisure time to compensate for job related stress. The declining percentage of unionized workers, resulting from the reduced manufacturing base, has led to less union pressure for safe working conditions and employee control over work. Jobs produced by the new economy have tended to involve combined physical and psychosocial dangers, such as repetitive strain injuries or sick building syndrome. Workers have also been exposed to job insecurity from low wage temporary work and to psychosocial pressure due to demands for high output, combined with lack of autonomy, physical danger or monotony. The author proposes that psychosocial hazard reduction interventions focus on the social context of such hazards, rather than limiting them to individual coping with job stress. Examples of positive organizational changes were policies that would increase employee autonomy, job security, skill levels and supervisory and coworker social support. Improved physical working conditions and better use of technology, were also suggested. The author concludes that interventions intended to reduce sources of psychosocial stress should be based on knowledge of the many causes of such stress and the multiple symptoms produced. Interventions should be assessed with psychophysiological strain and attitudinal measurements, such as the NIOSH occupational stress questionnaire and Job Content Questionnaire.

Dembe-A.E. **Occupation and disease - How social factors affect the conception of work-related disorders.** London : Yale University Press; 1996.

AB : This book examines the process by which certain medical disorders come to be regarded by physicians as work-related. Following an introductory chapter on how social factors can shape the medical recognition and conception of occupational disease, three ailments now commonly considered to be work-related are considered: cumulative trauma disorders of the hands and wrists, back pain, and noise-induced hearing loss. The relative contribution of each of the key social factors in each case study is assessed and common trends and patterns are highlighted.

1995

Andersson-G.B.J., Fine-L.J., Silverstein-B.A. Musculoskeletal Disorders Occupational Health. In: Levy-B.S., Wegman-D.H., Ed. **Recognizing and Preventing Work-Related Disease**. 3ª ed. Boston : Little, Brown and Company, 1995. p. 455-489.

Work related musculoskeletal system disorders focused on low back pain (LBP) and problems of the neck and upper extremities, the most commonly occurring musculoskeletal disorders, were reviewed. Case reports describing an automobile mechanic suffering from LBP and a spot welder who developed carpal tunnel syndrome were presented to illustrate the two disorders. A discussion of LBP and neck and upper extremity disorders considered the magnitude and cost of each

condition, techniques used for diagnosis, risk factors, techniques used for managing the conditions, their prognosis, and preventing and controlling the problems. LBP is considered the most costly of the occupational health problems. More than 16 billion dollars is spent each year for treating and compensating LBP patients in the US. Occupational risk factors for LBP include jobs that involve heavy physical work, static work postures, frequent bending and lifting, pushing and pulling, repetitive work, vibration exposures, and psychosocial factors such as monotony and job dissatisfaction. It has been postulated that psychological factors may be more important than physical factors for LBP severe enough to result in filing a workers' compensation claim for LBP. Only limited data exist on the incidence of neck and upper extremity disorders. The Bureau of Labor Statistics estimated that the incidence of occupational illnesses and disorders associated with repetitive trauma was three cases per 1,000 fulltime workers (case/1,000) in 1991. There has been a steady increase in the rate since 1982, when the rate was 0.4case/1,000. Risk factors for neck and upper extremity musculoskeletal disorders include repetitive and forceful motions, mechanical stress, static or awkward postures, local vibrations, and psychosocial factors originating from personality factors interacting with the way work is organized. A summary of the various categories of work related upper extremity musculoskeletal diseases was presented.

Araujo-J.-G. An Ambiguous Policy of Institutional "Reinsertion". **International Sociological Association-Research Committee on Clinical Sociology-No. 46 (ISA-RCCS)** 1995.

Brazil

The increase in repetitive strain injury in Brazil is becoming a problem both for worker health & for the human resource policies of organizations. Described here is a university program of worker readaptation & relocation, illustrated by the case of a group of women restaurant workers who were offered new jobs involving simple & light tasks requiring reduced physical & mental effort. While this policy meets legal obligations, it serves a humanitarian purpose, protecting those women from the personal sufferings associated with unemployment. However, when considered from a socioclinical point of view, it is shown that the women experienced feelings of loss, particularly those related to social recognition, professional identity & performance, & missing their former restaurant colleagues, resulting in complaints of loneliness, anonymity, & uselessness. Examining the ambiguous nature of this policy of "reinsertion," discussed is how it can paradoxically lead to "misinsertion," despite the institution's best efforts.

Fogleman-M., Brogmus-G. Computer Mouse Use and Cumulative Trauma Disorders of the Upper Extremities. **Ergonomics** Dec. 1995; 38 (12) : 2465-2475.

Information pertaining to the count, total costs and average costs per claim of Liberty Mutual Group workers' compensation claims data which were due to cumulative trauma disorders of the upper extremities (CTDUE) associated with computer and computer mouse use was presented. Records of the claims compensation from Liberty Mutual Group were analyzed for 1986 through 1993. Over 88% of the claims had been closed. Costs included medical services such as medical care provider payments, rehabilitation expenses and vocational training expenses, indemnity payments for lost wages, and investigative or legal fees incurred by the company. The claims associated with the use of a computer mouse were very small relative to all claims, and relative to CTDUE claims, but were not small when related only to computer claims. CTDUE claims have risen as a percent of all claims in a steady progression from 1986 through 1993, but the average cost declined from 1988 through 1993. The median total costs for 1993 were 192 dollars for all claims, 372 dollars for CTDUE claims, 314 dollars for computer claims and 170 dollars for mouse claims. Females experience a disproportionate number and cost of CTDUEs, computer related CTDUEs and computer mouse related CTDUEs. Computer mouse claims have a somewhat higher proportion of strains and a somewhat lower proportion of carpal tunnel syndrome categorizations. Computer mouse claims have a somewhat lower proportion of wrist injuries and a slightly higher proportion of hand injuries, upper arm injuries and lower arm injuries. The authors conclude that, although there are few claims related to computer mouse use and the present magnitude is less than for other musculoskeletal disorders, it appears to be a growing problem which deserves more research and intervention attention.

Gross-A. S., Louis-D. S., Carr-K.A., Weiss-S.A. Carpal Tunnel Syndrome: A Clinicopathologic Study. **Journal of Occupational and Environmental Medicine** Apr. 1995; 37 (4) : 437-441

A study of 44 patients undergoing carpal tunnel release was performed to determine if the observed histology was related to clinical course. All patients had standard wrist roentgenograms and nerve conduction studies showing prolonged sensory latency. Tenosynovium was biopsied from 16 males and 28 females with an average age of 51 years. Control tissue was obtained from ten patients undergoing elective hand or wrist surgery. Tenosynovial tissue was evaluated on a scale of one to three for inflammation, synovial hyperplasia, collagen degeneration, and edema myxoid changes. A follow up interview conducted at least 6 months post surgery surveyed satisfaction level and work limitations, whether this work required wrist repetitions, at what rate these repetitions occurred and if they involved forceful repetitions greater than 4 kilograms. Patients were grouped according to satisfaction level, and comparisons were made between groups as well as to histological groups using Fischer's exact test. Collagen degeneration was found in 89%, inflammation in 11%, and synovial hyperplasia in 7% of the patients with carpal tunnel syndrome and in none of the controls. Postoperative work limitation was dependent upon the involvement of forceful repetitions and the presence or absence of worker's compensation claims. The authors conclude that of the histological features evaluated, only marked collagen degeneration is significant. Tenosynovium changes do not show a progression that correlates with clinical history or outcomes but rather repetition forces and the presence of workers' compensation are related to a worse outcome following surgery.

1994

Arksey-H. Expert and Lay Participation in the Construction of Medical Knowledge. **Sociology-of-Health-and-Illness** 1994 Sep; 16 (4) : 448-468.

United-Kingdom

Investigates the explanatory value of Ludwik Fleck's conceptual analysis (eg, 1935) with regard to the development of medical knowledge, drawing on empirical data from an ongoing case study of repetitive strain injury, a condition currently disputed within medical circles. Though empirical substantiation is found for some of Fleck's beliefs, his notion that general practitioners are educated & patients uneducated is too simplistic; in particular circumstances, these attributes may be reversed. Furthermore, there is little evidence to show that ideas are circulated & exchanged between specialists, general practitioners, & laypersons: according to this revised view, medical knowledge is determined by experts alone. Invoking an extended version of H. M. Collins's notion of the "core-set" (see SA 37:3/89U6365), considered is how seemingly marginal actors can exploit their technical competence & thus play an influential role in medical debate. 70 References. Adapted from the source document.

Courville-J., Dumais-L., Vázina-N. Working conditions and development of musculoskeletal disorders among female and male workers on a poultry cutting line. **Travail et Santé** Sep.1994; 10 (3) : S17-S23.

Economic restructuring combined with the sexual division of labour increases the "taylorization" of work in the food and agricultural industry. This accentuates health problems, especially musculo-skeletal disorders, associated with repetitive work. A study involving 27 workers (17 women, 10 men) was carried out on a poultry-cutting line where accidents frequently occur to investigate workers' perceptions regarding conditions that could result in pain and work accidents. Accidents registered were studied, work procedures were observed on site and workers were interviewed. The information collected concerned pain and physical difficulties experienced while working, and the reported and observed causes of the problems. Important differences between men and women were noted for all these variables. These are probably related to the differences in job demands such as tasks, required forces, precision and meticulousness that differ between women's and men's jobs in the plant.

Mital-A., Ghahramani-B. The injury profile of a large telecommunication company: a statistical summary. **Ergonomics** Oct. 1994; 37 (10, Special Issue) : 1591-1601.

Over the years, over-exertion injuries have continued to increase despite ergonomic interventions to control their frequency of occurrence. Occupational injury and illness data from a large US telecommunications company (297,548 employees), collected over a seven-year period, suggest

that: (1) better record-keeping may be a reason behind the reported increase in injuries; workday losses decline as a result of improved ergonomic and occupational health interventions; (2) serious injuries are not just limited to heavy manufacturing industries; and (3) reduction in workday losses may not translate in injury cost savings.

CIRURGIA

1995

Siegel-D. B., Kuzma-G., Eakins-D. Anatomic Investigation of the Role of the Lumbrical Muscles in Carpal Tunnel Syndrome. **Journal of Hand Surgery** Sep. 1995; 20A (5) : 860-863.

The possible role of lumbrical muscles in carpal tunnel syndrome (CTS) was examined. The carpal canals of 128 hands of 119 patients with idiopathic CTS were surgically explored while performing carpal tunnel release for CTS. The origins of the lumbrical muscles were determined. A similar analysis was performed on 40 fresh cadaveric hands without thenar or intrinsic muscle atrophy, scarring indicative of previous surgery or hand injuries, or evidence of cortisone injection. In the CTS patients, the lumbrical muscle origins were located significantly more proximal to the transverse carpal ligament or carpal canal than were the origins of the same muscles in the cadaveric hand. CTS patients who were under 45 years of age whose jobs required repetitive hand movements typically had larger lumbrical muscles and muscles whose origins were more proximal to the transverse carpal ligament or carpal canal than the other CTS patients or the cadaver hands. The authors conclude that young patients with idiopathic CTS are more likely to have lumbrical muscles lying within the carpal tunnel than more elderly subjects. They recommend that all patients undergoing carpal tunnel release have a thorough exploration of the carpal tunnel to assess lumbrical muscle origin and size. As space occupying structures, the lumbrical muscles may contribute significantly to the compression neuropathy of the median nerve in the carpal tunnel characteristic of CTS.

1996

Franklin-GM, Fulton-Kehoe-D. Outcomes research in Washington state workers' compensation. **Am-J-Ind-Med**. 1996 Jun; 29(6): 642-648

UNITED-STATES

The extensive claim and medical bill payment databases of the Washington state workers' compensation system have been used to conduct epidemiologic and outcome studies of work-related conditions. Computerized administrative data must be supplemented with medical record review and structured interview of workers in outcome studies in order to adequately adjust for baseline severity and to address functional and patient satisfaction outcomes, respectively. Three examples of surgical outcome studies are described (carpal tunnel, lumbar fusion, thoracic outlet). Duration of disability prior to surgical intervention is an important predictor of duration of disability following surgery, even when other biologic markers of severity are included in multivariate modeling. Sufficient follow-up time is required to adequately assess longer-term outcomes, such as return-to-work status and the substantial effects of residual impairment even after claim settlement. Finally, well-conducted outcome studies may be linked to the development of surgical treatment guidelines in workers' compensation.

Millender-LH, Tromanhauser-SG, Gaynor-S. A team approach to reduce disability in work-related disorders. **Orthop-Clin-North-Am.** 1996 Oct; 27(4): 669-677

UNITED-STATES

Work-related disorders require a multidisciplinary approach. One must understand musculoskeletal disorders, job issues, and psychosocial issues that prolong disability. This introductory article presents an overview of the approaches to management that will be detailed in the articles that follow.

1994

Hertel-P, Cierpinski-T. [Muscle and tendon injuries in the athlete]. **Chirurg.** 1994 Nov; 65(11): 934-942

GERMANY

Muscle and tendon injuries are the most common injuries in sports; they are mostly caused by overuse and repetitive strain injuries and require special diagnosis and treatment. Selective examples are given of surgical therapy (when conservative treatment fails) for the most frequent sports injuries (like muscle ruptures, jumper's knee, Achilles tendon ruptures, rotator cuff tears, tendinitis, dislocation of tendons, compartment syndrome).

Katz-R.T Carpal tunnel syndrome: A practical review. **Am. Fam. Phys.** 1994; 49 (6) : 1371-1379.

Carpal tunnel syndrome is the most common focal entrapment syndrome. Forceful repetitive activity and vibration may be important workplace risk factors for carpal tunnel syndrome. Although systematic study has suggested that carpal tunnel syndrome is work-related, no clear 'dose-response' curve has been found between the amount or severity of work and the incidence or severity of the syndrome. Nocturnal pain is a hallmark of the syndrome, and Phalen's test, the carpal compression test and the Fick test are useful indicators of the diagnosis. The most commonly used confirmatory test is the nerve conduction study, with or without electromyography. The primary care physician can treat many cases successfully with simple ergonomic modifications, splinting and steroid injections. Surgical therapy is reserved for recalcitrant cases and patients with more severe nerve impingement. In addition to traditional open procedures, carpal tunnel release may be performed endoscopically.

CLASSIFICAÇÃO

1998

Bessette-L; Sangha-O; Kuntz-KM; Keller-RB; Lew-RA; Fossel-AH; Katz-JN. Comparative responsiveness of generic versus disease-specific and weighted versus unweighted health status measures in carpal tunnel syndrome. **Med-Care.** 1998 Apr; 36(4): 491-502

UNITED-STATES

OBJECTIVES: The authors evaluated the relative responsiveness to change of generic versus disease-specific and unweighted versus weighted health status measures in carpal tunnel syndrome (CTS). METHODS: Data were obtained from 196 subjects followed in a prospective community-based cohort study in Maine who underwent carpal tunnel release (The Maine Carpal Tunnel Syndrome Study). Patients were evaluated before and 6 months after surgery. The disease-specific, unweighted severity score was derived from the validated Carpal Tunnel Syndrome Assessment Questionnaire. Patients were asked to rate the importance of each symptom included in the severity score. Each severity question was weighted by its importance, creating a disease-specific weighted score. Generic instruments were the SF-36, SF-12, and a Quality of Life Rating Scale. Sensitivity to change was calculated with the standardized response mean (SRM, mean change/standard deviation of change) as well as the effect size (ES, mean change/standard deviation of baseline values). The ability of the instruments to distinguish clinically important differences was assessed by correlating the changes in scores with global ratings on satisfaction and perceived improvement as external criteria. RESULTS: The disease-specific weighted score (SRM: 1.56, ES: 1.99) was more responsive than the unweighted score (SRM: 1.36, ES: 1.57). The Quality of Life Rating Scale, SF-36, and SF-12 subscales were less sensitive to change, with standardized response means and effect sizes that ranged from -0.23 to 0.88. The ability to distinguish clinically important differences was higher for the two disease-specific scales. The coefficients of correlation with the external criteria ranged from 0.50 to 0.56 for the unweighted score and 0.56 to 0.62 for the weighted score and were significantly stronger than the correlations between external measures and the most responsive subscale of the SF-36 (Bodily Pain subscale, r = 0.36). The SF-12 health survey performed as well as the SF-36 in term of responsiveness and ability to distinguish clinically important change. CONCLUSIONS: Disease-specific measures were superior to generic measures in capturing clinical change after carpal tunnel release, and a weighted score was slightly more responsive than the unweighted score. The SF-12 showed comparable psychometric properties compared with the longer 36-item Short-Form Survey.

Rossignol-M, Patry-L, Sacks-S. Carpal tunnel syndrome: validation of an interview questionnaire on occupational exposure. **Am-J-Ind-Med.** 1998 Mar; 33(3): 224-31

UNITED-STATES

The objectives of this study were 1) to summarize in a clinically meaningful way information on occupational risk factors for carpal tunnel syndrome (CTS), and 2) to test a questionnaire on risk factors that could be used by physicians with their patients. For the two objectives, a systematic literature review was performed and synthetized graphically, and a questionnaire was developed and administered to 238 patients who underwent release surgery for CTS. Patients were classified in four groups according to the incidence rate of CTS surgery in their occupation. Answers to the questionnaire on exposure to risk factors for CTS were compared between these four groups with the hypothesis that the group with the highest incidence would report the highest exposure. The results showed that questioning workers on the amount of force required to perform tasks that are "especially demanding" for the wrists or hands is both useful clinically and valid to be used by the clinician to make a judgement on the occupational nature of CTS. Repetitiveness and segmental exposure to vibrations or to cold are potentially useful and will need further validation. There is no evidence at present that posture or motion of the wrists is potentially useful to describe occupational exposure when questioning patients with CTS.

Schmid-A, Huring-H, Huber-G, Gosele-A, Hecker-Kube-H, Gruhn-O, Stinus-H, Birnesser-H, Keul-J. Injury risk of competitive, handicapped cross-country skiers in training nd competition. **Sportverletz-Sportschaden.** 1998 Mar; 12(1): 26-30

GERMANY

Injuries caused by cross country skiing have been poorly investigated in handicapped athletes. The dynamic sliding shape of motion makes this sport to a suitable discipline for people with a deficit of locomotion. Visual handicapped people with a guide are able to improve their motoric skills, co-ordination, orientation and body self-consciousness in the track. Since handicapped athletes are performing in international competitions the training intensity to fulfill the requirements, but also the risk of overstrain induced injuries got increased, like in other high-performance sports. Our study examined injuries and overuse syndromes of the German National Team Ski Nordic during the Paralympics in Tignes/ Albertville (1992). Lillehammer (1994) and the training period in preparation for the Paralympics in Nagano (March 1998). The incidence and kind of injuries in the competitive handicapped cross country skier was comparable with non-handicapped athletes, but the injury pattern was different.

1997

Bonzani-PJ, Millender-L, Keelan-B, Mangieri-MG Factors prolonging disability in work-related cumulative trauma disorders. J-Hand-Surg-Am. 1997 Jan; 22(1): 30-4

UNITED-STATES

Workers' compensation costs for management of soft tissue disorders continue to increase. The complexity of medical management of these cases has increased due to social factors. The purpose of this study is to improve the physician's ability to recognize nonmedical issues that prevent a rapid return to employment. A classification system is presented that will allow the clinician to identify administrative and pyschosocial issues that prolong disability. Additionally, the patients' job demands were classified by known ergonomic risk factors. The system was applied retrospectively to 50 random cases referred to two occupational hand clinics over a 1-year period. The results indicated that the psychosocial classification of the patient and the current employment status are the most important factors in prolonging disability workers.

Nouhan-R, Kleinert-JM. Ulnar nerve decompression by transposing the nerve and Z-lengthening the flexor-pronator mass: clinical outcome. **J-Hand-Surg-Am.** 1997 Jan; 22(1): 127-31

UNITED-STATES

Controversy surrounds the reliability of methods of treating ulnar nerve compression at the elbow. The effectiveness of submuscular anterior nerve transposition was evaluated in 33 limbs of 31 patients. The flexor-pronator Z-lengthening technique, without internal neurolysis, was used.

Results were determined by patient chart reviews. Severity of preoperative nerve compression was measured using Dellon's classification. Of the 33 limbs, 6 had mild preoperative nerve compression; 7, moderate; and 20, severe. Overall outcome was evaluated using a modification of the Bishop rating system. At a mean follow-up period of 49 months, 12 limbs (36%) had excellent results, 20 limbs (61%) had good results, and 1 limb (3%) had a poor result. These findings indicate that submuscular ulnar nerve transposition using the flexor-pronator Z-lengthening technique without internal neurolysis is a reliable method of treating ulnar nerve compression at the elbow.

Padua-L, Lo-Monaco-M, Padua-R, Gregori-B, Tonali-P. Neurophysiological classification of carpal tunnel syndrome: assessment of 600 symptomatic hands. **Ital-J-Neurol-Sci.** 1997 Jun; 18(3): 145-50

ITALY

Following the AAEM electrodiagnostic guidelines, we developed a neurophysiological classification of carpal tunnel syndrome (CTS). Six hundred hands with clinical CTS (mean age 51.4 yr., female/male ratio 5.5/1, right/left ratio 1.8/1) were prospectively evaluated and divided into six classes of severity only on the basis of median nerve electrodiagnostic findings: extreme CTS (EXT-absence of thenar motor responses), severe CTS (SEV-absence of sensory response and abnormal distal motor latency-DML), moderate CTS (MOD-abnormal digit-wrist conduction and abnormal DML), mild CTS (MILD-abnormal digit wrist conduction and normal DML), minimal CTS (MIN-exclusive abnormal segmental and/or comparative study), and negative CTS (NEG-normal findings at all tests). Using this neurophysiological classification, the CTS groups appeared normally distributed (EXT 3% of cases, SEV 14%, MOD 36%, MILD 24%, MIN 21%, NEG 3%), and the age of patients and clinical findings appeared to be related to neurophysiological abnormalities. Significant differences in median neurophysiological parameters not included in the classification (such as palm-wrist sensory conduction velocity) were observed in the different CTS groups. The analysis of the groups showed that: 1) the majority of advanced cases (SEV and EXT) occurred in older patients (60-80 years), 2) most of the milder cases (MIN and MILD) occurred in young female patients. The aim of this study was to standardise the neurophysiological evaluation of CTS.

Padua-L, LoMonaco-M, Gregori-B, Valente-EM, Padua-R, Tonali-P. Neurophysiological classification and sensitivity in 500 carpal tunnel syndrome hands. **Acta-Neurol-Scand.** 1997 Oct; 96(4): 211-7

DENMARK

OBJECTIVES: To evaluate the following points about carpal tunnel syndrome (CTS): 1) characterization of a wide population; 2) sensitivity of electrodiagnostic tests, and particularly the contribution of disto-proximal ratio test; 3) validity of a neurophysiological classification developed by us. MATERIAL AND METHODS: Prospective study in 500 hands with CTS symptoms. Neurophysiological "standard" tests were always performed: sensory nerve conduction velocity (SNCV) first- and third digit-wrist and distal motor latency (DML). In "standard negative" hands disto-proximal ratio technique (R) was performed. Neurophysiological classification: Extreme CTS (absence of median motor, sensory responses), Severe (absence of sensory response, abnormal DML), Moderate (abnormal SNCV, abnormal DML), Mild (abnormal SNCV, normal DML), Minimal (abnormal R or other segmental/comparative test, normal standard tests). RESULTS: Sensibility of standard tests: 77%. R increased the diagnostic yield by 20%. CTS classification appeared reliable with significant differences between groups. CONCLUSION: R is a useful test, the classification may be useful in clinical/therapeutical decisions.

1996

Buchbinder-R, Goel-V, Bombardier-C, HoggJohnson-S. Classification systems of soft tissue disorders of the neck and upper limb: Do they satisfy methodological guidelines? **Journal of Clinical Epidemiology**, Feb, 1996; 49 (2) : 141-149

A critical appraisal of existing classifications of soft tissue disorders of the neck and upper limb was performed utilizing methodological criteria including appropriateness for purpose, validity, reliability, feasibility, and generalizability. Five classifications were assessed independently by three raters using standardized forms. For those criteria that can be assessed by inspection of the classification

itself, none of the classification systems appeared acceptable for reasons such as failure to be comprehensive, overlap of categories, and lack of demonstration that the criteria for inclusion into the categories are valid and reliable. No judgement could be passed about those criteria that require formal testing, such as reliability and construct validity, because of the absence of data. The overall interrater reliability of the critical appraisal was high, with an intraclass correlation coefficient of 0.82. The validity of studies that have relied upon existing classifications of soft tissue disorders of the neck and upper limb to group the entities under study is questioned in light of the findings of this study. Future work should be directed toward improving existing classification systems and/or developing new ones that fulfil basic measurement criteria.

Buchbinder-R, Goel-V, Bombardier-C. Lack of concordance between the ICD-9 classification of soft tissue disorders of the neck and upper limb and chart review diagnosis: one steel mill's experience. **Am-J-Ind-Med.** 1996 Feb; 29(2): 171-82

UNITED-STATES

The aim of this study is to determine the validity of the ICD-9 for diagnostic classification of soft tissue disorders of the neck and upper limb, using routinely collected data at a large steel company. The documentation in the clinical chart served as the gold standard. First, the overall accuracy of identifying these disorders from the ICD-9 was examined. Second, we examined whether the codes themselves, on an individual basis, accurately reflected the underlying problems as documented in the medical records. There were 1,267 new cases identified in 1991 by inclusion of all potentially applicable ICD-9 codes. Only 805 (63.5%) fulfilled the definition of a soft tissue disorder of the neck or upper limb as determined by chart review. A more restrictive strategy that only included cases coded by those ICD-9 codes that specifically pertain to these disorders yielded a higher proportion of true cases 458/480 cases (95.4%), but failed to identify the other 347 cases. The anatomical site of the problem could not be identified from the codes describing 651/1,267 cases (51.4%). There was poor agreement between the diagnostic labels recorded in the medical records and the ICD-9 codes, suggesting that many of the terms are being used interchangeably. Our results suggest that conclusions about these disorders drawn from analysis of administrative data which rely upon the ICD-9 for diagnostic classification must be interpreted cautiously. For these soft tissue disorders, researchers will need to develop strategies which would improve upon and supplement the ICD-9.

Kleindienst-A, Hamm-B, Hildebrandt-G, Klug-N. Diagnosis and staging of carpal tunnel syndrome: comparison of magnetic resonance imaging and intra-operative findings. **Acta-Neurochir-Wien.** 1996; 138(2): 228-33

AUSTRIA

PURPOSE: In order to determine the reliability of magnetic resonance imaging (MRI) in the diagnosis and staging of carpal tunnel syndrome (CTS), the most common entrapment neuropathy, the following prospective study has been performed. METHODS: We compared clinical and electrophysiological studies in 58 cases of CTS with MRI investigations and confirmed the reliability by exact correspondence with intra-operative findings. RESULTS: Typical MRI characteristics of the median nerve in CTS have been established. There is a significant difference in flattening ($p < 0.05$), swelling ($p < 0.01$) and signal intensity ($p < 0.05$) of the median nerve between early and advanced CTS. Comparison of MRI and intra-operative findings revealed that median nerve compression was diagnosed correctly in 91% of cases. Additional lesions in the carpal tunnel, which are a primary cause of nerve compression, were established by MRI in 25 cases and confirmed by surgery. CONCLUSION: MRI is a reliable diagnostic tool for assessing as well as staging of CTS. Morphological changes following chronic nerve compression can be visualized. It is particularly useful in cases of suspected lesions within the carpal tunnel as a cause of CTS. The information provided may support the choice of adequate treatment modality.

Sannino-G, Taviani-A, Tartaglia-R, Valiani-M, Ianniello-G. Repetitive movements of the upper limbs: results of exposure evaluation and clinical investigation in the production and packaging of ice cream. **Med-Lav.** 1996 Nov-Dec; 87(6): 598-602

ITALY

An evaluation was made of the degree of exposure to risk and the frequency of disorders attributable to biomechanical overload of the upper limb in workers employed on packaging in an ice cream factory. The risks were first evaluated against a checklist, then subsequently an assessment was made of the tasks found to feature the highest risks, using an ergonomic analysis method. The method identified several jobs, such as placing ice cream coupes and such like in boxes, as requiring a large number of actions per minute (> 30) and considerable muscular strength. The 59 female workers performing the packaging operations were given a risk-targeted physical examination. The clinical test detected an extremely high frequency of carpal tunnel syndrome, (7.1%) epicondylitis (5.2%) and scapulo-humeral periarthritis (3.5%) in the over 35 years age group, with respect to a control population not exposed to risk. The authors conclude that the repetitiveness of the actions, the use of gloves due to prolonged contact with frozen products and the effects of the low temperatures themselves, may have favoured the spread of the disorders that appeared in this population of workers. These findings must be further supported by more in-depth epidemiological studies.

1994

Katz-JN, Gelberman-RH, Wright-EA, Lew-RA, Liang-MH. Responsiveness of self-reported and objective measures of disease severity in carpal tunnel syndrome. **Med-Care**. 1994 Nov; 32(11): 1127-33

UNITED-STATES

Responsiveness, the ability to detect meaningful clinical change, is a critical attribute of instruments used to evaluate outcomes of treatments. The authors hypothesized that self-administered symptom severity and functional status questionnaires are more responsive to clinical improvement after carpal tunnel release than traditional physical examination measures of strength and sensibility. Data were obtained from a randomized clinical trial of endoscopic versus open carpal tunnel release conducted in four university medical centers. Patients were evaluated before surgery and 3 months after surgery. Seventy-four patients indicating that they were more than 80% satisfied with the results of surgery were assumed to have clinically meaningful improvement and were the focus of the analysis. Evaluations included questionnaires assessing symptom severity, functional status, and activities of daily living as well as measurement of grip, pinch, and abductor pollicus brevis strength, and 2-point discrimination and Semmes-Weinstein pressure sensibility. Responsiveness was calculated with the standardized response mean (mean change/standard deviation of change) as well as the effect size (mean change/standard deviation of baseline values). The symptom severity scale was four times as responsive, and the functional status and activities of daily living scales were twice as responsive, as the measures of strength and sensibility. Self-administered symptom severity and functional status scales are much more responsive to clinical improvement than measures of neuromuscular impairment and should severe as primary outcomes in clinical studies of therapy for carpal tunnel syndrome.

Peate-WF. O ccupational musculoskeletal disorders. **Prim-Care.** 1994 Jun; 21(2): 313-27

UNITED-STATES

Musculoskeletal disorders of the workplace include the acute, cumulative and chronic injuries or illnesses of the soft tissues which are caused by mechanical stress, strain, sprain, vibration, inflammation, or irritation. The successful management of occupational musculoskeletal disorders must account for workplace conditions (ergonomics and work practices), psychosocial factors, diagnostic uncertainties, and the need for active modalities (exercises and a progressive increase in activities of daily living), rather than passive (bed rest and traction). Although most occupational musculoskeletal disorders respond to conservative measures such as ice or heat, protective devices such as, neutral splints for carpal tunnel syndrome, nonsteroidal anti-inflammatory drugs, and progressive strengthening, resolution may take months. Prevention is often more important than treatment, and may entail workplace revisions and special worker training. Worker selection programs--strength testing, pre-placement radiographs, and inquiries about prior low back pain--have poor predictive value.

Ruiz-Martin-J. The carpal tunnel syndrome. The clinical and therapeutic aspects. **Aten-Primaria.** 1994 Mar 15; 13(4): 204-6

SPAIN

COMPLICAÇÕES

1997

Byl-NN, Melnick-M. The neural consequences of repetition: clinical implications of a learning hypothesis. **J-Hand-Ther.** 1997 Apr-Jun; 10(2): 160-74

UNITED-STATES

Repetitive strain injuries (RSIs) are difficult to treat. Some individuals with RSIs may ultimately develop chronic pain syndromes or movement problems like focal hand dystonia (FDh), a disorder of motor control manifested in a specific context during skilled, hand tasks. This paper reports on the results of four neuroplasticity studies suggesting that repetitive hand opening and closing can lead to motor control problems, measurable somatosensory changes, and problems in graphesthesia and stereognosis. The experiments support a learning hypothesis for the origin of severe RSIs, particularly FDh. This degradation in the sensory representation of the hand may not only explain the therapeutic challenge of returning these patients to work, but also provide a foundation for developing more effective physical rehabilitation strategies. Implications and conjectures for the applications of this learning hypothesis to conditions of chronic pain are also discussed.

1995

Almekinders-LC, Baynes-AJ, Bracey-LW. An in vitro investigation into the effects of repetitive motion and nonsteroidal antiinflammatory medication on human tendon fibroblasts. **Am-J-Sports-Med.** 1995 Jan-Feb; 23(1): 119-23

UNITED-STATES

Soft tissue injuries due to repetitive motion are common sports injuries and are often treated with antiinflammatory therapies. We investigated the in vitro effects of repetitive motion and nonsteroidal antiinflammatory medication on human tendon fibroblasts. In addition, we studied the effects related to the presence of inflammatory cells. Repetitive motion was associated with an increased release of prostaglandin E2 and increased deoxyribonucleic acid (DNA) and protein synthesis. The presence of nonsteroidal antiinflammatory medication decreased prostaglandin E2 release and DNA synthesis but increased protein synthesis. Contact with macrophages caused a marked additional increase in prostaglandin E2 and a concomitant increase in DNA synthesis. Release of interleukin-6 by the macrophages also suggested that this cytokine plays a role in the response to repetitive motion. Our results can aid in the search for a more scientific approach to the treatment of soft tissue injuries associated with repetitive motion. They suggest that nonsteroidal antiinflammatory medication may have potentially negative effects during the proliferative phase of a healing since it was associated with decreased DNA synthesis. However, it may be beneficial in the maturation and remodeling phase since it stimulated protein synthesis.

Elsner-G; Nienhaus-A; Beck-W. Arthroses of the finger joints and thumb saddle joint and occupationally related factors.. **Gesundheitswesen.** 1995 Dec; 57(12): 786-91

GERMANY

In a one-to-one matched case control study, 37 cases with rhizarthrosis (31 female, 6 male) and 44 cases with osteoarthritis in the finger joints (35 female, 9 male) were compared to their matches equal in sex and age regarding occupational strains. For calculating the odds ratios matching was maintained. In females the risk of rhizarthrosis was elevated for typists (OR 5.0, CI 1.27-19.59) and for work involving dexterity (OR 2.0, CI 0.77-5.23). In both sexes an elevated odds ratio for osteoarthritis in the finger joints was found for repetitive work (OR 3.8, CI 1.52-9.49).

Higgs-PE; Mackinnon-SE. Repetitive motion injuries. **Annu-Rev-Med.** 1995; 46: 1-16

UNITED-STATES

Repetitive motion injuries have presented clinicians with a significant challenge over the past two and a half decades. Acceptable treatment of inflammatory disorders is well established, but compressive neuropathies and nonspecific complaints of numbness, tingling, and discomfort in the upper extremity present vexing dilemmas. Current research and experience point to multilevel

problems, including posturally induced muscular imbalance. Although surgical solutions to these problems are sometimes indicated, conservative approaches successfully treat many individuals and have narrowed the scope and indications for surgical intervention. These approaches include ergonomic changes at the workstation, postural changes, and muscle stretching and strengthening to correct imbalance.

Patten-RM. Atraumatic osteolysis of the distal clavicle: MR findings. **J-Comput-Assist-Tomogr.** 1995 Jan-Feb; 19(1): 92-5

UNITED-STATES

OBJECTIVE: The purpose of this study was to describe the MRI appearance in atraumatic osteolysis of the distal clavicle (AODC). MATERIALS AND METHODS: We retrospectively evaluated MRI, medical records, ancillary diagnostic imaging studies and clinical course in five men and two women (mean age, 39 years) in whom the final clinical diagnosis of AODC was established. None of the patients had significant shoulder injury, but all participated in activities involving repetitive strain of the acromioclavicular (AC) joint. In three of these patients, we performed follow-up MRI (ranging from 5 1/2 to 15 months after the initial MRI). RESULTS: In all seven patients, signal intensity changes within the intramedullary portion of the distal clavicle on MRI were consistent with diffuse bone marrow edema. Marrow edema was most conspicuous on STIR imaging and occasionally could be misinterpreted as normal marrow signal patterns on spin-echo imaging. Cortical thinning or irregularity of the distal clavicle was seen in six cases and tiny subchondral cysts were seen in three, corresponding to subtle cystic changes on shoulder radiography. Limited bone scans obtained in two patients showed markedly increased uptake of radiotracer at the distal clavicle and AC joint. Histologic examination in one case showed disruption of articular cartilage, subchondral cysts, and metaplastic bone formation with increased osteoclastic activity. Follow-up MRI in three patients who were asymptomatic following conservative therapy showed normalization of marrow signal intensity. CONCLUSION: Atraumatic osteolysis of the distal clavicle is a relatively uncommon but important cause of shoulder pain. Particularly when the clinical history is suggestive of repetitive AC joint stress, MRI of the distal clavicle should be examined closely for marrow edema, cortical irregularity, and cystic changes. Such abnormalities may be especially conspicuous when STIR imaging techniques are used.

DIAGNÓSTICO

1998

Rossignol-M, Patry-L, Sacks-S. Carpal tunnel syndrome: validation of an interview questionnaire on occupational exposure. **Am-J-Ind-Med**. 1998 Mar; 33(3): 224-31.

UNITED-STATES

The objectives of this study were 1) to summarize in a clinically meaningful way information on occupational risk factors for carpal tunnel syndrome (CTS), and 2) to test a questionnaire on risk factors that could be used by physicians with their patients. For the two objectives, a systematic literature review was performed and synthetized graphically, and a questionnaire was developed and administered to 238 patients who underwent release surgery for CTS. Patients were classified in four groups according to the incidence rate of CTS surgery in their occupation. Answers to the questionnaire on exposure to risk factors for CTS were compared between these four groups with the hypothesis that the group with the highest incidence would report the highest exposure. The results showed that questioning workers on the amount of force required to perform tasks that are "especially demanding" for the wrists or hands is both useful clinically and valid to be used by the clinician to make a judgement on the occupational nature of CTS. Repetitiveness and segmental exposure to vibrations or to cold are potentially useful and will need further validation. There is no evidence at present that posture or motion of the wrists is potentially useful to describe occupational exposure when questioning patients with CTS.

Simons-DG, Mense-S. Understanding and measurement of muscle tone as related to clinical muscle pain. **Pain** 1998 Mar; 75 (1) : 1-17

Measurable sources of muscle tension include viscoelastic tone, physiological contracture (neither of which involve motor unit action potentials), voluntary contraction, and muscle spasm (which we define as involuntary muscle contraction). The latter two depend on motor unit action potentials to generate the tension. Total muscle tension is most accurately measured as stiffness. Thixotropy of muscle is an ubiquitous and functionally important phenomenon that is not commonly recognized. A clinical pain condition associated with increased muscle tension is tension-type headache, which is largely muscular in origin; it is often caused by myofascial trigger points, but not by a pain-spasm-pain cycle, which is a physiologically and clinically untenable concept. Clinical conditions associated with painful muscle spasm include spasmodic torticollis, trismus, unnecessary muscle tension, nocturnal leg cramps, and stiff-man syndrome.

1997

Concannon-MJ; Gainor-B; Petroski-GF; Puckett-CL. The predictive value of electrodiagnostic studies in carpal tunnel syndrome**. Plast-Reconstr-Surg.** 1997 Nov; 100(6): 1452-8

UNITED-STATES

In recent years, electrodiagnostic studies have become an expected component in the work up and evaluation of carpal tunnel syndrome. We conducted a retrospective review of 460 carpal tunnel decompressions to determine whether the accuracy of diagnosis and the prediction of therapeutic outcome could be related to the positivity and severity of findings on preoperative electrical studies. The 349 patients (460 hands) were divided into two groups: group 1 consisted of hands with the clinical diagnosis of carpal tunnel syndrome but with normal electrodiagnostic studies (n = 62); in group 2 the hands had a clinical diagnosis of carpal tunnel syndrome with confirmatory electrodiagnostic studies (n = 398). The number and distribution of signs and symptoms of carpal tunnel syndrome were not statistically different between these two groups. There was not a statistically significant difference in the success rate of surgery or the incidence of complications. The similarities between these two groups suggests that the distinction between them (the positivity of electrodiagnostic studies) is an artificial one and that the clinical diagnosis of carpal tunnel syndrome is sufficient to predict the presence of the disease, as well as outcome of surgery. On the basis of these data, strict adherence to electrodiagnostic studies to confirm the diagnosis will exclude 13 percent of the patients with legitimate carpal tunnel syndrome from receiving appropriate therapy.

Fredericks-T.K., Fernandez-J.E., Pirela-Cruz M.A. Kienbock's disease. II. Risk factors, diagnosis, and ergonomic interventinos. **Int. J. Occup. Med. Environ Health** 1997; 10 (2) : 147-157.

The term CTD has been used to refer to those musculoskeletal imparmeintes that appear to be work-related and tend to be chronic. Upper extremity CTD are categorized in three major groups: tendon disorders, neurovascular disorders, and nerve. Kienbock's disease, on the other hand, has been documented in the workplace and has a similar etiology, but due to current anatomic classifications cannot be considered a CTD. With this in mind, the present article reviews risk factors, diagnosis, and treatment, with the purpose of providing physicians, engineers, and desingners with information to reduce the risk of workers developing this potentially debilitating disease .Furthermore, additional support will be accumulated and combined with Part I of this article with the intent of introducing into the literature a new category of upper extremity CTD: Bone Disorders.

Friedman-PJ. Predictors of work disability in work-related upper-extremity disorders. **J-Occup-Environ-Med**. 1997 Apr; 39(4): 339-43.

UNITED-STATES

The aim of this study was to compare symptoms, signs, grip strength, passive wrist flexion angle, and self-rated disability in work-related upper extremity disorders (WRUEDs) to determine predictors of work disability in 106 consecutive patients. Age, gender, and duration of symptoms were unrelated to current work status. The best predictors of current work hours were, in descending order, the Fibromyalgia Impact Questionnaire (FIQ), Modified Stanford Health Assessment Questionnaire (SHAQ), weeks of work absence, passive wrist flexion angle of the affected arm, neck pain or stiffness on movement, and grip in affected arm. FIQ and SHAQ scores

were significantly correlated with objective measures of upper-extremity function. FIQ and SHAQ scores are valid measures of work disability in WRUEDs, which are more closely related to current work hours than to time off work, symptoms, or physical signs.

Gemne-G. Diagnostics of hand-arm system disorders in workers who use vibrating tools. **Occup-Environ-Med.** 1997 Feb; 54(2): 90-5

ENGLAND

A hand-arm vibration syndrome occurs in some workers who use hand held vibrating tools. It is recognised to consist of white fingers, diffusely distributed finger neuropathy, pain in the arm and hand, and a small excess risk of osteoarthrosis from percussion to the wrist and elbow. Carpal tunnel syndrome is mainly due to ergonomic factors other than vibration, but certain factors related to vibration may contribute to its development. A decrease in muscle power induced by vibration, and excessive hearing deficit have been postulated. The assessment of a disorder suspected of being induced by vibration includes deciding whether there is a disorder and, if so, whether the symptoms can be caused by vibration. To decide whether the symptoms can be caused by vibration epidemiological documentation and pathogenically reasonable theories must exist. A causal diagnosis finally requires and epidemiological decision whether or not the factual exposure has elicited the patient's symptoms. Epidemiological data on the quantitative association between vibration and excessive risks of white fingers and diffusely distributed neuropathy are incomplete. The symptomatic diagnosis of white fingers is still mainly based on anamnestic information. Available laboratory tests are incapable of grading the severity of individual cases. Recording the finger systolic blood pressure during cold provocation is a method of symptomatic diagnosis with reasonable levels of specificity, sensitivity, and predictive value. For diffusely distributed neuropathy these levels are lower than desired. Electrodiagnostic tests for carpal tunnel syndrome have sufficient validity. Proper exposure evaluation must be based on an appreciation of the character of the vibration as well as effective duration and intermittency. If this is not taken into account, the number of hours of exposure and intensity of vibration are likely to be non-commensurable variables, and the simple product of them is a questionable dose measure. Separate models for risk evaluation of vascular and neurological disorders related to work with different tools and processes will have to be established. Ongoing research to obtain further data on exposure-response relations for neurological disturbances begins to yield encouraging results.

Jeng-OJ, Radwin-RG, Moore-JS, Roberts-M, Garrity-JM, Oswald-T. Preliminary evaluation of a sensory and psychomotor functional test battery for carpal tunnel syndrome: Part 2--Industrial subjects. **Am-Ind-Hyg-Assoc-J.** 1997 Dec; 58(12): 885-92

UNITED-STATES

This study evaluated the Wisconsin functional sensory and psychomotor test battery for carpal tunnel syndrome (CTS). Subjects were 27 employees recruited from a food processing plant. Both hands of all subjects were examined and categorized by presence or absence of symptoms and nerve conduction study (NCS) findings (Symptom-/NCS-, Symptom+/NCS-, Symptom-/NCS+, and Symptom+/NCS+). Symptom-/NCS- category hands had significantly better performance (15-60%) for most of the functional test battery variables than Symptom+/NCS+ category hands. A significant gap detection threshold difference (32%) was observed between NCS+ and NCS- hands regardless of symptoms, with NCS- having impaired performance. No significant effect of CTS symptoms on performance was observed. Stepwise discriminant analysis was used to select the best variables to differentiate between groups. The ratio of the change in pinch rate with respect to required pinch force differentiated NCS+ from NCS- hands, with a sensitivity of 0.71 and a specificity of 0.68. The same variable had a sensitivity of 0.74 and specificity of 0.83 for distinguishing Symptom-/NCS- hands from all other categories. Pinch rate had a sensitivity of 0.82 and a specificity of 0.81 for separating Symptom+/NCS+ hands from all other categories. Use of both gap detection threshold and the ratio of the change in pinch rate with respect to required pinch force could best differentiate Symptom+/NCS+ from Symptom-/NCS- cases for a sensitivity of 0.91 and specificity of 0.87. Outcomes could not be generalized to a specific work population but demonstrate that the non-invasive test battery may be useful for providing objective measures of deficits associated with CTS symptoms and electrophysiological parameters.

Ranney-D., Wells-R., Moore-A. Upper Limb Musculoskeletal Disorders in Highly Repetitive Industries: Precise Anatomical Physical Findings. **Ergonomics** . 1997 Jul.; 38 (7) : 1408-1423.

The incidence of strain injuries of the upper extremities was determined in female workers in five industries performing repetitive work tasks. Clinical examinations and task performance evaluations were conducted on 146 female workers required to perform repetitive work tasks using the upper limbs. The workers were employed in garment and automotive trim sewing, electronic assembly, metal parts assembly, supermarket cashiering, and packaging. Evidence of tissue injury was identified in 56% of the workers. The most common problem was muscle pain and tenderness followed by tendon problems and neuritides. The most frequently diagnosed neuritis was carpal tunnel syndrome which was seen in 11% of the subjects. Six workers were diagnosed with thoracic outlet syndrome and one with cervical neuritis. Several workers were found to have more than one form of neuritis in the same upper limb. The most frequently diagnosed tendon disorders of the distal forearm, hand and wrist were deQuervain's tenosynovitis and wrist flexor tendinitis. The most common site of muscle pain and tenderness was the neck/shoulder area followed by the muscles of the forearm/hand. The authors emphasize the importance of bilateral evaluations of strain injuries, as well as assessment of the shoulder and the forearm in evaluations of repetitive strain injuries.

Ribeiro-H.P. **A violência do trabalho no capitalismo: o caso das lesões dos membros superiores por esforços repetitivos em trabalhadores bancários**. São Paulo : s.n; 1997. [Tese de Doutorado - Faculdade de Saúde Pública da USP]

BRASIL

Na primeira parte do estudo, intitulada de Violência Explícita do Trabalho, sustenta-se que o perfil de morbimortalidade da classe trabalhadora acompanha os ciclos de desenvolvimento e crise do capitalismo. Relata a evolução das instituições financeiras no país e da categoria bancária, especialmente no banco investigado. São revistos os modos de adoecer e morrer dessa categoria, vítima coletiva de uma doença do trabalho, as lesões por esforços repetitivos (LER). Os próprios trabalhadores adoecidos se fizeram sujeitos e pesquisados desse estudo de desenho híbrido, baseado em 525 questionários que preencheram e em 346 depoimentos que escreveram. Sob o ponto de vista quantitativo, trata-se de um estudo descritivo numa amostra não probabilística de 1223 casos de LER notificados pela empresa ao Instituto Nacional de Seguro Social. A análise dos 346 depoimentos revela sentimentos de perda e medo de incapacidade, esforço para aceitar os novos limites e vontade de retornar ao trabalho para evitar a discriminação e marginalização social e afetiva. Revelam-se, também, as representações que construíram das diversas instituições …s quais tiveram que recorrer. (AU).

Schelo-C, Kroger-K, Hinrichs-A, Rensing-N, Rudofsky-G [Ischemia of the arm with finger necroses: differential carpal tunnel syndrome and thoracic outlet syndrome diagnosis] **Vasa**. 1997 Nov; 26(4): 311-3

SWITZERLAND

Upper extremity ischemia with finger necrosis: carpal-tunnel syndrome or thoracic outlet syndrome? A 26-year-old male patient complained of pain paraesthesia in the right upper extremity while working with the arm elevated. After electrophysiological diagnosis of a carpal-tunnel-syndrome the patient received surgical treatment. Following this treatment he developed acral necrosis at the fingers. Additional diagnostic effort let to the diagnosis of a thoracic-outlet-syndrome due to a cervical rib. This case report and a review of the literature show that electrophysiological investigations alone can not differentiate the carpal-tunnel-syndrome from the thoracic-outlet-syndrome. Thus an operative release of a carpal-tunnel should not be performed until the arterial perfusion of the upper extremity has been judged.

Sheon-RP. Repetitive strain injury. 2. Diagnostic and treatment tips on six common problems. The Goff Group. **Postgrad-Med.** 1997 Oct; 102(4): 72-8, 81, 85 passim

UNITED-STATES

Repetitive strain injury is caused by recurrent overuse, resulting in microtrauma to tissues. Local pain and tenderness, weakness, inflammation, and limited function are common findings. Some of

the strain injuries seen most often are carpal tunnel syndrome, trigger finger, shoulder impingement syndrome, tennis elbow, thoracic outlet syndrome, and myofascial pain disorders. Often, treatment can be started at the initial visit, after systemic disorders have been ruled out. A vital step is elimination of aggravating factors, such as improper posture, inadequate attention to ergonomic factors at work, and contributory habits (e.g., jaw or hand clenching). Use of simple joint-protection measures can alleviate much of the discomfort. Appropriate self-help strategies used at home may restore flexibility and strength with a minimum of medical intervention, but pain relief must be achieved before patients can be expected to follow through with rehabilitation efforts. Use of ice packs, massage, NSAIDs, or topical pain-relief agents is often helpful. Prompt, temporary pain relief can also be achieved with injection of a local anesthetic-corticosteroid mixture. Persistent disability should prompt consideration of psychosocial factors. In addition, fraudulent claims of disability do occur. Although physicians should make every effort to support legitimate claims of work-related injury, they should also be aware of the possibility that activities outside of work (e.g., sports participation, accidental injuries) may be contributing factors.

Werner-RA, Franzblau-A, Albers-JW, Buchele-H, Armstrong-TJ. Use of screening nerve conduction studies for predicting future carpal tunnel syndrome. **Occup-Environ-Med**. 1997 Feb; 54(2): 96-100.

ENGLAND

OBJECTIVE: To determine if an abnormal sensory nerve conduction study consistent with median mononeuropathy in asymptomatic workers was predictive of future complaints of the hand or finger suggestive of carpal tunnel syndrome. METHODS: This was a case-control study of over 700 active workers at five different work sites: four sites involved manufacturing workers and one site represented clerical workers. Patients' reports of symptoms of pain, numbness, tingling, or burning in the hand or finger that lasted more than one week or occurred three or more times after the initial screening were investigated. 77 cases were defined as asymptomatic workers with electrodiagnostic findings of median mononeuropathy in either hand based on a comparison of median and ulnar sensory evoked peak latencies. A difference > or = 0.5 ms was defined as abnormal; a normal difference was < or = 0.2 ms. Controls were asymptomatic age, and sex matched workers with normal nerve conduction studies in both hands. Follow up questionnaires were completed 17 (SD 6) months later. RESULTS: The follow up participation rate was 72%. Cases had a 12% risk of developing symptoms during the follow up period compared with 10% in the control group, chi 2 = 0.12, P = 0.73. CONCLUSIONS: Abnormal median sensory nerve conduction studies in asymptomatic workers were not predictive of future hand or fingers complaints and if used for preplacement screening among active workers this should be done with caution.

Yassi A. Repetitive strain injuries. **Lancet** 1997 Mar. 29; 349 (9056) : 943-947.

Disorders commonly arising from repetitive strain injuries (RSI) are listed and ergonomic conditions that pose a threat for RSI are outlined: repetitive and forceful motions; static muscle load and mechanical stress; vibration and temperature extremes; awkward postures arising from improperly designed equipment, tools or workstations; and organizational factors (excessive work rates, inadequate work breaks, monotonous work). Procedures for the diagnosis and evaluation of RSI are described along with the clinical course of the disorder, possible ergonomic interventions, and medical treatment.Marxhausen P. Computer related repetitive strain injury. Internet WWW pages, home-page address: http://engr-www.unl.edu/ee/eeshop/rsi.html Copyright: 1996.This document examines the nature and causes of repetitive strain injury (RSI) and other disorders related to the use of computers, and outlines preventive measures. Contents: symptoms of RSI; correct typing technique and posture; work breaks and relaxation exercises; reporting of symptoms; sources of information and help; review of ergonomic research on visual display workstations (electromagnetic radiation, vision complaints, musculoskeletal disorders, psychosocial stresses and workstation design).Erdil M.; Dickerson O.B.; eds. Cumulative trauma disorders - Prevention, evaluation and treatment. New York : Van Nostrand Reinhold, 1997.Manual on the diagnosis, treatment and prevention of cumulative trauma disorders (CTDs). Contents include: introduction to the definition and history of CTDs, disease prevalence and costs, and causation controversies; CTDs of the upper extremities (determining the work-relatedness of carpal tunnel syndrome; management of CTDs with physical therapy; surgical evaluation and treatment of peripheral nerve entrapment syndromes; screening and medical surveillance; whole-body and segmental human

vibration; video display workstations; ergonomic analysis and the ergonomic safety programme; disability assessment); low back pain (diagnosis and medical management; ergonomic considerations for manual handling); regulatory issues.

1996

David-AM, Taiwo-AO. Bartender's hand an unusual form of occupational cumulative trauma disorder. **West-J-Med**. 1996 Apr; 164(4): 353-4.

UNITED-STATES

Faucett-J, Rempel-D. Musculoskeletal symptoms related to video display terminal use: an analysis of objective and subjective exposure estimates. **AAOHN-J**. 1996 Jan; 44(1): 33-9.

UNITED-STATES

The occupational use of video display terminals (VDTs) has been associated with the increasing incidence of upper extremity musculoskeletal disorders, often called cumulative trauma disorders. To guide clinical and policy decisions about the prevention and treatment of these VDT related disorders, valid and economic measures of total daily VDT use and VDT related job tasks such as data entry or editing will be important. In this study of newspaper reporters and copy editors (n = 83), VDT use was measured with employee self reports and by sampling the work behaviors of a subsample of employees. Behavioral sampling estimated VDT use as a characteristic of the job as opposed to a characteristic of individual employee performance. Overall, the two techniques of measuring occupational VDT use compared favorably, with the exception that self reported hours of VDT use tended to exceed the hours of use estimated by behavioral observation for employees who were younger and those who reported greater job demands. The findings suggest that behavioral sampling is a valid technique for estimating VDT use as a job characteristic.

Higgs-PE, Young-VL. Cumulative trauma disorders. **Clinics In Plastic Surgery** 1996 Jul; 23 (3) : 421-;

A direct relationship between work activities and the onset of musculoskeletal symptoms has not been definitively proven, but several diagnostic entities are thought to be caused or magnified by repetitive motions or cumulative trauma on the job. This article discusses the identification and treatment of these recognized clinical entities, including compressive neuropathies, sites of tenosynovitis (such as trigger digit, de Quervain's syndrome, and intersection syndrome), epicondylitis, and carpometacarpal arthritis. These conditions typically produce a definable set of symptoms and physical findings, and standard treatment approaches have been identified. If the picture is unclear and diagnosis of a specific clinical condition cannot be established, the authors recommend that physicians not label patients with vague diagnostic terms unsupportable by objective criteria.

Kleindienst-A, Hamm-B, Hildebrandt-G, Klug-N. Diagnosis and staging of carpal tunnel syndrome: comparison of magnetic resonance imaging and intra-operative findings. **Acta-Neurochir-Wien.** 1996; 138(2): 228-33

AUSTRIA

PURPOSE: In order to determine the reliability of magnetic resonance imaging (MRI) in the diagnosis and staging of carpal tunnel syndrome (CTS), the most common entrapment neuropathy, the following prospective study has been performed. METHODS: We compared clinical and electrophysiological studies in 58 cases of CTS with MRI investigations and confirmed the reliability by exact correspondence with intra-operative findings. RESULTS: Typical MRI characteristics of the median nerve in CTS have been established. There is a significant difference in flattening ($p < 0.05$), swelling ($p < 0.01$) and signal intensity ($p < 0.05$) of the median nerve between early and advanced CTS. Comparison of MRI and intra-operative findings revealed that median nerve compression was diagnosed correctly in 91% of cases. Additional lesions in the carpal tunnel, which are a primary cause of nerve compression, were established by MRI in 25 cases and confirmed by surgery. CONCLUSION: MRI is a reliable diagnostic tool for assessing as well as staging of CTS. Morphological changes following chronic nerve compression can be visualized. It

is particularly useful in cases of suspected lesions within the carpal tunnel as a cause of CTS. The information provided may support the choice of adequate treatment modality.

Liss-G. M., Stock-S. R. Can Dupuytren's Contracture Be Work-Related?: Review of the Evidence American **Journal of Industrial Medicine** 1996 May; 29 (5) : 521-532.

The evidence for Dupuytren's contracture (DC) being work related was reviewed. The clinical and epidemiological characteristics of DC were summarized. The results of a literature survey of DC and its possible associations with work related vibration exposure, repetitive manual work, and acute trauma were discussed. Literature surveyed included the MEDLINE, NIOSHTIC, and Index Medicus databases, occupational medicine texts and journals books on DC, and references in review articles and books. Ten studies, five investigating the relationship between DC and manual work and five examining DC and occupational vibration exposure, that were considered to be methodologically valid were identified. No studies investigating DC and acute trauma were found. The study results were analyzed in detail and odds ratios (ORs) for DC being associated with occupational vibration exposure and manual work were computed. Three studies investigating DC and vibration exposure including workers with vibration white finger and rock and quarry drillers found significant increased risks for DC, ORs 2.1, 2.3, and 2.6. The lower limit of the 95% confidence interval (CI) was above 1.0 in each study. Only one study found an association between DC and manual repetitive work. The OR was 5.5; however the lower limit of the CI was below 1.0. The authors conclude that there is good support for occupational vibration exposure being associated with DC. There is weaker evidence for DC being associated with manual work.

Nathan-PA; Keniston-RC; Lockwood-RS; Meadows-KD. Tobacco, caffeine, alcohol, and carpal tunnel syndrome in American industry. A cross-sectional study of 1464 workers. **J-Occup-Environ-Med.** 1996 Mar; 38(3): 290-8

UNITED-STATES

We investigated the effects of three legal drugs (tobacco, caffeine, and alcohol) on the prevalence of carpal tunnel syndrome (CTS) confirmed by nerve conduction studies (definite CTS) in two groups of American industrial workers: 656 nonclaimant workers and 808 working patients referred for upper extremity symptoms. Comparing workers with definite CTS to workers without definite CTS revealed 26% greater current use of tobacco, 19% greater lifetime use of tobacco, 5% greater current use of caffeine, 14% lesser current use of alcohol, and 75% greater history of alcohol abuse in the workers with definite CTS. All these differences were statistically significant. Those who currently used alcohol but not tobacco or caffeine were at the lowest risk for slowing, symptoms, and definite CTS. Those who currently used caffeine alone or in combination with tobacco were at the highest risk. In female workers, current smoking, current caffeine use, and current coffee consumption independently predicted 5.0% of the explainable risk for definite CTS. In male workers, history of alcohol abuse and current beer consumption independently predicted 3.0% of the explainable risk for definite CTS. Prevalence of slowing, symptoms, and definite CTS in 12 specific job categories correlated directly with current tobacco use. We conclude that the use of legal drugs affects the prevalence of median nerve slowing, symptoms, and carpal tunnel syndrome, but the effects of the drugs independently explain only a small portion of the total risk. Nevertheless, legal drug use or abuse may serve as a marker for increased CTS risk.

Ping-CL, Keung-SC, Yee-PL. Functional assessment of repetitive strain injuries: two case studies. **J-Hand-Ther**. 1996 Oct-Dec; 9(4): 394-8

UNITED-STATES

More patients with repetitive strain injuries (RSIs) are being seen in occupational therapy clinics in Hong Kong. To reduce the incidence of work-related RSIs, it is necessary to identify problem jobs and/or specific tasks that are associated with an increased risk of these disorders. Physical assessment, videotaping, ergonomic evaluations, and analyses of workstation designs are used for this purpose. In Hong Kong, however, these methods cannot be implemented at the jobsite without the approval of the employer. This restriction constitutes a major problem in planning the rehabilitation of workers who have RSIs. A self-assessment method using the Work Evaluation Systems Technology (WEST) Tool Sort and the LLUMC Activity Sort was adopted as part of the evaluation of clients with RSIs. The questionnaires were translated into Chinese and reviewed and

revised for content validity by ten occupational therapists. Two case studies are presented to illustrate the occupational therapy intervention program based on this self-report instrument. The questionnaires were found to be efficient and useful in assessing the client's abilities at work and in explaining to the client the relationship of his or her working conditions to the RSIs.

Raffi-GB, Lodi-V, Malenchini-G, Missere-M, Naldi-M, Tabanelli-S, Violante-F, Minak-GJ, D'elia-V, Montesi-M. Cumulative trauma disorders of the upper limbs in workers on an agricultural farm**. Arh-Hig-Rada-Toksikol.** 1996 Mar; 47(1): 19-23

CROATIA

The work associated with repetitive efforts and inadequate resting periods, strong physical exertion, awkward postures or static positioning exposes workers to the risk of cumulative trauma disorders of the upper limbs. These risk factors are present in many agricultural activities. A study was carried out among workers on an agricultural farm. The workers' histories were taken and they were given periodical medical check-ups. The presence of upper limb disorders was shown in a group of workers. A sample of 42 people was selected for the study by means of specific tests: electromyography, ultrasonography and laser-doppler flowmetry. The tests showed a high incidence of carpal tunnel syndrome and microcirculation disorders. The study confirmed that electromyography, ultrasonography and/or laser-doppler flowmetry are highly useful tools for identifying cumulative trauma disorders.

Terrono-AL; Millender-LH. Management of work-related upper-extremity nerve entrapments**. Orthopedic Clinics of North America** 1996 Oct; 27 (4) : 783-;

Peripheral nerve symptoms are common in the worker. Great care must be given to obtain an accurate diagnosis. Diagnostic labels should not be given unless one is sure of the diagnosis. A detailed evaluation of the worker, job, and medical and psychosocial conditions must be performed. Nonoperative treatment is primary Understanding "at-risk" patients and managing them carefully can decrease disability and improve results following treatment.

Winzeler-S, Rosenstein-BD. Occupational injury and illness of the thumb. Causes and solutions. **AAOHN-J**. 1996 Oct; 44(10): 487-92.

UNITED-STATES

The special functions of the thumb (opposition, retroposition, palmar abduction, and radial abduction) account for up 50% of overall hand use. 2. Knowledge of specific questions to ask on history taking and proper initial evaluation can help with timely and appropriate referrals for suspected thumb fracture, dislocations, and/or torn ligaments. 3. Repetitive and/or forceful thumb movements can aggravate or cause the following cumulative trauma disorders: stenosing tenosynovitis ("trigger thumb"), de Quervain's tenosynovitis, and carpometacarpal joint arthritis. 4. The occupational health nurse can suggest many ergonomic solutions to decrease thumb motions and forceful thumb pressures encountered at work.

1995

Assunção-A. Á. Sistema músculo-esquelético: lesões por esforços repetitivos (LER). In: Mendes, René. **Patologia do trabalho**. São Paulo: Atheneu; 1995.p.173-212.

BRASIL

Chatigny-C., Seifert-A.M., Messing-K. Repetitive strain in nonrepetitive work - A case study**. Journal of Occupational Safety and Ergonomics** 1995; 1 (1) : 42-51.

A study was made of the movements and forces involved in a factory job in which a woman worker developed epicondylitis. Although tasks were extremely varied, certain movements at risk for epicondylitis were repeated many times, in particular the turning of valves. Strain on the elbow was particularly intense for the woman worker because of the design of the workplace. Although it cannot be concluded that the worker's epicondylitis was due to her job, results suggest that

equipment and worksites should be adapted to a wider range of potential worker sizes. Issues concerning the definition of repetitive strain in epidemiologic studies are discussed.

Diwaker-H.N., Stothard-J. What do doctors mean by tenosynovitis and repetitive strain injury? **Occup. Med.**, 1995; 45 (2) : 97-104.

Confusion exists in both the scientific and the lay press on the meaning of the terms tenosynovitis and repetitive strain injury. The courts are increasingly being asked to make judgements on individual cases but this gives little in the way of guidance to doctors producing reports for the Department of Social Security or solicitors. The aim of this study was to document what such doctors mean by these terms, what diagnostic criteria they use, and to make any necessary recommendations. The diagnostic criteria for DSS industrial conditions A8 (tenosynovitis) and A4 (professional cramp) varied greatly and what the experts understood by the term ‘repetitive strain injury (RSI)’ was so variable that the term is meaningless. Half of the doctors who responded felt that there was no genuine organic condition corresponding to their assessment of what the term means.As half of the doctors providing reports believe that ‘repetitive’ strain injury’is not a genuine disease entity and the other half do, court cases will continue. The dilemma appears to be that completely different meanings are ascribed to the same term. Therefore, the term ‘repetitive strain injury’ should no longer be used.

Gerr-F, Letz-R, Harris-Abbott-D, Hopkins-LC. Sensitivity and specificity of vibrometry for detection of carpal tunnel syndrome. **J-Occup-Environ-Med**. 1995 Sep; 37(9): 1108-15

UNITED-STATES

A cross-sectional study was performed to assess the utility of vibrotactile thresholds (VTs) obtained before and after a 10-minute period of wrist flexion as a method for detection of carpal tunnel syndrome (CTS) among adult subjects. Subjects with hand discomfort were recruited from patients referred to a university-based electromyography laboratory. Asymptomatic subjects were recruited from among office and technical staff at a professional school. In addition to electrophysiologic evaluation (EP), all subjects were offered VT measurement of the index and small fingers, bilaterally, before and after a 10-minute period of wrist flexion. A total of 144 subjects were recruited, and three hand-condition groups were established: 57 hands had symptoms and EP results compatible with CTS (Group 1), 58 hands had symptoms compatible with CTS and normal EP results (Group 2), and 123 hands had no symptoms and normal EP results (Group 3). Group 1 was considered the "disease-positive" group, and Groups 2 and 3 were both considered "disease-negative" groups. Analyses were performed separately for dominant and nondominant hands, and results were pooled when appropriate. Outcomes of interest were the VTs obtained from the index and small fingers before and after 10 minutes of maximal voluntary wrist flexion as well as variables calculated from them. Significant differences in mean VT were observed between the three hand-condition groups for most of the outcomes evaluated. At any given level of specificity, the sensitivity of vibrometry performed after 10 minutes of wrist flexion was approximately two times that obtained before wrist flexion for detection of electrophysiologically confirmed CTS.(ABSTRACT TRUNCATED AT 250 WORDS)

Gordon-L. Hand and Wrist Disorders. In: Herington, T. N., Morse, L. H., Ed. **Occupational Injuries. Evaluation, Management, and Prevention**. St. Louis, Missouri : Mosby-Year Book; 1995. p. 103-124.

An approach to the diagnosis and treatment of work related injuries in the hand were outlined. Specific topics discussed included acute injuries (soft tissue injuries, splinting, flexor tendon injuries, extensor tendon injuries, nerve injuries, high pressure injection injuries, fingertip injuries, and vascular injuries); bone and joint injuries (fracture and dislocation of the thumb, phalangeal fracture and dislocation, and interphalangeal joint injuries); and amputations and crush injuries. Cumulative trauma disorders were discussed, including the etiology, diagnosis, and treatment. Repetition, stressful postures and factors which are not even associated with the work situation can be causative agents. Specific cumulative trauma disorders discussed included entrapment neuropathies (carpal tunnel syndrome, pronator syndrome, ulnar nerve syndrome, ulnar tunnel syndrome, radial tunnel syndrome, and posterior interosseous nerve syndrome), tendonitis, and synovitis.

Ho-CP. Sports and occupational injuries of the elbow: MR imaging findings. **AJR-Am-J-Roentgenol**. 1995 Jun; 164(6): 1465-71.

UNITED-STATES

Elbow injuries may limit participation in sports and occupational endeavors, as well as activities of daily living. Conventional radiography is the appropriate initial screening technique for evaluation of possible osseous injury or arthritis/arthrosis, but often it offers little information concerning soft-tissue derangement, which is a common source of dysfunction. MR imaging can evaluate these soft tissue to assist in diagnosis, as well as in planning treatment and assessing response to treatment. This essay illustrates MR findings of both the chronic overuse and the more acute traumatic soft-tissue injuries involving ligaments, tendons, muscles, and neurovascular structures, as well as radiographically occult osteochondral injuries.

Jeng-O-J., Radwin-R. G. A Gap Detection Tactility Test for Sensory Deficits Associated with Carpal Tunnel Syndrome. **Ergonomics** 1995 Dec; 38 (12) : 2588-2601.

Gap detection thresholds were reported for 16 healthy working age subjects in a tactility test for sensory deficits associated with carpal tunnel syndrome (CTS), using an aesthesiometer. The study was conducted to determine population normative responses, study reliability of the test as a routine monitoring tool, investigate important factors affecting the sensory threshold, and determine optimal test conditions for administering the test. A pilot study was conducted milling a flat polished surface on top of the jaws of a precision vice and using steel shims to produce a gap. In general, workers suffering from CTS may not detect a surface with scratches in a tactile inspection task unless it is twice as large as detected by workers without CTS. A normative study indicated that the gap test was easily administered and determined tactile sensitivity rapidly. The gap test was learned quickly and test results had high repeatability. A contact force of 50 grams was recommended as the optimal force condition since it required moderate force but resulted in a low threshold. The low intersubject variability of the dynamic test will ensure a high sensitivity when it is used as a monitoring tool for detecting sensory deficits. Further studies are needed for understanding the relationship between performance in the gap detection test and physiological evidence of nerve injuries before the test can be used as a monitoring tool.

Martinez-Albaladejo-M, Nombela-Gomez-M, Perez-Flores-D. With respect to Tinel and Phalen's signs. An-**Med-Interna.** 1995 Jan; 12(1): 21-4

SPAIN

The increment sensibility of the median nerve's compressed fibres in the carpal tunnel constitute the basis of the most known clinical tests, Phalen's test an Tinel's sign, used for diagnosis of the Carpal Tunnel syndrome. The frequence of these signs found in the literature is very variable, by this reason we realized this work, for determining the correlation between these tests and the clinical features and the electro-diagnosis. In our series (288 hands) the Tinel's sign demonstrate significative correlation with the motor and sensory conduction velocity ($p < 0.05$), showing significative increase of its frequence when distal motor and sensory latency were upper 4.5 ms. Phalen's test non correlated with any electrical parameters. Nevertheless, 97% of cases with positive Phalen's test were typical clinic forms of Carpal Tunnel syndrome, white 85% of cases with positive Tinel's sign concerned to typical group.

Mendes-R. **Patologia do trabalho**. Sao Paulo; Atheneu; 1995. 643 p. ilus, tab.

BRASIL

Miyashita-K, Morioka-I, Luo-WZ, Gowa-Y, Takeda-S, Kasamatsu-T, Hashimoto-T. Age-related evaluation of peripheral circulation of workers with vibration exposure. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 22-6

CZECH-REPUBLIC

This study was designed to clarify the age variation of the indices in the accelerated plethysmography (APG) for fingers and set the standard ageing curve. The indices of APG of workers with exposure to vibration were compared with those of the standard ageing curves. The subjects were 815 male workers, ranging in age from 18 to 66, without exposure to vibration and

without history of hypertension, circulatory diseases or diabetes. Their indices of APG are used establishing the standard ageing curves. The workers occupationally exposed to hand-arm vibration were also the subjects to evaluate peripheral circulation of hand. The APG was measured on the index finger tip of his dominant side by an accelerated plethysmometer. The subjects were divided into age groups at intervals of 5 years. In all age groups from 18 to 64 years, each index of APG showed an approximately normal distribution in a logarithmic scale. The mode of the distribution shifted to a lower value with increasing age. The standard ageing curves were drawn by calculating 25th, 50th and 75th percentiles by a nonparametric method for each group. Each index of the standard ageing curves dropped with increasing age. The significant age effect was slightly marked below 30 years, but marked between 30 and 50 years. The indices of APG of workers with exposure to vibration were also compared with those of the standard ageing curve. The indices of -b/a and a/d of workers with exposure to vibration were deteriorated beyond physiological change. We established the standard ageing curves for APG for male men. The technique is good for the evaluation of peripheral circulation disorder of aged workers with occupational exposure to vibration.

Ranney-D., Wells-R., Moore-A. Upper Limb Musculoskeletal Disorders in Highly Repetitive Industries: Precise Anatomical Physical Findings. **Ergonomics** Jul. 1995; 38 (7) : 1408-1423.

The incidence of strain injuries of the upper extremities was determined in female workers in five industries performing repetitive work tasks. Clinical examinations and task performance evaluations were conducted on 146 female workers required to perform repetitive work tasks using the upper limbs. The workers were employed in garment and automotive trim sewing, electronic assembly, metal parts assembly, supermarket cashiering, and packaging. Evidence of tissue injury was identified in 56% of the workers. The most common problem was muscle pain and tenderness followed by tendon problems and neuritides. The most frequently diagnosed neuritis was carpal tunnel syndrome which was seen in 11% of the subjects. Six workers were diagnosed with thoracic outlet syndrome and one with cervical neuritis. Several workers were found to have more than one form of neuritis in the same upper limb. The most frequently diagnosed tendon disorders of the distal forearm, hand and wrist were deQuervain's tenosynovitis and wrist flexor tendinitis. The most common site of muscle pain and tenderness was the neck/shoulder area followed by the muscles of the forearm/hand. The authors emphasize the importance of bilateral evaluations of strain injuries, as well as assessment of the shoulder and the forearm in evaluations of repetitive strain injuries.

Sposato-RC; Riley-MW; Ballard-JL; Stentz-TL; Glismann-CL. Wrist squareness and median nerve impairment. **J-Occup-Environ-Med**. 1995 Sep; 37(9): 1122-6

UNITED-STATES

Previous research indicated that a wrist-squareness ratio (thickness/width) greater than .7 is likely to indicate a median nerve sensory latency greater than 3.7 ms, usually a predictor of carpal tunnel syndrome (CTS). In this study, wrist thicknesses and widths were measured and wrist-squareness ratios were calculated for a sample of 417 railroad maintenance workers. Electrodiagnostic testing, in accordance with American Academy of Electrodiagnostics Medicine guidelines, was performed on both motor and sensory fibers of the median nerve to evaluate subjects for the presence of median nerve impairment typical of CTS. Results of this study indicate that wrist squareness is not a useful predictor of median nerve impairment typical of CTS in the railroad maintenance workers tested.

Young-V. L., Seaton-M. K., Feely-C. A., Arfken-C., Edwards-D. F., Baum-C. M., Logan-S. Detecting Cumulative Trauma Disorders in Workers Performing Repetitive Tasks. **American Journal of Industrial Medicine** Mar. 1995; 27 (3) : 419-431.

A study was conducted on the incidence of cumulative trauma disorders of the upper extremities among workers in the poultry processing industry. Cumulative trauma disorders of the upper extremities were assessed in 157 workers from two different poultry processing factories. Clinical measures such as grip strength, pinch strength, cutaneous pressure, vibration threshold, terminal motor latency of the median nerve, Tinel's sign, and Phalen's test of the subjects were evaluated and scored by nurses or occupational therapists. Symptoms such as pain, numbness, swelling, and weakness were also assessed. Between five and six abnormal findings were identified in the

average worker. Of those studied, 83% of the workers had total scores for signs and symptoms of cumulative trauma disorders greater than 1.0, and 50% had total scores greater than 2.5. The highest incidences of abnormalities were seen for pinch strength, vibration sensitivity, and reports of numbness. Both measured signs and reported symptoms consistent with cumulative trauma disorders were seen in 62% of the workers while symptoms alone were seen in 8%, and signs alone in 25%. The authors conclude that the methods used to detect cumulative trauma disorders in this group of workers are useful for the early detection and treatment of these disorders.

1994

Buckle-P. Ergonomic Stressors Related to Neurological Disorders of the Upper Limbs. In: Bleecker-M. L., Hansen-J. A., Ed. **Occupational Neurology and Clinical Neurotoxicology**. Baltimore, Maryland : Williams and Wilkins; 1994. p. 253-267.

Studies concerning work related neurological disorders of the upper limbs were reviewed. Specific disorders were discussed, along with related stressors and examples of occupations where these stressors may be common. The stressors to the nerves were characterized as compression or entrapment stressors, and repetitive or sustained stressors. Median nerve disorders included: carpal tunnel syndrome which has been associated with repetitive, forceful movements of the hand, wrist and fingers, or the use of vibrating tools, particularly during flexion of the wrist; pronator syndrome, associated with repetitive grasping and/or wrist pronation; compression at the shoulder (uncommon, but found in soldiers and possibly associated with tight gun straps); anterior interosseous nerve syndrome, associated with repetitive elbow flexion and pronation; and median nerve injury in opponens branch, associated with pressure or pounding into the palm. Ulnar nerve disorders included: cubital tunnel syndrome associated with placement of weight on the fully flexed elbow; and palmar branch of the ulnar nerve, associated with chronic repetitive trauma to the base of the hypothenar eminence. Radial nerve disorders included wrist drop syndrome/high axillary radial nerve lesion, associated with traumatic conditions and pressure on the inner aspect of the arm; posterior interosseous nerve syndrome, which involved motions of outstretched arms with weights or repeated pronation and supination or forceful extension of the arms; and superficial radial nerve injury, associated with compression at the wrist or forearm. Brachial plexus lesions included: thoracic outlet syndrome, associated with repetitive abduction and adduction of the shoulder and arm and hyperextension of the neck; suprascapular nerve injury, associated pressure on the shoulder; and damage to the long thoracic nerve, associated with pressure on the shoulder or exertion of the shoulder. Digital nerve entrapment in the hand has been associated with trauma to the hand. The author cites lack of reporting of validity of methods and lack of dose response relationship as faults in the studies under review and suggests that attention to these areas would be beneficial.

Harber-P., Hsu-P., Pena-L. Subject-Based Rating of Hand-Wrist Stressors. **Journal of Occupational Medicine** 1994; 36 (1) : 84-89.

Hand/wrist motions were studied using subject based rating (SBR) methods. Subjects performed wrist motion tasks involving different levels of force, wrist position, repetition frequencies, and grip type and were asked to rate the relative perceived exertion for the different factors using an SBR method. An electrogoniometer was used for quantitative measurement of wrist flexion. Grip type was the most important factor affecting overall comfort and sense of exertion. Significantly increased discomfort was seen with the use of a precision grip method. Repetition frequency did not appear to be a significant factor; however, the use of extremely frequent motions was rated overall as highly adverse. Wrist flexion was rated as a more adverse position compared with extension and the magnitude of the effect of force was lower than that seen for the other variables. The authors conclude that SBR methods may be useful in characterizing risk of cumulative trauma disorders and for differentiating among different workload situations.

Kirschberg-G. J., Fillingim-R., Davis-V. P., Hogg-F. Carpal Tunnel Syndrome: Classic Clinical Symptoms and Electrodiagnostic Studies in Poultry Workers with Hand, Wrist, and Forearm Pain. **Southern Medical Journal** Mar. 1994; 87 (3) : 328-331.

Clinical findings and electrodiagnostic studies were used to identify abnormalities in 112 consecutive patients doing repetitive jobs in the poultry industry who were referred to a neurologist with pain, numbness, tingling, or any combination of these. The group included 95 women and 17 men. Of the 112 patients, 25 were considered to have classic clinical carpal tunnel syndrome (CTS). Of the 25, six had negative electromyograms. Positive electrodiagnostic results were obtained in 14 additional patients without classic clinical CTS. There was a high degree of agreement between the results of electrodiagnostic studies and assessment using classic CTS symptoms with 88.2% of the males and 81.1% of the females testing either positive or negative with both classic symptoms and electrodiagnostic criteria. The authors suggest that both classic clinical symptoms and positive results to electrodiagnostic criteria be present before surgery is contemplated in these patients.

Lopes-A; Villanacci Neto-R. A Síndrome do Túnel Carpal: um risco profissional para o cirurgião dentista **Rev. Assoc. Paul. Cir. Dent** 1994 Nov; 48(6):1545-52.

Os autores conceituam a Síndrome do Túnel Carpal (STC) entre as neuropatias perif,ricas e as lesões de esforço repetitivo (LER), relacionam a incidência do distúrbio de caráter ocupacional com os procedimentos odontológicos, fazem uma revista da literatura, descrevem a fisiopatologia, o diagnóstico e o tratamento e dão sugestões para a prevenção do distúrbio (AU).

Miller-RF, Lohman-WH, Maldonado-G, Mandel-JS. An epidemiologic study of carpal tunnel syndrome and hand-arm vibration syndrome in relation to vibration exposure [see comments]. **J-Hand-Surg-Am**. 1994 Jan; 19(1): 99-105

UNITED-STATES

No Minnesota workers' compensation claims have been filed for permanent partial disability benefits with a diagnosis of hand-arm vibration syndrome (HAVS). A cross-sectional study was undertaken to evaluate 519 compensation claimants following carpal tunnel surgery. Workers with significant vibration exposure and symptoms compatible with HAVS were identified within the group. The results show that some workers are not diagnosed as having HAVS even though they meet the diagnostic criteria. This suggests that HAVS should be considered in the differential diagnosis when a worker presents with neural and/or vascular symptoms of the hands and fingers.

Ohlsson-K., Attewell-R. G., Johnsson-B., Ahlm-A., Skerfving-S. An Assessment of Neck and Upper Extremity Disorders by Questionnaire and Clinical Examination. **Ergonomics** May 1994; 37 (5) : 891-897.

The validity of a screening questionnaire for neck and upper limb complaints was examined. The questionnaire sought information on subjective pain, aches, or discomfort in the neck and upper limbs during the preceding 7 days and 12 months, and any complaints that had affected work ability during the past 12 months. The questionnaire was completed by 101 women (mean age 47 years) employed in an electrical equipment production factory whose jobs involved repetitive motions usually requiring the arms to be adducted and the arms elevated, and 64 females (mean age 42 years) who had more varied and mobile jobs in supermarkets (excluding cashier work) and offices (excluding constant video display terminal work). The subjects were given physical examinations focussing on the necks and upper limbs. The symptoms reported on the questionnaire were compared with those found in the clinical examinations. Ninety four subjects reported complaints on the questionnaire. Seventy three were related to the neck and shoulders region and 61 to the elbows and hands. A total of 140 subjects had symptoms at the clinical examination. Seventy five were given at least one diagnosis. Tension neck syndrome was the most frequent diagnosis, 55 cases being diagnosed. The overall sensitivity and specificity of the questionnaire for detecting clinical disorders of the neck and upper limbs were 83 and 64%, respectively. By anatomical region, the questionnaire had the best sensitivity, 92%, for detecting disorders in the shoulder region. The poorest sensitivity was for identifying subjects with neck and hand problems, 66 and 67%, respectively. Except for the shoulders, the specificity of the questionnaire was high for all regions, 76 to 88%. The specificity for detecting shoulder disorders was 71%. The authors conclude that the questionnaire can provide a fairly accurate picture of the neck and upper extremity status of a working female population. A detailed clinical examination is still required, however, to obtain a clear view of any neck and upper extremity problems.

Pelmear-P. L., Taylor-W. Carpal Tunnel Syndrome and Hand-Arm Vibration Syndrome. A Diagnostic Enigma. **Archives of Neurology** 1994 Apr; 51 (4) : 416-420.

Carpal tunnel syndrome and hand/arm vibration syndrome were discussed with emphasis on diagnostic difficulties and treatments. Specific topics addressed included: overview of hand/arm vibration syndrome (HAVS) and carpal tunnel syndrome (CTS); epidemiology of CTS and HAVS; the HAVS versus CTS diagnosis dilemma; and treatment of HAVS and CTS. The ability to distinguish between CTS and HAVS depended on proper evaluation of anatomical factors, associated physiological and medical conditions, work exposure history, and ulnar nerve involvement. Specific signs and symptoms that were considered included: exposure to vibration; exposure to repetitive strain; finger numbness; tingling; sleep disturbance; muscle cramps; aches and pains in arms; reduction in grip strength; and Raynaud's phenomenon. Surgical intervention was generally not recommended in cases of CTS where hand/arm vibration exposure was a contributing factor, since the associated reduction in grip strength was a potentially serious handicap for workers. Diagnosis and treatment of patients with HAVS and CTS appeared to vary considerably from country to country. The authors conclude that there is a need for more in depth knowledge of HAVS and CTS, their management at work, and response to conservative treatment regimens.

Viikari-Juntura-E., Hietanen-M., Kurppa-K., Huuskonen-M., Kuosma-E., Mutanen-P. Psychomotor Capacity and Occurrence of Wrist Tenosynovitis. **Journal of Occupational Medicine** 1994 Jan.; 36 (1) : 57-60.

A possible relationship between psychomotor capacity and the occurrence of tenosynovitis among meat processing factory workers was studied. Meatcutters, sausage makers, and packers who had a history of at least two episodes of tenosynovitis or peritendinitis of the wrist or forearm and matched referents were given a series of psychomotor capacity tests including reaction and movement time tests, the Purdue pegboard test, a test of finger dexterity, a test of visuospatial ability, and a visual attention test using the Critical Flicker Fusion Frequency. No significant differences were seen between the subjects and referents in any of the measures of psychomotor capacity. The authors conclude that the psychomotor test battery used to determine psychomotor capacity in this group of workers is not useful in the prediction of a history of tenosynovitis.

White-KM, Congleton-JJ, Huchingson-RD, Koppa-RJ, Pendleton-OJ. Vibrometry testing for carpal tunnel syndrome: a longitudinal study of daily variations. **Arch-Phys-Med-Rehabil.** 1994 Jan; 75(1): 25-8

UNITED-STATES

The method of limits procedure was used to obtain 84 120Hz vibration thresholds, over a 3-month period, on four age-matched women with different levels of carpal tunnel syndrome (CTS). Each woman used a keyboard for 4 hours a day during work. Testing was conducted in a room with a temperature of 28 degrees C +/- 2 degrees C after 20 minutes acclimation. Results indicate vibration thresholds vary significantly from day to day and also demonstrate how a single vibrometry measure may falsely identify the participant's true CTS condition. Specifically, a single measure could account for a negative CTS determinations in affected wrists or positive CTS determinations in healthy wrists. Subsequent analysis revealed menses related fluid retention and day of the week increase the vibration thresholds. Analyzing the levels of fluid retention by day of the week indicates a compounding effect of the personal and occupational risk factors.

1993

Brasil. Ministério da Previdência Social. Instituto Nacional do Seguro Social**. LER lesões por esforços repetitivos: normas técnicas para avaliação da incapacidade**. Brasília; Brasil. Ministério da Previdência Social; 1993. 21 p.

BRASIL

Duro-L.A, Penque-G.M.C.A, Sztyglic-R.E. Estudo das latências motoras e sensitivas dos nervos cubital, mediano e radial em pacientes com a síndrome do digitador. **Rev. bras. neurol**; 29(6):189-92, nov.dez. 1993. tab.

BRASIL

Instituto Nacional do Seguro Social. **LER - lesoes por repetitivos: normas tecnicas para avaliacao da incapacidade - 1993.** Brasilia; Instituto Nacional do Seguro Social; 1993.

BRASIL

Jackson Filho-J.M. **Avaliação da incidência de lesões por esforço repetitivo nos setores de compensação bancária e de processamento de dados na região de Florianópolis do Banco do Estado de Santa Catarina: laudo pericial**. Florianópolis: FUNDACENTRO; 1993. 84 p. tab.

BRASIL

Lech-O, Varnieri-S.; Alvarenga-I.; Valenzuela-C. Apoiador móvel para braço (AMPB) análise na prevenção das lesões por esforços repetitivos. **Rev. bras. ortop** 1993 Mar; 28(3):155-159.

BRASIL

Os autores apresentam novo aparelho ergonômico utilizado para repouso dos membros superiores durante o período de digitação. O "apoiador móvel para braço" (AMPB) determina uma diminuição do esforço muscular estático e corrige a postura, aliviando a tensão muscular e o stress localizado do membro superior. Trinta e um digitadores foram utilizados na avaliação do AMPB; 10 (32,26 por cento) homens e 21 (67,74 por cento) mulheres, com idade variando entre 24 e 41 anos. Vinte e seis (83,87 por cento) possuíam queixas nos membros superiores relacionadas ao serviço. O tempo médio de utilização do aparelho foi de 39 dias. Houve diminuição ou eliminação dos sintomas em todos os indivíduos sintomáticos. Vinte e nove (93,54 por cento) utilizariam regularmente este novo aparelho ergonômico durante sua jornada de trabalho. (AU).

1992

Assunção-AA. Rotina de atendimento de trabalhadores com suspeita ou confirmação de lesões por esforços repetitivos. In: Assunção-AA; Silveira-AM., Dias-E.C., Silva-J.M., Rigotto-R.M. **Manual de rotinas: ambulatório de doenças profissionais.** s.l, Imprensa Universitária da UFMG, 1992. p.103-20, ilus.

BRASIL

Brito-AC., Orso-M.B., Gomes-E., Mühlen-C.A. Lesões por esforços repetitivos e outros acometimentos reumáticos em músicos. **Rev. bras. reumatol** 1992 Mar/Abr.; 32(2):7983.

BRASIL

Federação Estadual dos Bancários de São Paulo; Sindicato dos Bancários de São Paulo**. Trabalho bancário x saúde, LER lesões por esforços repetitivos: resoluções 180 e 197 de 1992 da Secretaria Estadual da Saúde**. São Paulo; Sindicato dos Bancários de São Paulo CUT; 1992. 16 p.

BRASIL

Pereira-R.A G. **Ler: doença das trabalhadoras**. Salvador; s.n; 1992. 161 p. ilus, tab.

BRASIL

Bernardino Ramazzine, em 1700, identificava as principais causas de doença e sofrimento entre os trabalhadores que desempenhavam trabalhos repetitivos: a contínua vida sedentária, o contínuo e sempre o mesmo movimento da mão e a atenção mental. O pai da Medicina do Trabalho descrevia as doenças específicas dos escribas e notários, duas categorias profissionais, que se distinguiam pela arte de escrever com velocidade, estavam em extinção com o advento da indústria tipográfica, e cuja atividade pouco tinha em comum com as desempenhadas pela maioria dos trabalhadores do seu tempo. Nesta época, o mundo do trabalho se caracterizava pela

utilização da força humana como força energética, e o trabalho realizado em prolongadas jornadas, implicava em grande esforço físico, gasto calórico elevado e variedade de movimentos, resultando em um padrão de desgaste que aliava a desnutrição e as doenças infecto-contagiosas aos acidentes de trabalho graves e fatais. Só no final do século XVIII, com as profundas transformações advindas da Revolução Industrial, a energia das máquinas substitui a força física dos homens. O desenvolvimento dos processos de trabalho automatizados, com base na microeletrônica e na informática, difundidos em praticamente todos os ramos da economia, caracterizam o momento atual. A automatização foi, e ainda é, comumente festejada pelas suas possibilidades de transformação das condições de trabalho, libertando o homem dos trabalhos penosos e perigosos, ou "modernizando" e facilitando os processos de trabalho na indústria e serviços através da utilização dos computadores...(AU).

1991

Barreira-T.H.C. **A tarefa de enrolamento de produtos agulhados: relatório de levantamento**. São Paulo; FUNDACENTRO; 1991. 50 p. ilus, tab.

BRASIL

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 1ª parte. **Rev. Bras. Neurol** jan/fev 1991; 27(1):9-12.

Os músicos podem ser acometidos por afecções neurológicas de natureza ocupacional. O temor de palco , um distúrbio decorrente da descarga adrenérgica excessiva relacionada a apresentações difícies e/ou importantes. O uso excessivo dos músculos ao tocar por períodos prolongados pode resultar em uma lesão ultra-estrutural de resolução demorada. A compressão de nervos periféricos pode resultar do contato direto com os instrumentos musicais ou da posição necessária para tocá-los. Mais raramente, os músicos são acometidos por uma discinesia ocupacional, de origem obscura e tratamento difícil.

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 2 parte. **Rev. Bras. Neurol.** Mar/abr. 1991; 27(2):63-6, mar.-abr. 1991.

BRASIL

Gonik-R. Afecçäes neurológicas ocupacionais dos músicos: 3a. parte. **Rev. Bras. Neurol**. Maio/Jun. 1991; 27(3):87-91.

BRASIL

Rocha-L.E. Tenossinovite e trabalho: análise das comunicações de acidentes de trabalho (CATs) registradas no município de São Paulo. **Rev. Bras. Saúde Ocup.** abr.-jun. 1991; 8 (70) : 29-39.

O presente estudo analisou 284 CATs de tenossinovite registradas no município de São Paulo, no período de novembro de 1986 a dezembro de 1987. A tenossinovite, apesar de ser uma entidade clínica associada ao trabalho há muito tempo, começou a ser reconhecida como decorrente de movimentos repetitivos no Brasil, principalmente após a publicação da Circular nº10 do INAMPS, de 7/11/86, e da Portaria nº4.062 do INPS, de 6/8/87. Em relação àocupação dos 284 casos registrados 88,6% eram digitadores; isto se deve à mobilização dos profissionais de processamento de dados. Na realidade, esta patologia pode acometer diferentes ocupações, nas quais se desenvolvam movimentos repetitivos. Com a aceleração do ritmo de trabalho e controle da máquina sobre o trabalho do homem, a tenossinovite vem adquirindo outras características, tornando-se um importante problema de saúde ocupacional. O quadro clínico verificado não se restringe à tenossinovite, tendo sido denominado de Lesões por Esforços Repetitivos. É necessário que se desenvolvam estudos quanto à real incidência, ao quadro clínico, tratamento e à evolução desta patologia.(AU).

Salles-M.M. Tenossinovite: doença ocupacional ou social. **Rev. Bras. Saúde Ocup.** Abr./Jun. 1991; 19(73):8690.

BRASIL

As lers (Lesões por Exposições Repetitivas) e as LTCs (Lesões por Traumas Cumulativos) têm sido negligenciadas ou supervalorizadas pelos serviços de Saúde Ocupacional das empresas com conseqüências ruins para o empregado, empregador e para o país quando ocorre aposentadoria por doença ocupacional. O presente artigo faz uma revisão crítica dessa situação como colocações diagnósticas e preventivas, sugerindo medidas para minimizar tal impacto social (AU).

Lech-O; Hoefel-M.G. **Protocolo de investigação das lesões por esforços repetitivos (L.E.R.)**. São Paulo; RHODIA FARMA; s.d. 64 p. ilus, tab.

BRASIL

EDUCAÇÃO

1997

Thornton-J.K. Carpal Tunnel Syndrome in ARL Libraries. **College-&-Research-Libraries** 1997 Jan**;** 58 (1) : 9-18.

A survey of 72 member libraries in the Association of Research Libraries revealed the incidence of carpal tunnel syndrome (CTS) and the measures taken to cope with it. Recommends implementing proactive ergonomics programs; soliciting staff input for solutions; providing report guidelines; using external help; stressing preventive measures and education; investigating problems; providing diverse tasks; viewing CTS web sites. (PEN)

1996

Arp-L.W., Brundick-E.L. The Importance of Proper Keyboarding Techniques in Reducing Computer-Related Repetitive Stress Injuries. **Office-Systems-Research-Journal** Fall 1996; 14 (2) : 13-18.

Reviews the impact of repetitive stress injuries in the workplace, the nature of those injuries, and what teachers can do to help prevent the development of such injuries by teaching proper keyboarding techniques. (Author/JOW)

Blaszczynski-C., Joyce-M.S. Keyboarding Instruction at NABTE Institutions: Are We Teaching Techniques to Reduce CTD Incidence? **Delta-Pi-Epsilon-Journal** Fall 1996; 38 (4) : 195-208**.**

Responses from 157 of 193 business teachers who teach keyboarding indicated that 78.7% were aware of cumulative trauma disorder and 22% had experienced it. Only 13% of classrooms were equipped with wrist rests. About 53% teach techniques to reduce incidence, but 20% did not know whether they taught preventive measures. (SK)

Rosskam-E. **Ergonomics.** Genève, Switzerland : ILO Publications, International Labour Office; 1996.

AB : This training module provides students with basic information on ergonomics. Topics discussed include information on the following topics: acute and chronic health problems which can result from poor ergonomic conditions at work; basic ergonomic principles of work involving sitting and standing postures; heavy manual work; ergonomic principles of tool and job design; role of the health and safety representative. In annexes: exercise for the identification of problems and developing solutions to ergonomic problems; recommendations for manual lifting and carrying; job design check list; what to do if cumulative trauma disorder is suspected; evaluation of risk factors at work; control of vibration hazards.

1995

National Occupational Health and Safety Commission (Worksafe Australia**). Core training elements for the National Standard for Manual Handling**. Canberra : Australian Government Publishing Service; 1995.

This is one of a series of core training manuals for the performance-based standards (see CIS 91-2055 and 95-784 for the ones on manual handling and OOS) addressing major hazards and developed by Worksafe Australia. It is recommended to include its contents in any Australian training programme on manual handling. The core training elements are grouped under: scope; target groups; training aims; training objectives; performance indicators; main topic/content areas; notional times; training and learning methods; resource list. In appendix: a series of "breakdown" (data) sheets, presenting the role of everyone in the workplace in dealing with specific issues: legislation on manual handling and the prevention of occupational overuse syndrome (OOS); health and safety effects of manual handling and OOS; identification, assessment and control of risks; communication and consultation regarding the implementation of management safety plans; design of a management programme for manual handling and OOS.

Thornton-J.K. Battling Carpal Tunnel Syndrome through Ergonomics: A Case Study of Texas A&M's Library Provides Insights and Answers. **Computers-in-Libraries** 1995 Sep; 15 (8) : 22-25.

Current library automation practices and new technologies have forced library managers to seek some means of reducing carpal tunnel syndrome, and a case study of Texas A&M's library provides insights. Highlights include identifying and assessing the injuries, adjusting work surfaces, testing and selecting new keyboards, and developing adjustable work stations. (AEF)

1994

Health and Safety Department, International Union, United Automobile. **Ergonomics awareness manual**. Detroit, MI, USA : UAW; 1994.

The aim of this training manual is to increase the awareness of ergonomics issues among workers. Coverage: cumulative trauma disorders (symptoms and evaluation); ergonomic risk factors (repetitive work, forceful exertions, awkward postures, mechanical stress concentration, vibration); ergonomics programmes within enterprises. In annex: symptoms survey; glossary.

Louis-D.M. **Safety and Health Concerns in Academic and Public Libraries**. Ohio, Kent State University; 1994.

UNITED-STATES

The library is a relatively safe work place, but no place is completely free from hazards. This paper examines the major health and safety concerns of staff and patrons of academic and public libraries, based on a literature review of approximately 60 articles. According to this literature, general safety hazards are not considered a major problem in libraries, as evidenced by the fact that they are mentioned infrequently, and each hazard is referred to an average of only two times. Fire can be a major hazard, and insufficient emergency procedures training for staff is the largest concern, at 16.7% frequency (9 times) in the literature, followed closely by arson (8 times), locked or blocked exits (8 times) and defective exit signs (8 times). Harassment was found to be the largest crime threat, referred to 14 times in the literature, followed by assault (8 times) and arson (7 times). Having a clearly written safety policy and training staff on emergency procedures are important safeguards in minimizing safety concerns. The major health concerns reported in the literature were repetitive strain injuries (referred to 6 times), carpal tunnel syndrome (5 times), tendonitis (5 times), eye strain (4 times) and general stress (4 times). The following precautions were recommended to avoid these health problems: have "ergonomically" designed work areas, alternate tasks to prevent excessive repetitive motion and take frequent breaks. Two appendices include a supplemental bibliography and listings of all health and safety issues examined in the paper. (Contains 24 references.) (MAS)

Merrell-W.L.; Zeimet-D.E. Workstation Analysis, Ergonomic Style: Don't Despair, Teaching Ergonomic Workstation Analysis Isn't That Tough; but You Need a Plan. **ATEA-Journal** 1994 Oct-Nov; 22 (1) : 16-19.

Lists 15 principles for working safely with equipment. Describes phases of an ergonomic hazards program to identify and prevent problems and causes of cumulative trauma disorders in the workplace. (SK)

1992

[Anonymus]. Getting a Hand up on Carpal Tunnel Syndrome. Tips for Beating the Malady of the Information Age. **PTA-Today** 1992 Apr; 17 (6) : 8.

Presents a series of exercises to help prevent carpal tunnel syndrome, a painful hand disorder caused by stressful and repetitive motions. (SM)

Miller-NL. Are Computers Dangerous to Our Children's Health? **PTA-Today** 1992 Apr; 17 (6) : 5-7

Computer use can affect students' health. Recommends instruction on safe computer use, placement of computers to minimize children's exposure to magnetic field. Preventive measures are suggested to help children avoid eye strain and repetitive strain injuries. (SM)

Stedt-JD. Interpreter's Wrist: Repetitive Stress Injury and Carpal Tunnel Syndrome in Sign Language Interpreters. **American-Annals-of-the-Deaf** 1992 Mar; 137(11) : 40-43.

In a survey concerning repetitive stress injury (RSI) and carpal tunnel syndrome, 87 percent of the 40 sign language interpreters reported that they had at some time experienced at least 2 symptoms associated with RSI, and most interpreters knew others with RSI problems. Data indicate that RSI is a severe problem among sign language interpreters. (Author/JDD)

Wright-C, Friend-L. Ergonomics for Online Searching. **Online** 1992 May; 16 (3) :13-15,17-20,22-27.

Describes factors to be considered in the design of ergonomically correct workstations for online searchers. Topics discussed include visual factors, including lighting; acoustical factors; radiation and visual display terminals (VDTs); screen image characteristics; static electricity; hardware and equipment; workstation configuration; chairs; keyboards; repetitive motion injuries; modems; printers; staff training; and psychological implications. (43 references) (LRW)

EPIDEMIOLOGIA

1998

Atcheson-SG, Ward-JR, Lowe,W. Concurrent medical disease in work-related carpal tunnel syndrome. **Archives of Internal Medicine** 1998 Jul 27; 158 (14) : 1506-1512

Background: Work-related carpal tunnel syndrome (CTS) now accounts for more than 41% of all repetitive motion disorders in the United States. Carpal tunnel syn drome is also associated with obesity and many different medical diseases. Patients and Methods: Two hundred ninety-seven patients medically certified with;a work-related upper extremity industrial illness underwent a systematic search for concurrent medical diseases. Diagnoses of CTS were made using 4 separate case definitions. Results: One hundred nine separate atraumatic illnesses (mainly hypothyroidism, diabetes mellitus, and various arthropathies) capable of causing arm pain or CTS were diagnosed in a third of all patients. Using record reviews and patient histories alone, 68% of these conditions would have been missed. One hundred ninety-eight patients had been diagnosed as having CTS 420 times in more than 1000 office visits, but diagnostic laboratory studies were ordered only 25 times. Every case definition of CTS was significantly associated with a related medic:al condition. Two definitions yielded more than 41% prevalence of concurrent disease (odds ratio, greater than or equal to 2.36; P less than or equal to.004), and up to two thirds of these patients had either a medical disease or were obese (odds ratio, greater than or equal to 3.15; P less than or equal to.001). Two cohorts totaling 114 patients (38%) working for companies employing nearly 19 000 people included all CTS claims filed during 2 evaluation periods. They did not differ from the other patients with CTS with respect to age, concurrent disease, or obesity. Conclusions: Routine patient histories and record reviews are inadequate for proper evaluation of work-related CTS. Unrecognized medical diseases capable of causing CTS are common. Studies asserting an association between occupational hand usage and CTS are of questionable validity unless they prospectively account for confounding disease anti obesity.

Colombini-D . An observational method for classifying exposure to repetitive movements of the upper limbs. **Ergonomics**, 1998 Sep; 41 (9) : 1261-1289

ENGLAND

This article presents and discusses a model for describing and evaluating the principal risk factors characterizing occupational exposure: frequency and repetitiveness of movements; use of force; type of posture and movements; distribution of recovery periods; and presence of other influential (additional) factors. For each risk factor, the author proposes a method of practical detection in the field, as well as criteria for classifying and interpreting the results based on a critical review of the available literature on the subject. Numerous examples are supplied to better illustrate the concepts presented. The various factors considered are classified using numbers or indexes, so that they can be integrated into a concise exposure index.

Feuerstein-M, Miller-VL, Burrell-LM, Berger-R. Occupational upper extremity disorders in the federal workforce: Prevalence, health care expenditures, and patterns of work disability**. Journal of Occupational and Environmental Medicine**, 1998 Jun; 40 (6) : 546-555.

Upper extremity disorders (UEDs) account for a significant number of work-related illnesses in the US workforce. Little information exists on the distribution of UEDs, their associated health care and indemnity costs, or patterns of work disability. The study presented is an analysis of upper extremity claims within the federal workforce. In this study, the universe consisted of all claims accepted by the US Department of Labor, office of Worker' Compensation Programs (OWCP), from Oct, 1, 1993, through Sep, 30, 1994,. A total of 185,927 claims of notices injury were processed during the study period and of these, 8,147 or 4.4% had an UED diagnosis coded according to the International Classification of Diseases, Clinical Modification (ICD-9-CM). 5,844 claims involved a single UED diagnosis and were he only claims filed by these employees between Oct, 1, 1990, and Sep, 30, 1994,. These single claims with single diagnoses comprised the sample for further analysis. Mononeuritis and enthesopathies of the upper limb were the most common diagnoses, accounting for 43% and 31% of the claims respectively. Women had a higher proportion of carpal tunnel syndrome, "unspecified" mononeurtis, and "unspecified" enthesopathies. The majorities of claimants for both the mononeuritis- and enthesopathy-related diagnoses were between 31 and 50 years of age, received only health care benefits, and did not incur wage loss. Health care costs for mononeuritis and enthesopathy of claims were $12,228,755 (M = $2,849). Carpal tunnel syndrome (CTS) and enthesopathy of the elbow were the most costly diagnoses, accounting for 57% and 16% of the total, respectively. Surgical services represented the highest expenditures in CTS claims. Physical therapy accounted for the majority of health care costs for enthesopathy cases. The mean number of workdays lost for CTS and enthesopathy claims were 84 and 79 and the average indemnity costs were $4,941 and $4,477, respectively. These findings indicate that while UEDs represent a relatively small percentage of all workers' compensation cases, the health care and indemnity costs are considerable. Also mean duration and pattern of work disability revealed that these disorders can result in chronic work disability similar to that observed in low back pain. The results highlight the need to determine whether interventions that account for the majority of costs significantly impact long-term outcomes. There is also a need to identify risk factors for prolonged disability in those who experience problems with delayed recovery.

Finsen-L., Christensen-H., Bakke-M. Musculoskeletal disorders among dentist and variation in dental work. **Applied Ergonomics** 1998; 29 (2) : 119-125.

The purpose was to assess risk factors in dentistry which may contribute to musculoskeletal disorders. A questionnaire was used to identify common work tasks, and to estimate one year prevalence for troubles (65% for neck/shoulder, 59% for the low back). In a field study working postures and electromyography (shoulder / neck) were registered during the three most common work tasks. Prolonged neck flexion and upper arm abduction were found, as well as high static muscle activity levels (splenius and trapezius muscles). No differences between work tasks were found regarding postures, frequencies of movements or muscle activity. Alterations between the three work tasks do not produce sufficient variation to reduce musculoskeletal load on the neck and shoulders.

Fry-HJH, Hallett-M, Mastroianni-T, Dang-N, Dambrosia-J. Incoordination in pianists with overuse syndrome. **Neurology**, 1998 Aug; 51 (2) : 512-519.

To investigate claims that painful musculoligamentous overuse in the arms and hands of pianists is accompanied by loss of motor control, we studied 18 pianists with overuse syndrome of one or both arms and hands and 22 skill-matched pianists with no history of overuse. All of the pianists performed continuous repetitions of a five-finger exercise on a piano keyboard at metronome-paced tempos. The main outcome measures were quantitative analysis of four measurements of performance (duration of key presses, interval between key presses, velocity of key presses [loudness], and time off the metronome beat [difference between actual and expected time of key press]); comparison of the errors in the two groups; and comparison of the performances by a listening panel. The two groups had significant differences in performance, and a classification tree had a sensitivity of 0.886 and a specificity of 0.862 in identifying the affected hands. The pianists with overuse syndrome made more skill-based errors. The listening panel could distinguish between the affected and unaffected hands. We conclude that pianists with overuse syndrome have a coordination disturbance.

Garcia-M.E., Martins-AAB.K, Braggio-E.F., Rossi-J.C.B., Albuquerque-V.G.C. et al. Distúrbios ósteo-musculares relacionados ao trabalho na Coordenadoria de Assistência Social da Universidade de São Paulo. **Rev. Med. HU-USP** 1998; 8 (1): 21-24.

BRASIL

Grieco-A, Molteni-G, DeVito-G, Sias-N. Epidemiology of musculoskeletal disorders due to biomechanical overload. **Ergonomics** 1998 Sep; 41 (9) : 1253-1260

ENGLAND

The link between occupation and musculoskeletal disorders has been focused on in numerous research projects, ranging from those simply observing the different pathological findings reported among workers performing particular tasks, down to the latest studies actually quantifying the 'exposure' of workers to physical and psychosocial stimuli. For some disorders and certain tissues, it has been reported that specific types of work-related exposure are associated with the development of musculoskeletal pathologies, and that the relative risks for certain types of occupational exposure can be extremely high. This has been proven in relation to tendinitis of the shoulder and hand-wrist, carpal tunnel syndrome, as well as several localized aspecific musculoskeletal symptoms, such as pain. For other pathologies, the studies reported contradictory results. This is the case for lateral epicondylitis and cervical radiculopathy.

Hashemi-L, Webster-BS, Clancy-EA, Courtney-TK. Length of disability and cost of work-related musculoskeletal disorders of the upper extremity. **Journal of Occupational and Environmental Medicine** 1998 Mar; 40 (3) : 261-269.

There is little information on the length of disability (LOD) reported for work-related musculoskeletal disorders of the upper extremity (WMSDUE). For this study, LOD, cost, and the relationship between LOD and cost were derived from a large workers' compensation company's claims data for 1994 WMSDUE (n = 21,338). The average LOD was 87 days, with a;median of zero days. For those claims with at least one day of compensable disability (25.2%), the average and median LOD were 294 and 99 days, respectively. The distribution of cost was skewed, with the average cost of a claim being 13 times higher than its median. Approximately 60% of the claims cost $1000 or less. Additionally, the 6.8% of the claims with an LOD greater than one year accounted for 59.9% of the cost and 75% of the total disability days. The majority of WMSDUE claimants did not lose sufficient time to qualify for indemnity. For those who did receive lost time wages, a disability duration of more than three months was typical.

Hoozemans-M.J.M, Van der Beck-A.J. Frings-Dresen-M.H.W. Pushing and pulling in relation to musculoskeletal disorders: A review of risk factors. **Ergonomics** 1998; 41 (6) : 757-781.

The objective was to review the literature on risk factors for musculoskeletal disorders related to pushing and pulling. The risck factors have been described and evaluated from four perspectives: epidemiology, psychophysics, physiology, and biomechanics. Epidemiological studies have shown, based on cross-sectional data, that pushing and pulling is associated with low back pain. Evidence with respect to complaints of other parts of the musculoskeletal system is lacking. Risck factors have been found to influence the maximum (acceptable) push or pull forces as well as the

physiological and machanical strain on the human body. The risck factors have been divided into: (a) work situation, such as distance, frequency, handle height, and cart weight, (b) actual working method and posture/movement/exerted forces, such as foot distance and velocity, and (c) worker's characteristics, such as body weight. Longitudinal epidemiological studies are needed to relate pushing and pulling to musculoskeletal disorders.

Hudson-N, Fitzcharles-MA, Cohen-M, Starr-MR, Esdaile-J M. The association of soft-tissue rheumatism and hypermobility. **Br-J-Rheumatol.** 1998 Apr; 37(4): 382-6

ENGLAND

Soft-tissue rheumatism (STR--tendinitis, bursitis, fasciitis and fibromyalgia) accounts for up to 25% of referrals to rheumatologists. The estimated prevalence of generalized hypermobility in the adult population is 5-15%. There have previously been suggestions that hypermobile individuals may be predisposed to soft-tissue trauma and subsequent musculoskeletal pain. This study was designed to examine the mobility status and physical activity level in consecutive rheumatology clinic attendees with a primary diagnosis of STR. Of 82 patients up to age 70 yr with STR, 29 (35%) met criteria for generalized hypermobility. Hypermobile compared to non-hypermobile individuals reported significantly more previous episodes of STR (90% vs 51%, $P < 0.01$), and more recurrent episodes of STR at a single site (69% vs 38%, $P < 0.001$). Although we were unable to show any difference in the time spent carrying out physical activity between the two groups, the hypermobile patients were performing significantly more repetitive activities. When specific anatomical sites of STR were analysed, small joints (elbows, hands and feet) currently affected with STR were more likely to show localized hypermobility than if those joints were asymptomatic. These findings suggest that hypermobility may be a factor in the development of STR. Repetitive activity may be a contributing factor towards STR in some hypermobile individuals.

Ireland-D.C.R. Australian repetition strain injury phenomenon. **Clin. Orthop. Relat. Res.** 1998; 351: 63-73.

The industrial upper limb pain epidemic colloquially known as repetition strain injury rapidly increased in the early 1980s to peak in 1985. Its less precipitous decline coincided with an awareness that repetition strain injury was a nonphysical sociopolitical phenomenon and a corresponding loss of the pecuniary benefits enjoyed by the powerful vested interest groups. Although its protagonists incorrectly claimed that this was a new disease, the rise and fall of repetition strain injury followed its historical predecessors including telegraphists' wrist and writer's cramp. Those affectedby this phenomenon, a clearly defined cohort, were all employees who were highly suggestible and engaged in menial repetitious tasks with little job satisfaction. These patients were differentiated from those with genuine work related injuries whose symptoms are reproducible, with physical signs easily defined, disease identifiable, and response to physical treatment predictable. Most patients with repetition strain injury genuinely suffered the symptoms of which they complained and made litle secondary gain relative to the protagonists of repetition strain injury who had a vested interest. The similarities between Australian repetition strain injury in the 1980s and American cumulative trauma disorder in the 1990s is compelling.

Lemasters-G.K., Atterbury-M.R., Booth-Jones-A.D. Prevalence of work related musculoskeletal disorders in active union carpenters. **Occup. Environ. Med.** 1998; 55 (6) : 421-427.

Objectives: To determine the prevalence and risk factors for work related musculoskeletal disorders among union carpenters. Methods- A detailed questionnaire on musculoskeletal symptoms and work history was administered to 522 carpenters. The symptom questions assessed if carpenters experienced pain, numbness, or tingling in a particular body region. A subset of this group then received a physical examination of the upper extremities and knees. Results - The study group was primarily white (94,9%) and male (97,8%) with a mean age of 42,3 years. The highest prevalence of work related musculoskeletal disorders cases by carpentry specialty ranged from 20%-24% for those doing drywall or ceiling, finishing or framing, and the building of concrete forms. Generally, as duration of employment increased, the prevalence of symptoms increased. An adjusted logistic regression analysis showed that the group with the longest (ó 20 years) duration of employment in carpentry was significantly associated with work related musculoskeletal disorders of the shoulders (odds ratio (OR) 3.2, 95% confidence interval (95% CI) 1.1 to 8.9), hands or wrists (OR 3.1, 95% CI 1.1 to 8.4), and knees (OR 3.5, 95% CI 1.3

to 9.2). Also, analyses showed that carpenters who reported that they had litle or no influence over their work schedule had significant increases of work related musculoskeletal disorders of the shoulders, hips, and knees with ORs of 1.9(95% CI 1.1 to 3.2), 2.9(95% CI 1.1 to 7.2), and 2.3(95% CI 1.2 to 4.1), respectively. Feeling exhausted at the end of was day also a significant risk factor for work related musculuskeletal disorders of the knee (OR 1.8 95% CI 1.1 to 3.1). Upper extremity disorders were the most prevalent work related musculoskeletal disorders reported among all carpenters. Drywall or ceiling activities involve a considerable amount of repetitive motion and awkward postures often with arms raised holding heavy dry walls in place, whereas form work is notable for extensive lumbar flexion and had the two highest rates of work related musculoskeletal disorders. The psychosocial element of job control was associated with both upper and lower extremity disorders. These union carpenters, who were relatively young, already were experiencing considerable work related physical problems. Conclusion - This study supports the need for vigilant ergonomic intervention at job sites and early ergonomic education as an integral part of apprenticeship school training to ensure that carpenters remain fit and healthy throughout their working lifetime.

Marklin-RW, Monroe-JF. Quantitative biomechanical analysis of wrist motion in bone-trimming jobs in the meat packing industry. **Ergonomics**, 1998 Feb; 41 (2) : 227-237

ENGLAND

This study was motivated by the serious impact that cumulative trauma disorders (CTDs) of the upper extremities have on the meat packing industry. To date, no quantitative data have been gathered on the kinematics of hand and wrist motion required in bone-trimming jobs in the red-meat packing industry and how these motions are related to the risk of CTDs. The wrist motion of bone-trimming workers from a medium-sized plant was measured, and the kinematic data were compared to manufacturing industry's preliminary wrist motion benchmarks from industrial workers who performed hand-intensive, repetitive work in jobs that were of low and high risk of hand/wrist CTDs. Results of this comparison show that numerous wrist motion variables in both the left and right hands of bone-trimming workers are in the high-risk category. This quantitative analysis provides biomechanical support for the high incidence of CTDs in the meat packing industry. The research reported in this paper established a preliminary database of wrist and hand kinematics required in bone-trimming jobs in the red-meat packing industry. This kinematic database could augment the industry's efforts to reduce the severity and cost of CTDs. Ergonomics practitioners in the industry could use the kinematic methods employed in this research to assess the CTD risk of jobs that require repetitious, hand-intensive work.

Matias-AC, Salvendy-G, Kuczek-T. Predictive models of carpal tunnel syndrome causation among VDT operators. **Ergonomics**, 1998 Feb; 41 (2) : 213-226.

ENGLAND

Carpal tunnel syndrome (CTS), a cumulative trauma disorder of the hand and wrist, is one of the most common disabling injuries experienced by video-display terminal (VDT) operators. The purpose of this study was to develop a theoretically based operational quantitative predictive model of the risk of work-related CTS among VDT operators. A total of 100 female VDT operators, who performed a variety of office functions, were studied at a major midwestern university. Data were collected on job exposure, anthropometry and posture factors using questionnaires, direct observation and video-recording. Discriminant analysis and logistic regression were performed to develop the operational models. The results of the study indicated the following: (1) percentage of workday working with a VDT was the most significant factor and accounted for 60% of the variance explaining the causation of musculoskeletal discomforts associated with CTS; (2) discriminant function with six variables (i.e. work duration, trunk incline, wrist extension, wrist ulnar deviation, overall anthropometric measure, weighted anthropometric measure) correctly classified 73% of the CTS group and 72% of the non-CTS group; (3) using the logistic regression model, the probabilities associated with changes in the predictive variables as affecting CTS risk are presented such that increasing the daily work duration from 1 h to 4 h increases the probability of CTS risk from 0.45 to 0.92. The results of the study suggest that the main causation of CTS is job design, the secondary (and lesser cause) is posture associated with the workplace design and the least contributing factor to CTS causation is the individual's anthropometric make-up.

Occhipinti-E. OCRA: a concise index for the assessment of exposure to repetitive movements of the upper limbs. **Ergonomics**, 1998 Sep; 41 (9) : 1290-1311

ENGLAND

In the light of data and speculation contained in the literature, and based on procedures illustrated in a previous research project in which the author described and evaluated occupational risk factors associated with work-related musculoskeletal disorders of the upper limbs (WMSDs), this paper proposes a method for calculating a concise index of exposure to repetitive movements of the upper limbs. The proposal, which still has to be substantiated and validated by further studies and applications, is conceptually based on the procedure recommended by the NIOSH for calculating the Lifting Index in manual load handling activities. The concise exposure index (OCRA index) in this case is based on the relationship between the daily number of actions actually performed by the upper limbs in repetitive tasks, and the corresponding number of recommended actions. The latter are calculated on the basis of a constant (30 actions per minute), which represents the action frequency factor; it is valid - hypothetically - under so-called optimal conditions; the constant is diminished case by case (using appropriate factors) as a function of the presence and characteristics of the other risk factors (force, posture, additional elements, recovery periods). Although still experimental, the exposure index can be used to obtain an integrated and concise assessment of the various risk factors analysed and to classify occupational scenarios featuring significant and diversified exposure to such risk factors.

Ono-Y, Nakamura-R, Shimaoka-M, Hiruta-S, Hattori-Y, Ichihara-G, Kamijima-M, Takeuchi-Y. Epicondylitis among cooks in nursery schools. **Occup-Environ-Med.** 1998 Mar; 55(3): 172-9

ENGLAND

OBJECTIVES: To investigate the prevalence and risk factors of epicondylitis among cooks in nursery schools in a cross sectional study because they are suspected to have strenuous workloads on the hands and arms. METHODS: Prevalence of epicondylitis among 209 nursery school cooks and 366 control workers aged 40-59 were studied. Both groups consisted of women workers chosen from 1299 subjects who agreed to participate from 1329 social welfare employees in a city. All workers were interviewed with a questionnaire and had a clinical examination of the tenderness to palpation of epicondyles and epicondylar pain provoked by resisted extension and flexion of the wrist. RESULTS: Nursery school cooks had a significantly higher prevalence of epicondylitis (11.5%) than the controls (2.5%). In a logistic regression model, job title of the cook was also found to have a strong association with epicondylitis (odds ratio (OR) 5.4, 95% confidence interval (95% CI) 2.4 to 11.9) after adjustment for age, body length, and body mass index. Weaker associations were also found between epicondylitis and suspected job stress or workload scores for mechanical workload and psychosocial stressors based on factor analysis. CONCLUSIONS: This study supported the hypothesis that nursery school cooks had a higher prevalence of epicondylitis than other workers with less strenuous hand and arm tasks. It was suggested that risk factors of epicondylitis would be multifactorial, including mechanical workload and psychosocial factors.

Punnett-L. Ergonomic stressors and upper extremity disorders in vehicle manufacturing: cross sectional exposure-response trends. **Occupational and Environmental Medicine**, 1998 Jun; 55 (6) : 414-420

Objective-To evaluate the association between upper extremity soft tissue disorders and exposure to preventable ergonomic stressors in vehicle manufacturing operations. Methods-A cross sectional study was conducted in one vehicle stamping plant and one engine assembly plant. A standardised physical examination of the upper extremities was performed on all subjects. An interviewer administered questionnaire obtained data on demographics, work history, musculoskeletal symptoms, non-occupational covariates, and psychophysical (relative intensity) ratings of ergonomic stressors. The primary exposure score was computed by summing the responses to the psychophysical exposure items. Multivariate regression analysis was used to model the prevalence of disorders of the shoulders or upper arms, wrists or hands, and all upper extremity regions (each defined both by symptoms and by physical examination plus symptoms) as a function of exposure quartile. Results-A total of 1315 workers (85% of the target population) was examined. The prevalence of symptom disorders was 22% for the wrists or hands and 15% for the

shoulders or upper arms; cases defined on the basis of a physical examination were about 80% as frequent. Disorders of the upper extremities, shoulders, and wrists or hands all increased markedly with exposure score, after adjustment for plant, acute injury, sex, body mass index, systemic disease, and seniority. Conclusions-Musculoskeletal disorders of the upper extremities were strongly associated with exposure to combined ergonomic stressors. The exposure-response trend was very similar for symptom cases and for physical examination cases. It is important to evaluate all dimensions of ergonomic exposure in epidemiological studies, as exposures often occur in combination in actual workplaces.

Schafer-J, Gaulrapp-H, Pforringer-W. Acute and chronic overuse injuries in extreme sport-climbing. **Sportverletz-Sportschaden.** 1998 Mar; 12(1): 21-5

GERMANY

From May to September 1994 a study on acute and chronic overuse injuries in to rockclimbing was performed. The etiology of trauma was referred to trainingforms and climbing techniques. 112 climbers participating in the study climbed at level 9+/10- (8a). This study demonstrated that the incidence of overstrain syndromes increased with the performance level. The overall predominance of finger injuries was followed by acute spinal syndromes, knee, and ankle sprains. Among the most frequent overstrain complaints epicondylopathias, chronic complaints of the finger joins and flexor tendons, and nerve compression syndromes of the upper extremities could be seen. Most notable was the fact that the frequency of certain overstrain syndromes increased in relation to the years of climbing.

Schmid-A, Huring-H, Huber-G, Gosele-A, Hecker-Kube-H, Gruhn-O, Stinus-H, Birnesser-H, Keul-J. Injury risk of competitive, handicapped cross-country skiers in training nd competition. **Sportverletz-Sportschaden.** 1998 Mar; 12(1): 26-30

GERMANY

Injuries caused by cross country skiing have been poorly investigated in handicapped athletes. The dynamic sliding shape of motion makes this sport to a suitable discipline for people with a deficit of locomotion. Visual handicapped people with a guide are able to improve their motoric skills, co-ordination, orientation and body self-consciousness in the track. Since handicapped athletes are performing in international competitions the training intensity to fulfill the requirements, but also the risk of overstrain induced injuries got increased, like in other high-performance sports. Our study examined injuries and overuse syndromes of the German National Team Ski Nordic during the Paralympics in Tignes/ Albertville (1992). Lillehammer (1994) and the training period in preparation for the Paralympics in Nagano (March 1998). The incidence and kind of injuries in the competitive handicapped cross country skier was comparable with non-handicapped athletes, but the injury pattern was different.

Trail-IA. The prevalence of work-related upper limb disorders in a printing factory. **Occup-Med-Oxf**. 1998 Jan; 48(1): 23-6.

ENGLAND

The association between problems of the upper limb and the workplace is complex. A large printing manufacturer in the North West of England sought the advice of both a surgeon, specializing in problems of the upper limb and an ergonomist in an attempt to control the frequency of these abnormalities amongst its workforce. The prevalence of these problems prior to and after the introduction of a number of recommendations was collated and the results are discussed. Effectively the introduction of sensible and sympathetic modifications to the workplace appeared to reduce the number of upper limb disorders.

Vleck-VE, Garbutt-G. Injury and training characteristics of male Elite, Development Squad, and Club triathletes. **Int-J-Sports-Med. 1998** Jan; 19(1): 38-42

GERMANY

Links between overuse injury prevalence in triathletes training for 1.5km, 40km, 10km triathlon and both intrinsic and extrinsic factors were assessed in 12 Elite, 17 Development and 87 male Club triathletes by a five year retrospective questionnaire. Elite, Development and Club triathletes

differed in training mileage, duration and number of workouts but not in overall injury prevalence, distribution, and severity. Overuse injury occurred in 75.0% of male Elite Squad, 75.0% of Development Squad and 56.3% of Club athletes with 1.9-2.9 sites affected. The most common injuries - the achilles tendon (10.3-17.9%), lower back (15.8-17.9%) and knee (14.2-21.9% of injuries) - were also among the most severe. Running injuries accounted for more of the total number of injuries than cycling injuries in Elite (62.1 % vs 34.5%, $p<0.05$), Development (64.3% vs 25.0%, $p<0.05$) and Club triathletes (58.7% vs 15.9%, $p<0.05$). The number of running injuries sustained correlated with triathlon training distance, cycling distance ($p<0.03$), swimming distance ($p<0.01$), number of triathlon workouts ($p<0.03$) and number of running sessions ($p<0.03$) within one weeks race training. The number of overuse injuries sustained during cycling correlated with time spent running and cycling.

Zaza-C. Playing-related musculoskeletal disorders in musicians: A systematic review of incidence and prevalence. **Can. Med. Assoc. J.** 1998; 158 (8) : 1019-1025.

Background: Work-related musculoskeletal disorders cause pain, disability and loss of employment for many workers, including musicians. Although performing arts medicine is a growing field, the health problems of musicians remain under-recognized and under-researched. Therefore, the author undertook a systematic review of published information on the incidence and prevalence of playing-related musculoskeletal disorders (PRMDs) in classical musicians. Methods: Seven databases were searched for the period 1980 to 1996. The main textbook and performing arts medicine journals were searched manually, as were reference lists of all relevant papers. The author also contacted individuals familiar with the literature of performing arts medicine. Studies were included for review if they reported PRMD incidence or prevalence in classical musicians. Of the 24 studies identified, 18 cross-sectional surveys and cohort studies were reviewed. The author subjectively assessed the studies using criteria modified from na existing evaluation scale and used 4 criteria for data combination. On the basis of prevalence values from the eligible studies, x^2 tests for heterogeneity were performed. Results: Only one study estimated PRMD incidence. Ten of the 17 prevalence studies were ineligible for data combination, because of low response rates and other methodological problems. In the 7 eligible studies, PRMD point prevalence ranged from 39% to 87% in adult musicians and from 34% to 62% in secondary school music students. The best estimates of PRMD prevalence were derived from the 3 studies that excluded mild complaints; these studies indicated that PRMD prevalence was 39% and 47% in adults and 17% in secondary school music students respectively. Statistical combination of data across studies within each demographic category was not possible. Interpretation: Available data indicate that the prevalence of PRMD in adult classical musicians is comparable to the prevalence of work-related musculoskeletal disorders reported for other occupational groups. Several recommendations for future research are outlined.

1997

Bell-PM, Wang-H. Fuzzy linear regression models for assessing risks of cumulative trauma disorders. **Fuzzy Sets and Systems** 1997 Dec; 92 (3) : 317-340.

Cumulative trauma disorders (CTDs) are a major problem in industry and today's office environments, especially for keyboard users. Since comprehensive knowledge about individual or a combination of risk factors contributing to CTDs of the hand and forearm is still lacking, developing methodologies to quantify relationships of risk factors is greatly needed. The purpose of this research was to build fuzzy linear regression models to reveal the relationship of CTD risk factors, to predict the injuries, and to evaluate risk levels of individuals. Twenty-seven keyboard users (twenty-two for model building and five for model validation) and three CTD experts participated in the model building. Four fuzzy models were built corresponding to four risk categories, and a final fuzzy linear model was established using AHP pairwise comparisons. Multicolinearity effects were addressed and a partial standard deviation scaling method was used to eliminate the effects. From a methodological point of view, fuzzy linear regression models provide useful insight into risk. factors-CTD relationship. (C) 1997 Elsevier Science B.V.

Biundo-JJ Jr, Mipro-RC Jr, Fahey-P. Sports-related and other soft-tissue injuries, tendinitis, bursitis, and occupation-related syndromes [see comments] **Curr-Opin-Rheumatol.** 1997 Mar; 9(2): 151-4 Comment in: Curr Opin Rheumatol 1997 Mar;9(2):133-43

UNITED-STATES

In this review, four areas are discussed: fluoroquinolone-induced tendinitis, volar flexor tenosynovitis (trigger finger), Achilles tendon lesions, and occupational medicine issues. The relationship of fluoroquinolone treatment to musculoskeletal lesions, especially Achilles tendinitis and tear, is most intriguing. The steady increase in reports of the association cannot be ignored. Although Achilles tendinitis and rupture have comprised the most frequently seen lesions, articles on additional sites of involvement, such as in lateral epicondylitis and De Quervain's tenosynovitis, are reviewed. Volar flexor tenosynovitis and trigger finger are among the most common musculoskeletal problems, and additional studies support the success of corticosteroid injections. Although the value of injections was reported well over 25 years ago, surgery is still unfortunately the first-choice treatment of some physicians. We review three studies on Achilles tendinopathy. In one of the reports, diagnostic ultrasonography is again demonstrated to be of value in assessing tendon lesions. The push to use the term tendinosis rather than tendinitis continues as a result of histologic studies of tendinitis that lack the usual findings of inflammation. However, the presence or absence of chemical inflammation is yet to be ascertained. We review an article that fails to show that work activities are the sole cause of such musculoskeletal syndromes as cumulative trauma or repetitive use. Further studies are needed in the area of work-related upper extremity disorders.

Cherniack-M. G. Epidemiology of Occupational Disorders of the Upper Extremity. **Occupational Medicine: State of the Art Reviews**. 1997 Jul; 11 (3) : 513-530.

The epidemiology of the occupational disorders of the upper extremity (ODUE) was reviewed. The frequency of repetitive strain injuries (RSI) and cumulative trauma disorders in the general population was first discussed. Problems with categorizing ODUE included vague symptom complexes and the lack of definitive disease frequency data. Studies were cited which indicated that the frequency of carpal tunnel syndrome (CTS) was greater in occupations at high risk for repetitive hand use than in occupations at low risk. In determining the prevalence of ODUE in selected industries, two types of analyses were discussed, active surveys of occupations and passive analyses based on surveillance systems. The results of numerous active surveys were cited which reported high frequencies of ODUE in newspaper and office workers; store clerks; meat, fish, and poultry workers; ski manufacturers; electricians; sewing machine workers; and cardiac ultrasonographers. Surveillance system findings also yielded elevated prevalence rates for ODUE in particular industries, such as manufacturing and food processing. Underreporting was considered a major limitation of surveillance systems. Case definition was regarded as problematic for ODUE research. Two inclusive models for the diagnosis of RSI, one based on pain and symptoms and the other based on physical performance, were provided. Because CTS was associated with multiple symptoms and various testing techniques, the definition of CTS cases was considered problematic. Despite the methodological concerns, the author concludes that marked differences in the prevalence of ODUE are evident in various industries. Further study is needed to determine the best approach for the standardization of testing strategies and case definitions.

De Zwart-B.C.H., Broersen-J.P.J., Frings-Dresen-M.H.W., Van Dijk-F.J.H. Musculoskeletal complaints in the Netherlands in relation to age. **International Archives of Occupational and Environmental Health** 1997; 70 (5) : 352-360.

This cross-sectional study was performed in order to elucidate the relationship of musculoskeletal complaints with age, gender and physically demanding work in The Netherlands. Questionnaire data of male (n = 36.756) and female (n = 7,730) employees, gathered as part of periodical occupational health surveys among active workers in The Netherlands, were stratified for age, gender, and type of work demands . For each stratified group prevalence rates (PR) were calculated for complaints of the back, neck, upper and lower extremities. Moreover, prevalence rate defferences (PRD) were estimated as an absolute effect measure to various types of physical work demand, with active employees in mentally demanding work acting as a reference population. Musculoskeletal complaints among workers in physically demanding occupations were found to increase with age for both sexes. For several complaints, substantially higher rates were reported for women than for men, with a relatively hugh number of complaints, observed among the older female workers (around 40% for complaints of back, upper and lower extremities). Significant PRDs were present in particular for employees in heavy physically demanding occupations and in jobs with mixed mental and physical work demands. With ageing of the workforce in mind, these

findings stress the need for implementation of preventive measures. Special attention towards the susceptible group of female employees, the elderly age groups in particular, seems justified. In order to clarify the combined effects of age and physical work demands on musculoskeletal complaints, additional studies are required.

Ferreira-M; Conceicao-GMD; Saldiva-PHN. Work organization is significantly associated with upper extremities musculoskeletal disorders among employees engaged in interactive computer-telephone tasks of an international bank subsidiary in Sao Paulo, Brazil. **American Journal of Industrial Medicine**, 1997 Apr; 31 (4) :468-473.

UNITED-STATES

This study was designed to verify the risk factors for developing upper extremities musculoskeletal disorders (UEMD) among workers engaged in customer service tasks performed by telephone at a private banking corporation in Sao Paulo, Brazil. The monthly incidence of UEMD in hands and/or wrists in this group was studied retrospectively from Jan, 1993 to Jun, 1995,,. The statistical analysis was done by using multiple linear regression with the monthly incidence of UEMD considered as dependent variable in models controlled for age, seniority, mean daily regular work-time and overtime per operator rime pressure at work, rest/work schedule, management status, personnel training on postural and muscle stretching, and ergonomic hazards. The variables associated with UEMD were the following: time pressure at work (coefficient = 0.049; p = 0.008) and rest/work schedule (coefficient = -0.047; p = 0.02). The results indicate that working conditions are significantly associated with UEMD, and changes in the working schedule may decrease the incidence of this problem in workers assigned to tasks related to the interactive use of computer-accessible databases during telephone contacts. (C) 1997 Wiley-Liss, Inc.

Feuerstein-M; Carosella-AM; Burrell-LM; Marshall-L; DeCaro-J. Occupational upper extremity symptoms in sign language interpreters: Prevalence and correlates of pain, function, and work disability. **Journal of Occupational Rehabilitation**, 1997 Dec; 7 (4) : 187-205

The interactive role of work demands, occupational stressors, and ergonomic risk factors in work-related upper extremity (UE) disorders remains unclear: Professional sign language interpreting, which involves exposure of the upper limbs to a combination of potential ergonomic and psychosocial stressors represents a unique occupational group to investigate the multivariate nature of UE disorders. The present study reports data on the prevalence, patterns of symptoms, associated medical problems, and health care related to upper extremity disorders in sign language interpreters. The contribution of work demands, work style, and psychosocial stressors to the occurrence of self-reported function, pain, muscle tension, and work disability was also studied. A group of 1398 sign language interpreters completed an 83-item national survey on occupational musculoskeletal health (response rate of 58%). Interpreters were asked a series of demographic, workstyle, work environment, medical care, and symptom-related questions. Logistic regression, multivariate regression, and discriminant function analyses were used to examine the data. A large percentage of interpreters reported symptoms in the neck region (73.6%) followed by the hand/wrist (69.6%). Using a NIOSH case definition for work-relatedness, prevalence rates varied from 16% to 32% depending upon the anatomic location Medical care was primarily sought within the first month of symptoms (21.9%) and nonsteroidal antiinflammatory drugs were the most frequently used treatment (70.3%). A multivariate logistic regression indicated that female gender number of years worked pressure at work, fear of developing pain, tendency to work in pain to insure work quality, and increased wrist deviations from neutral were associated with case status. Impact on function, pain, and perceived muscle tension at work were all primarily associated with tendency to work in a painful way to insure work quality and fear of developing a pain problem. Time off work was also associated with these variables as well as with the lack of an opportunity to use one's initiative. Results indicate that upper extremity symptoms are prevalent in this work group and that a combination of work demands, workstyle, and psychosocial stressors are associated with case status and the exacerbation of pain, muscular tension functional limitations, and work disability.

Hadler-NM. Repetitive upper-extremity motions in the workplace are not hazardous. **Journal of Hand Surgery-American Volume**, 1997 Jan; 22A (1) : 19-29

UNITED-STATES

Hagberg-M., Christiani-D., Courtney-T. K., Halperin-W., Leamon-T. B., Smith-T. J. Conceptual and Definitional Issues in Occupational Injury Epidemiology. **American Journal of Industrial Medicine** 1997 Aug; 32 (2) : 106-115.

Issues concerning occupational injury research were considered. The conceptual breakthrough in injury modeling was described as the consideration of energy as the agent of injury. The new conceptual model of energy transfer and injury allowed for a broad view of injury morbidity, which revealed itself morphologically, physiologically, and/or subjectively. Adverse health effects were considered to be caused by a chain of events depending on numerous individual and environmental factors. A pathophysiological model of tissue effects and damage and tissue recovery and repair was also reviewed. The lack of clear, consistent definitions in the field of occupational injury research was viewed as problematic. These inconsistent definitions developed from the use of various administrative and exposure detection methods. The term occupational injury was defined as any damage inflicted to the body by energy transfer during work. Terms like cumulative trauma disorder and repetitive strain injury were considered to be misleading. When adequately defined, the concept of exposure included dose metrics and a time frame. Exposure studies, based on either hazard surveillance or exposure assessment related to an adverse outcome, were discussed. The variables chosen for an occupational injury study, such as work conditions, exposures, risk factors, and injuries, were considered to be influenced by the injury process, a cascade of events linking work conditions, the injurious incident, the injury itself, impairment, and disability. This model of the injury process revealed a tradeoff; the prospective sample size increased with decreasing probability of detection and decreasing specificity of data. The establishment of research priorities was influenced by the severity of the problem, the incidence rate, risk ratio, and the population at risk. The authors conclude that the use of the multidimensional models and specific definitions provided in this paper may improve the study of occupational injury.

Harmon-K.M., Herrberg-C. A., Kriegbaum-R. A. Cumulative trauma disorders among hand therapists. **Work**. 1997; 9 (3) : 275-284.

Objectives: This study examined the prevalence of cumulative trauma disorders (CTDs) among hand therapists. Factors such as hand therapy tasks and number of years spent performing these tasks were examined in their contribution to CTD symptoms of the upper extremity. Study desing: Of 356 questionnaires distributed to registrants at the 1996 Hand Conference, 195 (55%) were returned. A t-test was used to determine whether the number of years spent practicing hand therapy was a significant factor in the development of CTD symptoms among hand therapists. Results: Of the 195 respondents, 73% reported they had previously experienced CTD symptoms, and 46% reported they were currently experiencing CTD symptoms. A significant difference was found ($p < 0.05$) in the development of CTD symptoms with regard to number of years practiced. Conclusion: The work practices of hand therapists place them at risk for developing CTDs. Hand therapists who spend more years practicing are more likely to incur CTDs.

Helfenstein Júnior-M. **Prevalência da síndrome da fibromialgia em pacientes diagnosticados como portadores de lesões poe esforço repetitivos (LER).** São Paulo; s.n; 1997. 183 p. ilus, tab. [Tese de Doutorado - Escola Paulista de Medicina da Universidade Federal de Sao Paulo]

BRASIL

Hickey-GJ, Fricker-PA, McDonald-WA. Injuries to elite rowers over a 10-yr period. **Med-Sci-Sports-Exerc**. 1997 Dec; 29(12): 1567-72

UNITED-STATES

The purpose of this study was to analyze retrospectively all injuries occurring in a population of elite rowers over a 10-yr period to determine their pattern of injury. The medical records of all rowers at the Australian Institute of Sport from 1985 to 1994 inclusive were reviewed and all injuries included. Injuries were categorized according to time, location, cause, and whether acute or chronic. The study found a significant incidence of chest injuries, rib stress fractures, and low back injuries, and a high number of injuries occurring outside specific training. Elite rowers have little risk of major injury, but mild and moderate injuries are common.

Hughes-R.E., Silverstein-B.A., Evanoff-B.A. Risk factors for work-related musculoskeletal disorders in an aluminum smelter. **Am. J. Ind. Med.** 1997; 32 (1) : 66-75.

A cross-sectional study of selected jobs in an aluminum smelter was conducted to assess the prevalence of work-related musculoskeletal disorders (WMDs), and to estimate their association with physical and psychosocial characteristics of the jobs. A structured interview and physical exam were used to assess the musculoskeletal health status of the participants, and a self-administered questionnaire was used to assess the psychosocial factors. Observational job analysis was conducted to evaluate 37 potential physical risk factores. Complete data were available for 104 subjects. The prevelence of WMDs on interview and physical exam were 0.8% , 14.9%, 11.6%, 14.9%, and 17.4% for the neck, shoulder, elbow/forearm, hand/wrist, and low back regions, respectively. Unconditional multiple logistic regression was used to model the relationship between physical and psychosocial factors and health status. Years of forearm twisting were found to be a significant predictor for hand/wrist disorders on interview (OR = 17,95% CI = 2.9-106); for elbow/foream disorders on physical exam and interview (OR = 37,95% CI = 3.0-470): and for shoulder disorders on interview (OR = 92,95% CI = 7.3-...) and on interview and physical exam (OR = 46,95% CI = 3.8-550). Low decision latitude was also found to be significant for the shoulder on interview (OR = 4.5,95% CI = 1.3-16). High job satisfaction (OR = 5.9,95% CI = 1.4-25) and low social support (OR = 5.3,95% CI = 1.3-22) were associated with low back pain report on interview; only high job satisfaction (OR = 5.3, 95% CI = 1.1-26) was associated with low back pain on both interview and physical exam.

James-CPA, Harburn-KL, Kramer-JF. Cumulative trauma disorders in the upper extremities: Reliability of the postural and repetitive risk-factors index. **Archives of Physical Medicine and Rehabilitation** 1997 Aug; 78 (8) : 860-866.

Objective: This study addresses test-retest reliability of the Postural and Repetitive Risk-Factors Index (PRRI) for work-related upper body injuries. This assessment was developed by the present authors. Design: A repeated measures design was used to assess the test-retest reliability of a videotaped work-site assessment of subjects' movements. Subjects: Ten heavy users of video display terminals (VDTs) from a local banking industry participated in the study. Setting: The 10 subjects' movements were videotaped for 2 hours on each of 2 separate days, while working on-site at their VDTs. Main Outcome Measure: The videotaped assessment which utilized known postural risk factors for developing musculoskeletal disorder, pain, and discomfort in heavy VDT users (ie, repetitiveness, awkward and static postures, and contraction time), was called the PRRI. The videotaped movement assessments were subsequently analyzed in 15-minute sessions (five sessions per 2-hour videotape, which produced a total of 10 sessions over the 2 testing days), and each session was chosen randomly from the videotape. The subjects' movements were given a postural risk score according to the criteria in the PRRI. Each subject was therefore tested a total of 10 times (ie, 10 sessions), over two days. The maximum PRRI score for both sides of the body was 216 points. Results: Reliability coefficients (RCs) for the PRRI scores were calculated, and the reliability of any one session met the minimum criterion for excellent reliability, which was .75. A two-way analysis of variance (ANOVA) confirmed that there was no statistically significant difference between sessions (p <.05). Calculations using the standard error of measurement (SEM) indicated that an individual tested once, on one day and with a PRRI score of 25, required a change of at least 8 points in order to be confident that a true change in score had occurred. The significant results from the reliability tests indicated that the PRRI was a reliable measurement tool that could be used by occupational health practitioners on the job site. (C) 1997 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation.

JuulKristensen-B, Fallentin-N, Ekdahl-C. Criteria for classification of posture in repetitive work by observation methods: A review. **International Journal of Industrial Ergonomics**, 1997 May; 19 (5) : 397-411.

Observation methods have been widely used to assess mechanical exposure in ergonomic epidemiology. In this review study, eight published and still applied observation methods are reviewed and classified with special emphasis on criteria used for classification of body angles and movement intervals. An obvious lack of standardized body angles hampers comparison between the methods. A more general question is raised concerning the internal and external validity of observation methods in epidemiologic studies. The internal validity has shown to be acceptable in

certain work situations. The external validity of observation methods seems more questionable. Only frequency and duration of movements and posture are included in the methods while other possibly more important risk factors of cumulative trauma disorders i.e. force, angular velocity, and acceleration are not included. It is suggested that observation methods should be standardized. Furthermore, they should be expanded to include some of the other known risk factors or alternatively be supplemented by more direct measurements at the workplace.

Latko-WA, Armstrong-TJ, Foulke-JA, Herrin-GD, Rabourn-RA, Ulin-SS. Development and evaluation of an observational method for assessing repetition in hand tasks. **American Industrial Hygiene Association Journal**, 1997 Apr; 58 (4) : 278-285.

Several physical stressors, including repetitive, sustained, and forceful exertions, awkward postures, localized mechanical stress, highly dynamic movements, exposures to low temperatures, and vibration have been linked to increased risk of work-related musculoskeletal disorders. Repetitive exertions have been among the most widely studied of these stressors, but there is no single metric for assessing exposure to repetitive work. A new methodology enables repetitive hand activity to be rated based on observable characteristics of manual work. This method uses a series of 10-cm visual-analog scales with verbal anchors and benchmark examples. Ratings for repetition reflect bath the dynamic aspect of hand movements and the amount of recovery or idle hand time. Trained jab analysis experts rate the jobs individually and then agree on ratings. For a group of 33 jobs, repetition ratings using this system were compared to measurements of recovery time within the cycle, exertion counts, and cycle time. Amount of recovery time within the job cycle was found to be significantly correlated with the analysis ratings (r(2)=0.58), as were the number of exertions per second (r(2)=0.53). Cycle time was not related to the analyst ratings. Repeated analyses using the new method were performed 1 1/2 to 2 years apart on the same jobs with the same group of raters. Ratings for repetition differed less than 1 point (on the 10-cm scale), on average, among the different sessions,These results indicate that the method is sensitive to exertion level and recovery time, and that the decision criteria and benchmark examples allow for a consistent application of these methods over a period of time. This method of rating repetition can be combined with similar scales for other physical stressors.

Lin-ML, Radwin-RG, Snook-SH. A single metric for quantifying biomechanical stress in repetitive motions and exertions. **Ergonomics** 1997 May; 40 (5) : 543-558.

ENGLAND

The relative effects of repetition, force and posture were studied in order to investigate how continuous biomechanical measurements can be combined into a single metric corresponding to subjective discomfort. A full factorial experiment was conducted involving repetitive wrist flexion from a neutral posture to a given angle against a controlled force. Seven subjects performed the task using two paces (20 and 4 motions/min), two force levels (15 and 45 N) and two angles (15 and 45 degrees) for 1 h each. Discomfort was reported on a 10 cm visual analogue scale anchored between 'no discomfort' and 'very high discomfort'. Repeated measures analysis of variance showed that all main effects were statistically significant (p < 0.05) and no significant interactions were observed. A linear regression model was fitted to the data and used for generating frequency weighted digital filters that shape continuous recordings of repetitive motions and exertions into an output proportional to relative discomfort. The resulting high-pass digital filter had a 22 dB/decade attenuation slope. A simulated industrial task used for validating the model involved repetitively transferring pegs across a horizontal bar and inserting them into holes against a controlled resistance. Angular wrist data were recorded using an electrogoniometer and filtered. Six subjects performed the task of the three conditions consisting of (1) 15 degrees wrist flexion, 15 N resistance and 6 motions/min, (2) 15 degrees wrist flexion, 45 N resistance and 12 motions/min, and (3) 45 degrees wrist flexion, 45 N resistance and 15 motions/min. Subjective discomfort was reported after performing the task for 1 h. Pearson correlations between subjective discomfort ratings and the integrated filtered biomechanical data for individual subjects ranged from 0.90 to 1.00. The pooled correlation across subjects was 0.67. This approach may be useful for physical stress exposure assessment and for design of tasks involving repetitive motions and exertions.

Lynch-R.M., Mohr-S.N., Gochfeld-M. Prediction of tendinitis and carpal tunnel syndrome among solderers. **Applied Occupational and Environmental Hygiene** 1997; 12 (3) : 184-189.

While numerous occupational and nonoccupational risk factors are known to be associated with CTS, no quantitative thresholds are known to exist. This nested cross-sectional study was designed to determine occupational and nonoccupational risk factors associated with CTS and to develop a predictive linear equation for tendinitis and CTS among the hands of solder touch-up workers in the eletronics assembly industry. The draft equation was tested on workers for whom the same measurements were collected at a similar yet difference workplace from the same employer. By combining the data from both sites, a final equation was developed and its predictive accuracy evaluated. results indicate that (1) interemployee differences in work predict whether or not the hands of exposed workers are likely to hve tendinitis or CTS risk, (2) equations can predict whether or not the hands of exposed workers are likely tendinitis or CTS by applying measurements of currently accepted risk factors, (3) work-related risk factors appear to be more important than nonoccupational risk factors such as age and obesity in predicting whether a hand is likely to have CTS or not, and (4) interactions between occupational risk factors (angles and frequencies) are important predictor variables.

Malchaire-JB, Cock-NA, Piette-A, Leao-RD, Lara-M, Amaral-F. Relationship between work constraints and the development of musculoskeletal disorders of the wrist: A prospective study. **International Journal of Industrial Ergonomics**, 1997 Jun; 19 (6) : 471-482

A 2-year prospective study was conducted on 184 workers about the relationship between the development of musculoskeletal wrist disorders (WD) and the occupational constraint parameters at their job (wrist angles, forces, repetitiveness and angular velocities), taking into account personal and occupational confounding factors. The results demonstrate a greater probability of developing WD for the workers suffering from chronic diseases, from psychological disorders, practising a sport involving the upper limbs and judging their work tiring. All occupational constraint factors are correlated except for the angles. Logistic correlation analyses show that the most significant associations with a greater probability of developing WD are observed for the mean relative EMG value recorded on the finger and hand flexors and the time during which the velocity in flexion-extension is greater than 50 degrees/s. None of the angular parameters shows any association. Relevance to industry: The study shows that the main factor on which to act in order to reduce the risk of WD is clearly the forces exerted by the hand. The objective of the control measures should be to reduce the muscular activity of the finger and hand flexors below 15% of the maximum activity corresponding to the maximum voluntary contraction of the finger flexors. A reduction of these forces appears to be associated with a reduction of the angular velocities of the wrist and of the repetitiveness.

Meservy-D, Suruda-AJ, Bloswick-D, Lee-J, Dumas-M. Ergonomic risk exposure and upper-extremity cumulative trauma disorders in a maquiladora medical devices manufacturing plant. **Journal of Occupational and Environmental Medicine**, 1997 Aug; 39 (8) : 767-773.

Workers at a Nogales, Mexico, maquiladora plant that assembles medical devices were studied to determine the prevalence of upper-extremity cumulative trauma disorders (CTD). Subjects included production workers employed 6 months or longer; of the 148 eligible workers, 145 (98%) participated. Subjects had a mean age of 24.6 years (SD = 5.2; range, 17 to 45) and the mean length of employment was 3.5 years (SD = 2.5; range, 0.5 to 14). Job tasks were videotaped and analyzed for ergonomic risk factors, using predefined criteria. All jobs performed by study subjects were found to involve one or more ergonomic risk factors associated with the development of CTD. A CTD questionnaire and screening physical examination format, similar to that used by the National Institute of Occupational Safety and Health (NIOSH) in a chicken processing plant study, were administered Period prevalence of CTD within the previous year, as reported on the questionnaire, was 28%. Prevalence of CTD was 17%, using-data from the screening physical examination. Point prevalence (current pain data from the questionnaire plus positive symptoms on the screening physical examination) was 15%. CTD was reported more frequently in women than men (46% and 25%, respectively; P < 0.05) and in subjects who had worked at the plant less than one year (50%; P < 0.05). Workforce tumover (3% monthly) may have resulted in those affected by CTD leaving employment, reducing the apparent CTD rate in experienced workers.

Mital-A. Recognizing musculoskeletal injury hazards in the upper extremities and lower back. **Occup-Health-Saf.** 1997 Aug; 66(8): 91-9

UNITED-STATES

Moore-JS. De Quervain's tenosynovitis. Stenosing tenosynovitis of the first dorsal compartment. J-Occup-Environ-Med. 1997 Oct; 39(10): 990-1002

UNITED-STATES

De Quervain's tenosynovitis is a disorder characterized by pain on the radial (thumb) side of the wrist, impairment of thumb function, and thickening of the ligamentous structure covering the tendons in the first dorsal compartment of the wrist. It is precisely defined as stenosing tenosynovitis of the first dorsal compartment. It is a relatively common, uncomplicated, and noncontroversial musculoskeletal disorder of the distal upper extremity. The purpose of this review is to summarize information from the medical literature on aspects of De Quervain's tenosynovitis likely to be of interest and relevant to occupational medicine practitioners. The topics covered include normal anatomy and kinesiology; history; clinical observations related to diagnosis; pathology; pathophysiology; clinical observations on etiology; descriptive epidemiology; epidemiological studies; and case management. Models for the pathogenesis of De Quervain's tenosynovitis are proposed and opportunities for future research presented.

Polanyi-MF, Cole-DC, Beaton-DE, Chung-J, Wells-R, Abdolell-M, Beech-Hawley-L, Ferrier-SE, Mondloch-MV, Shields-AS, Smith-JM, Shannon-HS. Upper limb work-related musculoskeletal disorders among newspaper employees: cross-sectional survey results. **Am-J-Ind-Med.** 1997 Dec; 32(6): 620-8

UNITED-STATES

At a metropolitan newspaper office in Canada with extensive video display terminal (VDT) use, researchers carried out a survey (n = 1,007, 84% response) to establish baseline prevalence of work-related musculoskeletal disorders (WMSDs) and to identify demographic, postural, task, and psychosocial factors associated with WMSD symptoms. One-fifth of the respondents reported moderate or worse upper limb pain recurring at least monthly or lasting more than a week over the previous year. Logistic regression showed that employees who faced frequent deadlines and high psychological demands (fast work pace and conflicting demands), had low skill discretion and social support, spent more time keyboarding, or who had their screen in a non-optimal position were more likely to report moderate to severe symptoms. Women reported significantly higher levels of symptoms than men.

Ribeiro-H.P. **A violência do trabalho no capitalismo: o caso das lesões dos membros superiores por esforços repetitivos em trabalhadores bancários.** São Paulo: s.n; 1997. 363 p. [Tese de Doutorado - Faculdade de Saúde Pública da USP]

BRASIL.

Na primeira parte do estudo, intitulada de Violência Explícita do Trabalho, sustenta-se que o perfil de morbimortalidade da classe trabalhadora acompanha os ciclos de desenvolvimento e crise do capitalismo. Relata a evolução das instituições financeiras no país e da categoria bancária, especialmente no banco investigado. São revistos os modos de adoecer e morrer dessa categoria, vítima coletiva de uma doença do trabalho, as lesões por esforços repetitivos (LER). Os próprios trabalhadores adoecidos se fizeram sujeitos e pesquisados desse estudo de desenho híbrido, baseado em 525 questionários que preencheram e em 346 depoimentos que escreveram. Sob o ponto de vista quantitativo, trata-se de um estudo descritivo numa amostra não probabilística de 1223 casos de LER notificados pela empresa ao Instituto Nacional de Seguro Social. A análise dos 346 depoimentos revela sentimentos de perda e medo de incapacidade, esforço para aceitar os novos limites e vontade de retornar ao trabalho para evitar a discriminação e marginalização social e afetiva. Revelam-se, também, as representações que construíram das diversas instituições …s quais tiveram que recorrer. (AU).

Saurel-Cubizolles-M.J., Derriennic-F., Monfort-C. Repetitive work with fast pace and upper-limb symptons among industrial workers (Fren) **Arch. Mal. Prof. Med. Trav.** 1997; 58 (6) : 522-532.

FRANCE

Relationship between repetitive work with fast pace and upper limb symptoms among industrial workers are studied from two epidemiological surveys carried out wiht occupational practitioners. The E.S.T.E.V. survey and the slaughterhouses-canneries survey show that women report upper-

limb pain more often than men, whatever their age, and they are more often exposed to repetititve work with fast pace. Significant associations between repetitive work with fast pace and upper-limb symptoms are shown, even after taking into account other working conditions possibly related to these symptoms. Repetitive work with fast pace, specially work on assembly line, is a type of task organization. Knowing the multifactorial etiology of articular disordes and the important role of mechanical factores, the measure of the especific effect of this constraint is not necessarly very ligh. But a strategy of prevention must not ignore the observed excess of risk.

Silverstein-BA, Stetson-DS, Keyserling-WM, Fine-LJ. Work-related musculoskeletal disorders: Comparison of data sources for surveillance. **American Journal of Industrial Medicine**, 1997 May; 31 (5) : 600-608.

UNITED-STATES

Work-related upper extremity musculoskeletal disorders "associated with repented trauma" account for more than 60% of all newly reported occupational illness, 332,000 in 1994 according to the U.S. Department of Labor. These numbers do not include, for example, those disorders categorized as "injuries due to overexertion in lifting," approximately 370,000. Early identification of potential disorders and associated risk factors is needed to reduce these disorders. There are a number of possible method's for conducting surveillance for work-related musculoskeletal disorders (WMDs) based on health outcome: workers' compensation, sickness and accident insurance, OSHA 200 logs, plant medical records, self-administered questionnaires, professional interviews, and physical examinations. In addition, hazard surveillance based on evaluation of job exposures to physical stressors by nonoccupational health personnel is possible. As part of a large labor-management-initiated intervention study to reduce the incidence of WMDs in four automotive plants, we were able to compare the strengths and limitations of each of these surveillance tools. University administered health interviews yielded the highest rate of symptoms; combined physical examinations plus interview (point prevalence) rates were similar to self-administered questionnaires (period prevalence) rates. Plant medical records yielded the lowest rate of WMDs. WMD status on self-administered questionnaire and on physical examination were associated with risk factor exposure scores. This study suggests that symptoms questionnaires and checklist-based hazard surveillance are feasible within the context of joint labor-management ergonomics programs and are more sensitive indicators of ergonomic problems than pre-existing data sources.

Smith-AC, Wolf-JG, Xie-GY, Smith-MD. Musculoskeletal pain in cardiac ultrasonographers: results of a random survey. **J-Am-Soc-Echocardiogr**. 1997 May; 10(4): 357-62.

UNITED-STATES

Myalgias and arthralgias are common among workers whose jobs require repetitive isometric maneuvers or malalignment of body position. However, few systematic studies have been performed to evaluate the frequency of these complaints among cardiac ultrasonographers. Therefore the purpose of this study was to determine the prevalence of musculoskeletal pain (MSP) among ultrasonographers and to identify risk factors related to their occurrence. Two hundred twenty ultrasonographers randomly chosen from a list of more than 1600 active members of the American Society of Echocardiography were mailed surveys consisting of 22 questions. Included were questions regarding height, age, years of experience, frequency and type of physical exercise, and job-related parameters such as a number of scans per day, scanning from right or left side of bed, number of hours, bed type, type of equipment, and manual or self-propelled machines. Respondents were asked whether they had had back, neck, or shoulder pain related to their profession and to describe treatment rendered and its effectiveness. One hundred thirteen (51%) of 220 ultrasonographers responded to the survey. Ninety (80%) of 113 respondents reported new pain that was not present before they began scanning, with 42 of this group (46%) requiring either physiotherapy (n = 17) or medication (n = 23). Treatment was believed to be helpful in 63% of cases. Factors found to have a positive relationship to MSP included ultrasonographer height less than 63 inches, performing 100 or more scans per month, average scan time of 25 minutes or more per patient, and use of manually propelled machines (each $p < 0.05$). Factors found to have no relationship to MSP included age, type of equipment, right or left scan position, physical conditioning, bed type, and time between patients. Musculoskeletal pain is prevalent among cardiac ultrasonographers, and may have specific work-related factors for its occurrence.

Tanaka-S, Wild-DK, Cameron-LL, Freund-E. Association of occupational and non-occupational risk factors with the prevalence of self-reported carpal tunnel syndrome in a national survey of the working population. **Am-J-Ind-Med**. 1997 Nov; 32(5): 550-6.

UNITED-STATES

To compare the association of occupational versus personal, nonoccupational risk factors with the prevalence of carpal tunnel syndrome (CTS), data from the 1988 National Health Interview Survey, Occupational Health Supplement, were analyzed. When both occupational factors (bending/twisting of the hands/wrists [B/T] and use of hand-held vibrating tools) and personal nonoccupational factors (gender, race, age, body mass index [BMI], smoking, education, and family income) were included in a multivariate logistic regression model, adjusted odds ratios (AORs) of these factors for reporting medically called CTS (MC-CTS) were: exposure to B/T, 5.5; exposure to vibration, 1.9; white race, 16.7; female gender, 2.3; BMI > or = 25, 2.0; history of cigarette smoking, 1.6; age > or = 40, 1.2; education > 12 years, 1.2; and annual family income > or = $20,000, 1.5. Although both occupational and nonoccupational factors are associated with reporting of CTS, repetitive bending/twisting of the hands/wrists and use of vibrating tools remain important risk factors for work-related carpal tunnel syndrome.

Viikari-Juntura-ERA. The scientific basis for making guidelines and standards to prevent work-related musculoskeletal disorders. **Ergonomics** 1997 Oct; 40 (10) : 1097-1117

ENGLAND

Regulations concerning the work environment, tools, and the performance of work are at their best based on scientific evidence. Existing European directives, European and North American standards, and recent guidelines with the potential to prevent musculoskeletal disorders, are either qualitative or semiquantitative. The exception is the NIOSH lifting guide, which is highly quantitative. of the European directives and standards, few have been developed with the primary goal of preventing musculoskeletal disorders, whereas one North American standard and another suggestion for a standard have this specific aim. In a review of epidemiological studies on low-back, neck, shoulder, and upper extremity disorders, several physical load factors were identified as risk factors for the disorders. Many of these factors have been repeatedly identified, and for different types of outcomes of an anatomical area (e.g. pain, disc herniation, disc degeneration of the low-back or neck). However, quantitative exposure-response relationships between physical load factors and disorders based on field studies are largely unknown. Experimental studies have provided a multitude of potentially useful data. It is concluded that both well-designed epidemiological studies with quantitative assessments of physical work load and valid measurements of musculoskeletal disorders, and experimental studies are needed for the future development of regulation. To determine the role of experimental studies in regulation, it should be known to what extent fatigue and other short-term responses are precursors of disorders. Regulation should be directed especially towards factors that are likely to be causative for musculoskeletal disorders. Examples of such factors are sudden overload in manual handling activities, heavy physical work involving manual handling tasks, and vibration from tools. Guidelines that are acceptable and feasible can and should be developed. The effects of such guidelines on the occurrence of musculoskeletal disorders should be investigated.

Violante-F.S., Bonfiglioli-R., Lodi-V., Missere-M., Raffi-G.B. Work-Related Upper Limb Disorders: A New Epidemic? (In Italian.) **Medicina del Lavoro** 1997; 88 (6) : 454-461.

ITALY

Work-related upper limb disorders are one of the leading occupational diseases in many industrialized countries. The paper reviews the evidence of work-relatedness of the most common upper limb disorders (namely carpal tunnel syndrome, hand-wrist and shoulder tendinitis, trapezius myalgia, hand hammer syndrome). Attention is drawn to the difference in the number of reported cases in Italy and other countries, assuming, as na underlying cause, underreporting of such conditions in Italy.

Wedderkopp-N, Kaltoft-M, Lundgaard-B, Rosendahl-M, Froberg-K. Injuries in young female players in European team handball. **Scand-J-Med-Sci-Sports.** 1997 Dec; 7(6): 342-7

DENMARK

The purpose of this study was to examine the nature, extent and severity of sports injuries in young female players in European team handball and to identify the etiological factors involved in the injuries. Twenty-two teams with 217 players, aged 16-18 years, participated in the study. A very high injury incidence during games was observed, with 40.7 injuries/1000 hours of game. Backplayers had the highest incidence (54.8/1000 hours), which is five times higher than any previously recorded injury incidence in players in European team handball. We found that 92.9% of injuries were traumatic and 7.1% were from overuse. One-hundred and twenty-four of the 211 injuries were traumatic injuries of the lower extremities. Of these 63 (51%) were without contact with an opponent. The study confirmed that European team handball is a sport that has a very high injury rate, especially regarding young female players. Field position and earlier injuries are major risk factors, with an earlier injury being the single highest risk factor and with backplayers having a significantly higher number of injuries than players in other field positions.

Willians-N.R., Dickinson-C.E. Musculoskeletal complaints in lock assemblers, testers and inspectors. **Occup. Med**. 1997; 47 (8) : 479-484.

The objectives of this study were to determine the prevalence of musculoskeletal complaints in a population of lock assembers in the West Midlands ; to follow one group over 12 months and to explore the relationship between survey data, sickness absence information and claims experience. An adapted Nordic Musculoskeletal Questionnaire was used to determine annual and weekly prevalence and annual disability rates for musculoskeletal complaints. There was no statistically significant difference in complaints between the six companies, apart from an increased reporting of neck ($p < 0.001$), upper back ($p < 0.001$) and hip ($p < 0.05$) symptoms at one company (Site 4) during the week prior to the study. When the study was repeated at Site 4 one year later, new employees had significantly fewer complaints of neck and elbow discomfort over the previous year and week, but no difference in wrist complaints was reported. This survey of lock assemblers has highlighted high levels of self-reported upper limb complaints when compared to other referent groups of workers.

Zaza-C, Farewell-VT. Musicians' playing-related musculoskeletal disorders: An examination of risk factors. **American Journal of Industrial Medicine**, 1997 Sep; 32 (3) : 292-300

UNITED-STATES

Several studies have shown that playing-related musculoskeletal disorders (PRMDs) present a significant health problem for musicians. To examine physiological, psychological, and behavioral risk factors of musicians musicians' PRMDs, data for a case-control analysis were collected from classically-trained professional and university student musicians in the Canadian province of Ontario in 1994. Two-hundred and eighty-one subjects completed a self-report questionnaire and hypermobility and hand-span measurements. Cases were identified according to an operational PRMD definition developed by musicians and health care professionals in a qualitative study. Logistic regression was used to compare data from 44 prevalent PRMD cases who had no previous history of a PRMD, and 90 controls who had never experienced a PRMD. Data from all subjects were analyzed to examine the role of a prior PRMD on the risk of a current PRMD. This study suggests that females and string players were at a higher PRMD risk. A number of other individual characteristics were also important determinants of the development of a PRMD. Warming up before and taking breaks during practice sessions protected the subject from a PRMD. Given the high proportion of musicians who experience PRMDs, prevention programs are warranted.

Zetterberg-C, Forsberg-A, Hansson-E, Johansson-H, Nielsen-P, Danielsson-B, Inge-G, Olsson-BM. Neck and upper extremity problems in car assembly workers. A comparison of subjective complaints, work satisfaction, physical examination and gender. **International Journal of Industrial Ergonomics**, 1997 Apr; 19 (4) : 277-289

This study includes 564 car assembly workers, 440 men and 124 women, Questionnaires, including work satisfaction, orthopaedic examination and exposure evaluation were performed.

Women had more neck-myalgia and more physical signs from the hands, especially nerve related problems and tendinitis compared to men, Impingement of the shoulder was equally prevalent among women and men, doing the same work. Women showed a higher work satisfaction than men. Stress at work correlated both to subjective complaints from all locations in the upper half of the body and to findings at the physical examination. A logistic regression analysis showed that subjective complaints from the neck, shoulders and feet correlated to less good work satisfaction, while work dissatisfaction was not correlated to any of the physical signs, Those having station-bound work showed less good relations to foremen/workmates and better to the work in comparison with the workstations at the assembly line, the questionnaire gave around 50% higher prevalence of pain from different body areas, when compared to the physical examination. The result represent 23 workstations, constituting the assembly line, A great variation of symptoms and signs was found, significantly so for subjective pain in the wrists/hands (p<0.02), objective pain in the cervical spine (p<0.01) and shoulder impingement (p<0.01), Some specific ergonomic problems were found. A summary for each workstation was presented to the factory and some changes were accomplished. The quality of the production is, among other things, depending on healthy workers, high work satisfaction, low workforce turnover, etc. This study shows how the combination of questionnaires, including work satis faction, physical examination and exposure evaluation can give possibilities to specific intervention.

Zimmermann-C.L., Cook-T.M., Rosecrance-J.C. Operating engineers: work-related musculoskeletal disorders and the trade. **Applied Occupational and Environmental Hygiene** 1997; 12 (10) : 670-680.

Construction is among the leading industries in work-related injuries and workers'compensation costs. Among the construction trades, operating engineers are exposed to unique job-related musculoskeletal demand. Their environmental stressors tend to be more postural and sustained in nature when compared with other construction trades. To reduce the incidence of work-related musculoskeletal disorders (WMDs) and associated compensation costs, an evaluation of the operating engineers'trade was performed. Questionnaires were mailed to 1075 members of an operanting engineers'local union. Four hundred and ten members responded to the symptom and job factors questionnaire. Analysis of the responses identified a lower rate of self -reported symptoms among operating engineers reported the greatest incidence of symptoms, physician visits, and missed work related to the low back, neck, and shoulder regions. The job factors reported to contribute the most to WMDs included prolonged time in the same postue, awkward trunk postures, environmental conditions, and continuing to work when injured or hurt. The uniqueness of the operating engineers'trade relative to other construction trades provides different opportunities for intervention strategies. Operating engineers spend nearly all of their time in a work environment designed by the equipment manufacturer. This allows for working environment interventions to be made by the manufactrer and circumvents some of the less effective methods of ergonomics intervention such as education and peer accountability. The results of the survey suggest that recent changes in equipment design heve aided in a reduction in musculoskeletal complaints among operating engineers. Therefore, based on the findings of this investigation, acquisition of new equipment and continued changes in the ergonomics of equipment appear to be a primary method of intervention when attempting to reduce WMDs among operating engineers.

1996

Arfaioli-C, Tartaglia-R, Lombardi-A, Ianniello-G, Camporeale-P. Repetitive movements of the upper limbs: results of exposure evaluation and clinical investigation in refinishing ceramic ornaments. **Med-Lav**. 1996 Nov-Dec; 87(6): 593-7.

ITALY

An evaluation was made of the degree of exposure to risk and the frequency of disorders attributable to biomechanical overload of the upper limb in workers performing finishing operation on ceramic vases and cups in a ceramics factory. The risks were first evaluated against a checklist, then subsequently an assessment was made of the tasks found to feature the highest risks, using an ergonomic analysis method, which identified activities associated with a large number of actions per minute (> 50). The 22 female workers performing the tasks in question underwent a risk-targeted physical examination which included an electroneurographic test using surface electrodes. The clinical test detected an extremely high frequency of carpal tunnel

syndrome cases, in addition to other upper limb disorders. In particular, nine female workers (41%) were found to be suffering from carpal tunnel syndrome, and five (22%) from other pathologies of the upper limbs (4 scapulo-humeral periarthritis, 1 epicondylitis). As a result of the findings arising out of this study, immediate preventive measures were adopted; moreover, it has become evident that further epidemiological studies on larger sample populations are needed.

Armstrong-T., Foulke-J., Latko-W., Rabourn-R., Ulin-S. Work Related Musculoskeletal Disorders of the Upper Limb: Exposure Evaluation. In: Mital, A., Kruger, H., Kumar, S., Menozzi, M., . Fernandez, J., Ed. **Advances in Occupational Ergonomics and Safety I**. Cincinnaty, Ohio, USA : International Society for Occupational Ergonomics and Safety; 1996. v. 1; p.405-410

Physical risk factors of work related musculoskeletal disorders of the upper limb include: repetition, force, contact stress, certain postures, low temperatures and vibration. An observational system for rating these factors is proposed and demonstrated for identifying and rating physical stresses, determining where instrumental methods may be used, designing interventions and performing epidemiological studies. Job stress ratings before and after interventions can be used to determine their potential impact on worker comfort and health.

Atterbury-MR, Limke-JC, Lemasters-GK, Li-YH, Forrester-C, Stinson-R, Applegate-H. Nested case-control study of hand and wrist work-related musculoskeletal disorders in carpenters. **American Journal of Industrial Medicine**, 1996 Dec; 30 (6) : 695-701

UNITED-STATES

Unionized carpenters (n = 522) participated in a telephone interview regarding their jobs and musculoskeletal symptoms. From this group, a nested case-control study was conducted on 25 symptomatic carpenters who met a hand or wrist work-related musculoskeletal disorder (WMD) case definition and on 35 asymptomatic carpenters who were of similar, age, sex, height, and weight. The purpose of the study was to determine if questionnaire symptom data could be used to estimate the prevalence of hand/wrist WMDs. To test this hypothesis, a subset of subjects underwent physical examination and electrodiagnostic testing to determine if these symptom-derived cases had findings of carpal tunnel syndrome or other hand or wrist musculoskeletal disorders. Standardized upper extremity physical examinations and unilateral ulnar and median nerve conduction studies were administered Physical examination findings of CTS were significantly increased among WMD cases. Mean median sensory and motor distal latencies were significantly longer (P < 0.05) and median sensory amplitudes smaller in cases compared to controls. Median relative to ulnar sensory and motor latencies also were longer in cases. A median mononeuropathy at the wrist was found in 78% of the cases. These findings suggest that symptom-derived WMD data are useful in estimating the prevalence of CTS among carpenters.

Bacis-M, Molinero-G, Cologni-L, Mosconi-G, Seghizzi-P. Repetitive movement of the upper limbs: results of exposure evaluation and clinical investigation in wood sanding in Bergamo. **Med-Lav**. 1996 Nov-Dec; 87(6): 613-24.

ITALY

The authors report their findings regarding a risk assessment study and clinical tests carried out among a group of 121 workers whose job was to sandpaper and buff timber products. The results of the risk assessment indicate that the job in question is at significant risk for the development of WMSDs in relation to the principal risk factors (repetitiveness, force, posture, short recovery periods). The clinical tests, undertaken by medical staff, complied with the anamnestic models proposed by EPM. The results showed that 21 workers were above the anamnestic threshold, and were thus referred for specialist examinations. As a result of the latter, the relevant diagnoses were made. A positive correlation was reported between the occupational exposure level and the clinical abnormalities detected.

Barbieri-PG. Carpal tunnel syndrome in workers engaged in the assembly of manufactured products in various industries in the province of Brescia. **Med-Lav**. 1996 Nov-Dec; 87(6): 686-92.

ITALY

Tests were carried out on five manual assembly departments in a variety of different factories, in order to assess the risks associated with the onset of Carpal Tunnel Syndrome and to describe the prevalence of this disorder among exposed workers. The application of the risk analysis method proposed by the EPM Research Unit in Milan (Italy) demonstrated the presence of numerous jobs featuring both a high frequency of actions per minute and a total lack of recovery times, in addition to a variety of incongrous upper limb postures. The clinical and instrumental investigation diagnosed 76 cases of Carpal Tunnel Syndrome among the 170 exposed workers. 62% of the cases was bilateral and 24% was associated with Guyon Channel Syndrome. In two of the five departments reviewed, the carpal tunnel disorders detected were endemic, and featured unusually high prevalence. The situation had been seriously underestimated by the company technical and medical staff, resulting in a failure to call for the urgent adoption of individual protection and collective prevention measures. The authors recommend that an extensive and adequate occupational risk assessment analysis be performed: the local occupational health services could play a critical role in identifying the highest risk industries and the diseases diagnosed in a hospital environment.

Barbieri-PG, Colombini-D, Rocco-A, Custureri-F, Paderno-G. Outbreak of carpal tunnel syndrome of the upper limbs in automobile seat assemblers: results of exposure evaluation and clinical investigation. **Med-Lav**. 1996 Nov-Dec; 87(6): 646-55.

ITALY

A group of 59 female workers in the sewing and upholstery departments of a factory manufacturing automobile seats underwent clinical and instrumental tests following reports of several cases of suspected carpal tunnel syndrome. A risk evaluation analysis for disorders attributable to repeated trauma of the upper limbs (WMSDs) was simultaneously carried out using the protocol recommended by the EPM Research Unit in Milan. Evidence was found of a high frequency of elementary actions associated with considerable muscular involvement along with inadequate recovery periods. The clinical investigation revealed an unusually high percentage of carpal tunnel syndromes, often associated with Guyon channel syndrome. This disorder affects males and females equally, is often bilateral, and is not associated with known non-occupational factors. The widespread outbreak of work-related musculo-skeletal disorders reported in the departments in question may have arisen from a combination of significant risk factors relating to the types of activities performed, and the long service of the workers. It is reasonable to assume that failure to adopt technical preventive and organisational measures may have stemmed primarily from a poor evaluation of the relevant occupational risks, and from many years of substandard health surveillance practices.

Bingham-RC, Rosecrance-JC, Cook-TM. Prevalence of abnormal median nerve conduction in applicants for industrial jobs. **American Journal of Industrial Medicine**, , 1996 Sep; 30 (3) : 355-361.

UNITED-STATES

There has been much debate regarding the work relatedness of carpal tunnel syndrome (CTS) and whether workers diagnosed with CTS had pre-existing disease at the time they were hired. To elucidate the latter issue, we examined the prevalence of abnormal median nerve conduction within the carpal tunnel in applicants for industrial jobs. Nerve conduction studies (NCS) were performed on both hands of 1,021 applicants following a conditional offer of employment. Each applicant completed a self-administered symptom survey specific to the upper extremity. Applicants had worked previously for an average of 4.4 (range 0-33) years and had a mean age of 30.1 (S.D. 8.9) years. Nerve conduction studies were performed in a private medical clinic. Sensory palmar latencies were determined over an 8 cm segment for the median and ulnar nerves. The difference between the median and ulnar sensory latencies was the primary electrophysiologic measurement used to determine median neuropathy. Using a very conservative criterion for abnormal median nerve conduction, 17.5% of the applicants were classified with neuropathy in at least one hand. Despite the relatively high prevalence of median neuropathy, relatively few (10%) with positive NCS acknowledged symptoms associated with CTS. Males had a higher percentage of median neuropathy than did females. We conclude that a large percentage of industrial workers have objective evidence of abnormal median nerve conduction within the carpal tunnel when hired

The high prevalence of abnormal median nerve conduction without corresponding symptoms may suggest a subclinical entity associated with CTS. (C) 1996 Wiley-Liss, Inc.

Biondi-MC, Nanni-C, Sallese-D. Repetitive movements of the upper limbs: results of exposure evaluation and clinical investigation in the manual sanding of wood in the Valdichiana region. **Med-Lav**. 1996 Nov-Dec; 87(6): 625-33.

ITALY

The aim of this study was to evaluate the level of risk exposure deriving from repetitive movements of the upper limbs, among a population of female workers manually sand papering timber products. The study also included an anamnestic and clinical assessment for the purpose of detecting and diagnosing WMSDs in the study population. The authors report a distinct prevalence of such disorders among the female workers exposed to a high level of risk, also in view of the total absence of recovery periods.

Blanc-P.D., Faucett-J., Kennedy-J. J., Cisternas-M., Yelin-E. Self-Reported Carpal Tunnel Syndrome: Predictors of Work Disability from the National Health Interview Survey Occupational Health Supplement. **American Journal of Industrial Medicine** Sep. 1996; 30 (3) : 362-368.

Risk factors for work disability among persons with carpal tunnel syndrome were identified using data from the Occupational Health Supplement of the National Health Interview Survey. Subjects included 544 survey respondents with self reported carpal tunnel syndrome in the past 12 months and 32,688 survey respondents without recent carpal tunnel syndrome. The selected dependent variable was work disability (due specifically to carpal tunnel syndrome or with no attributable cause) while the independent variable was ergonomic risk of work disability as indicated by minutes of repetitive hand and wrist work; covariates were sociodemographic and health status characteristics. A cross tabular grid of industrial and occupational categories of employment was constructed to provide estimates of ergonomic exposure in those subjects without specific ergonomic data. Among the 544 persons with carpal tunnel syndrome, 58 reported work disability specifically attributed to carpal tunnel syndrome. Workplace ergonomic risk was a significant factor predictive of carpal tunnel syndrome attributed work disability after adjustment for sociodemographic factors and general health status. The authors conclude that work disability among persons with carpal tunnel syndrome is common; for affected workers, repetitive bending of the hand or wrist may increase the risk of work disability associated with this condition.

Brogmus-GE, Sorock-GS, Webster-BS. Recent trends in work-related cumulative trauma disorders of the upper extremities in the United States: An evaluation of possible reasons. **Journal of Occupational and Environmental Medicine**, 1996 Apr; 38 (4) : 401-411.

The increasing trends of cumulative trauma disorders of the upper extremities (ctdues) in US industry is well established; however, systematic examination of potential reasons for these trends has been lacking, Data from the United States Bureau of Labor Statistics and from Liberty Mutual Group workers' compensation claims were used to count ctdues. The proportions of all Bureau of Labor Statistics' cases and Liberty Mutual Group Workers' compensation claims that resulted front ctdues were estimated for the years 1986 to 1993. The proportions by occupation (job classification code), gender, potential video display unit use and in the meat-packing industry are described. Both data systems show a steady increase in cases and claims from less than 1% in 1986 to about 4% in 1993. Women and specific occupational categories are over-represented with respect to ctdues. A shift to service industry work and video display unit use do not appear to be strongly related to the increased reporting of ctdues, whereas increased productivity, an increased number of women in the workforce, and general awareness of ctdues in the media and health care system may be related, Coding and definition problems still limit these conclusions, however.

Cherniack-M. G. Epidemiology of Occupational Disorders of the Upper Extremity. **Occupational Medicine: State of the Art Reviews** 1996; 11 (3) : 513-530.

The epidemiology of the occupational disorders of the upper extremity (ODUE) was reviewed. The frequency of repetitive strain injuries (RSI) and cumulative trauma disorders in the general population was first discussed. Problems with categorizing ODUE included vague symptom complexes and the lack of definitive disease frequency data. Studies were cited which indicated

that the frequency of carpal tunnel syndrome (CTS) was greater in occupations at high risk for repetitive hand use than in occupations at low risk. In determining the prevalence of ODUE in selected industries, two types of analyses were discussed, active surveys of occupations and passive analyses based on surveillance systems. The results of numerous active surveys were cited which reported high frequencies of ODUE in newspaper and office workers; store clerks; meat, fish, and poultry workers; ski manufacturers; electricians; sewing machine workers; and cardiac ultrasonographers. Surveillance system findings also yielded elevated prevalence rates for ODUE in particular industries, such as manufacturing and food processing. Underreporting was considered a major limitation of surveillance systems. Case definition was regarded as problematic for ODUE research. Two inclusive models for the diagnosis of RSI, one based on pain and symptoms and the other based on physical performance, were provided. Because CTS was associated with multiple symptoms and various testing techniques, the definition of CTS cases was considered problematic. Despite the methodological concerns, the author concludes that marked differences in the prevalence of ODUE are evident in various industries. Further study is needed to determine the best approach for the standardization of testing strategies and case definitions.

Colombini-D, Occhipinti-E. The application of the concise exposure index to repetitive movement tasks of the upper limbs in various production settings: preliminary experience and validation. **Med-Lav**. 1996 Nov-Dec; 87(6): 704-15.

ITALY

A summary of eight investigations is presented, which were carried out using standardised methods, for the purpose of quantifying exposure to tasks involving repetitive movements of the upper limbs, as well as quantifying the prevalence of Work Related Musculo Skeletal Disorders of the upper limbs in groups of exposed workers. A total of 462 exposed workers were examined, and the study also took into account the data pertaining to a matched control group comprising 749 workers not exposed to any specific occupational risk. Regarding the quantification of exposure to increased risk, use was made of a Concise Index (OCRA), proposed by the Authors in a previous publication. The data resulting from the eight investigations were used for the study of measurements and models of association among the exposure variables (mainly represented by the OCRA index), as well as the effect variables represented by the prevalence of the various WMSDs of the upper limbs taken both individually and jointly. Significant associations were reported between the OCRA index and an effect indicator represented by the prevalence of all the WSMDs of the upper limbs, calculated on the number of upper limbs at risk. When a logarithmic conversion of the relative exposure (OCRA) and injury indices was carried out, a simple linear regression model resulted which seems to provide a satisfactory predictive performance of the risk of WMSDs of the upper limbs, based on the exposure index. The study confirmed the efficacy of various other models designed to predict effects based on multiple linear regression functions, in which the independent variables are represented by both the OCRA exposure index and by parameters relative to the breakdown by sex and age of the groups of exposed workers.

Cook-T.M., Rosecrance-J.C., Zimmermann-C.L. Work-related musculoskeletal disorders in bricklaying: A symptom and job factors survey and guidelines for improvements. **Appl. Occup. Environ Hyg** 1996; 11 (11) : 1335-1339.

Workers in the construction trades experience high rates of injury and illness, including work-related musculoskeletal disorders. As the basis for formulating and implementing ergonomics changes to reduce musculoskeletal disorders among bricklayers, a questionnaire survey was conducted regarding work-related musculoskeletal disorders and the troublesome job factors which bricklayers perceived as contributing to those disorders . A two-page questionnaire was mailed out to all members of a Midwestern bricklayers union local. The responses of 39 nonretired bricklayers, having an average age of 45 and an average of 21.8 years of work experience, were and alyzed. Results indicated that work-related symptomatic areas, and those accounting for the most reported lost work time and physician visits, were primarily back, neck, and shoulder, and secondarily, elbow and wrist/hand. The survey respondents consistently identified job factors describing awkward postures of the back and shoulder, and handling bricks and mortar in these awkward postures, as the leading causes of their work-related musculoskeletal disorders.The results of this study, along with reports of previous investigations, point to a number of important factors that must be addressed in order to reduce musculoskeletal disorders among bricklayers. These include

brick supply and mortar locations, brick placement/scaffold height, brick weight and size, and rate duration of work.

Cooper-C., Baker-P. D. Upper Limb Disorders. **Occupational Medicine** Dec. 1996; 46 (6) : 435-437.

Clinically evaluating upper limb disorders in work environments was discussed. The epidemiological aspects of upper limb disorders were considered. The annual prevalence of upper limb disorders in the general population varies from about 1 to 5%. Among persons of working age, the incidence rate is around 1 case per 100 person years. Prevalence rates as high as 9% have been reported among specific occupational groups such as packers and meat cutters. There appears to be an association between repetitive use of a particular muscle group or joint and the risk of pain at this site. The major types of discrete diagnoses that should be considered by occupational physicians when evaluating patients with upper limb pain were described. These include disorders affecting the shoulder, elbow, and hand or wrist. The most common shoulder disorders are rotator cuff disorders, capsulitis (frozen shoulder), bicipital tendinitis, acromioclaviculitis, joint dysfunction, and gleno/humeral arthritis. The most common elbow disorders are epicondylitis and olecranon bursitis. The most common hand or wrist disorders are carpal tunnel syndrome, tenosynovitis, and arthritis. Factors to be considered when performing a clinical evaluation of upper limb disorders were reviewed. These consist of the history and the physical examination. Relevant features of the history include pain, stiffness, swelling, loss of function, relationship to trauma, and the occupational history. The major components of the physical examination include inspection, palpation, determining the range of motion, stress tests, and applying specific tests to the joint involved. Investigating the cause of and treating upper limb disorders were discussed.

Dignan-M., Hayes-D., Main-H., Parker-K. Cumulative Trauma Disorders among Apparel Manufacturing Employees in the Southeastern United States. **Southern Medical Journal** 1996; 89 (11) : 1057-1062.

The incidence of cumulative trauma disorders (CTDs) of the upper extremities among garment manufacturing workers was studied retrospectively. Data regarding work related CTDs of the upper extremities that were reported by employees of three apparel manufacturing facilities during the fiscal years 1991 and 1992 and that were recorded on OSHA 200 logs were analyzed. A total of 123 cases from 1991 and 198 from 1992 were studied; the respective incidence rates for these years were 13.1 and 19.4 per 100 full time equivalent employees. The highest CTD rates were seen in the months of January, March, August, and September. The peaks in CTD rates did not correspond to average hours worked per week. CTD rates were related to age and duration of employment and were highest among workers 45 to 49 years of age and those with 1 to 3 years of service. The authors conclude that new, untrained and unconditioned workers are at increased risk of CTDs, that increases in the incidence of CTDs may be expected after return from vacation, and that there are areas other than body mechanics that may be effective targets for intervention for the prevention of CTDs.

Estill-C.F., Tanaka-S., Wild-D.K. Ergonomic Considerations of Manually Harvesting Maine Wild . **American Industrial Hygiene Association Journal**. 1996 Oct; 57 (10) : 946-948.

A field study consisting of a symptom questionnaire, limited physical examination, and ergonomic analysis was conducted to determine if blueberry raking may cause cumulative trauma disorders of the wrist. To extract berries from the plant, the raker grips the rake handle, places the tines of the rake under the bush, and pulls the rake up through the plant. Anywhere from 10 to 100 raking motions are needed to fill a rake, depending on the plant thickness and quantity of berries on the plants. For the ergonomic analysis, each of ten workers was viewed for 10 minutes. Nine of 14 harvesting crews in various fields were visited during the study and 134 rakers completed the survey questionnaire. Most rakes used had 55 to 60 tines with the average weight being 1.7 kilograms. The average number of lifts per minute was 32 with a standard deviation of 13. Of the ten rakers observed, seven used both hands at once to rake the blueberries. The posture was stooped. The worker's torso was bent over most of the time while the wrist, arm, and shoulder were used to move the rake through the berries. The force required to pull the rake through the blueberry bushes averaged 87 newtons (N) with a standard deviation of 17.5N for three attempts. Of the 134 rakers participating in the study, a history of tendinitis in the hand or wrist was reported

by 12% and a history of carpal tunnel syndrome was reported by 5%. Back pain was reported by 27% of those surveyed, hand and wrist pain by 20%, and elbow pain 11%. Based on specific criteria, 4% of the participants had carpal tunnel syndrome, another 4% had de Quervain's disease, and 2% had both.

Fallon-KE. Musculoskeletal injuries in the ultramarathon: the 1990 Westfield Sydney to Melbourne run. Br-**J-Sports-Med.** 1996 Dec; 30(4): 319-23

ENGLAND

OBJECTIVE: To document the injuries sustained by participants in a 1005 km ultramarathon. METHODS: Clinical notes were reviewed on entrants in the 1005 km Sydney to Melbourne ultramarathon. An injury was recorded following self referral by a participant or if the history obtained from the runner or his support crew indicated the likelihood of a significant injury which could have an impact upon performance. RESULTS: 64 injuries were found in 32 runners. The knee (31.3%) and ankle (28.1%) regions were most commonly injured. The most common single diagnosis was retropatellar pain syndrome, and Achilles tendinitis and medial tibial stress syndrome were the next most common injuries. Peritendinitis/tendinitis of the tendons passing under the extensor retinaculum at the ankle, an injury infrequently reported in other sports, was common (19% of all injuries). CONCLUSIONS: The injuries were typically associated with running but 12 (19% of the total) involved the tendons of the muscles of the anterior compartment of the lower leg, and in almost every case the major site of inflammation was at the extensor retinaculum at the anterior aspect of the ankle. This injury appears to be relatively specific to the ultramarathon- "ultramarathoner's ankle".

Fogg-T., Henderson-R. Upper extremity musculoskeletal strain in a sample of New Zealand clerical workers : an examination of self-reported and diagnosed strain. **Journal of Occupational health and Safety - Australia and New Zealand** 1996; 12 (2) : 207-212.

This paper examines both self-reported and diagnosed levels of upper extremity musculoskeletal strain among a matched (keybord users/non-keyboard users) sample of New Zealand clerical workers. A total of 1,073 self-report questionnaires (512 keyboards users, 561 non-keyboards users) were examined for self-reported location and severity of upper extremity musculoskeletal strain. Medical examinations were conducted on those reporting a musculoskeletal strain to ascertain the diagnosed levels of the strain. Results highlighted differences in location of the reported strain. A between the groups with regard to the severity of pain, the keyboard group exhibited a statistically shorter duration of pain. This result is discussed in relation to the type of work content in keyboard and non-keyboard type jobs.

Frazier-L.M., Loomis-D.P. Usefulness of North Carolina Workers' Compensation Data for Surveillance of Cumulative Trauma Disorders. **Applied Occupational and Environmental Hygiene** 1996; 11 (9) : 1125-1130.

North Carolina workers' compensation claims data were explored to determine the case with which the data could be used to study cumulative trauma disorders. A descriptive survey was performed to determine the frequency and distribution of claims for carpal tunnel syndrome and upper extremity tendinitis during 1986 to 1988. Minor claims were not computerized and therefore were not available for study. Cases were not entered into the database until the claim had legally closed, resulting in a delay in claim ascertainment for more complex cases. Race of claimants was not available for study. There were 851 claims for cumulative trauma disorders in the study group. The highest rate was found in the food products industry (5.6 claims per 10,000 workers); the 6 next highest rates were found among manufacturing industries (2.5 to 4.2 claims per 10,000 workers). In the 10 industries with highest cumulative trauma disorder rates, the proportion of claims diagnosed as carpal tunnel syndrome varied from 26.3 to 67.9 percent. The mean number of lost work days per claim in these industries varied from 34 to 128 days. The most frequently cited sources of injury were nonpowered hand tools and meat, poultry or seafood.

Gerr-F., Marcus-M., Ortiz-D. J. Methodological Limitations in the Study of Video Display Terminal Use and Upper Extremity Musculoskeletal Disorders. **American Journal of Industrial Medicine**. 1996 Jun; 29 (6) : 649-656.

The limitations and methodology inherent in human factors and epidemiological studies of upper extremity musculoskeletal disorders and video display terminal (VDT) use were considered. Human factors studies, while frequently being used to question the safety of data entry tasks, have suffered from the limitation of having a small number of subjects, and short term exposure under conditions found in the laboratory, and the questionable practice of using short term outcomes to predict chronic health effects. Difficulties in interpreting data taken from epidemiologic studies usually have been traced to limitations in the methodology established in the research outlines. These difficulties in epidemiologic studies relate to obtaining a poor measurement of exposure and health outcomes and neglecting potentially confounding variables. Some studies have improved the measures of VDT usage but these improvements have not resulted in improved consistencies in the findings. The authors stress the need for additional studies attempting to clarify exposure and effect relationships by well conducted epidemiologic studies. Research should examine associations between VDT use and upper extremity disorders but only when measures of both exposure and adverse health effects are standard, objective, and valid.

Ghersi-R, Cavallaro-AM, Lodi-V, Missere-M, Violante-FS. Repetitive movement of the upper limbs: results of a current exposure evaluation and a clinical investigation in workers employed in the preparation of pork meat in the province of Modena. **Med-Lav**. 1996 Nov-Dec; 87 (6): 656-74.

ITALY

Exposure assessment tests were undertaken to measure the biomechanical overload factors affecting the upper limbs. The tests were carried out on a group of 86 workers employed on the cutting, boning and trimming line of a pork meat processing plant. Anamnestic screening and clinical tests targeted at correlated disorders were also performed and were followed by instrumental tests. The results are reported with respect to frequency of repetitive technical actions, degree of muscular involvement, postural risk, several complementary factors and distribution of recovery periods. The clinical investigation showed a high prevalence of carpal tunnel syndrome, tendon disorders of the hand and epicondylosis of the elbow, in addition to other disorders. The report confirms the presence of additional risks for the workers, both in the past and under present circumstances, and suitable preventive measures are formulated.

Hales-TR, Bernard-BP. Epidemiology of work-related musculoskeletal disorders. **Orthop-Clin-North-Am.** 1996 Oct; 27(4): 679-709

UNITED-STATES

Musculoskeletal disorders are common in the United States. Although precise estimates are not available, most researchers agree that exposure to a combination of work place risk factors is a major contributor to these disorders. Along with personal factors (age, gender, etc.). Epidemiologic studies of workers have associated these disorders with many work-place physical and psychosocial factors. Specific physical factors associated with these disorders include intense, repeated, or sustained exertions, awkward, sustained, or extreme postures of the body, insufficient recovery time, vibration, and cold temperatures. Specific examples of work-place psychosocial factors include monotonous work, time pressure, high work load, lack of peer support, and a poor supervisor-employee relationship.

Hansson-GA, Balogh-I, Ohlsson-K, Rylander-L, Skerfving-S. Goniometer measurement and computer analysis of wrist angles and movements applied to occupational repetitive work. **Journal of Electromyography and Kinesiology**, 1996 Mar; 6 (1) : 23-35.

In epidemiological studies of occupational musculoskeletal disorders there is a need for quantitative exposure measurements of the physical work load. In studies of neck and upper limb disorders the so-called cumulative trauma disorders (CTDs), in particular the carpal tunnel syndrome, the positions and movements of the wrist are of special interest. A biaxial flexible electrogoniometer was used to measure continuously, with a sampling rate of 20 Hz, wrist flexion/extension and abduction/adduction angles up to 27 min. Evaluation of the influence of rotation on the goniometer showed some inherent crosstalk, which, however, did not invalidate the results. For occupational repetitive work, 99.5% of the signal power was contained in the 0-5 Hz band. Two-dimensional angle distributions and power spectra gave comprehensive information about wrist postures and movements. Measures reflecting both static and dynamic properties were

derived from time and frequency domains. These measures give quantitative information on different potential risk factors and are therefore useful in epidemiological studies. Mean power frequency (MPF) is suggested as a generalized measure of repetitiveness. The method was applied in field studies of fish processing industry workers with highly repetitive work and risk of CTD.

Hoekstra-E.J., Hurrel-J., Swanson-N.G., Tepper-A. Ergonomic, job task, and psychosocial risk factors for work related musculoskeletal disorders among teleservice center representatives**. International Journal of Human-Computer Interaction** 1996; 8 (4) : 421-431.

A cross-sectional study was conducted to evaluate the association betweeen work-related musculoskeletal disorders (WRMDs) and work conditions, perceived exhaustion, job dissatisfaction, and job-stress issues at two teleservice centres (TSCs). The study covered teleservice representatives who respond to toll-free calls for assistance. The work involves a computer or manual search for information, and data entry using keyboards. One facility had upgraded the furniture at the workstations; the other facility had not. A questionnaire survey among 114 teleservice representatives and an ergonomic evaluation were conducted to determine WRMDs was found at both TSCs. Suboptimal ergonomic conditions were associated with neck, shoulder, elbow, and back WRMDs, as well as with increased job dissatisfaction. Perceived increased workload variability and lack of job control were associated with the occurence of neck and back WRMDs, repectively. WRMDs were more frequently reported by teleservice representatives at the centre with older furniture and sboptimal ergonomic conditions. WRMDs may be prevented by improving ergonomic conditions at workstations and adressing work-organization elements.

Hrncir-E., Urban-P. Regional differences in the numbers of notified occupational diseases from repetitive strain injury in the Czech Republic. **Prac Lek.** 1996; 48 (4) : 164-173.

The authors analyzed the numbers of occupational diseases notified in the Czech Republic according to item 29 of List of Occupational Diseases, Repetitive Strain Injury in the years 1991 to 1994, with reference to gender, diagnosis and region, where the disease was diagnosed. It has become obvious that the differences among individual regions are so significant that they cannot be explained by a random fluctuation or by regional or time differences between the general health state of the works. These data indicate that in the process of granting the status of occupational diseases of locomotor apparatus, subjective factors may play a significant role as well as various local customs and circumstances.

Kasdan-ML, Leis-VM, Lewis-K, Kasdan-AS. Trigger finger: not always work related. J**-Ky-Med-Assoc.** 1996 Nov; 94(11): 498-9

UNITED-STATES

A retrospective chart review of 516 patients with 719 trigger fingers was undertaken to determine the relationship between trigger finger and occupation. Of the 516 patients, 361 were employed. One hundred seventy-eight (34.5%) of the employed patients had trigger fingers related to heavy lifting and/or high force gripping activities. The decision of causation is arbitrary and not based on science.

Kalavar-SS, Hunting-KL. Musculoskeletal symptoms among cytotechnologists. **Laboratory Medicine**, 1996 Nov; 27 (11) : 765-769

We measured the prevalence of musculoskeletal symptoms among cytotechnologists in the metropolitan Washington, DC, area, We surveyed cytotechnologists to assess the prevalence of neck, shoulder upper-back, elbow/forearm, hand/wrist, and lower-back symptoms in the prior year. Eighty-two (69%) of 125 cytotechnologists returned questionnaires of which 95% were working as cytotechnologists. The prevalences of neck (61.5%), hand/wrist (56.4%), and lower-back (42.3%) symptoms were highest Laboratory workers routinely involved in microscope-related work may be at risk for cumulative trauma disorders . We concluded that an ergonomic approach to this problem can help prevent musculoskeletal symptoms.

Killough-M.K., Crumpton-L.L. An investigation of cumulative trauma disorders in the construction industry. **International Journal of Industrial Ergonomics** 1996; 18 (5-6) : 399-405.

Disorders associated with repeated trauma were the most common occupational illness in the U.S. in 1991, accounting for 61% of all occupational illnesses (Bureau of Labor Statistics). Research on cumulative trauma injuries in the construction industry is scarce. Therefore, the purpose of this research was to investigate factors associated with the development of cumulative trauma disorders (CTDs) in the construction industry. Additionally, this research evaluates the types of CTD most prevalent in the construction industry. Results of this research show seven common CTDs prevalent in the construction industry: Carpal Tunnel Syndrome, Tennis Elbow, Trigger Finger, Arthritis of the Thumb, Thumb/Wrist Tendinitis, Vibration Syndrome and Impingement. Na index was developed to rank tasks based on possible development of CTDs by quantifying factors that contribute to the occurrence of these CTDs such as tool design, work task design, awkward posture, repetition, and application of force. This paper presents an empirical approach for quantifying the risk of developing CTDs while performing common job tasks within the construction industry.

Klaiman-MD, Gerber-LH. General considerations for managing tendon injuries. **Bull-Rheum-Dis.** 1996 Feb; 45(1): 1-6

UNITED-STATES

Malchaire-J.B., Cock-N.A., Robert-A.R. Prevalence Of Musculoskeletal Disorders at the Wrist as a Funcion of Angles, Forces, Repetitiveness and Movement Velocities. **Environment & Health** 1996; 22 (3) : 176-181.

The purpose of this investigation was to study the relationship between the prevalence of musculoskeletal disorders at the wrists and the characteristics of the work conditions in terms of angles, forces, repetitiveness, and movement velocities. Nine workplaces were selected and the prevalence of wrist disorders was determined by means of a questionnaire for both arms separately, along with characteristics of the 335 subjects (age, weight, height, seniority). A work analysis was performed on subjects selected at random from each workplace by recording, for both wrists during a represenative number of work cycles, the angles both in radial and ulnar deviations and in flexion-extension and the surface electromyogram on the hand flexors of the forearm. Repetitiveness (defined as the number of transitions per minute) and movement velocities (in deviation and flexion-extension) were derived from the recordings of the angles. All the derived variables were highly correlated, greater angles and greater forces being associated with greater velocities and higher repetitiveness. A multivariate linear regression model for the prediction of the prevalence of musculoskeletal disorders of the wrist was constructed (R = 0.904). Height, weight, seniority, angles in radial-ulnar deviation, and forces were significantly linked to wrist angles in deviation and to forces exerted. Due to their high correlation with force, the repetitiveness indices and velocities as defined do not appear to play an additional role. Further research is needed to find alternative ways of characterizing repetitiveness.

Martinelli-M, Carri-MG. Evaluation of the exposure to biomechanical overload of the upper limbs and clinical investigation in a female population employed in the manual loading of production lines in 2 ceramics factories. **Med-Lav.** 1996 Nov-Dec; 87(6): 675-85

ITALY

The aim of this study was to assess the presence of an increased risk of biomechanical overload of the upper limbs in the ceramics industry, among workers manually loading production lines. The study focused on two factories: in the first, most of the work was performed manually, whilst in the second the manufacturing process had been almost entirely automated. A total of 46 female workers were examined in both factories, to check for the presence of any disorders of the shoulder, elbow and wrist, as well as for any signs of carpal tunnel medial nerve pain. Approximately two thirds of the workers had positive results of the examinations and went on to undergo 2nd level testing (physiatric examination, muscle tendon US, electromyography) to confirm the diagnosis. In both factories, an increased risk was detected in terms of intensity of exertion, frequency of actions and inadequate recovery times. The posture and movements analysis showed that each of the segments of the upper limbs studied were involved. In both factories, at least 3 out of every 4 workers tested positive for a disorder of at least one segment.

Diagnoses were almost invariably confirmed by the 2nd level tests. The progressive automation of the ceramics industry over recent years does not seem therefore to have reduced the risk of biomechanical overload disorders in the upper limbs, at least in relation to those jobs which still feature manual tasks. In view of the social costs associated with such disorders, it would appear mandatory to pursue the investigation further, particularly focusing on those jobs (e.g. polishing, cutting, special shapes, etc.) which can be expected to feature manual tasks.

Melhorn-J.M. A prospective study for upper extremity cumulative trauma disorders of workers in aircraft manufacturing. **Journal of Occupational and Environmental Medicine** Dec. 1996; 38 (12) :1264-1271.

To investigate the impact of measures for reducing the risk of upper extremity cumulative trauma disorders (CTDs), 212 aircraft workers who used rivet guns were assigned to one of four primary factor groups: ergonomic posture training, exercise training, rivet gun type, or a control group. During the 15 month study, individual risk levels were established by questionnaire, physical measurements, and nerve sensitivity testing. Of the primary factors, only posture training showed a positive risk reduction benefit. However, when associated factors were taken into account, a positive benefit was demonstrated for posture training and exercise training in certain groups. The study helps to identify the possible benefits of worker training for controlling CTDs. .

Merseburger-E. Repetitive movements of the upper limbs: results of exposure evaluation and clinical investigation during the sorting and packaging of apples. **Med-Lav.** 1996 Nov-Dec; 87 (6): 603-12.

ITALY

In the fruit industry, workers sorting and packing apples perform a job that is characterised by repetitive actions, that require them to remain in an upright position for prolonged periods of time and, occasionally, to manually lift loads of apples. The aim of the study was to detect and provide a preliminary quantification of any possible risks for the musculo-skeletal system, as well as any disorders present among the workers. A risk analysis for WMSDs was performed in an apple packing plant, using video recordings of the job cycles associated with two different tasks (semi-automatic sorting and manual packing). A clinical and anamnestic investigation was carried out in nine plants; a standard questionnaire was distributed to 180 employees, with the purpose of detecting disorders and diseases of the locomotor system. An initial evaluation of the risks for WMSDs indicated that the routine tasks performed by the female apple workers featured a very high frequency of actions, also in view of the fact that the repetitive tasks lasted for the duration of the entire work shift. In the situation examined, the action frequency limits were greatly exceeded; moreover, the recovery times were inadequate in terms both of their duration and distribution. Regarding clinical and anamnestic examination, an overall analysis of the results shows a very high prevalence of spinal and hand-arm disorders. Given these preliminary findings, the authors suggest that the sample population of fruit sorters should undergo clinical and instrumental testing to evaluate the condition of the spine and upper limbs, and that a specific health surveillance programme should be adopted across the industry.

Molteni-G; De-Vito-G; Sias-N; Grieco-A. Epidemiology of musculoskeletal disorders caused by biomechanical overload (WMSDs). **Med-Lav.** 1996 Nov-Dec; 87(6): 469-81.

ITALY

The link between occupation and musculo-skeletal disorders has been focused on in numerous research projects, ranging from those simply observing the different pathological findings reported among workers performing particular tasks, down to the latest studies actually quantifying the "exposure" of workers to physical and psycho-social stimuli, Recently, Hagberg et al (11) carried out a critical review of the literature concerning the upper limbs. For some disorders and certain tissues, the authors reported that specific types of work-related exposure are associated with the development of musculo-skeletal pathologies, and that the relative risks for certain types of occupational exposure can be extremely high. This has been proven in relation to tendinitis of the shoulder and hand-wrist, carpal tunnel syndrome, and tense neck syndrome, as well as several localised aspecific musculo-skeletal symptoms, such as pain. For other pathologies, the study reported contradictory results. This is the case for lateral epicondylitis, narrow chest syndrome and

cervical radiculopathy. Associations have moreover been observed between several groups of disorders and certain psycho-social factors (e.g. workload, degree of discretionality).

Murphy-PL, Sorock-GS, Courtney-TK, Webster-BS, Leamon-TB. Injury and illness in the American workplace: A comparison of data sources. **American Journal of Industrial Medicine**, 1996 Aug; 30 (2) : 130-141

UNITED-STATES

Setting priorities for workplace health and safety research depends upon accurate and reliable injury and illness data. All occupational health databases have limitations when used to summarize the national scope of workplace hazards. The comparison of data from multiple sources may produce more credible estimates of the lending occupational injuries and illnesses. The purpose of this paper is to describe the strengths and weaknesses of six data collection systems that record occupational injuries and illnesses on a national level and to compare the leading estimates from these systems for 1990. The six systems are: 1) National Traumatic Occupational Fatalities database, 2) the Bureau of labor Statistics Census of Fatal Occupational Injuries, 3) The Bureau of Labor Statistics Annual Survey data, 4) a large workers' compensation database, 5) the National Council on Compensation Insurance data, and 6) The National Electronic Injury Surveillance System. Occupational injuries, as defined herein, predominate over illnesses in terms of the number of cases and the overall costs. Databases that provide information on the antecedents of injuries suggest how these injuries may be prevented and warrant more attention and refinement. (C) 1996 Wiley-Liss, Inc.

Necas-M. Musculoskeletal symptomatology and repetitive strain injuries in diagnostic medical sonographers: A pilot study in Washington and Oregon. **J. Diagn. Med. Sonogr.** 1996; 12 (6) : 266-273.

Repetitive strain injuries are beginning to be widely recognized as a serious occupational risk for sonographers. The goal of this study was to establish the incidence of musculoskeletal symptomatology and repetitive strain injuries in sonographers from Washington state and Oregon and to correlate certain physical attributes, work load, and work habits with the reporting rates of musculoskeletal symptomatology and repetitive strain injuries. The data for this study were gathered through a comprehensive questionnaire. Eighteen percent of respondents suffered no symptoms; 66% suffered symptoms without repetitive strain injury, and 15% were diagnosed with repetitive strain injury . The analysis revealed that a positive correlation exists between certain ergonomically unsound work habits and increased symptomatology. The proportion of repetitive strain injury-diagnosed sonographers tended to increase with more years in the profession. The reporting rate of musculoskeletal symptomatology and repetitive strain injuries also appeared to be influenced by other variables, such as gender, work load, and stress in the workplace.

Panzone-I, Carra-G, Melosi-A, Rappazzo-G, Innocenti-A. Repetitive movement of the upper limbs: results of exposure evaluation and clinical investigation during jar packaging of preserved vegetables. **Med-Lav**. 1996 Nov-Dec; 87(6): 640-5.

ITALY

In order to assess the prevalence of work-related musculo-skeletal disorders of the upper limbs, a total population of 29 female workers in an industrial vegetable preserving plant were examined. The average age of the workers was 41.3 years (SD = 9.2), and their average length of service was 16.7 years (SD = 7.2). Only 20% of the workers were anamnestically negative, while 80% had one or more disorders attributable to repetitive trauma of the upper limbs. The disorders showed no prevalence for the right side, a finding in line with the risk analysis which indicated that both limbs were equally used. The results of the risk analysis and clinical assessment confirm that high-frequency actions, combined with improper posture and a shortage of suitable recovery times, play a causal role in determining the onset of the disorders studied.

Panzone-I, Melosi-A, Carra-G, Rappazzo-G, Innocenti-A. Repetitive movement of the upper limbs: results of exposure evaluation and clinical investigation in cash register operators in supermarkets. **Med-Lav.** 1996 Nov-Dec; 87(6): 634-9

ITALY

In order to evaluate the prevalence of joint and periarticular disorders of the upper limbs attributable to repetitive movements (WMSDs), 100 female supermarket cashiers were examined. Their average age was 29.5 years (SD = 6.3), and their average length of service was 3.9 years (SD = 1.9). Only 26% of the women were anamnestically negative for WMSDs, while 74% had one or more disorders due to repetitive trauma of the upper limbs, although a definite diagnosis could be made in only 33 cases. The majority of the disorders affected the right side and the localisation was primarily in the shoulder and wrist. The risk factor analysis on the one hand confirmed that high-frequency repetitive movements of the wrist and hand, associated with inadequate recovery times, do play a role in determining the onset of upper limb and carpal tunnel syndrome. On the other hand, the study also revealed a definite need to review the way the work is organised, so that each shift at the cash register includes suitable functional recovery periods.

Pen-LJ, Barrett-RS, Neal-RJ, Steele-JR. An injury profile of elite ironman competitors. **Aust-J-Sci-Med-Sport.** 1996 Mar; 28(1): 7-11

AUSTRALIA

An injury questionnaire was administered to the 30 elite ironman competitors (mean age = 25.7 +/- 4.6 yrs) participating in a commercially sponsored seven race national series. Responses provided retrospective data from the preceding three years indicating the type, location, frequency, cause and severity of injuries sustained by ironmen, and associated these injuries with particular race components (run, swim, board, ski). Twenty self-reported questionnaires were returned for analysis that described a total of 67 injuries incurred by 19 subjects. Results indicated the following: (i) the most frequently injured body parts were the knee (n = 18) and shoulder (n = 14) with the lower extremity accounting for 55% of all injuries reported; (ii) knee, shin and calf injuries had a significant association with the run component and upper extremity injuries had a significant association with the swim component; (iii) running was perceived to be the most injurious race component in terms of the frequency and severity of injury; (iv) overtraining was perceived to be the main cause of injury; (v) tendinitis was perceived to be the main type of injury; (vi) athletes adjusted their training mode to accommodate injury so that total training volume could be maintained; and (vii) injury did not result in withdrawal from competition. Further research investigating the techniques used in the ironman event and their relationship to injury is recommended.

Pierre-Jerome-C., Bekkelund-S. I., Mellgren-S. I., Torbergsen-T. Quantitative Magnetic Resonance Imaging and the Electrophysiology of the Carpal Tunnel Region in Floor Cleaners Scandinavian. **Journal of Work, Environment and Health** Apr. 1996; 22 (2) : 119-123.

Quantitative magnetic resonance imaging data were compared with electrophysiological parameters of the median nerve in an attempt to identify structural changes occurring in the carpal tunnel and subclinical damage to the median nerve among 24 professional floor cleaners (all female). They used a dry or wet mop for floor cleaning. The volumes of the carpal tunnel among the cleaners were similar to the volumes measured in a control group of 19 female workers. Both the cleaners and the control subjects were selected from workers visiting an occupational health service for a routine physical examination. The range in volumes for the cleaners was 872 to 1253 cubic millimeters compared to 820 to 1198 cubic millimeters for the control group. The tunnel inlet was larger than the outlet in all subjects. The thenar eminences had a mean cross sectional area of 293 square millimeters for the cleaners and 298 square millimeters for the control group. The cleaners had a larger cross sectional area of the hypothenar eminences. The signal intensity of the median nerve was higher, but not significantly so, among the cleaners. Mean skin temperatures of the index finger were 29.0 and 29.1 degrees-C for the cleaners and controls, respectively. A significantly lower motor nerve conduction velocity of the right median nerve was noted among the cleaners who also demonstrated a tendency towards longer distal latency. A positive association was observed between the hand grip in the cleaners and the area of the hypothenar eminence. The authors conclude that subclinical damage to the median nerve was identified in professional cleaners when compared with noncleaners.

Punnett-L. Adjusting for the healthy worker selection effect in cross-sectional studies. **Int-J-Epidemiol**. 1996 Oct; 25(5): 1068-76.

ENGLAND

BACKGROUND: In a cross-sectional study of musculoskeletal disorders, women employed in highly repetitive manual work (garment assembly) were found to have approximately double the risk observed in a population with more varied tasks (hospital work). It was suspected that this estimate might be biased if garment workers with musculoskeletal pain were more likely than others to leave employment. METHODS: Retrospective information on date of first onset of symptoms and years employed to date of pain onset, or to survey date (whichever was earlier), was used to calculate age and calendar period-specific rates of onset, conditional on remaining employed until the survey. RESULTS: These rates, and the relative risk for garment work, increased over the 20-year period preceding the year of the survey. The trend was not explained by age or length of employment, or by any known changes in work demands that might have caused a true increase in incidence density. CONCLUSIONS: In the absence of longitudinal cohort data, alternative explanations for these results cannot be excluded. However, with specified assumptions, the most plausible appears to be a healthy worker selection effect acting differentially between high and low exposure groups. This effect would have caused the smallest bias in the prevalence in the year immediately before the survey, and a better estimate of the true relative risk would be approximately five. Where date of onset has been obtained, this method may be used in other cross-sectional studies to estimate and reduce the magnitude of selection bias in a survivor population, if longitudinal data cannot be collected.

Rocha-L.E. **Estresse ocupacional em profissionais de processamento de dados: condicões de trabalho e repercussões na vida e saúde dos analistas de sistemas**. São Paulo : s.n.; 1996. [Tese de Doutorado - Faculdade de Saúde Pública da USP]

Resumo: Estudou-se a relação trabalho-saúde dos analistas de sistemas. A metodologia incluiu equipe multidisciplinar, entrevistas, analise ergonômica da tarefa e aplicação de questionários para 553 analistas e 136 trabalhadores de outras ocupações de duas empresas de processamento de dados de são Paulo, com analise fatorial e de regressão múltipla. Descrevem-se características sócio-demográficas, conteúdo da tarefa e principais condições de trabalho (exigência de tempo, carga mental de trabalho e tipo de relação com o computador) associadas as repercussões sobre a saúde dos analistas de sistemas (fadiga, manifestações visuais, musculares, distúrbios psicossomáticos e principalmente psicossociais). Como fatores protetores da saúde são descritos: a satisfação com o trabalho, o suporte familiar e o lazer.

Rosecrance-J.C., Cook-T.M., Zimmermann-C.L. Work-related musculoskeletal symptoms among construction workers in the pipe trades. **Work** 1996; 7 (1) : 13-20.

Workers in the construction trades experience high rates of injuries and illnesses, including work-related musculoskeletal disorders. As the basis for formulating and implementing ergonomic changes to reduce musculoskeletal disorders among workers in the pipe trades, a cross-sectional survey was conducted. The survey instrument assessed the prevalence of work-related musculoskeletal symptoms and identified job factors that may contribute to those symptoms. A two-page questionnaire was mailed out to members of three plumber and pipe/steamfitter unions. Results from 526(40% response rate) apprentices and journeymen indicated that the highest work-related symptoms and reported lost work time due to those symptoms, were in the back, neck, and knees. Awkward postures and working in the same position for long periods were identified as the leading causes of work-related musculoskeletal symptoms. These results can be used to formulate appropriate intervention strategies for the reduction of musculoskeletal symptoms for construction workers in the pipe trades.

Rovetta-S, Bosco-MG, Tornese-C, Rischia-G, Emili-A, Morino-S. Investigation in a slaughter house and processing of pork meat. Repetitive task work and osteo-articular and musculotendinous pathology of the upper limbs. **Med-Lav**. 1996 Nov-Dec; 87(6): 693-703.

ITALY

The investigation concerned 47 workers (43 males and 4 females), whose average age was 41.5 years and average length of service 12 years. The aim of the study was to quantify the presence in an abattoir and meat processing plant of risk factors represented by repetitive movements requiring the use of force, and to describe the work-related musculo-skeletal disorders (WMSDs) of the upper limbs found in a group of workers exposed to such risk factors. The work was found to feature high speeds and very particular operations which, for most of the workers, required highly

repetitive actions often associated with the use of force. Almost all the tasks had duration cycles of less than 30 seconds and a medium-high rate of actions/minute (from 20 to 60), with peak rates reached in the boning operations; the postural involvement was also considerable, particularly for the right wrist. The amount of force employed-calculated as a percentage of the Maximum Voluntary Contraction-averaged 50%. With very few exceptions, there were no significant pauses during the cycle. The group displayed a high prevalence of pain and paraesthesia and joint disorders, particularly in the over 35 age groups; statistically significant differences emerged with respect to the data from a matched population sample given the same anamnestic and clinical protocol. The group also exhibited significantly different Carpal Tunnel Syndromes with respect to the control population: 7 right-hand CTSs and five left-hand. CTS affected two out of every three women aged over 35 and 3 out of every 23 men over 35. The authors discuss the results in the light of previous studies and of the definition of CTS. The study concludes that investigating and preventing WMSDs in the meat processing industry is a justified, albeit very difficult, task whilst the protection afforded by current legislation appears to be most inadequate.

Sannino-G, Taviani-A, Tartaglia-R, Valiani-M, Ianniello-G. Repetitive movements of the upper limbs: results of exposure evaluation and clinical investigation in the production and packaging of ice cream. **Med-Lav**. 1996 Nov-Dec; 87(6): 598-602.

ITALY

An evaluation was made of the degree of exposure to risk and the frequency of disorders attributable to biomechanical overload of the upper limb in workers employed on packaging in an ice cream factory. The risks were first evaluated against a checklist, then subsequently an assessment was made of the tasks found to feature the highest risks, using an ergonomic analysis method. The method identified several jobs, such as placing ice cream coupes and such like in boxes, as requiring a large number of actions per minute (> 30) and considerable muscular strength. The 59 female workers performing the packaging operations were given a risk-targeted physical examination. The clinical test detected an extremely high frequency of carpal tunnel syndrome, (7.1%) epicondylitis (5.2%) and scapulo-humeral periarthritis (3.5%) in the over 35 years age group, with respect to a control population not exposed to risk. The authors conclude that the repetitiveness of the actions, the use of gloves due to prolonged contact with frozen products and the effects of the low temperatures themselves, may have favoured the spread of the disorders that appeared in this population of workers. These findings must be further supported by more in-depth epidemiological studies.

Schreuer-N., Lifshitz-Y., Weiss-P.L. The effect of typing frequency and speed on the incidence of upper extremity cumulative trauma disorder. **Work** 1996; 6 : 87-95.

AB : Results of a questionnaire survey of 100 female typists in Israel show that it is preferable that not more than 5 days per week and not more than 8h per day be spent typing

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Silverstein-M.A., Silverstein-B.A., Franklin-G.M. Evidence for work-related musculoskeletal disorders: A scientific counterargument. **Journal of Occupational and Environmental Medicine** 1996 May; 38 (5) :477-484.

This response to an article by Dr N.M. Hadler (see CIS 96-1507) considers that work-related musculoskeletal disorders are a leading cause of preventable morbidity and disability in the workplace. It is argued that the incidence and prevalence of work-related musculoskeletal disorders are increasing and that there is a body of credible scientific evidence showing associations between a variety of musculoskeletal disorders and work-related factors. Dr Hadler's selection of studies and treatment of the facts are criticized along with his reasoning and logic. It is concluded that ergonomic tools are required to eliminate physical risk factors at their source.

Stephens-C., Smith-M. Occupational overuse syndrome and the effects of psychosocial stressors on keyboard users in the newspaper industry. **Work and Stress** 1996 Apr.-June; 10 (2) : 141-153.

In a survey of 550 keyboard users working in different offices of the same newspaper company, 29.3% of workers reported experiencing neck, shoulder or arm pain. Differences between high- and low-pain reporting office groups were significantly related to perceptions of the quality of the work environment. Factors associated with low-pain reporting environments included higher peer

cohesion, higher staff support, higher control, less work pressure, less stress, greater autonomy and more physical comfort. Consideration should be given to psychosocial factors in the design of work and workplaces.

Stock-SR, Cole-DC, Tugwell-P, Streiner-D. Review of applicability of existing functional status measures to the study of workers with musculoskeletal disorders of the neck and upper limb. **American Journal of Industrial Medicine**, 1996 Jun; 29 (6) : 679-688

UNITED-STATES

Both epidemiologic studies of the factors that contribute to the development of work-related musculoskeletal disorders of the neck and upper limb and intervention studies that test the effectiveness of workplace ergonomic and organizational changes are needed to provide empiric evidence for preventive strategies. This study reviews the relevance and comprehensiveness of existing functional status instruments for epidemiologic studies of ork-related neck and upper limb disorders. Twelve domains were identified as the major areas of life affected by workers' neck and upper extremity disorder(s): work, household and family responsibilities, self-care, transportation/driving, sexual activity, sleep, social activities, recreational activities, mood self-esteem, financial effects, and iatrogenic effects of assessments and treatment. Fifty-two functional status instruments were identified. of these, 21 met the specified criteria as otentially relevant and were rated on the 3-point scale for relevance and comprehensiveness for each domain. None of the instruments covered all 12 domains adequately.

Toomingas-A. **Methods for the evaluation of work-related musculoskeletal neck and upper-extremity disorders.** Arbete och och Halsa: National Institute for Working Life (Arbetslivsinstitutet); 1996. 40 p.

The aim of this tesis was to develop, evaluate and characterise some effective measurement methods used in epidemiological research on work related musculoskeletal disorders in the neck and upper extremities.

Triebig-G. Retrospective analysis of occupational diseases in chemical workers in Germany (west). **Int-Arch-Occup-Environ-Health.** 1996; 68(6): 429-35

GERMANY

Viikari-Juntura-E., Rauas-S., Martikainen-R. Validity of self-reported physical work load in epidemiologic studies on musculoskeletal disorders. **Scand J. Work Environ. Health.** 1996; 22 (4) : 251-259.

Objectives: This study assessed the validity of self-reported physical work load by questionnaire and logbook against task analysis and observation. It also investigated factors (job type and low-back or neck pain) affecting the self-assessment of physical work load and compared the assessments between the questionnaire and the logbook. Methods. A self-administered questionnaire including 10 questions (ordinal scales) on physical work load and musculoskeletal symptoms was filled out by 2756 men in the forest industry. From this population, 36 men were selected for task analysis and observation. Logbooks including 10 continuous variables were analyzed for 386 men. Results. The Spearman rank correlation coefficients between the sel-assessments and observations for the frequency of manual handling, duration of trunk flexion, neck rotation, hand above shoulder level, and squatting or kneeling ranged between 0.42 and 0.55. The correlation coefficients for the questionnaire items were higher in general, and the accuracy better, for those with no low-back pain than for those with pain. The duration of trunk flexion, neck flexion and hand above shoulder level was overestimated in the questionnaires and less so in the logbooks. Conclusions. Self-administered questionnaires may help to classify groups with heterogeneous occupational tasks according to some work-load factors. The accuracy of the assessments is not good for studying quantitative exposure-effect relationships, however. The logbook method might give more valid information. The perception of musculoskeletal pain may bias the self-assessment of work load.

Yassi-A., Sprout-J., Tate-R. Upper Limb Repetitive Strain Injuries in Manitoba. **American Journal of Industrial Medicine** 1996; 30 (4) : 461-472.

Factors associated with upper limb repetitive strain injuries (RSIs) were examined. Injury claim data for 1991 was obtained from the Workers' Compensation Board in Manitoba, Canada. A claim was considered a definite RSI if the injury was musculoskeletal, not caused by a specific accident, and if the factors which facilitated the injury occurred over at least 1 day. Of the 763 claims checked, 295 were considered definite cases of RSI, of which 80% were coded as sprains/strains or inflammation/irritations and 20% as occupational illnesses. Most of the RSIs were attributed to voluntary or involuntary body motion and overexertion. Of the claim diagnoses, 27.5% were tendinitis and 19.3% were carpal tunnel syndrome. Among age groups, the highest RSI rate, 0.91 cases per 1,000 workers, was determined for the 35 to 44 years age group. Although a larger percentage of RSI cases were men, the rate of RSI claims was higher in women. Of all the occupations studied, processing occupations accounted for the most RSI claims. The highest RSI rates were determined in food and beverage processing, with a claim rate of 14.68 cases per 1,000 workers, and in fabricating, assembling, and repairing metal products, with a claim rate of 9.32 cases per 1,000 workers. The highest risk sectors in Manitoba for upper limb RSI claims were meat processing and packaging and airplane manufacture. The average time lost and cost per claim were significantly higher for RSI claims than for other claims. In addition, workers with RSIs were significantly less likely to return to work than workers with other injuries. The authors conclude that RSIs result in great expense and significantly reduced capability among workers. They recommend the upgrading of Canada's occupational surveillance system in order to enable the further study of RSIs.

Yu-I.T.S, Wong-T.W. Musculoskeletal problems among VDU workers in a Hong Kong bank. **Occup. Med.** 1996; 46 (4) : 275-280.

A survey of musculoskeletal problems among visual display unit (VDU) users was carried out in a bank using a self-administered questionnaire. The prevalence of complaints in various body parts were: neck - 31,4%, back - 30,6%, shoulder - 16,5%, hand and wrist - 14,9% and arm - 6,6%. Frequent users of VDU had significantly more musculoskeletal problems in the neck and shoulder regions than infrequent users. Individual musculoskeletal complaints were associated with various risk factors including personal attributes, working posture, repetitive movements and work station design. Back, neck and shoulder problems were more related to unfavourable working postures, while arm, hand and wrist problems were more affected by repetitive movements. Some risk factors for musculoskeletal problems were specifically related to the nature or design of VDU work. Modification of the workstation design and improvement in work organization should be able to reduce the prevalence of these disorders.

1995

Andersson-G. B. J., Fine-L. J., Silverstein-B. A. Musculoskeletal Disorders. In: Levy-B. S., Wegman-D. H., Ed. **Occupational Health. Recognizing and Preventing Work-Related Disease.** 3rd. ed. Boston : Little, Brown and Company; 1995. p. 455-489.

Work related musculoskeletal system disorders focused on low back pain (LBP) and problems of the neck and upper extremities, the most commonly occurring musculoskeletal disorders, were reviewed. Case reports describing an automobile mechanic suffering from LBP and a spot welder who developed carpal tunnel syndrome were presented to illustrate the two disorders. A discussion of LBP and neck and upper extremity disorders considered the magnitude and cost of each condition, techniques used for diagnosis, risk factors, techniques used for managing the conditions, their prognosis, and preventing and controlling the problems. LBP is considered the most costly of the occupational health problems. More than 16 billion dollars is spent each year for treating and compensating LBP patients in the US. Occupational risk factors for LBP include jobs that involve heavy physical work, static work postures, frequent bending and lifting, pushing and pulling, repetitive work, vibration exposures, and psychosocial factors such as monotony and job dissatisfaction. It has been postulated that psychological factors may be more important than physical factors for LBP severe enough to result in filing a workers' compensation claim for LBP. Only limited data exist on the incidence of neck and upper extremity disorders. The Bureau of Labor Statistics estimated that the incidence of occupational illnesses and disorders associated with repetitive trauma was three cases per 1,000 fulltime workers (case/1,000) in 1991. There has been a steady increase in the rate since 1982, when the rate was 0.4case/1,000. Risk factors for neck and upper extremity musculoskeletal disorders include repetitive and forceful motions, mechanical stress, static or awkward postures, local vibrations, and psychosocial factors

originating from personality factors interacting with the way work is organized. A summary of the various categories of work related upper extremity musculoskeletal diseases was presented.

Ashbury-F. D. Occupational Repetitive Strain Injuries and Gender in Ontario, 1986 to 1991**.** **Journal of Occupational and Environmental Medicine** Apr. 1995; 37 (4) : 479-485.

A study of the influence of gender on the occurrence of occupational repetitive strain injuries (RSIs) in Ontario, Canada was conducted. The files of the Ontario Workers' Compensation Board were searched to identify all lost time claims for RSIs that were compensated from 1986 through 1991. All allowed claims were analyzed to determine the gender of the claimant and whether the claimant was employed in one of five occupational categories: processing materials handling, crafts, construction, clerical work, and service jobs. A total of 15,988 RSI claims were allowed during the study period. The annual rate of claims generally increased during the period, from 1,939 in 1986 to 3,326 in 1991. By gender, 7,301 claims were made by males and 8,707 by females. When stratified by year and gender, the claim frequency rates for males were: 1986 35.2 claims per 100,000 workers (claim/100,000), 1987 31.9claim/100,000, 1988 30.8claim/100,000, 1989 35.3claim/100,000, 1990 56.7claim/100,000, and 1991 60.6claim/100,000. The annual claim frequency rates for female claimants were: 1986 52.5claim/100,000, 1987 49.1claim/100,000, 1988 50.1claim/100,000, 1989 55.6claim/100,000, 1990 75.2claim/100,000, and 1991 81.4claim/100,000. The relative risk of a female employee incurring a claim, defined as the ratio of the RSI claim frequency of the females to that of the males, by year was: 1986 1.495, 1987 1.541, 1988 1.626, 1988 1.576, 1990 1.326, and 1991 1.343. Stratification by job category indicated that the incidence of allowed RSI claims in all job classifications increased since 1986. The largest number of claims were made by workers employed in processing, machining, and fabricating occupations. Data for 1990 and 1991 indicated female workers lost more work time due to RSIs than males, 39 and 38 versus 33 and 31 days, respectively. The author concludes that females have a greater risk of sustaining an occupational RSI injury than males. Females receive compensation benefits for RSIs for longer periods than males. This could reflect a longer lasting effect of RSIs on females than on males.

Baldasseroni-A., Tartaglia-R. Carnevale-F. Carpal tunnel syndrome risk in various jobs. **Med. Lav.** 1995; 86 (4) : 341-351.

AB: The aim of the study was to generate hypotheses on what could be the ISTAT (National Institute of Statistics) job classes with a major risk of carpal tunnel syndrome in order to plan more specific analytic epidemiology studies and apply more correct ergonomic solutions. A case-control cross-sectional survey without matching was carried out. The source of data were the computerized medical records of a large regional hospital: 833 carpal tunnel syndrome cases (mean age 48, SD 9.33) and 3222 controls (mean age 43.5, SD 13.22) hospitalized for other diseases, were selected. The odds ratio (OR) and 95% confidence limits, controlled for age and gender by a logistic linear regression model, were calculated as measures of association for the comparison between non-exposed managerial/administrative staff and industrial workers. The analysis showed a statistically significant risk for some ISTAT job classes, in particular class 53 (spinners, weavers, dyers and similar jobs) (OR = 2.65; C.L. 1.52-4.62) class 54 (knitters, tailors, hatmakers, upholsterers and similar jobs) (OR = 1.69; C.L. 1.06-2.71), 55 (tanners, shoemakers, leather manufacture workers and similar jobs) (OR = 2.74; C.L. 1.66-4.53) and group 742 (Hotel and restaurant cooks) (OR = 2.99; C.L. 1.45-6.13). Job classes 45 (carpenters, welders and similar jobs). 62 (electricians, electrotechnicians, radio engineers and similar jobs), 63 (gasfitters, plumbers, heating engineers and similar jobs) and 85 (porters and other jobs involving manual handling of loads) showed ORs higher than 2 but without statistical significance. The results are valid for planning further studies, especially in the textile and shoe and leather manufacturing sectors.

Beaumont-D, Noeuveglise-M, Vibert-ML. Screening of vibration-induced disorders in the building industry using digital tactilometry. Results of a field study. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 103-6

CZECH-REPUBLIC

As occupational physicians in the building industry, we observed among these workers a high frequency of vibration exposure, during different tasks. We intended to study vibration exposure

effects on vibration perception thresholds measured by digital tactilometry in this population of construction workers. A cross-sectional field study was made, 405 subjects were examined; each of them answered a questionnaire, underwent a medical examination and performed a test measuring his vibration perception thresholds, 150 subjects constituted the reference group. A close relationship between age and thresholds among the non-exposed group was observed. A threshold normalization of age of study the 204 exposed subjects was applied. Two exposure indices allowing time dependency vibration exposure analysis were defined the present daily exposure and cumulated exposure. In the examined population, thresholds rise with the present daily exposure in hours per day for 125 Hertz, while no significant influence of cumulated exposure is apparent. It was also pointed out that subjects exposed more than one and a half hour per day have higher thresholds than reference subjects, even if they do not have any clinical neurological complaints. This results seems to indicate the infraclinical feature of the test. These results suggest that screening of hand-arm vibration exposed population should be developed using this method. As occupational physicians in the construction industry, practising in Paris and surrounding areas, the authors studied the relationship between neurological disorders measured by vibrotactile perception thresholds, and hand-arm vibration exposure, among workers. They present the results of a field study they led within their institute, in collaboration with the tested workers' firms, and with the financial participation of the French Ministry of Labour.

Bergqvist-U., Wolgast-E., Nilsson-B. Voss M. The influence of VDT work on musculoskeletal disorders. **Ergonomics** 1995; 38 (4) : 754-762.

Relationships between visual display terminal (VDT) use and musculoskeletal problems were examined in a group of 353 office workers, using data from medical and workplace investigations as well as questionnaires. There were no general differences between VDT and non-VDT users as to the occurrence of muscle problems. Combinations of specific VDT work situations such as data entry work or work with a VDT for more than 20h/week and the presence of some other factors were, however, associated with excess risks of certain muscle problems. The extraneous factors involved in the definitions of such risk groups were: use of bifocal or progressive glasses at a VDT; stomach-related stress reactions; limited rest break opportunity; repetitive movements; non-use of lower arm support; and possibly the vertical position of the keyboard; and presence of specular glare.

Bergqvist-U., Wolgast-E., Nilsson-B., Voss-M. Musculoskeletal disorders among visual display terminal workers: Individual, ergonomic, and work organizational factors. **Ergonomics** 1995 38 (4) : 763-776.

A number of individual, ergonomic, and organizational factors of presumed importance for the occurrence of musculoskeletal disorders were investigated in a group of 260 visual display terminal (VDT) workers. The cross-sectional study utilized medical and workplace investigations as well questionnaires. The results were subjected to a multivariate analysis in order to find the major factors associated with various upper-body muscular problems. Several such factors were identified for each investigated type of musculoskeletal problem. Some were related to the individual: age, gender, woman with children at home, use of spectacles, smoking, stomach-related stress reactions, and negative affectivity. Organizational variables of importance were opportunities for flexible rest breaks, extreme peer contacts, task flexibility, and overtime. Identified ergonomic variables were static work posture, hand position, use of lower arm support, repeated work movements, and keyboard or VDT vertical position.

Bystrom-S; Hall-C; Welander-T; Kilbom-A . Clinical disorders and pressure-pain threshold of the forearm and hand among automobile assembly line workers. **J-Hand-Surg-Br**. 1995 Dec; 20(6): 782-90.

SCOTLAND

The prevalence of forearm and hand disorders was examined by questionnaire and clinical examination in 199 automobile assembly line workers and in 186 controls. The pressure-pain threshold, hand grip force and hand anthropometry were also studied. There was an increased prevalence of de Quervain's disease for male automobile assembly line workers, and of carpal tunnel syndrome in female workers. The prevalence of symptoms in the forearm and hand during the last 7 days were twice as high among automobile assembly line workers than controls for both

men and women. The occurrence of symptoms in the last 7 days was associated with de Quervain's disease, carpal tunnel syndrome and sick-leave due to forearm or hand problems, and it also influenced activities of daily living. Hand grip strength and anthropometrics were not associated with findings in the clinical examination or the occurrence of symptoms in the last 7 days. Low pressure-pain threshold was not associated with findings in the clinical examination, except for reported occurrence of symptoms in the last 7 days for women. Pressure-pain threshold as an indicator of tissue damage is discussed.

Bystrom-S; Hall-C; Welander-T; Kilbom-A. Clinical disorders and pressure-pain threshold of the forearm and hand among automobile assembly line workers. **J-Hand-Surg-Br.** 1995 Dec; 20(6): 782-90

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Cail-F.; Aptel-M.; PichŠne-A. Evaluation questionnaire on the occupational experience of employees exposed to the risk of musculoskeletal problems (French). **D M T - Documents pour le médecin du travail 4th Quarter** 1995; 64 : 253-267.

FRANCE

This article presents a computerized questionnaire for capturing the working conditions of workers in the secondary and tertiary sectors who are presumed to be at risk of musculoskeletal disorders. The history of the development of the questionnaire is followed by a presentation of its different parts: generalities, the worker's post, functional complaints, indicators of chronic psychological stress, open space for other observations. Computer aspects (use of database and spreadsheet programs) and the application of the questionnaire in the enterprise are also discussed. An appendix shows the two versions of the questionnaire.

Chatigny-C.; Seifert-A.M.; Messing-K. Repetitive strain in nonrepetitive work - A case study**. Journal of Occupational Safety and Ergonomics** 1995; 1 (1) : 42-51.

A study was made of the movements and forces involved in a factory job in which a woman worker developed epicondylitis. Although tasks were extremely varied, certain movements at risk for epicondylitis were repeated many times, in particular the turning of valves. Strain on the elbow was particularly intense for the woman worker because of the design of the workplace. Although it cannot be concluded that the worker's epicondylitis was due to her job, results suggest that equipment and worksites should be adapted to a wider range of potential worker sizes. Issues concerning the definition of repetitive strain in epidemiologic studies are discussed.

English-CJ, Maclaren-WM, Court-Brown-C, Hughes-SP, Porter-RW, Wallace-WA, Graves-RJ, Pethick- AJ, Soutar-CA. Relations between upper limb soft tissue disorders and repetitive movements at work. **Am-J-Ind-Med**. 1995 Jan; 27(1): 75-90.

UNITED-STATES

To make a preliminary assessment of whether upper limb soft tissue disorders might be associated with activities at work, we have conducted a case-control study of subjects attending orthopedic

clinics in three cities. All subjects between the ages of 16 and 65 years, in whom defined soft tissue conditions of the upper limb were diagnosed by the participating orthopedic surgeons, were invited to take part. Controls were subjects attending the same clinics within the same age range whose clinical diagnosis did not include disease of the upper limb, cervical or thoracic spine. Information concerning repetitive movements of the upper limbs at work was elicited by questionnaire. Five hundred eighty cases and 996 controls were studied, representing 96% and 93%, respectively, of those invited to participate. The diagnoses of the cases included soft tissue conditions affecting the shoulder, elbow, forearm, wrist, thumb, hand, and fingers. The diagnoses of the controls included traumatic, degenerative, and inflammatory conditions, mostly of the legs and lower back. Women predominated among the cases (70%) and men among the controls (56%). Of 221 female cases with injury to the wrist and forearm, 32 were cleaner/domestics (14.5%) compared to 35 to 439 controls (8%), a difference statistically significant at the 2 1/2% level. Other jobs significantly overrepresented (5% level) among female cases with injuries at various anatomical sites included hairdressers, secretary/temps, assembly line workers, and machine operators (type unspecified). Among male cases, electricians were significantly overrepresented (5% level). Jobs for which there was a suggestion ($p < 0.1$) of overrepresentation among cases included butchers and teacher/lecturers (both males only) and the combined job groups (chosen a priori for analysis) of keyboard operators, machine operators, and music teachers (all three jobs, females only).

Foulkes-GD. Orthopedic casualties in an activated National Guard Mechanized Infantry Brigade during Operation Desert Shield. **Mil-Med.** 1995 Mar; 160(3): 128-31

UNITED-STATES

From November 1990 to April 1991, the 48th Infantry Brigade (Mechanized), an Army National Guard unit, was activated under Operation Desert Shield and deployed to the National Training Center, Fort Irwin, California, for training in desert warfare. All casualties requiring care beyond the battalion aid stations were evacuated to the medical company organic to the 48th Brigade. Each of 727 orthopedic patient visits were grouped into one of eight etiologies: trauma, degenerative, overuse, infectious, neoplastic, congenital/pediatric, miscellaneous, and psychiatric. Each case was also classified according to anatomic region, severity, and disposition as well as need for a minor procedure, operation, or referral. Orthopedic casualties in a reserve mechanized infantry brigade undergoing intensive field training primarily arose from four common etiologic/regional presentations: wrist/hand trauma, knee/leg trauma, spine/pelvis degenerative, and ankle/foot overuse. Many of these injuries are predictable consequences of a particular soldier's military occupational specialty and unit mission.

Futatsuka-M, Inaoka-T, Ohtsuka-R, Sakurai-T, Moji-K, Igarashi-T. Hand-arm vibration in tropical rain forestry workers. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 90-2.

CZECH-REPUBLIC

Working conditions and health hazards including vibration syndrome related to forestry work using chain-saws were studied in Papua New Guinea and Indonesia. The subjects comprised 291 workers including 97 chain-saw operators. The health examination consisted of peripheral circulatory and sensory tests in the upper extremities. The vibration spectrum measured at the handle of the chain-saw indicated that these acceleration levels would lead to a moderately high risk of hand-arm vibration syndrome (HAVS). The peripheral circulatory function tests revealed dysfunction after more than five years vibration exposure. However, in general, the results of the function tests and subjective complaints showed fewer health problems compared to those of Japanese forestry workers. The reason of such differences of vibration effects seem to be the following: (1) warmer climate (more than 25 degrees C throughout the year), (2) young workers and short work experience. (3) short time vibration exposures on working days in the natural forests, (4) seasonal changes in logging work (5) healthy workers effects. Thus, we found no clear evidence that the workers of our study suffered from HAVS. A principal component analysis was applied. The factor score of the components of the reactive dynamics of peripheral circulation differed significantly after more than five years' exposure. On the other hand, we cannot deny the possibility that subclinical dysfunction of peripheral circulation may be caused by chain-saw operation in the tropics in future. Further investigations on the HAVS among forestry workers in the tropic environment are needed.

Higgs- P.E., Edwards-D., Martin-D.S., Weecks-P.M. Carpal tunnel surgery outcomes in workers: Effect of worker's compensation status. **J. Hand. Surg. (USA)** 1995; 20 (3 I) : 354-360.

One hundred thirteen workers' compensation and 53 non-workers' compensation patients who had undergone open carpal tunnel release were queried about job status and the presence or absence of residual symptoms of numbness, pain, or nocturnal awakening an average of 42 months postoperatively. Thirty-nine non workers' compensation subjects were at their original jobs as compared to only 53 workers' compensation subjects. Seventeen of the workers' compensation subjects were unemployed versus two non-workers' compensation subjects. These differences were significant. Of patients changing jobs, 39 workers' compensation subjects and 2 non workers' compensation subjects attributed their job change to symptoms of carpal tunnel syndrome. Residual symptoms were significantly more common in workers' compensation compared to non workers' compensation subjects, with 92 of the former and 26 of the latter subjects reporting some residual symptoms.

Himmelstein-J.S., Feuerstein-M., Stanek III-E.J. Work-related upper-extremity disorders and work disability: Clinical and psychosocial presentation. **J. Occup. Environ Med.** 1995; 37 (11) 1278-1286.

Work-related upper-extremity disorders (WRUEDs) are an increasingly common cause of work-related symptoms and disability. Although most upper-extremity disorders are acute and self-limited, a small percentage of workers with symptoms go on to permanent disability and account for the majority of costs associsted with these conditions. Little is known, however, about this progression from symptoms to disability and how it might be prevented. In this study we evaluate the demographic, vocational, medical, and psychosocial characteristics of patient with WRUEDs and examine several hypotheses regarding the differences between working and work-disabled patients. One hundred twenty-four consecutive patients were evaluated in a clinic specializing in occupation upper-extremity disorders. Patients currently working (n = 55) and work-disabled patients (n = 59) were similar with regard to age, gender, and reported job demands. The work-disabled group reported less time on the job, more surgeries, a higher frequency of acute antecedent trauma, and more commonly had 'indeterminate' musculoskeletal diagnoses. They also reported higher pain levels, more anger with their employer, and a greater psychological response or reactivity to pain. These findings, though cross-sectional in nature, suggest that, in addition to medical management, more aggressive approaches to pain control, prevention of unnecessary surgery, directed efforts to improve patients' abilities to manage residual pain and distress, and attention to employer-employee conflicts may be important in preventing the development of prolonged work disability in this population.

Holmstrom-E., Moritz-U., Engholm-G. Musculoskeletal Disorders in Construction Workers**. Occupational Medicine: State of the Art Reviews** Apr. 1995; 10 (2) : 295-312.

Various musculoskeletal disorders that occur in construction related jobs were reviewed. Comparisons were made between construction workers and office workers, and between occupational groups in construction. Odds ratios were shown from a Swedish study comparing occupation to frequency of neck pain, shoulder, knee, and lower back symptoms. Standardized morbidity ratios for carpenters, bricklayers, concrete workers, plumbers, and machine and crane operators were significantly higher compared to Swedish men. Other studies were cited also linking musculoskeletal disorders to construction workers. Neck symptoms were most prevalent among crane operators, insulators and painters. Shoulder symptoms were most frequent among scaffolding erectors, insulators and painters. Knee symptoms were highest among carpet and floor layers, followed by plumbers and roofers. Low back pain symptoms were reported highest among roofers, carpet and floor layers, and scaffolding erectors. Increased rates of neck/shoulder or low back pain were associated with frequent use of machines but not with manual handling of construction materials. Concrete workers were reported to have significantly increased risks for disorders caused by vibration, such as white finger syndrome. Reports on clinical findings and tissue pathology for specific disorders were reviewed. Muscular, tendon, articular, spine, and nerve entrapment disorders were included. Support systems, work organization and psychological factors were discussed. The possible associations between musculoskeletal disorders and the individual factors of age, smoking, height and weight, leisure time, and muscle strength and endurance were reviewed. The authors conclude that normal degenerative processes may be accelerated by heavy, repetitive work and psychosocial and individual factors.

Leamon-T.B., Dempsey-P.G. The Unusual Congruence between Subjective Evaluations and Losses Associated with Inadequate Hand Tool Design International Journal of Industrial. **Ergonomics** Jul. 1995; 16 (1) : 23-28.

Relationships between subjective evaluations of discomfort and objective measures of musculoskeletal diseases and losses associated with inadequate hand tool designs were discussed. A number of epidemiological studies have shown that repetitive use of poorly designed hand tools can increase the incidence of cumulative trauma disorders (CTDs) and other hand and wrist disorders. These problems originated from the increased ulnar deviation caused by the poor tool designs. The results of a field study investigating hand/wrist disorders among 80 Western Electric Company trainees who used bent or straight handled pliers and a laboratory study investigating psychophysical responses to hand tool designs were discussed. The Western Electric Company trainees who used traditional straight handled pliers had a much higher incidence of CTDs than those who used bent handled pliers, 260 versus 41 cases per 200,000 working hours. The rates of tenosynovitis, carpal tunnel syndrome, and epicondylitis among the trainees using the straight handled pliers correlated with complaints of soreness on the back of the hand, carpal tunnel syndrome, and elbow soreness reported by the subjects in the laboratory study, respectively, who were tested on simulated nut driver designs requiring varying degrees of ulnar deviation. The authors conclude that musculoskeletal problems associated with use of straight handled pliers by the trainees could have been predicted with perfect accuracy by examining the psychophysical responses of the subjects in the laboratory study.

Liss-GM, Jesin-E, Kusiak-RA, White-P. Musculoskeletal problems among Ontario dental hygienists. **Am-J-Ind-Med**. 1995 Oct; 28(4): 521-40.

UNITED-STATES

Two U.S. surveys suggested that dental hygienists (DHs) may suffer from carpal tunnel syndrome (CTS), but these studies did not use validated questionnaires, adjust for confounders, or include external controls. We conducted a questionnaire survey of all 2,142 DHs belonging to the Ontario Dental Hygienists' Association, and a referent group of 305 dental assistants (DAs), who do not scale teeth. The Standardized Nordic Questionnaire was used as the basis for asking about musculoskeletal symptoms. The response rates in the two groups were identical. Of the DHs, 7.0% had been told by a physician since starting work that they had CTS, but only 1 of 65 had received workers' compensation. Compared to the DAs, after adjusting for age the DHs were 5.2 times (95% confidence interval [CI] 0.9-32) more likely to have been told they had CTS and 3.7 times (95% CI 1.1-11.9) more likely to meet a CTS case definition. The DHs were also 2.5 (95% CI 1.6-3.9), 2.8 (95% CI 1.8-4.4), and 1.8 (95% CI 1.2-2.7) times more likely to report hand/wrist, shoulder, and neck problems in the past 12 months, respectively, but were less likely to report low back trouble. In internal analyses among DHs using logistic regression models, the number of heavy calculus patients per day, "clock" position around the dental chair, and years in practice were significant predictors of CTS. Days worked per week (but not heavy calculus patients), time with the trunk rotated, and years of practice were significant predictors of reported shoulder trouble in the past 12 months. Given that there are more than 9,000 DHs in Canada and about 100,000 in the United States, these findings suggest an important public health problem. They highlight the need to inform DHs during training and continuing education about musculoskeletal problems in general and CTS in particular. Attention should be directed to areas such as work station design, posture, treating patients with heavy calculus, and scheduling rest periods.

Madden-M. The prevalence of occupational overuse syndrome among Australian Sign Language interpreters. **Journal of Occupational Health and Safety - Australia and New Zeland** 1995; 11 (3) : 257-263.

The issue of occupational overuse syndrome (OOS) among sign language interpreters in Australia has been largely neglected, both in terms of investigating the incidence rates and the effects of conditions upon individuals’lives and attitude to their job. This study set out to survey Australian Sign Language (Auslan) interpreters to determine the prevalence of overuse conditions. To this end, interpreters in all States and Territories were asked to complete a questionnaire on various aspects of their work history, as well as their injury experience (if any) and general positive and negative fellings about the job. Incidence rates are presented, as well as recommendations for the

education of sign language interpreters on occupational health matters. In addition, suggestions are made for ways in which the work of Auslan interpreting may be modified to avoid the further spread of OOS in this occupational group.

Nakladalova-M, Fialova-J, Korycanova-H, Nakladal-Z. State of health in dental technicians with regard to vibration exposure and overload of upper extremities. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 129-31

CZECH-REPUBLIC

The authors examined 120 dental technicians, 111 women, 9 men, of mean age 44.8 years, mean duration of exposure 24.9 years. Cold water test, plethysmographic investigation, and EMG (in indicated persons), X-ray, neurological and orthopedic examinations were performed. Combination of exposure to vibration above the limit value, with overload of upper extremities, was proved by hygienic measurement. The most frequent subjective complaints included vertebral complaints (52.5%), paresthesiae in the hand fingers (47.4%) and pain in the joints of upper extremities (elbow 26.6%, shoulder 10.8%, wrist 6.6% and small joints of hand 6.6%). Four workers reported history of white fingers, but the cold water test did not prove it. Deteriorated plethysmographic curve was in 11 cases only. Pathological motor conduction in nervus medianus was found (by EMG investigation) in 13 persons. Carpal tunnel syndrome was acknowledged in 4 individuals as an occupational disease. The results of these investigations show the hazard of dental technicians work and the necessity of improvement of their work conditions.

O'Dwyer-KJ, Howie-CR. Medial epicondylitis of the elbow**.** **Int-Orthop**. 1995; 19(2): 69-71

GERMANY

Ninety-five cases of medial epicondylitis are reported in 83 patients; 90% were related to work and only 10% to sport or leisure activities. Most recovered with conservative treatment. Operation was needed in 12%, which compared with under 4% of patients with lateral epicondylitis over the same period. The results of open release of the common flexor origin were good, with only one exception.

Ohlsson-K., Attewell-R.G., Palsson-B., Karlsson-B., Balogh-I., Johnsson-B., Ahlm-A., Skerfving-S. Repetitive Industrial Work and Neck and Upper Limb Disorders in Females**.** **American Journal of Industrial Medicine** May 1995; 27 (5) : 731-747.

A study was conducted on the effects of repetitive work tasks on the neck and upper limbs. Musculoskeletal disorders of the neck and upper limbs were assessed in female workers performing highly repetitive tasks and a referent group of working women. The subjects reported higher levels of stress and worry compared with referents, while the referents reported having greater control over their work, more stimulating work, less work strain, greater fellowship, more frequent social interaction at work, a greater degree of well being at work, and fewer psychosomatic complaints. Catecholamine excretion rates were similar in both groups and were increased during work compared with leisure times. Symptoms or signs in the neck/shoulders were identified in 87% of the subjects and 67% of the referents upon physical examination. The subjects had a higher prevalence of symptoms and/or signs in the elbows/hands compared with the referents and diagnoses were more common among this group as well. The most frequent diagnosis in both groups was neck tension. A inverse relationship was seen between duration of repetitive work and prevalence of musculoskeletal disorders. Particularly high prevalence odds ratios were seen for diagnoses in the neck/shoulders of subjects in the assembly occupational group and for diagnoses of the elbows/hands for polishers. Significant associations were seen between repetitive work, age, muscular tension, and stress/worry tendencies, and diagnoses of the neck/shoulders and repetitive work overall and diagnoses in the elbows/hands. The authors conclude that a prevalence of disorders of the neck and upper limbs is associated with repetitive work and that these disorders may be potentiated by personal traits.

Ono-Y., Lagerstrom-M., Hagberg-M., Linden-A., Malker-N. Reports of work related musculoskeletal injury among home care service workers compared with nursery school workers and the general population of employed women in Sweden. **Occupational and Environmental Medicine** 1995; 52 : 686-693.

The authors'aim was to describe the nationwide occurrence of work related musculoskeletal injuries among all home care service workers in Sweden, and to identify relative risks and risk factors of the injuries. In home care service workers, the annual incidence of injury from overexertion accidents and musculoskeletal diseases were 19,2 and 15,1 per 1000 workers, respectively which was higher than those in nursery school workers and all employed women in Sweden. For five injury locations including the back, all the age standardised relative risks (SRR) of overexertion accidents exceeded 4,0, and most of those for musculoskeletal deiseases were 1,5 or more in home care service workers compared with all other employed women in Sweden. Total duration of sick leave due overexertion accidents was 7,7 times, and musculoskeletal diseases 3,5 times, longer than in nursery school workers. National loss due to sick leave resulting from only musculoskeletal injuries in home care service workers was about 8,2% of the total work related sick leave in all employed women in Sweden, although the number of home care service workers represented only some 5% of this population. Lifting other people was most frequently reported as the main risk cause of overexertion accidents in both kinds of worker. The results musculoskeletal injuries than nursery school workers have higher annual injury incidence of musculoskeletal injuries than nursery school workers due to physically stressful tasks that are far less common in nursery school workers.

Rantanen-J. New epidemics in occupational health. Which ones and how to identify them**. Medicina del Lavoro** Mar.-Apr. 1995; 86 (2) : 139-151.

Paper presented at the 10th International Symposium on Epidemiology in Occupational Health (Como, Italy, 20-24 Sep. 1994). It discusses the increasing complexity of "new" epidemics in the work environment, often of a multi-exposure and multi-outcome nature. The epidemics are often due to changes in the nature of the workplace or in the working population. Epidemiology as a science must also keep pace with growing demands from society (privacy protection, decentralization etc.). Some new epidemics specifically mentioned are: Hanta virus infections, sudden deaths, musculoskeletal overuse syndromes, multiple chemical sensitivity syndrome, health problems due to exposure to electric and magnetic fields, psychological disorders (connected with VDU or other computer work). Ways to identify new epidemics are listed.

Reilly-P.A. Approaches to RSI in the United Kingdom. **Journal of Musculoskeletal Pain** 1995; 3 (2) : 123-125.

The author aimed to review the factors influencing the current epidemic of work-related upper limb pain in the United Kingdom, and to discuss the role of medicine and law in its genesis and perpetuation. The epidemic has a multifactorial etiology. Its is best viewed as a complex psychosocial phenomenon, with historical precedents in writers'and telegraphists'cramps of the last century. The unhelpful interaction of doctors, lawyers, the media, trade unions and society as a whole has been to the dedetriment of sufferers. Greater understanding of the complex nature of chronic pain and the avoidance of confrontation and litigation are to be encouraged if the United Kingdom is not to follow the same ruinous path as Australia a decade ago.

Ribeiro-H.P. **Estado atual das lesões por esforços repetitivos (ler) no Banco do Estado de São Paulo. São Paulo :** Afubesp; 1995. (Caderno de Saúde / Afubesp, 1)

BRASIL

Ritz-BR. Humeral epicondylitis among gas- and waterworks employees**. Scand-J-Work-Environ-Health.** 1995 Dec; 21(6): 478-86

FINLAND

OBJECTIVES: In this cross-sectional study 290 male employees of the public gas- and waterworks of Hamburg, Germany, were examined for symptoms of epicondylitis. Forty-one workers were diagnosed with symptoms of lateral or medial epicondylitis. The effect of employment in different job categories on the prevalence of epicondylitis was explored. METHODS: The diagnosis of epicondylitis was based on the study's own criteria and compared with criteria used in former studies. Jobs were categorized into high, moderate, and no exposure groups according to tasks regarded as strenuous for the elbow. The data were analyzed with the help of multivariate logistic regression. RESULTS: With the study's diagnostic criteria, the prevalence odds ratio (OR) for 10

years of high exposure to elbow straining work was 1.7 [95% confidence interval (95% CI) 1.04-2.68] for currently held jobs and 2.16 (95% CI 1.08-4.32) for formerly held jobs. For workers regarded as moderately exposed in current jobs the odds ratio for 10 years was 1.4 (95% CI 1.00-1.93). Very similar results were obtained for current exposure when stricter diagnostic criteria were employed. CONCLUSIONS: The results suggest a cumulative exposure effect with length of employment. Workers with high exposure in former jobs compared with employees with high exposure in their current job exhibited more residual or slight epicondylitis symptoms upon examination.

Schierout-GH, Meyers-JE, Bridger-RS. Work related musculoskeletal disorders and ergonomic stressors in the South African workforce. **Occupational and Environmental Medicine** 1995; 52 (1): 46-50.

To investigate exposures-responses relations between adverse musculoskeletal outcome and ergonomic exposure variables, a cross-sectional study was conducted in 11 factories from seven sectors of manufacturing industry in South Africa. Exposure to workplace ergonomics stressors was assessed in factory floor jobs with a simple low-technology observation model. Repetition, force, static posture, dyniamic movement, and other job exposures were measured. Data on adverse musculoskeletal outcome and on potential coonfounders and effect modifiers were obtained from each job category with a questionnnaire given by interviewers. This study indicates good predictive ability to reduce ergonomic stress with the exposure model, simple surveillance methods, and educational programmes in the workplace

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Slepicka-J., Hromada-J., Strakova-V. Occupational diseases of upper extremities in musicians. **Prac. Lek.** 1995; 47 (5) : 215-222.

The authors observed occupational diseases of upper extremities in 14 musicians during the years 1973-1993. The mean age of the patients was 48.1 ñ 10.6 years and the mean period of exposure was 29.3 ñ 7.8 years. As far as the musical instruments were concerned, violins were represented in five cases (one case was a woman), harp in four (women), and one each of viola, violoncello, double-bass, hautboy and flute (all of them in men). In all these musicians the authors detected compressive ischaemic neuropathy (tunnel syndrome), in 21% also focal dystonia and in 43% orthopedic changes. The analysis of work load has shown in all these cases examined that criteria of item N^{O}. 29 of the List of Occupational Diseases were fulfilled in view of the character of the load and frequency of manipulation in the given position of upper extremities while playing the musical instruments. The cases were concluded after a differential diagnostic evaluation in 13 cases as occupational diseases - repetitive strain injuries, one case in 1973 as ‘another occupational - related damage’, since it was observed before the item N^{O}. 29 was introduced into the List of Occupational Diseases.

Taboun-SM, Dutta-SP, Kourtis-CP. A study of sewing operations with emphasis on repetitive strain injuries. In: Bittner- C. , Champney-P.C., Ed. **Advances in industrial ergonomics and safety**. London: Taylor & Francis; 1995. p.67-74.

Workers at a plant that produces high-quality steering wheels for luxury cars hace reported na unaccepably hig rate of repetitive strain injury (RSI) symptoms. The results indicate that RSI symptoms occur due specifically to the nature of the work performed and are not accountable to indivual differences of the workers. As such, every worker in the plant is suscepitble to injury. Analysis of the sewing operations was performed with a video camera. Six sewing operators were filmed in the performance of their task. Analysis of their performance revealed little difference between categories of workers. This indicates that only way to reduce injuries is through redesign of the required work. A number of proposed improvements are also presented.

Tanaka-S, Wild-DK, Seligman-PJ, Halperin-WE, Behrens-VJ, Putz-Anderson-V. Prevalence and work-relatedness of self-reported carpal tunnel syndrome among U.S. workers: analysis of the Occupational Health Supplement data of 1988 National Health Interview Survey**.** **Am-J-Ind-Med.** 1995 Apr; 27(4): 451-70

UNITED-STATES

To estimate the prevalence and work-relatedness of self-reported carpal tunnel syndrome (CTS) among U.S. workers, data from the Occupational Health Supplement of 1988 National Health Interview Survey (NHIS) were analyzed. Among 127 million "recent" workers" who worked during the 12 months prior to the survey, 1.47% (95% CI: 1.30; 1.65), or 1.87 million self-reported CTS, and 0.53% (95% CI: 0.42; 0.65), or 675,000, stated that their prolonged hand discomfort was called CTS by a medical person. Occupations with the highest prevalence of self-reported CTS were mail service, health care, construction, and assembly and fabrication. Industries with the highest prevalence were food products, repair services, transportation, and construction. The risk factor most strongly associated with medically called CTS was exposure to repetitive bending/twisting of the hands/wrists at work (OR = 5.2), followed by race (OR = 4.2; whites higher than nonwhites), gender (OR = 2.2; females higher than males), use of vibrating hand tools (OR = 1.8), and age (OR = 1.03; risk increasing per year). This result is consistent with previous reports in that repeated bending/twisting of the hands and wrists during manual work is etiologically related to occupational carpal tunnel syndrome.

Van-der-Windt-DA, Koes-BW, de-Jong-BA, Bouter-LM. Shoulder disorders in general practice: incidence, patient characteristics, and management. **Ann-Rheum-Dis.** 1995 Dec; 54(12): 959-64

ENGLAND

OBJECTIVES--To study the incidence and management of intrinsic shoulder disorders in Dutch general practice, and to evaluate which patient characteristics are associated with specific diagnostic categories. METHODS--In 11 general practices (35,150 registered patients) all consultations concerning shoulder complaints were registered during a period of one year. Patients with an intrinsic shoulder disorder who had not consulted their general practitioner for the complaint during the preceding year (incident cases) were asked to participate in an observational study. Participants completed a questionnaire regarding the nature and severity of their complaints. The general practitioners recorded data on diagnosis and therapy. RESULTS--The cumulative incidence of shoulder complaints in general practice was estimated to be 11.2/1000 patients/year (95% confidence limits 10.1 to 12.3). Rotator cuff tendinitis was the most frequently recorded disorder (29%). There were 349 incident cases enrolled in the observational study. Patient characteristics showed small variations between different diagnostic categories. Age, duration of symptoms, precipitating cause and restriction of movement seemed to be discriminating factors. Twenty two percent of all participants received injections during the first consultation; most (85%) were diagnosed as having bursitis. The majority of patients with tendinitis (53%) were referred for physiotherapy. CONCLUSION--With respect to diagnosis and treatment, the practitioners generally appeared to follow the guidelines issued by the Dutch College of General Practitioners. Although the patient characteristics of specific disorders showed some similarities with the clinical pictures described in the literature, further research is required to demonstrate whether the proposed syndromes indeed constitute separate disorders with a different underlying pathology, requiring different treatment strategies.

Van Dijk-FJH Work-related musculoskeletal and mental disorders **. Central European Journal of Occupational and Environmental Medicine** 1995; 1(4): 292-305

The overview of work-related musculoskeletal and mental disorders is based mainly on research and occupational health practice in The Netherlands. The prevalence of work-related musculoskeletal disorders is outlined along with risk factors (lifting, pushing and pulling, static working posture, repetitive movements and whole-body vibration), prevention involving the participation of workers and management, and research and development. Work-related mental disorders include nervous breakdown, post-traumatic stress disorders and burnout. Sickness absence and disability related to mental disorders are discussed along with a clinical approach to prevention .

Welch-L.S., Hunting-K.L., Kellogg-J. Work-related musculoskeletal symptoms among sheet metal workers. **American Journal of Industrial Medicine** June 1995; 27 (6) : 783-791.

In a survey of 18 disabled sheet metal workers, subjects with rotator cuff injury reported the greatest proportion of time spent hanging duct, an overhead task commonly carried out during field work; carpal tunnel cases reported more hand tool use than did rotator cuff cases. A questionnaire

survey of 47 active and retired sheet metal workers showed that the proportion of time spent in a sheet metal shop (as opposed to field work) was associated with hand symptoms; time spent hanging duct was associated with neck and shoulder symptoms. Results highlight construction industry tasks which may increase the risk of musculoskeletal disorders.

Wilber-CA, Holland-GJ, Madison-RE, Loy-SF. An epidemiological analysis of overuse injuries among recreational cyclists. **Int-J-Sports-Med**. 1995 Apr; 16(3): 201-6

GERMANY

Two-hundred and ninety-four male and 224 female randomly selected recreational cyclists responded to a mail questionnaire. Significant differences were observed between male and female cyclists' training characteristics. Overall, 85% of the cyclists reported one or more overuse injury, with 36% requiring medical treatment. The most common anatomical sites for overuse injury/complaints reported by the male and female cyclists combined were the neck (48.8%), followed by the knees (41.7%), groin/buttocks (36.1%), hands (31.1%), and back (30.3%). For the male cyclists, effect upon back and groin/buttocks overuse injuries/complaints were miles/week, lower number of gears, and less years of cycling. For female cyclists, training characteristics which had the most significant effect upon groin/buttocks overuse injury/complaints were more non-competitive events/year and less stretching before cycling. The odds of female cyclists developing neck and shoulder overuse injury/complaints were 1.5 and 2.0 times more, respectively than their male counterparts.

Young-V.L., Seaton-M.K., Feely-C.A., Arfken-C., Edwards-D.F., Baum-C.M., Logan-S. Detecting cumulative trauma disorders in workers performing repetitive tasks. **American Journal of Industrial Medicine** Mar. 1995; 27 (3) : 419-431.

Clinical measures to assess the physical status of the upper extremity were carried out among 157 poultry processors. Criteria that indicated abnormal findings were established for 12 measures. 50% of workers had three or more abnormal findings; the average worker had five to six abnormal findings. Impaired pinch strength, decreased vibration sensitivity in the fingertips, and reports of current numbness were the most prevalent. Of workers with signs, 25% reported no symptoms; 8% of workers reported symptoms but had no signs. The method may be used to determine prevalence of cumulative trauma disorders and for preclinical detection of these disorders.

1994

Bernard-B, Sauter-S, Fine-L, Petersen-M, Hales-T. Job task and psychosocial risk factors for work-related musculoskeletal disorders among newspaper employees. **Scand-J-Work-Environ-Health.** 1994 Dec; 20(6): 417-26

FINLAND

OBJECTIVES--A cross-sectional study was conducted to assess the association of upper extremity musculoskeletal disorders and work-related factors among employees using video display terminals at a large metropolitan newspaper. METHODS--The study included 1050 randomly selected workers from four departments. The workers were asked to complete questionnaires on symptoms, job tasks, and psychosocial and work organization conditions. Musculoskeletal disorders of the upper extremities were defined by frequency, duration, and intensity of symptoms not attributable to acute injury. Data were analyzed with the use of logistic regression. RESULTS--A total of 973 workers completed the survey. The one-year period prevalence rate for any musculoskeletal disorder of the upper extremities was 41%. Neck symptoms (26%) were the most frequently reported, followed by hand or wrist (22%), shoulder (17%), and elbow (10%) symptoms. Greater time working at the video display station was associated with increased hand or wrist symptoms in a dose-response relationship. In addition, variables corresponding to increased work-load demands (eg, increased time working under deadline and increased job pressure) were associated with increased neck, shoulder, and hand or wrist disorders. Women were more likely to report symptoms in several areas, but this finding may reflect the concentration of women in jobs involving more risk factors. CONCLUSIONS--The results

suggest a high prevalence of musculoskeletal disorders of the upper extremities among newspaper employees, and they provide additional evidence that increased work load, time pressure, and greater hours of computer use are related to the occurrence of work-related musculoskeletal disorders among these workers, particularly for disorders in the hand or wrist area.

Brandimiller-P.A. Caixas: Segmento de impacto da automação bancária. **Revista Brasileira de Saúde Ocupacional** Jan.-Mar. 1994; 22 (81) : 33-41.

This statistical study, based on interviews, involved 585 bank employees in the State of Sao Paulo, 88 (15%) of whom were tellers. When compared with bank employees as a whole, tellers had a statistically significant increase in health problems in general, and in the incidence of gastrointestinal, musculoskeletal, eye and repetitive strain problems. Among the preventive methods suggested: more rest breaks; limitation of working time at tellers' workstations to 3h at a time; limitation of work load (expressed in terms of number of verifications registered at the computer terminal); improved ergonomic conditions.

Buschbacher-R. Overuse syndromes among endoscopists. **Endoscopy**. 1994 Aug; 26(6): 539-44.

GERMANY

A survey of 400 gastroenterological endoscopists was carried out to determine what kinds of overuse syndromes they suffer from as a result of doing endoscopic procedures. The response rate was 72%. Thumb pain, hand pain, elbow pain, low back pain, and possibly shoulder pain all appear to be caused by endoscopy to at least some extent. Physicians who perform the most procedures tend to have the highest risk of developing such problems. Age, sex, practice setting, and hobbies did not seem to have an impact on the overuse conditions identified. These conditions are most likely due to the equipment and technique of endoscopy. Further study is needed to determine the anatomic lesions causing the various pain states, so that they can be treated or prevented.

Courville-J., Dumais-L, Vézina-N. Working conditions and development of musculoskeletal disorders among female and male workers on a poultry cutting line. **Travail et Santé** Sep.1994; 10, (3) : S17-S23.

Economic restructuring combined with the sexual division of labour increases the "taylorization" of work in the food and agricultural industry. This accentuates health problems, especially musculo-skeletal disorders, associated with repetitive work. A study involving 27 workers (17 women, 10 men) was carried out on a poultry-cutting line where accidents frequently occur to investigate workers' perceptions regarding conditions that could result in pain and work accidents. Accidents registered were studied, work procedures were observed on site and workers were interviewed. The information collected concerned pain and physical difficulties experienced while working, and the reported and observed causes of the problems. Important differences between men and women were noted for all these variables. These are probably related to the differences in job demands such as tasks, required forces, precision and meticulousness that differ between women's and men's jobs in the plant.

Cunningham-ME. Bursitis and tendinitis**.** **Orthop-Nurs.** 1994 Sep-Oct; 13(5): 13-6, 70

UNITED-STATES

"Joint pain" may be a chief complaint reported by patients who are suffering from bursitis or tendinitis. Both disorders can develop in various joints throughout the body, but this article emphasizes the heel area since it is a common site for both disorders. Also addressed are the essential diagnostic features, general medical management, and nursing issues relevant to these disorders.

Davis-P.J., Fernandez J.E. Maximum acceptable frequencies for females performing a drilling task in different wrist postures. **Journal of Human Ergology** Dec. 1994; 23 (2) : 81-92.

A study was made of 12 females performing a simulated drilling task using nine wrist postures at an adjustable workstation. Results revealed that flexion, extension and radial deviation all had a

significant effect on maximum acceptable frequencies, while ulnar deviation did not. The postures are ranked in order of possible risk of contributing to cumulative trauma disorders, with neutral having the lowest risk and flexion having the highest risk.

Ekberg-K., Bjorkqvist-B., Malm-P., Bjerre-Kiely-B., Karlsson-M., Axelson-O. Case-Control Study of Risk Factors for Disease in the Neck and Shoulder Area. **Occupational and Environmental Medicine** Apr. 1994; 51 (4) : 262-266.

A case/control study examined the risk factors for musculoskeletal diseases of the neck and shoulder regions, with special emphasis on psychosocial factors. The study was centered in a rural area of southern Sweden where the economy was characterized by many small manufacturing companies and a large rubber industry. Selection criteria included an age range of 18 to 59 years, at least 2 months occupational exposure, no employment in the rubber industry, and no chronic illness. Persons who consulted a physician for musculoskeletal disorders of the neck, shoulder, arm, or upper thorax were selected for study, and referents were persons from the same area. The Nordic questionnaire was administered, and exposure measures were based on the information given in the questionnaire. Odds ratios were calculated, with the lowest exposures used as reference for risk factors. Results indicated that 109 subjects had diagnosed neck or shoulder disorders. The most common problems were cervical syndrome (18%), tension neck syndrome (47%), and humeral tendinitis (27%). Being female, immigrant, and a smoker were significant determinants. Repetitive movements were also significant, and were dose related. Self rated work pace, work role ambiguity, high attention demands, low quality work, and psychological work climate deficits were also determinants. The authors conclude that musculoskeletal diseases of the neck and shoulders are of multifactorial origin, that both physical and psychological situations are involved, and that preventive efforts need to focus on the entire complex that constitutes the work situation.

Faucett-J., Rempel-D. VDT-related musculoskeletal symptoms: Interactions between work posture and psychosocial work factors. **Am. J. Ind. Med.** 1994; 26 (5) : 597-612.

Video display terminal (VDT) operators (n = 150) in the editorial department of a large metropolitan newspaper participated in a study of day- to- day musculoskeletal symptoms. Work posture related to the VDT workstation and psychosocial work factors were also investigated for their contributions to the severity of upper body pain, numbness, and stiffness using a representative subsample (n = 70). Self- report measures included karasek's Job Content Instrument and the author-designed Work Interpersonal Relationships Inventory. Independent observations of work posture were performed using techniques similar to those reported by Sauter et al.[1991]. Pain during the last week was reported by 59% (n = 88) of the respondents, and 28% (n = 42) were categorized by symptom criteria potentially to have musculoskeletal disorders. More hours per day of VDT use and less decision latitude on the job were significant risk factors for potential musculoskeletal CTDs. Head rotation and relative keyboard height were significantly related to more severe pain and stiffness in the shoulders, neck, and upper back. Lower levels of co-worker support were associated with more severe hand and arm numbness. For both the region of the shoulders, neck, and upper back and the hand and arm region, however, the contributions of relative keyboard and seat back heights to symptom severity were modified by psychological workload, decision latitude, and employee relationship with the supervisor. Alternative explanations for these findings are discussed.

Hales-T.R. et al. Musculoskeletal disorders among visual display terminal users in a telecommunications company. **Ergonomics** 1994; 37 (10) : 1603-1621.

The relationship between workplace factors and work-related upper extremity musculoskeletal disorders (UE disorders) was assessed in a cross-sectional study of 533 telecommunication employees utilizing video display terminals (VDT). Case of UE disorders were defined uding symptom questionnaires and physical examinations. Data on demographics, individual factors (medical conditions and recreational activities), work organization and practices, and psychosocial aspects of work, including electronic performance monitoring (EPM), were obtained by questionnaire. Associations between workplace factors and UE disorders were assessed by multiple logistic models generated for each of the four UE areas (neck, shoulder, elbow, hand/wrists). One-hundred and eleven (22%) participants met the case definition for UE disorders. Problable nerve entrapment syndromes were found in 4% of participants. The hand/wrist was the

most affected., 12% of participants. The following variables had associations in the final models (p.<0,05) with at least one of the four UE disorders, although the strength of these associations were modest. Non-white race, a diagnosis of a thyroid condition (self-reported), use of bifocals at work, and seven psychosocial variables (fear of being replaced by computers, increasing work pressure, surges in workload, routine work lacking decison-making opportunities, high information processing demands, jobs which required a variety of tasks and lack of a production standard) were associated with UE disorders. This study indicates that work-related UE musculoskeletal disorders are relatively common among telecommunication workers who use VDTs, and adds to evidence that the psychosocial work environment is related to the occurence of these disorders.

Hunting-KL, Welch-LS, Cuccherini-BA, Seiger-LA. Musculoskeletal symptoms among electricians. **Am-J-Ind-Med**. 1994 Feb; 25(2): 149-63.

UNITED-STATES

This study ascertained the presence of musculoskeletal symptoms among electricians, in order to evaluate the prevalence of cumulative trauma disorders (CTD) in this population. We adapted the CTD surveillance questionnaire used by National Institute for Occupational Safety and Health (NIOSH) to assess the prevalence of neck, shoulder, elbow, hand/wrist, back, and knee symptoms in the year prior to the survey. Questionnaires were completed by 308 apprentices and journeymen enrolled in training classes at the local union hall. The participants were relatively young individuals, and 86% of the participants were currently working as electricians. Participants reported a high prevalence of symptoms which occurred more than three times during the past year or which lasted more than 1 week. Back symptoms and hand/wrist symptoms were experienced most frequently, by about half the population, while elbow symptoms were reported by only 15% of participants. Symptom prevalence was lower, but still notable, when defined as symptoms which had occurred at least once a month or lasted more than a week in the past year. Eighty-two percent of participants reported at least one musculoskeletal symptom using the most inclusive definition, while 57% reported two or more symptoms. This survey highlights that: 1) low back discomfort is common in young construction workers, and resulted in medical care, missed work, or light duty for almost 35% of the participants; 2) neck discomfort is also very common and required doctor visits or work modification for almost one quarter of the participants; 3) these construction workers continued to work with symptoms that are classifiable as a CTD; and 4) history of injury is correlated with the subsequent prevalence of musculoskeletal symptoms.

Jitpraphai-C, Prachathomrong-P, Chira-Adisai-W. Subclinical carpal tunnel syndrome in hospital staff. **J-Med-Assoc-Thai**. 1994 Oct; 77(10): 517-9.

THAILAND

An electrodiagnostic study was performed on 50 subjects (one hundred hands) of asymptomatic hospital staff (pharmacists, secretaries, typists, nurses, cleaners, and cooks) by using an MS-92 electrodiagnostic instrument at Ramathibodi Hospital, Bangkok, Thailand. It was found to be 64 per cent. The longer the duration of the worker's experience on the job, the greater the incidence of carpal tunnel syndrome. Based on the result of this paper: cleaners, pharmacists and nurses face a higher risk of developing carpal tunnel syndrome 5.67, 3.92 and 2.24 times greater, respectively, than others.

Johansson-J.A. Work-related and non-work-related musculoskeletal symptoms. **Appl. Ergon.** 1994; 25 (4) : 248-251.

The purpose of the study was to analyse the prevalence of self-reported work-related and non-work-related musculoskeletal symptoms among white-and blue-collar workers. The study was carried out at eight metal industry companies and included 450 subjects, where 241 were blue-collar workers and 209 were white -collar workers. Among the blue-collar workers 39% were females and among the white-collar workers 35% were females. The study was based on a questionnaire, using the general standardized Nordic Musculoskeletal Questionnaire (NMQ). The NMQ was completed with a question concerning whether or not the symptoms were believed to be related to the individual’s present work. It was found that the differences between white-and blue-collar workers’ musculoskeletal symptoms became greater when solely work-related symptoms were included, compared with symptoms in general according to the NMQ. Furthermore, it was

found in both groups that the prevalence of musculoskeletal symptoms decreased substantially when solely work-related symptoms were included, compared with symptoms in general.

Kilbom-A. Repetitive Work of the Upper Extremity: Part II - The Scientific Basis (Knowledge Base) for the Guide International. **Journal of Industrial Ergonomics**. 1994 Aug; 14 (1-2) : 59-86.

A review of the scientific basis behind guidelines for repetitive work of the upper extremity was presented. The review was based upon scientific literature in the areas of biomechanics, ergonomics, occupational medicine, orthopedics, physiology, and rheumatology. The definition of repetitive work needs to be specified with regard to similarity of work cycles and repetitiveness. Repetitive work cycles are often subdivided into fundamental work cycles and work elements. Similarities between repeated motor activities can be defined with respect to time, space, and force. It is important to quantify static loads, external force, posture, duration of exposure, and body region, while new instrumentation and mythological developments have been described in the workplace assessment of repetitive work and in field studies. The work elements that are recognized as part of repetitive work tasks in industry through these means can be analyzed in models in the lab. A complete model for work related neck and upper limb disorders has furthered the understanding of the pathophysiological mechanisms of repetitive work with regard to muscles, tendons, nerves, cartilage, and bone. Epidemiological studies have found associations between repetitive work and musculoskeletal disorders. Intermittent static and repetitive dynamic exercise have been used experimentally to study the effects of repetitive work on the musculoskeletal system. However, at present, there is only limited support in experimental studies for guidelines on frequencies and forces of repetitive industrial jobs. Previous guidelines often fall short on many aspects of control of repetitive work of the upper extremity. More research is needed both on epidemiological exposure and effect relationships, and pathophysiological mechanisms.

Lavender-S. A., Marras-W.S. The Use of Turnover Rate as a Passive Surveillance Indicator for Potential Low Back Disorders. **Ergonomics**. 1994 Jun; 37 (6) : 971-978.

The use of job turnover rate as a passive surveillance indicator for detecting low back disorders was examined. The purpose of the study was to test the hypothesis that specific jobs within a facility that had high employee turnover rates not attributable to differential pay scales indicated the presence of ergonomic hazards associated with low back cumulative trauma disorders (LBCTDs). Data were taken from a dataset assembled from a study in which trunk motions associated with repetitive manual handling jobs where there had been turnover but no LBCTD were measured (dataset 1). Data were also taken from a similar study in which employee turnover and elevated incidence rates for LBCTD, ranging up to 12 cases per 200,000 hours of exposure (dataset 2), occurred. The data were used in a multiple logistic regression model to calculate the probability that a high turnover rate in repetitive jobs that required excessive trunk motions would be associated with an elevated risk for LBCTD. When the turnover rate in jobs in dataset 1 that required excessive trunk motions was compared with the turnover rate in jobs that required little or no trunk motion, an odds ratio (OR) for LBCTD of 5.2 was obtained. This indicated that jobs involving turnover, even in the absence of any injury, were likely to have many characteristics that could cause LBCTD. Analysis of jobs in dataset 2 produced an OR for the association between turnover rate and LBCTD of 11.0. This indicated that when turnover occurs in jobs with a moderate injury rate, it was even more likely that these jobs contain characteristics that could increase the risk for LBCTD. The authors conclude that jobs with employee turnover are likely to contain components similar to jobs associated with a high LBCTD risk. Passive surveillance programs that rely on injury reporting to identify ergonomic problems within a facility would be more sensitive if employee turnover rates were included in the data.

Lei-Y., Laurig-W., Seidel-Fabian-B. Results of a field study of musculoskeletal disorders among workers in a chinese automobile factory (In German). **Zentralblatt fur Arbeitsmedizin, Arbeitsschutz und Ergonomie** 1994; 44 (10) : 338-342.

GERMANY

The influence of occupational and individual factors on musculoskeletal disorders was investigated among 419 workers in a Chinese automobile factory. The investigation methods included questionnaires and occurrence sampling for analysis of body postures. The subjects most frequntly mentioned disorders of the lower back, the hands, the dorsal spine, the neck, and the shoulders.

The relationship between the occupation and musculoskeletal disorders can be shown by the prevalence of disorders, the occurrence of severe pain, and the rate of sick leave. The higher the subjects rate their own work load, the more frequently musculoskeletal disorders occur. The results of the occurrence sampling study support the assumption that body posture is a possible risk factor. Subjects frequently working in a bent and twisted posture belong to the group with the most complaints about disorders. The results indicate that for developing concepts of prevention of occupational disease a close look at special aspects of defined tasks is needed, rather than a simple classification of the entire job.

Miller-R.F., Lohman-W.H., Maldonado-G., Mandel-J.S. An Epidemiologic Study of Carpal Tunnel Syndrome and Hand-Arm Vibration Syndrome in Relation to Vibration Exposure. **Journal of Hand Surgery**. 1994 Jan; 19A (1) : 99-105.

An evaluation was undertaken of 519 compensation claimants following carpal tunnel surgery to determine whether there was a systematic misdiagnosis of hand/arm vibration syndrome (HAVS) among these claimants. No compensation claims have been filed in Minnesota for permanent partial disability benefits with this diagnosis. Participants responded to a questionnaire developed to retrieve data regarding symptoms and all vibration exposure over the 5 years prior to carpal tunnel surgery. Male respondents had the highest vibration exposures. No association could be found between the vascular stage of a claimant and vibration exposure. No reports were found of stage 4 vascular symptoms. Of the 519 respondents, 56 (22%) reported over 5,000 hours of vibration exposure. No association was found between vibration exposure and the claimant's neural stage. There did not appear to be any significant relationship between the prevalence of finger blanching and increasing vibration exposure. A major workmen's compensation award was received by about 14% of those who reported over 5,000 hours of vibration exposure. A comparison between recovery following carpal tunnel surgery and a possible or probable diagnosis of HAVS revealed no significant difference. The authors conclude that HAVS was misdiagnosed among these workers. Some workers were either misdiagnosed as having carpal tunnel syndrome (CTS) or had both CTS and HAVS.

Monsivais-JJ, Bucher-PA, Monsivais-DB. Nonsurgically treated carpal tunnel syndrome in the manual worker. **Plast-Reconstr-Surg**. 1994 Oct; 94(5): 695-8.

UNITED-STATES

This study evaluates the course of carpal tunnel syndrome in a group of manual laborers who declined surgery for personal or social reasons. Thirty-five patients and 67 extremities with carpal tunnel syndrome were evaluated in a group of manual laborers. The carpal tunnel syndrome was classified as mild, moderate, or severe on the basis of initial evaluation data. Sensory batteries, motor and sensory conduction velocities, and electrical studies were performed on a scheduled basis. Follow-up ranged between 14 and 58 months, with an average of 34.3 months. Three patients became worse and one improved during the study period. All others remained unchanged. Six patients returned to work, but only three returned to their original jobs. Although carpal tunnel syndrome does not appear to be a progressive condition once the triggering cause is removed, nonsurgical treatment does not seem to be the treatment of choice for patients who must continue in a manual labor position.

Moore-J.S., Garg-A. Upper extremity disorders in a pork processing plant: relationships between job risk factors and morbidity. **American Industrial Hygiene Association Journal** 1994; 55 (8) : 703-715.

Thirty-two jobs at a pork processing plant were semi-quantitatively analyzed in terms of their ergonomic characteristics, then classified as hazardous or safe in terms of potential risk for elbow or hand/wrist disorders. The spectrum, number, and incidence of such disorders occurring during the preceding 20 months were then compared to the jobs analysis and hazard classifications. There were 104 disorders associated with 15 job categories. The strength demands of the jobs without morbidity were significantly greater than those with jobs without mobidity. Differences in wrist posture were less significant. Type of grasp and repetitiveness were not significantly different. Practilly all morbidity was associated with the hazardous job categories and ocurred with a characteristic pattern of co-morbidity. This study provides additional epidemiological evidence that

upper extremity musculotendinous disorder and some cases of CTS may be causally associated with work. The exertional demands of a task best explained the occurrence of morbidity.

Ohlsson-K. Hansson-G.A., Balogh-I. Disorders of the neck and upper in women in the fish processing industry. **Occup. Environ. Med.** 1994; 51 (12) : 826-832.

Objective: The aim was to study the association between personal factors and physical and psychosocial work environment factors and disorders of the neck or upper limbs among women in the fish processing industry. Methods: A cross sectional study was performed on 206 women in the fish processing industry and 208 control women. Several physical and psychosocial work environment factors were evaluated. Subjective complaints about the neck or upper limbs were assessed by questionnaire and by a clinical examination. Results: The study showed a high prevalence (35%) of diagnoses in the neck or shoulders of the exposed women. All prevalence odds ratios (POR's) were substantially higher in young women. There was a pronounced dose-response relation between disorders of the neck or shoulders and duration of employment for women < 45 years old. When studying 322 former workers, the proportion who claimed musculoskeletal complaints as the reason for leaving was highest among the older women. Muscular tension, stress or worry, work strain, and the largest fraction of the work time spent with highly repetitive work tasks were clearly associated with disorders of the neck or shoulders. The measurements of the wrist movements also showed that the work was performed almost with out any pauses and that the median flexion and extension velocity was high (41^{o} /s) The results of observation showed good agreement with the measurements of wrist motion. Conclusion: Work in the fish processing industry is a risk factor for disorders of the neck and upper limbs. Due to the homogenity of the physical work load in the exposed group, we could not show any associations between the objective measurements and disorders. In cross sectional studies the risk may be underestimated due to a healthy worker effect.

Osorio-AM, Ames-RG, Jones-J, Castorina-J, Rempel-D, Estrin-W, Thompson-D. Carpal tunnel syndrome among grocery store workers. **Am-J-Ind-Med**. 1994 Feb; 25(2): 229-45.

UNITED-STATES

The California Department of Health Services evaluated carpal tunnel syndrome (CTS), a median nerve entrapment condition associated with forceful and repetitive wrist motion, among grocery store workers at a large California supermarket where a CTS cluster had been reported. Forceful and repetitive wrist motion was measured, in three exposure levels, through a job classification scheme based upon type of work tasks and average time per week spent performing these tasks. A medical questionnaire and measurements of median sensory nerve conduction were used to measure CTS. CTS prevalence was 23% based upon a sample of 56 participants drawn from a workforce of 69 employees. A relative risk of 8.3 (95% confidence interval 2.6-26.4) for a history of CTS-like symptoms between the high and low exposure level groups held up after adjustment for the potential confounders of age, sex, alcohol consumption, and high-risk medical history. It was concluded that the basic principles of good ergonomic design should be used to prevent or diminish the risk of musculoskeletal injury in the workplace.

Roquelaure-Y., Touranchet-A., Mandereau L., Fanello S., Hámon-D., Penneau-Fontbonne-D. Health status of shoe industry workers. **Archives des Maladies Professionnelles et de Médecine du Travail** 1994; 55 (6) : 441-447.

FRANCE

The health status of workers in the shoe industry in the Pays de Loire (France) was assessed as well as risk factors. A cross-sectional survey was thus carried out in 26 representative companies (1,964 workers). Data gathering was performed during yearly visits, through a medical examination and a standardized workstation survey carried out by 15 occupational physicians (response rate 90.5%). The surveyed population was young (average age: 35) and predominantly female (67.4%). Pathology essentially involved bone and soft tissue disorders such as lumbago and sciatica, carpal tunnel syndrome and, above all, chronic pain and/or functional difficulties, mainly in the lower back and/or back and/or neck, shoulders and legs. Bone and joint pain were significantly related to sitting, repetitive movements, substantial visual strain and small size of the enterprise. Other pathologies encountered included venous insufficiency, gastralgia and visual fatigue. Exposure to

dust (519 workers) was associated with respiratory irritation and nasal obstruction. Exposure to solvents and glues (479 workers) was associated with skin and mucosal irritation, gastralgia, dizziness and sensitivity disorders. The importance of addressing ergonomic issues and of developing technical preventive measures to minimize exposure to dust, glues and solvents is underlined.

Rosecrance-JC, Cook-TM, Zimmermann-CL. Active surveillance for the control of cumulative trauma disorders: a working model in the newspaper industry. **J-Orthop-Sports-Phys-Ther.** 1994 May; 19(5): 267-76

UNITED-STATES

Health and risk factor surveillance is a critical aspect of an effective ergonomics process. Physical therapists are becoming increasingly involved in many components of the ergonomics process, including health and risk factor surveillance. The purpose of this study was to develop and implement a multistaged active surveillance program for the management and control of cumulative trauma disorders. The surveillance program was established at three newspaper companies consisting of 1,150 employees. This study focused on the first three stages of the multistage surveillance model, which incorporates the use of symptom and job factor questionnaires, specific anatomical surveys, and clinical detection tests. The results of the study indicated that 1) musculoskeletal symptoms in the back, neck, and hands accounted for the majority of reported missed work among the newspaper workers; 2) production workers had a higher prevalence of musculoskeletal symptoms than office workers; and 3) the prevalence of probable carpal tunnel syndrome among the newspaper workers was 1.5%.

Ross-J., Woodward-A. Risk Factors for Injury during Basic Military Training. Is There a Social Element to Injury Pathogenesis? **Journal of Occupational Medicine**. 1994 Oct; 36 (10) : 1120-1126.

Risk factors for injury during basic military training were examined with special regard to whether there was a social element to injury pathogenesis. A retrospective case/control study was conducted at the Recruit Training Unit of the Royal Australian Air Force Base, Edinburgh, South Australia from 1985 to 1990, with 8,644 subjects (5,794 males and 2,850 females). Training was identical for the two sexes. Preenlistment physical activity and history of lower limb injury were included in constructing a stepwise model to identify statistically significant associations. Results identified 238 case subjects (2.7% of the population). Of these, 123 were overuse injuries, and 115 were acute injuries. The proportion of recruits with injuries increased in 1990 to a level over five times that in 1985. Risks for women were higher (odds ratio (OR) of 4.3). Most overuse injuries and acute injuries occurred in the second week. Significant associations were found between height, body mass index, season, sex, year of training, physical training, lower limb deformity, history of lower limb injury, and gender integration courses with the sustaining of significant musculoskeletal injury. When overuse injuries alone were used as cases, the associations with all musculoskeletal injuries became stronger. Physical activity then became significantly associated with an OR of 3.86. Recruits training in 1990 were about 15 times as likely to sustain an overuse injury than those who trained in 1985. Among women, overuse injuries rose from 0.2% in 1985 to 8.8% in 1990. Responsible factors were analyzed. The authors conclude that social pathogenesis, a phenomenon in which trivial discomfort becomes protracted, painful, and even disabling due to actions with therapeutic intent by doctors, allied health professionals, and unions, may be an element in this increase.

Schoenmarklin-R.W., Marrs-W.S., Leurgans-S.E. Industrial wrist motions and incidence of hand/wrist cumulative trauma disorders.. **Ergonomics** 1994; 37 (9) : 1449-1459.

One of the major research voids in the study of occupational hand/wrist cumulative trauma disorders (CTDs) is the lack of quantification of the relationship between the known kinematic risk factors, such as wrist angle and repetition, and CTD risk. A previously published article in this journal reported the descriptive results from a quantitative surveillance study performed in industry in which worker's wrist motions were monitored on the factory floor. The wrist motion components that were monitored on each subject were position, velocity, and acceleration measures in each plane of movement (radial/ulnar, flexion/extension, and pronation/supination). The objective of this article was to form a metric that associates the degree of incidence of hand/wrist CTDs with those

types of wrist motions that were significant in the earlier paper. Of all the kinematic parameters measured, miltivariate analysis of the motion data revealed that acceleration in the flexion/extension plane discriminated the best between groups of low and high incidence rates of CTDs. The epidemiological association between flexion/extesion acceleration and CTD incidence rate is compatible with results from empirical studies and theoretical models in the physiologic and biomechanical literature. The flexion/extension acceleration values from this study can serve as preliminary motion benchmarks that establish relative risk levels of CTDs for hand-intensive, highly repetitive jobs that do not require hand tools.Industrial practitioners can use this methodology, along with other accepted tools, to enhance ergonomic assessments of jobs.

Stevens-H.L. Occupational therapists whose primary area of practice is hand therapy : self-reported cumulative trauma disorders. **Work** 1994; 2 (3) : 171-179.

Hand therapists perform hand-intensive work and engage in tasks that require movements and postures cited in the literature to be risk factors for the development of cumulative trauma disorders. This study was conducted to determine the incidence, prevalence, and types of work-related cumulative trauma disorder of the hand, wrist, and elbow experienced by national random sample of 289 occupational therapists, 227 of whom responded. A total of 328 upper-extremity injuries/syndromeswere reported by 165 (79%) of the responded. A total of 328 injuries occurred as a result of cumulative work trauma. This study identified hand therapy as another occupation where cumulative trauma disorders are common. It is crucial thet hand therapists become cognizant of their occupational risks and limitations so that such painful and disabling conditions can be prevented.

Tan-MY, Low-CK, Tan-SK. De Quervain's tenosynovitis and ganglion over first dorsal extensor retinacular compartment. **Ann-Acad-Med-Singapore.** 1994 Nov; 23(6): 885-6

SINGAPORE

Between 1988 to 1991, 80 cases of de Quervain's disease were managed at the Department of Orthopaedic Surgery, Singapore General Hospital. Six of them had an associated ganglion over the first dorsal retinacular compartment. Five out of 6 cases had intracompartment injections of hydrocortisone and lignocaine but the treatment was not effective in relieving the pain of de Quervain's tenosynovitis. All 6 cases had excision of the ganglion and decompression of the first extensor compartment. All the lumps were found arising from the dorsal aspect of the retinaculum and no intracompartment extension of the ganglion was found.

Tanaka-S, Wild-DK, Seligman-PJ, Behrens-V, Cameron-L, Putz-Anderson-V. The US prevalence of self-reported carpal tunnel syndrome: 1988 National Health Interview Survey data. **Am-J-Public-Health**. 1994 Nov; 84(11): 1846-8.

UNITED-STATES

To estimate the prevalence of carpal tunnel syndrome among US adults, data from the Occupational Health Supplement of the 1988 National Health Interview Survey were analyzed. Based on a sample of 44,233 households (response rate, 91.5%), an estimated 1.55% (2.65 million) of 170 million adults self-reported carpal tunnel syndrome in 1988. Females and Whites had a higher prevalence of self-reporting carpal tunnel syndrome than males and non-Whites, respectively. Among 127 million adults who worked during the 12 months before the survey, 0.53% (0.68 million) reported that their "prolonged" hand discomfort was called carpal tunnel syndrome by a health care provider.

Wells-R., Moore-A., Potvin-J., Norman-R. Assessment of Risk Factors for Development of Work-Related Musculoskeletal Disorders (RSI). **Applied Ergonomics**. 1994 Jun; 25 (3) : 157-164.

An approach to quantified and semiquantified analysis of risk factors for work related repetitive strain injuries by recording musculoskeletal load over time and superimposing these loads on a video recording was described. Workers from an automotive trim factory making car seat covers and two different jobs at an electrical panel factory participated in the study. Workers filled out questionnaires detailing perceived discomfort and elements of the job found to be most uncomfortable. Data on musculoskeletal stresses were collected using a system that allowed the recording of quantitative estimates of the hand, wrist, shoulder, and back loads during manipulative

tasks. At the same time, video recording of the movements were made. A goniometer was used to transduce wrist flexion, extension, abduction, and adduction. Linear envelope electromyography (EMG) and wrist angle data were collected. The EMG and wrist transducer data were encoded onto one stereo channel of a video camcorder. The results indicated that the technique of superimposing musculoskeletal load on video was valuable for semiquantitative evaluation of work related musculoskeletal disorders. The authors conclude that this method can give quantitative information for epidemiological studies and risk assessment on the job.

1993

Buschinelli-J.T.P. **Epidemiologia das doencas profissionais registradas no Brasil na decada de 80.** Sao Paulo, s.n.; 1993. 139p. [Dissertação de Mestrado - Faculdade de Saúde Pública da USP]

Brasil

Estuda as ocorrencias de doencas profissionais em alguns paises mais desenvolvidos e a situacao brasileira na decada de 80, quanto aos aspectos de legislacao, servicos de saude voltados para a saude do trabalhador e organizacao dos trabalhadores. O material usado para o estudo sao as doencas profissionais registradas pela previdencia social e as populacoes de trabalhadores com direito a lei do acidente do trabalho, exceto para os anos de 89 e 90 para os quais nao existe esta ultima informacao, utilizando estimativa feita pelo metodo da regressao linear. O metodo usado baseou-se na tendencia da evolucao dos coeficientes de incidencia, tecnica semelhante ao diagrama de controle denominada carta de controle. Os resultados mostram que a incidencia de doencas profissionais do brasil e menor que a nos paises desenvolvidos, com aumento no segundo quinquenio da decada, nos estados mais desenvolvidos e com movimento sindical mais organizado e atuante. Este aumento pode ser explicado pela regulamentacao das lesoes por esforcos repetitivos em 1986/1987 e implantacao de servicos voltados a atencao medica a trabalhadores, os programas de saude do trabalhador e pela diminuicao do sub-registro.

Rocha-L.E., Rigotto-R.M., Buschinelli-J.T.P. **Isto é trabalho de gente? Vida, doença e trabalho no Brasil.** São Paulo : Vozes; 1993.

Trinta e sete profissionais (médicos, sociólogos, ergonomistas, psicólogos, fonoaudiólogos, sanitaristas, etc.), muitos com especialização em Medicina do Trabalho, escrevem sobre os problemas de saúde dos trabalhadores; os caminhos da relação entre saúde e trabalho no Brasil, desde o final do século passado até os anos 80; apresentam instrumentos para o estudo da relação entre a saúde e o trabalho; e a doença como fruto de um contexto social(AU).

1992

Pereira-R.A.G. **Ler: doença das trabalhadoras**. Salvador; s.n; 1992. 161 p. ilus, tab.

BRASIL

1991

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 1ª parte. **Rev. Bras. Neurol,** jan./fev. 1991; 27(1):9-12.

Os músicos podem ser acometidos por afecções neurológicas de natureza ocupacional. O temor de palco , um distúrbio decorrente da descarga adrenérgica excessiva relacionada a apresentações difícies e/ou importantes. O uso excessivo dos músculos ao tocar por períodos prolongados pode resultar em uma les„o ultra-estrutural de resolução demorada. A compressão de nervos periféricos pode resultar do contato direto com os instrumentos musicais ou da posição necessária para tocá-los. Mais raramente, os músicos são acometidos por uma discinesia ocupacional, de origem obscura e tratamento difícil.

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 2 parte. **Rev. Bras. Neurol**. mar./abr. 1991; 27(2):63-6.

BRASIL

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 3a. parte. **Rev. Bras. Neurol**; 27(3):87-91, maio-jun. 1991.

BRASIL

ETIOLOGIA

1998

Baker-P, Cooper-C. Upper limb disorder due to manual pipetting. **Occup-Med-Oxf.** 1998 Feb; 48(2): 133-134.

ENGLAND

This case report describes the occurrence of non-specific upper limb symptoms, in a 47-year-old female scientific officer, associated, with manual pipetting. The discussion considers the difficulty of risk assessment and reduction for this common procedure.

Greening-J, Lynn-B. Vibration sense in the upper limb in patients with repetitive strain injury and a group of at-risk office workers. **Int-Arch-Occup-Environ-Health.** 1998 Feb; 71(1): 29-34

GERMANY

OBJECTIVES: To investigate in patients with repetitive strain injury (RSI) and in office workers using computer keyboard equipment (a) whether the vibration threshold in the hand was altered, (b) the immediate effects of keyboard use on vibration thresholds and (c) whether the tolerance of suprathreshold vibration was normal. METHOD: A vibrametre (Somedic Ab, Stockholm Sweden) was used to obtain threshold vibration measurements, by the method of limits, for all peripheral-nerve cutaneous distributions in the hand. Tolerance of suprathreshold stimulation was obtained by stimulation of the soft tissues of the forearm by increasing the amplitude of vibration. RESULTS: Thresholds for vibration were significantly raised for the median nerve in both the patient and office-worker groups. The patient group additionally had raised thresholds for the ulnar nerve. Following use of the keyboard, thresholds for the median nerve were further elevated in the patient group, but not in the other groups, demonstrating a work-related exacerbation. At suprathreshold stimulation. 14 members (82%) of the patient group experienced an allodynic response to vibration, indicating, possible changes in the central processing of non-noxious sensory information. This changed sensory response was not seen in either the office-worker or control groups. CONCLUSION: Patients may have a minor polyneuropathy, whereas the office workers demonstrate early signs of the condition. Quantitative measurement of vibration perception may prove useful in patient assessment and for detection of the early onset of RSI in the work environment.

Guay-AH. Commentary: ergonomically related disorders in dental practice. **J-Am-Dent-Assoc.** 1998 Feb; 129(2): 184-6.

UNITED-STATES

Marklin-RW, Monroe-JF. Quantitative biomechanical analysis of wrist motion in bone-trimming jobs in the meat packing industry. **Ergonomics.** 1998 Feb; 41(2): 227-37.

ENGLAND

This study was motivated by the serious impact that cumulative trauma disorders (CTDs) of the upper extremities have on the meat packing industry. To date, no quantitative data have been gathered on the kinematics of hand and wrist motion required in bone-trimming jobs in the red-meat packing industry and how these motions are related to the risk of CTDs. The wrist motion of bone-trimming workers from a medium-sized plant was measured, and the kinematic data were compared to manufacturing industry's preliminary wrist motion benchmarks from industrial workers who performed hand-intensive, repetitive work in jobs that were of low and high risk of hand/wrist CTDs. Results of this comparison show that numerous wrist motion variables in both the left and right hands of bone-trimming workers are in the high-risk category. This quantitative analysis provides biomechanical support for the high incidence of CTDs in the meat packing industry. The

research reported in this paper established a preliminary database of wrist and hand kinematics required in bone-trimming jobs in the red-meat packing industry. This kinematic database could augment the industry's efforts to reduce the severity and cost of CTDs. Ergonomics practitioners in the industry could use the kinematic methods employed in this research to assess the CTD risk of jobs that require repetitious, hand-intensive work.

Matias-AC, Salvendy-G, Kuczek-T. Predictive models of carpal tunnel syndrome causation among VDT operators. **Ergonomics.** 1998 Feb; 41(2): 213-26.

ENGLAND

Carpal tunnel syndrome (CTS), a cumulative trauma disorder of the hand and wrist, is one of the most common disabling injuries experienced by video-display terminal (VDT) operators. The purpose of this study was to develop a theoretically based operational quantitative predictive model of the risk of work-related CTS among VDT operators. A total of 100 female VDT operators, who performed a variety of office functions, were studied at a major midwestern university. Data were collected on job exposure, anthropometry and posture factors using questionnaires, direct observation and video-recording. Discriminant analysis and logistic regression were performed to develop the operational models. The results of the study indicated the following: (1) percentage of workday working with a VDT was the most significant factor and accounted for 60% of the variance explaining the causation of musculoskeletal discomforts associated with CTS; (2) discriminant function with six variables (i.e. work duration, trunk incline, wrist extension, wrist ulnar deviation, overall anthropometric measure, weighted anthropometric measure) correctly classified 73% of the CTS group and 72% of the non-CTS group; (3) using the logistic regression model, the probabilities associated with changes in the predictive variables as affecting CTS risk are presented such that increasing the daily work duration from 1 h to 4 h increases the probability of CTS risk from 0.45 to 0.92. The results of the study suggest that the main causation of CTS is job design, the secondary (and lesser cause) is posture associated with the workplace design and the least contributing factor to CTS causation is the individual's anthropometric make-up.

1997

Akesson-I, Hansson-GA, Balogh-I, Moritz-U, Skerfving-S. Quantifying work load in neck, shoulders and wrists in female dentists. **Int-Arch-Occup-Environ-Health.** 1997; 69(6): 461-74.

GERMANY

OBJECTIVE: To assess the work load in neck and upper limbs of dentists. METHODS: Twelve right-handed female dentists (six with and six without a history of definite neck/shoulder disorders, pair-wise matched for age) were studied when performing authentic dental work. Electromyography (EMG) was used to quantify the muscular load of the shoulders bilaterally and of the right forearm. Positions and movements of the head and wrists were measured, using inclinometers and electrogoniometers. RESULTS: During work, the median load for the right upper trapezium muscle was 8.4% of the maximal voluntary EMG activity (MVE); during 90% of the time the load was > or = 3.3% MVE ("static" load). The figures were somewhat lower on the left side (7.0% and 2.5% MVE, respectively). Subjects with disorders had over all lower load levels for the trapezius muscles, although not statistically significant at < 0.05, than those without disorders. During a standardized reference contraction for the trapezius, the load was 17% MVE, and the quotient between MVE and torque [normalized to maximal voluntary torque (MVC)] was 0.5. These figures may be used for transformations. The muscular load on the right forearm was similar to the loads on the trapezius. The head was, on average, forward tilted > or = to 39 degrees, and during 10% of the time > or = 49 degrees. The left hand was held in more static positions, with palmar flexion and ulnar deviation, also reflected by lower angular velocities and repetitiveness, as compared with the right one, which was dorsiflexed. CONCLUSIONS: Dentists are exposed to high load on the trapezius muscles bilaterally, and steep, prolonged forward bending of the head. Further, for the wrists the postures were constrained, but the dynamic demands were low.

Barr-A. E. **Effect of Computer Mouse Design on Risk Factors for Cumulative Trauma Disorder and on Patterns of Motor Coordination of the Forearm and Wrist in Skilled and Novice Users**. New York : Occupational and Industrial Orthopaedic Center, Hospital for Joint Diseases, New York University Medical Center; 1997.

The common, forearm pronated (FP) computer mouse was compared with a new forearm neutral (FN) computer mouse designed to reduce the risk of cumulative trauma disorders (CTD). Twenty experienced mouse users and 20 novice mouse users participated in evaluations of the two mouse types. Use of the FP mouse was associated with mean forearm pronation up to maximum, high mean wrist ulnar deviation, motions of wrist radial ulnar deviation with intermittent occurrence of maximum ulnar deviation angles, and activation of the pronators and the wrist extensors at intensities between 8% maximum voluntary contraction (MVC) and 35% MVC at least 40% of the time. The FN mouse eliminated the postural and joint motion risk factors and reduced some muscular demands associated with postural risks. The FN mouse did not reduce mean wrist extension and it increased extensors carpi radialis activation to higher intensity levels. The highest speed of performance was attained with the FN mouse. Novice users demonstrated a similar rate of improvement in speed of performance with both mouse designs. Skilled users demonstrated a remarkable degree of skill transfer. The study showed that risk factors for forearm and wrist CTD can be attributed to mouse operation as such.

Boggild-H, Johansen-JP. Occupational environment and strain induced gout. A review of epidemiological studies of the connection between occupational environment and coxarthrosis. **Ugeskr-Laeger.** 1997 Jul 7; 159(28): 4370-6.

DENMARK

Osteoarthrosis of the hip is a frequent complaint with multifactorial causal relations. The causes have hitherto not been associated with the work environment. Through a systematic literature search 15 epidemiological studies dealing with the relation between occupation or factors in the work environment and coxarthrosis were found. A critical evaluation finds that farmers and construction workers have an increased risk of contracting coxarthrosis. Work that is strenuous for the hip such as lifting and ladder climbing might also be risk factors. Prevention of heavy work involving the hip is proposed as a consequence of this knowledge. The Danish Workers Compensation Act should also take these findings into consideration.

Burrus-O Are artists patients like everyone else? **Rev-Infirm.** 1997 May; (27): 12-7.

FRANCE

Feuerstein-M, Armstrong-T, Hickey-P, Lincoln-A. Computer keyboard force and upper extremity symptoms. **Journal of Occupational and Environmental Medicine** 1997 Dec; 39 (12) : 1144-1153.

This case-control study assessed whether office workers who report more severe levels of musculoskeletal symptoms of the upper extremities demonstrate higher levels of keyforce in comparison to controls with less severe symptoms. office workers reporting working on computer keyboards for four hours per day were classified as cases or controls based upon a median split on a Composite Symptom Severity score (cases 23, controls = 25). Keyboard force and keying rate lowe measured during a 15-minute keyboarding talk. Measures of task-related discomfort, muscular fatigue, pain, upper extremity symptoms, psychological distress and force were collected at baseline, post-keyboard task and recovery. Ratings of perceived effort and task credibility were also obtained. Measures of work demands, perceived job stress, and upper extremity strength and flexibility were also collected. The results indicated group equivalence on reported work demands and upper extremity strength. Cases were more likely to receive a medical diagnosis of upper extremity cumulative trauma disorder, awaken from sleep due to symptoms, report higher levels of pain during work, experience greater impact of pain on function, and report higher workload pressure and lower support. Cases generated significantly higher keyboarding forces than controls, although both groups produced forces well above that required to operate the keyboard (4-5 times activation force). Cases reported higher levels of upper extremity symptoms and discomfort than controls, and these measures were highest after the keyboarding task for both groups. No significant correlation between keyforce and key rate was observed in either group. Results suggest that generation of excessive force while working for a computer keyboard may contribute to the severity of upper extremity symptoms. Clinically, the findings suggest that evaluating how an individual worker performs keyboarding tasks, or his or her workstyle, may be helpful in the management of these symptoms and disorders.

Fredericks-T.K., Fernandez-J.E., Pirela-Cruz-M.A. Kienbock's Disease. I. Anatomy and Etiology. **International Journal of Occupational Medicine and Environmental Health** 1997; 10 (1) : 11-17.

The anatomic and etiological aspects of Kienbock's disease (KD) were reviewed. KD and its association with cumulative trauma disorders (CTDs) were considered. KD is a less common disease that does not fit into established CTD categories; however, it has been shown to have CTD like characteristics. KD has been found in carpenters, workers who use pneumatic tools, spot welders, sheet metal workers, and farmers. The anatomic characteristics of the wrist, especially those likely to be involved in KD, were described. The etiology of KD was discussed. KD was defined as an isolated disorder of the lunate of the wrist in which a progressive collapse of the lunate occurs. The early stages of the disease frequently may be clinically and radiographically indistinguishable from other causes of wrist pain. In its early stages, wrist X-rays may appear normal, which impedes identifying the condition as KD. Magnetic resonance imaging and bone scans, however, may detect KD in its early stages. The typical KD patient was usually 20 to 40 years old, and complained of dorsal wrist pain, limitation in the range of movement, and decreases in wrist grip strength. Twice as many males developed KD as females. The incidence of bilateral KD was very low. The exact etiology of KD was not known. Most currently accepted theories suggest that KD is caused either by repeated minimal trauma or a single acute trauma. Repeated minimal trauma as a cause has been inferred from the high incidence of KD that occurs among persons whose occupation involves frequent impacts to the wrist, such as from using a hammer.

Hadler-NM. Repetitive upper-extremity motions in the workplace are not hazardous**.** **J-Hand-Surg-Am.** 1997 Jan; 22(1): 19-29

UNITED-STATES

Hagg-GM, Astrom-A Load pattern and pressure pain threshold in the upper trapezius muscle and psychosocial factors in medical secretaries with and without shoulder/neck disorders. **Int-Arch-Occup-Environ-Health.** 1997; 69(6): 423-32

GERMANY

A current hypothesis for the genesis of muscular complaints in the shoulder/neck region postulates that short periods with a completely relaxed muscle are essential to avoid complaints. Another hypothesis is that these disorders are related to psychosocial conditions at work. In order to test these hypotheses, 23 medical secretaries were investigated. METHODS: The load pattern during work in the upper trapezius muscle bilaterally was assessed with electromyographic (EMG) technique and exposure variation analysis (EVA). In addition, pressure pain threshold (PPT) was measured on the trapezius muscle bilaterally and on the sternum. Psychosocial conditions at work were assessed with a questionnaire. RESULTS: The medical secretaries with complaints had significantly fewer episodes with totally or close to totally relaxed muscle compared with the healthy group. The group with complaints tended to have a more monotonous load pattern at low levels (approx. 1%-5% maximum voluntary contraction) while the healthy group had more frequent pauses but also somewhat more frequent short load peaks. The group with complaints showed lower PPT readings compared with the healthy group. However, the whole group had considerably lower PPTs than is usually reported in the literature. Of the 12 questions in the psychosocial questionnaire only one regarding work task satisfaction showed a significant difference between the two groups. CONCLUSION: Support is found for hypothesis that secretaries without complaints have more frequent episodes with totally relaxed muscle. A significant difference is found regarding work task satisfaction.

James-CP, Harburn-KL, Kramer-JF. Cumulative trauma disorders in the upper extremities: reliability of the postural and repetitive risk-factors index. **Arch-Phys-Med-Rehabil.** 1997 Aug; 78(8): 860-6

UNITED-STATES

This study addresses test-retest reliability of the Postural and Repetitive Risk-Factors Index (PRRI) for work-related upper body injuries. This assessment was developed by the present authors. DESIGN: A repeated measures design was used to assess the test-retest reliability of a videotaped work-site assessment of subjects' movements. SUBJECTS: Ten heavy users of video display

terminals (VDTs) from a local banking industry participated in the study. SETTING: The 10 subjects' movements were videotaped for 2 hours on each of 2 separate days, while working on-site at their VDTs. MAIN OUTCOME MEASURE: The videotaped assessment, which utilized known postural risk factors for developing musculoskeletal disorder, pain, and discomfort in heavy VDT users (ie, repetitiveness, awkward and static postures, and contraction time), was called the PRRI. The videotaped movement assessments were subsequently analyzed in 15-minute sessions (five sessions per 2-hour videotape, which produced a total of 10 sessions over the 2 testing days), and each session was chosen randomly from the videotape. The subjects' movements were given a postural risk score according to the criteria in the PRRI. Each subject was therefore tested a total of 10 times (ie, 10 sessions), over two days. The maximum PRRI score for both sides of the body was 216 points. RESULTS: Reliability coefficients (RCs) for the PRRI scores were calculated, and the reliability of any one session met the minimum criterion for excellent reliability, which was .75. A two-way analysis of variance (ANOVA) confirmed that there was no statistically significant difference between sessions ($p < .05$). Calculations using the standard error of measurement (SEM) indicated that an individual tested once, on one day and with a PRRI score of 25, required a change of at least 8 points in order to be confident that a true change in score had occurred. The significant results from the reliability tests indicated that the PRRI was a reliable measurement tool that could be used by occupational health practitioners on the job site.

Kihlberg-S, Hagberg-M. Hand-arm symptoms related to impact and nonimpact hand-held power tools. **Int-Arch-Occup-Environ-Health.** 1997; 69(4): 282-8

GERMANY

Hand and arm symptoms among workers using impact and non-impact hand-held power tools were investigated in a cross-sectional study and a 5-year follow-up study. The study population consisted of concrete workers (n = 103), truck assemblers (n = 234), electricians (n = 101), platers (n = 140) and lumberjacks (n = 102). Of the original 680 subjects, we followed up 312 after 5 years. A questionnaire concerning ongoing hand and arm symptoms, daily exposure to hand-held power tools, type of tool used, and individual factors was administered. More workers using low-frequency impact tools than workers using non-impact tools reported symptoms in the elbows and shoulders. Elbow symptoms were accentuated in the cross-sectional study, while shoulder symptoms were accentuated in the follow-up study. Wrist symptoms were reported by more of those working with high-frequency impact tools than of those using only non-impact tools when the analyses were controlled for age, years in the occupation and smoking habits. A possible explanation of the results found in this study is that low-frequency impact vibration is transmitted to the upper arm, and thus the elbow and shoulder are at risk, while high-frequency impact vibration is attenuated in the hand and wrist and may predominantly cause symptoms there.

Lewis-LC, Mireles-DZ. Occupational health hazard: carpal tunnel syndrome. **Semin-Perioper-Nurs.** 1997 Apr; 6(2): 105-10

UNITED-STATES

A significant portion of the American population today is exposed to computer-related illnesses. One of the most common injuries is carpal tunnel syndrome (CTS). Perioperative nurses will become increasingly exposed to computer-related illnesses with the advent of computerized patient record systems. Economic loss, physical disability, and emotional distress are frequent outcomes of computer-related illnesses. Federal legislation addressing preventive measures is currently nonexistent. Clinicians, as both employers and consumers of computer technology, must address computer-related illnesses, such as CTS, through identification of related risk factors, early symptoms, implementation of ergonomic measures, and support of federal and industrial safety standards.

Lynch-R.M., Mohr-S.N., Gochfeld-M. Prediction of tendinitis and carpal tunnel syndrome among solderers. **Applied Occupational and Environmental Hygiene** 1997; 12 (3) : 184-189.

While numerous occupational and nonoccupational risk factors are known to be associated with CTS, no quantitative thresholds are known to exist. This nested cross-sectional study was designed to determine occupational and nonoccupational risk factors associated with CTS and to develop a predictive linear equation for tendinitis and CTS among the hands of solder touch-up

workers in the eletronics assembly industry. The draft equation was tested on workers for whom the same measurements were collected at a similar yet difference workplace from the same employer. By combining the data from both sites, a final equation was developed and its predictive accuracy evaluated. results indicate that (1) interemployee differences in work predict whether or not the hands of exposed workers are likely to hve tendinitis or CTS risk, (2) equations can predict whether or not the hands of exposed workers are likely tendinitis or CTS by applying measurements of currently accepted risk factors, (3) work-related risk factors appear to be more important than nonoccupational risk factors such as age and obesity in predicting whether a hand is likely to have CTS or not, and (4) interactions between occupational risk factors (angles and frequencies) are important predictor variables.

Mackinnon-SE, Novak-CB. Repetitive strain in the workplace. **J-Hand-Surg-Am.** 1997 Jan; 22(1): 2-18

UNITED-STATES

Nordstrom-DL, Vierkant-RA, DeStefano-F, Layde-PM. Risk factors for carpal tunnel syndrome in a general population. **Occup-Environ-Med.** 1997 Oct; 54(10): 734-40

ENGLAND

OBJECTIVE: To determine the individual, physical, and psychosocial risk factors for carpal tunnel syndrome in a general population. METHODS: Population based case-control study in Marshfield epidemiological study area in Wisconsin, USA. Cases were men and women aged 18-69 with newly diagnosed carpal tunnel syndrome (n = 206 (83.1%) of 248 eligible). Controls were a random sample of residents of the study area who had no history of diagnosed carpal tunnel syndrome (n = 211 (81.5%) of 259 eligible). Cases and controls were matched by age. Telephone interviews and reviews of medical records obtained height and weight, medical history, average daily hours of exposure to selected physical and organisational work factors, and self ratings on psychosocial work scales. RESULTS: In the final logistic regression model, five work and three non-work variables were associated with risk of carpal tunnel syndrome, after adjusting for age. For each one unit of increase in body mass index (kg/m2), risk increased 8% (odds ratio (OR) 1.08; 95% confidence interval (95% CI) 1.03 to 1.14). Having a previous musculoskeletal condition was positively associated with carpal tunnel syndrome (OR 2.54; 95% CI 1.03 to 6.23). People reporting the least influence at work had 2.86 times the risk (95% CI, 1.10 to 7.14) than those with the most influence at work. CONCLUSIONS: Carpal tunnel syndrome is a work related disease, although some important measures of occupational exposure, including keyboard use, were not risk factors in this general population study. The mechanism whereby a weight gain of about six pounds increases the risk of disease 8% requires explanation.

Ribeiro-HP. **A violência do trabalho no capitalismo: o caso das lesões dos membros superiores por esforços repetitivos em trabalhadores bancários**. São Paulo : s.n; 1997. 363 p. tab. [Tese de Doutorado - Faculdade de Saúde Pública da USP]

BRASIL

Na primeira parte do estudo, intitulada de Violência Explícita do Trabalho, sustenta-se que o perfil de morbimortalidade da classe trabalhadora acompanha os ciclos de desenvolvimento e crise do capitalismo. Relata a evolução das instituições financeiras no país e da categoria bancária, especialmente no banco investigado. São revistos os modos de adoecer e morrer dessa categoria, vítima coletiva de uma doença do trabalho, as lesões por esforços repetitivos (LER). Os próprios trabalhadores adoecidos se fizeram sujeitos e pesquisados desse estudo de desenho híbrido, baseado em 525 questionários que preencheram e em 346 depoimentos que escreveram. Sob o ponto de vista quantitativo, trata-se de um estudo descritivo numa amostra não probabilística de 1223 casos de LER notificados pela empresa ao Instituto Nacional de Seguro Social. A análise dos 346 depoimentos revela sentimentos de perda e medo de incapacidade, esforço para aceitar os novos limites e vontade de retornar ao trabalho para evitar a discriminação e marginalização social e afetiva. Revelam-se, também, as representações que construíram das diversas instituições …s quais tiveram que recorrer. (AU).

Roquelaure-Y, Mechali-S, Dano-C, Fanello-S, Benetti-F, Bureau-D, Mariel-J, Martin-YH, Derriennic-F, Penneau-Fontbonne-D. Occupational and personal risk factors for carpal tunnel syndrome in industrial workers. **Scand-J-Work-Environ-Health.** 1997 Oct; 23(5): 364-9

FINLAND

The purpose of the study was to evaluate both nonoccupational and occupational factors associated with carpal tunnel syndrome (CTS) in industrial workers. METHODS: Sixty-five workers with CTS were compared with 65 referents matched for gender, age, and plant. The medical history and household activities of the workers and the ergonomic and organizational characteristics of the job were analyzed. RESULTS: Exertion of force over 1 kg was associated with CTS [odds ratio (OR) 9.0]. Two risk factors were related to motion repetitiveness: length of the shortest elementary operation of < or = 10 s (OR 8.8) and lack of change in tasks or lack of breaks for at least 15% of the daily worktime (OR 6.0). No posture of the upper limb was associated with CTS. Workstation design involving the manual supply of the workers (OR 5.0) and the lack of job rotation (OR 6.3) were associated with CTS. The only personal factor associated with CTS was a parity of at least 3 (OR 3.2). There was a continuous increase in the odds ratio against the number of risk factors accumulated by the workers; the odds ratio thus ranged from 5.6 when 3 of the 6 risk factors were present to > or = 90 when 4, 5, or 6 risk factors were accumulated. CONCLUSIONS: The results were in agreement with a model for CTS which included 1 personal and 5 occupational risk factors. The number of risk factors cumulated by the workers seems to be a major determinant of CTS.

Sahlstrom-A, Montgomery-F. Risk analysis of occupational factors influencing the development of arthrosis of the knee.**Eur-J-Epidemiol.** 1997 Sep; 13(6): 675-9

NETHERLANDS

The aim of this study was to identify occupational activities important for the development of arthrosis of the knee, taking into account the confounding factors that were suspected or could be recognized. In the archives of the Department of Diagnostic Radiology at the Malmo University Hospital all radiographs of weight-bearing knees of patients with painful knee joints from the period 1982-1986 were reassessed. We found 340 probands, i.e., subjects with arthrosis of the knee of at least grade 1 in the Ahlback classification. These probands and their age- and sex-matched controls (680) were analyzed by a validated questionnaire for details of activities at work inducing knee moment over three 15-year-periods as well as their history of knee injuries at work or in their leisure time. The questionnaire was answered by 266 (79%) arthrosis probands and 463 controls (70%). The results of the questionnaire answers and of the recorded history of knee injuries were statistically analyzed by logistic regression. The relative risk of knee arthrosis was slightly increased (RR: 1.9; CI: 1.4-2.7) in probands with weight-bearing knee bending, i.e., dynamic load of the knee joint when bending, whereas knee injuries (meniscectomies and haemarthrosis) were associated with a higher risk. Weight-bearing knee bending corrected for confounders was not a significant factor for knee arthrosis. Overweight was observed to increase the relative risk. A sedentary profession had, on the other hand, a low risk. The knee injuries (66) were, but for 9 probands, sustained in leisure activities, mainly soccer. We thus conclude that work which induces weight-bearing knee bending by itself does not significantly increase the risk of developing arthrosis of the knee - knee injuries and overweight are more important.

Siemon-B, Justen-P, Wessinghage-D. Stress complaints in musicians. **Z-Orthop-Ihre-Grenzgeb.** 1997 Mar-Apr; 135(2): Oa24

GERMANY

Zaza-C., Farewell-V.T. Musicians'playing-related musculoskeletal disorders: An examination of risk factors. **Am. J .Ind. Med.** 1997; 32 (3) : 292-300.

Several studies have shown that playing-related musculoskeletal disorders (PRMDs) present a significant health problem for musicians. To examine physiological, psychological, and behavioral risk factors of musicians ' PRMDs , data for a case-control analysis were collected from classically-trained professional and university student musicians in the Canadian province of Ontario in 1994. Two-hundred and eighty-one subjects completed a self-rerport questionnaire and hypermobility and hand-span measurements. Cases were identified according to an operational PRMD definition

developed by musicians and health care professionals in a qualitative study. Logistic regression was used to compare data from 44 prevalent PRMD eases who had no previous history of a PRMD, and 90 controls who had never experienced a PRMD. Data from all subjects were analyzed to examine the role of a prior PRMD on the risk of a current PRMD. This study suggests that females and string players were at a higler PRMD risk. A number other individual characteristics were also important determinants of the development of a PRMD. Warming up before and taking breaks during practice sessions protected the subject from a PRMD. Given the high proportion of musicians who experience PRMDs, prevention programs are warranted.

1996

Silverstein-B.A., Hughes-R.E. Upper extremity musculoskeletal disorders at a pulp and paper mill. **Applied Ergonomics** 1996; 27 (3) : 189-194.

A small cross-sectional study of upper extremity disorders was conducted in two departments of a pulp and paer mill. The objective of the study was to determine the prevalence of upper extremity disorders and identify any associated work place risk factors in long cycle jobs with multiple tasks of varying duration. Physical examinations and health status interviews were conducted on 23 employees (77%) in the paper machine department and on 17 employees (59%) of the power and recovery department. All participants completed questionnaires on physical and psychosocial job characteristics. There was a statiscally significant difference in hand wrist disorders between the two departments at the $p < 0,05$ level (34% in the power and recovery department, and 5,9% in the paper machine area). Multiple logistic regression models showed a significant relationship between the use of a steel lance and shoulder disorders. Elbow arthritis was also associated with lance usage. There was evidence that the job analysis was not able to fully describe the risk factors present in the paper machine department. Biomechanical exposures existing prior to the time of the study may not heve been adequately characterized. An important aspect of this study is that the jobs studied were not typical repetitive jobs that are commonly studied.

Andersson-A., Nordgren-B., Hall-J. Measurements of movements during highly repetitive industrial work. **Appl. Ergon.** 1996; 27 (5) : 343-344.

In the manufacturing industry highly repetitive movement patterns in the work situation are common. This work situation is often the cause of pain in the neck-arm region. To measure these movement patterns a new method has been developed by registering acceleration during ordinary industrial work. Three small accelerometers were fastened horizontally, tranversely and vertically in a small box at the wrist. The data were fed into a computer memory at the work site and analysed later. The method can be used during ordinary work in a factory causing no interference to the work.

Bonfiglioli-R., Lodi-V., Tabanelli-S., Violante-F.S. Ulnar nerve at the elbow due to repetitive movements : report of a clinical case. **Medicina del Lavoro** 1996; 87 (2) : 147-151.

The paper describes a case of ulnar neuropathy in a man who made household fittings and toys using bamboo. Several years after starting tahe job he showed symptoms and physical signs of ulnar nerve entrapment at the elbow, which were confirmed by electrophysiological findings. Job analysis revealed biomechanical risk factors consisting of a high repetition of forceful flexion and extension of the elbow, wrist and fingers without sufficient rest periods. Chronic musculoskeletal overuse gradually leads to tendon and nerve disorders. The ulnar neuropathy described can be classed under cumulative trauma, which is the most important cause of musculoskeletal disorders among the working population.

Cahill-J. Psychosocial Aspects of Interventions in Occupational Safety and Health. **American Journal of Industrial Medicine**. 1996 Apr;. 29 (4) : 308-313.

Increased attention to psychosocial hazards as targets of occupational health and safety interventions was proposed. Measurable psychosocial factors have been linked to negative psychological and physiological consequences and to physical health hazards. Economic trends, including declining wages, fewer manufacturing jobs, increased work hours, reduced unionization rates and poor implementation of technological changes, indicated that more jobs will have psychosocial hazards. Downward pressure on salaries has resulted from the shift from a

manufacturing based to a service based economy. Psychosocial hazards resulting from reduced wages included increased working hours, more families with two or more wage earners and less leisure time to compensate for job related stress. The declining percentage of unionized workers, resulting from the reduced manufacturing base, has led to less union pressure for safe working conditions and employee control over work. Jobs produced by the new economy have tended to involve combined physical and psychosocial dangers, such as repetitive strain injuries or sick building syndrome. Workers have also been exposed to job insecurity from low wage temporary work and to psychosocial pressure due to demands for high output, combined with lack of autonomy, physical danger or monotony. The author proposes that psychosocial hazard reduction interventions focus on the social context of such hazards, rather than limiting them to individual coping with job stress. Examples of positive organizational changes were policies that would increase employee autonomy, job security, skill levels and supervisory and coworker social support. Improved physical working conditions and better use of technology, were also suggested. The author concludes that interventions intended to reduce sources of psychosocial stress should be based on knowledge of the many causes of such stress and the multiple symptoms produced. Interventions should be assessed with psychophysiological strain and attitudinal measurements, such as the NIOSH occupational stress questionnaire and Job Content Questionnaire.

Cobb-TK, Cooney-WP, An-KN. Aetiology of work-related carpal tunnel syndrome: the role of lumbrical muscles and tool size on carpal tunnel pressures. **Ergonomics.** 1996 Jan; 39(1): 103-7

ENGLAND

A cadaveric study was undertaken to investigate the effect of tool size and lumbrical muscle incursion on carpal tunnel pressure during active grip. Active grip was simulated by securing the specimens on an apparatus and loading each of the eight finger flexor tendons with 1 kg each. Carpal tunnel pressures were measured with and without 1- and 2-in. tubing in the hand and before and after removing the lumbrical muscles. Both variables, tool size and lumbrical muscles, were found to have a statistically significant effect on carpal tunnel pressure. Higher pressure changes were found for the 2-in. tubing, compared with 1-in. tubing, but this difference was not statistically significant.

Cock-N., Malchaire-J., Piette-A. Wrist disorders and occupational risk factors. **Arch. Mal. Prof. Med. Trav.** 1996; 57 (6) : 445-449.

The prevalences of musculoskeletal disorders of the wrist (M.D.W.) were determined on the left and right wrists, at 9 work-places for a total of 335 workers. In addition, we proceeded to the measurement of the mean relative angles in radio-ulnar deviation as well as in flexion-extension, of the mean force, through the mean relative activity of the finger flexor muscles, of the repetitiveness in movement or in force, and finally of the mean movement velocities in the two planes. Prevalences and constraint factors were put in relation by multiple linear correlation, taking into account the confounding factors of age, weight, height and seniority. The results show that most of the constraint factors are highly correlated and that the parameter the most associated to the M.D.W. prevalences is the mean relative activity of the finger flexors, that is, the force. A diminution of the grip forces would directly be associated to a decrease in the repetitiveness and in the movement velocities and to a reduction of the prevalences of M.D.W.

Deal-G.A., Bernard-T.E. Factors Affecting Acceptable Rate of Closing Connectors (AIHCE Extended Abstract). **American Industrial Hygiene Association Journal** 1996 Oct.; 57 (10) : 950-953.

Factors influencing the acceptability of repetitive mating of electrical and mechanical connectors by workers on automotive assembly lines were examined. The factors included repetitiveness, force, and posture. Four pairs of forces and travel distances were selected to represent most connectors. Additionally, six grips along with four wrist and four elbow postures were factored into the laboratory study. Subjects were recruited from the community with an even number of men and women, aged 20 to 56 years. Each subject worked for 4 weeks, 40 hours a week. Each simulation of a connector activity lasted for 4 hours. Based on the findings, a composite variable called Force/Times/Rate (FTR) was developed as the best means of characterizing connectors within a job. The FTR is the force required for closing a connector times the number of closures required per minute. FTR were adjusted for grip and then added to the values associated with other

connectors on the job for an effective FTR. The effective FTR was then compared to a rating scheme called a Concern Level to determine the percent of workers who would find sustaining the effort needed for connector mating acceptable. Concern level ratings of 1, 2, 3, and 4 indicated that 95%, 75%, 25%, and 5% of workers, respectively, would find a connector mating job acceptable.

Dignan-M. Hayes-D. Main-H. Parker-K. Cumulative trauma disorders among apparel manufacturing employees in the southeastern United States. **South-Med-J.** 1996 Nov; 89(11): 1057-62

UNITED-STATES

Factors associated with cumulative trauma disorders (CTDs) of the upper extremities were studied retrospectively, using data from three apparel manufacturing plants in the southeastern United States. Reported CTDs among the employees at risk during fiscal years 1991 and 1992 were analyzed focusing on individual and plant variables. Results showed that CTD rates increased from 1991 to 1992 and fluctuated in a cyclical pattern each year, peaking during January, March, and August. Employee age and duration of employment were associated with CTD rates. Employees aged 45 to 49 had higher CTD rates than those in any other age groups. Employees with 1 to 3 years' experience had higher CTD rates than employees with more years of service.

Herman-GE, Elfont-EA, Genaw-C, Leone-K, Elfont-DM, Boback-AM. Histologists, microtomy, chronic repetitive trauma, and techniques to avoid injury .3. Comparison of performance characteristics of a motorized microtome to conventional rotary microtomes. **Journal of Histotechnology**, 1996 Mar; 19 (1) : 55-63

In the first and second articles of this series, the pathophysiology and etiology of cumulative trauma disorders were discussed. These disorders can be prevented by the elimination or minimization of chronic repetitive motion. With the advent of motorized microtomes, elimination of the repetitive motion of microtomy became possible. If motorized microtomy is to be accepted by the histotechnology community, however, it must Function as well as, or superiorly, to the conventional microtome, We have systematically assessed the quality of slides prepared with motorized microtomes and compared them to those prepared in rotary microtomes. We also addressed the effects of accurate tissue section thickness on the results of quantitative DNA and immunohistochemistry studies on estrogen receptor assay.

Hoekstra-E.J., Hurrel-J., Swanson-N.G., Tepper-A. Ergonomic, job task, and psychosocial risk factors for work related musculoskeletal disorders among teleservice center representatives**. International Journal of Human-Computer Interaction** 1996; 8 (4) : 421-431.

A cross-sectional study was conducted to evaluate the association betweeen work-related musculoskeletal disorders (WRMDs) and work conditions, perceived exhaustion, job dissatisfaction, and job-stress issues at two teleservice centres (TSCs). The study covered teleservice representatives who respond to toll-free calls for assistance. The work involves a computer or manual search for information, and data entry using keyboards. One facility had upgraded the furniture at the workstations; the other facility had not. A questionnaire survey among 114 teleservice representatives and an ergonomic evaluation were conducted to determine WRMDs was found at both TSCs. Suboptimal ergonomic conditions were associated with neck, shoulder, elbow, and back WRMDs, as well as with increased job dissatisfaction. Perceived increased workload variability and lack of job control were associated with the occurence of neck and back WRMDs, repectively. WRMDs were more frequently reported by teleservice representatives at the centre with older furniture and sboptimal ergonomic conditions. WRMDs may be prevented by improving ergonomic conditions at workstations and adressing work-organization elements.

Kilough-M.K., Crumpton-L.L. An investigation of cumulative trauma disorders in the construction industry. **Int. J. Ind. Ergon.** 1996; 18 (5-6) : 399-405.

Disorders associated with repeated trauma were the most common occupational illness in 1991, accounting for 61% of all occupational illnesses (Bureau of Labor Statistics). Research on cumulative trauma injuries in the construction industry is scarce. Therefore, the purpose of this research was to investigate factors associated with the development of cumulative trauma

disorders (CTDs) in the construction industry. Additionally, this research evaluates the types of CTDs most prevalent in the construction industry. Results of this research show seven common CTDs prevalent in the construction industry: Carpal Tunnel Syndrome, Tennis Elbow, Trigger Finger, Arthritis of the Thumb, Thumb/Wrist Tendinitis, Vibration Syndrome and Impingement. An index was developed to rank tasks based on possible development of CTDs by quantifying factors that contribute to the occurrence of these CTDs such as tool design, work task design, awkward posture, repetition, and application of force. Relevance to industry. This paper presents an empirical approach for quantifying the risk of developing CTDs while performing common job tasks within the construction industry.

Malchaire-J.B., Cock-N.A., Robert-A.R. Prevalence Of Musculoskeletal Disorders at the Wrist as a Funcion of Angles, Forces, Repetitiveness and Movement Velocities. **Environment & Health** 1996; 22 (3) : 176-181. Also published in **Scand-J-Work-Environ-Health.** 1996 Jun; 22(3): 176-81.

The purpose of this investigation was to study the relationship between the prevalence of musculoskeletal disorders at the wrists and the characteristics of the work conditions in terms of angles, forces, repetitiveness, and movement velocities. Nine workplaces were selected and the prevalence of wrist disorders was determined by means of a questionnaire for both arms separately, along with characteristics of the 335 subjects (age, weight, height, seniority). A work analysis was performed on subjects selected at random from each workplace by recording, for both wrists during a represenative number of work cycles, the angles both in radial and ulnar deviations and in flexion-extension and the surface electromyogram on the hand flexors of the forearm. Repetitiveness (defined as the number of transitions per minute) and movement velocities (in deviation and flexion-extension) were derived from the recordings of the angles. All the derived variables were highly correlated, greater angles and greater forces being associated with greater velocities and higher repetitiveness. A multivariate linear regression model for the prediction of the prevalence of musculoskeletal disorders of the wrist was constructed (R = 0.904). Height, weight, seniority, angles in radial-ulnar deviation, and forces were significantly linked to wrist angles in deviation and to forces exerted. Due to their high correlation with force, the repetitiveness indices and velocities as defined do not appear to play an additional role. Further research is needed to find alternative ways of characterizing repetitiveness.

Ostrem-CT. Carpal tunnel syndrome. A look at causes, symptoms, remedies. **Dent-Teamwork.** 1996 Mar-Apr; 9(2): 11-5

UNITED-STATES

Roquelaure-Y., Asselin-A., Foucher-A., Dano-C., Fanello-S., Penneau-Fontbonne-D. Risk Factors in Work-Related Upper Limb Disorders. **Performances Humaines & Techniques.** 1996; 82 :18-26.

Silverstein-M.A.; Silverstein-B.A.; Franklin-G.M. Evidence for work-related musculoskeletal disorders: A scientific counterargument. **Journal of Occupational and Environmental Medicine** 1996 May; 38 (5) :477-484.

This response to an article by Dr N.M. Hadler (see CIS 96-1507) considers that work-related musculoskeletal disorders are a leading cause of preventable morbidity and disability in the workplace. It is argued that the incidence and prevalence of work-related musculoskeletal disorders are increasing and that there is a body of credible scientific evidence showing associations between a variety of musculoskeletal disorders and work-related factors. Dr Hadler's selection of studies and treatment of the facts are criticized along with his reasoning and logic. It is concluded that ergonomic tools are required to eliminate physical risk factors at their source.

Toren-K, Jonsson-P. Is skull sawing by autopsy assistants overlooked as a cause of vibration-induced white fingers? **Scand-J-Work-Environ-Health**. 1996 Jun; 22(3): 227-9

FINLAND

Workers using vibrating tools have an increased prevalence of vibration-induced white fingers. One example of such workers is autopsy assistants, who use vibration for skull sawing. CASE HISTORY: A previously healthy 42-year-old Swedish male smoker had worked as an autopsy assistant at a forensic department between 1977 and 1991. He prepared corpses for autopsy, including sawing the skulls with an electric saw. Beginning in 1983, his right index finger blanched in cold. During subsequent years the blanching spread to the other fingers on the right hand, except for the thumb. The findings in the physical examination and the results of blood tests were normal. Digital blood pressure after cooling showed a severe vasospastic reaction in both middle fingers. Vibration measurements during skull sawing showed a frequency-weighted acceleration level of 8.9 m.s-2. QUESTIONNAIRE SURVEY: A questionnaire was mailed to all assistants (N = 17) preparing autopsies and to all medical examiners, as referents (N = 18), at the Swedish Institutes of Forensic Medicine. It was answered by 13 assistants (76%), 1 woman and 12 men, and 16 medical examiners (89%), 3 women and 13 men. Eleven of the assistants (85%), including one woman, and one of the physicians (6%), a men, reported a history of blanching fingers provoked by chill (difference 79%, P = 0.00003, Fisher's exact test). CONCLUSIONS: Autopsy assistants at forensic departments seem to have an increased prevalence of self-reported blanching fingers, which may be an effect of exposure to high levels of vibration.

Yu-IT, Wong-TW. Musculoskeletal problems among VDU workers in a Hong Kong bank. **Occup-Med-Oxf.** 1996 Aug; 46(4): 275-80

ENGLAND

A survey of musculoskeletal problems among visual display unit (VDU) users was carried out in a bank using a self-administered questionnaire. The prevalence of complaints in various body parts were: neck--31.4%, back 30.6%, shoulder--16.5%, hand and wrist--14.9% and arm--6.6%. Frequent users of VDU had significantly more musculoskeletal problems in the neck and shoulder regions than infrequent users. Individual musculoskeltal complaints were associated with various risk factors including personal attributes, working posture, repetitive movements and work station design. Back, neck and shoulder problems were more related to unfavourable working postures, white arm, hand and wrist problems were more affected by repetitive movements. Some risk factors for musculoskeletal problems were specifically related to the nature or design of VDU work. Modification of the workstation design and improvement in work organization should be able to reduce the prevalence of these disorders.

1995

Myllynen-P. Degenerative diseases and trauma. **Duodecim.** 1995; 111(17): 1694-6

FINLAND

Cail-F., Aptel-M., PichŠne-A. Evaluation questionnaire on the occupational experience of employees exposed to the risk of musculoskeletal problems (French). **D M T - Documents pour le médecin du travail 4th Quarter** 1995; 64 : 253-267.

This article presents a computerized questionnaire for capturing the working conditions of workers in the secondary and tertiary sectors who are presumed to be at risk of musculoskeletal disorders. The history of the development of the questionnaire is followed by a presentation of its different parts: generalities, the worker's post, functional complaints, indicators of chronic psychological stress, open space for other observations. Computer aspects (use of database and spreadsheet programs) and the application of the questionnaire in the enterprise are also discussed. An appendix shows the two versions of the questionnaire.

Codo-W., Almeida-M.C.C.G., Organizadores. **L.E.R.: diagnóstico, tratamento e prevenção: uma abordagem interdisciplinar**. Petrópolis: Vozes; 1995.

Dell'Omo-M, Muzi-G, Cantisani-TA, Ercolani-S, Accattoli-MP, Abbritti-G. Bilateral median and ulnar neuropathy at the wrist in a parquet floorer. **Occup-Environ-Med.** 1995 Mar; 52(3): 211-3

ENGLAND

Many cases of work related compression neuropathy of the ulnar and median nerves at the wrist have been described. This report presents a case of bilateral distal neuropathy of the median and ulnar nerves in a parquet floorer, who laid wooden block flooring by hand and used the palms and volar surface of both hands to hit the blocks into place. He also used an electric sander and polisher. Bilateral numbness and paraesthesias in all fingers had been present for about one year. Clinical examination was normal; the neurological assessment indicated slight impairment in response to tactile, heat, and pain stimuli in all 10 fingers. Electroneurography showed increased distal motor latencies of median and ulnar nerves at both wrists, although the lower limbs were normal. The results of blood, urine, and instrumental tests excluded systemic disease or local factors that could cause compression neuropathy. After stopping work for three months, the clinical picture and electroneurographic results improved. These data support the hypothesis that the damage to the median and ulnar nerves had been caused by the patient's way of working, which provoked repeated bilateral microtrauma to his wrists. To diagnose work related multiple neuropathy can be difficult and an accurate work history is necessary. Preventive measures and diligent health care are required for this category of worker.

English-C. J., Maclaren-W. M., Court-Brown-C.S., Hughes-P. F., Porter-R. W., Wallace-W. A. et al. Relations between Upper Limb Soft Tissue Disorders and Repetitive Movements at Work. **American Journal of Industrial Medicine**1995 Jan.; 27 (1) : 75-90.

A case/control study of possible associations between upper limb soft tissue disorders and work related repetitive movements was conducted. The cases consisted of 585 patients, 410 females, treated an orthopedic clinic who were diagnosed with soft tissue disorders of the upper limb. The controls consisted of 996 patients, 558 males, attending the clinic who were diagnosed with conditions other than upper limb, or cervical or thoracic spinal soft tissue disorders. All subjects ranged in age from 16 to 65 years. They were interviewed by questionnaire to obtain information on occupational history, directional components of upper limb movements during work, use of hand tools, hand dominance, and estimates of the repetitiveness of upper limb movements and degree of palmar gripping in their jobs. Among the cases, carpal tunnel syndrome and ganglion disorders were the most frequently diagnosed upper limb conditions. Foot, knee, and lumbar spine disorders were the most frequent diagnoses among the controls. Sales representatives and hairdressers among female cases, and teacher or lecturer and butcher among the male cases were the occupations most frequently reported with upper limb soft tissue disorders. Among female occupations selected for being associated with upper limb disorders, keyboard work was associated with thumb disorders, machine operation was associated with ganglion disorders, and music teacher was associated with any upper limb disorder. Thumb disorders were significantly positively associated with age, pinching hand movements, maintaining a fixed bent thumb, and making more than 20 wrist movements per minute, relative risks (RRs) 1.30, 4.03, 3.16, and 1.42, respectively. Age and rotating the shoulder with the elbow flexed were significant risk factors for a finger disorder, RRs 1.17 and 5.10, respectively. Sustaining an accidental injury to the relevant body part was not a risk factor for thumb, finger, or wrist and forearm disorders, RRs 0.14, 0.18, and 0.12, respectively. The authors conclude that jobs or tasks requiring pinching, maintaining a fixed flexed thumb, increased wrist movements, and prolonged periods of shoulder rotation with elevated arms may be associated with increased risks of upper limb disorders.

Fioravanti-A, Cocco-R, Francioni-C, Innocenti-A, Megale-F, Priolo-F, Raspanti-S, Sabadini-L, Sartorelli-P, Vannucchi-CE et-al. A syndrome caused by separating rags in textile industry: a new clinical entity? **Minerva-Med.** 1995 Nov; 86(11): 467-4

ITALY

A group of 104 workers were examined. They were employed in selecting rags and separating the lining from wollen fabrics to be used again as thread waste in the textile industry. The aim of the study was to point out tendon and joint related disorders of the upper limb due to repetitive and forced movements. Twenty-eight (26.9%) workers complained of hand and wrist echography and thermography. In 19 patients (67.8%) clinical carpal tunnel syndrome was diagnosed. Eight workers (28.5%) had Dupuytren's contracture. Swelling of the fingers was found in 23 (82.1%). 14.2% and 28.5% of the workers showed respectively acro-osteolysis and acrosclerosis. The textile industry of Prato shows peculiar characters: the workers employed in selecting rags out a manual job which causes soft tissues and skeletal disorders in a great number of them. The acro-

osteolytic and acrosclerotic changes of the fingers seem alike the bone disorders of chronic inflammatory rheumatic diseases as seronegative spondyloarthritis.

Fogleman-M, Brogmus-G. Computer mouse use and cumulative trauma disorders of the upper extremities. **Ergonomics.** 1995 Dec; 38(12): 2465-75

ENGLAND

The computer mouse is now present in virtually every office environment because of the recent adoption of the graphical user interface. However, Karlqvist et al. (1994) pointed out that there still remains a paucity of work on the musculoskeletal problems associated specifically with computer mouse use. Likewise, there have been no published data on the magnitude of upper extremity musculoskeletal disorders associated with computer mouse use. In order to ascertain this magnitude, claims data from the Liberty Mutual Group were reviewed for the years 1986 to 1993, inclusive. Count, total cost and average cost per claim for all claims associated with computer use and computer mouse use were determined for the years in question. It was concluded that although there are few claims related to computer mouse use, it appears to be a growing problem, and therefore, perhaps, deserves more research and intervention attention. However, the present magnitude is less than for other musculoskeletal disorders.

Fransson-Hall-C, Bystrom-S, Kilbom-A. Self-reported physical exposure and musculoskeletal symptoms of the forearm-hand among automobile assembly-line workers. **J-Occup-Environ-Med.** 1995 Sep; 37(9): 1136-44

UNITED-STATES

The aim was to study the prevalence of physical exposures and symptoms of the forearm-hand in a population with highly repetitive jobs. Automobile assembly-line workers (ALWs) (n = 521) and a control group (CG) from the general population answered a questionnaire. Consistent differences were found between the groups. ALWs reported more symptoms from the forearm-hand and higher exposure to repetitive movements, precision movements, and manual handling (< or = 15 kg) than the CG. Female ALWs reported more symptoms and higher exposure to known risk factors for work-related forearm-hand disorders than their male colleagues. In conclusion, automobile assembly-line workers appear to be a high-risk group for work-related symptoms from the forearm-hand. Also, exposure to physical load should be conscientiously analyzed, since women may perform different tasks than men.

Kuorinka-I, Alaranta - H., Erich-I . Prevention of musculoskeletal disorders at work: validation and reliability in a multicenter intervention study. **International Journal of Industrial Ergonomics** 1995; 15 (6), 437-446.

During the years 1986-1989 The Finnish Work Environment Fund initiated a multicentre intervention study (programme) to prevent musculoskeletal diosrders at work. The programme consisted of four different projects comprising methodological, epidemiological, and interventive themes. The main results were as follows; (1) More than half of the occupational physiotherapists and physisicians involved in the project felt that they did not have adequate trianing for testing the performance capacity of the musculoskeletal system. Several of the most commonly used musculoskeletal tests had eithers poor validity in predicting future musculoskeletal troubles or had poor reliability. (2) A controlled intervention study showed that active training of neck-shoulder muscles can prevent musculoskeletal troubles, even more than ergonomics actions. (3) It is possible to reduce sick-leave due low-back disorders by intervention measures directed toward both the work (environment tools) and the workers (working methods, positive attitude to work, preparedness to keep fit). (4) The identification of ergonomic hazards with the help of teamwork proved to be feasible. The practical improvements , however, were difficult to implement in the prevailing conditions. Some of the improvemtents increased the work load and the stress of the workers. This aspect needs further consideration. Active training of neck-shoulder muscles can prevent industrial musculoskeletal troubles.

Ong-C.N., Chia-S.E., Jeyaratnam-J, Tan-K.C. Musculoskeletal disorders among operators of visual display terminals. **Scand. J. Work Environ. Health.** 1995; 21 (1) : 60-64.

Using a visual display terminal (VDT) is today a common occupational task with both benefits and hazards. One of the hazards is the occurrence of musculoskeletal disorders. This paper examines the possible causes of such disorders and suggests some preventive strategies. The debate on the relationship between musculoskeletal disorders and VDT usage usually centers around occupational factors (eg, constrained posture, poor ergonomic design of the work-place, equipment design), work-related psychological factors (eg, perceived high job demands, mundane, boring and repetitive job activity, little control, poor support from colleagues and superiors), and psychosocial factors (eg, biodemographyc characteristics such as age, previous musculuskeletal injuries, emotional stress, family burden, environmental factors). Improving the ergonomic design of VDT workstations, changing occupational legislation, and improving occupational health services have been suggested as means to decrease the incidence of musculoskeletal disorders among VDT workers. Much research with a multidisciplinary approach is still needed.

Potter-PJ, Jones-IC. Medical problems affecting musicians. **Can-Fam-Physician.** 1995 Dec; 41: 2121-8

CANADA

The physical demands of performing on musical instruments can cause pain, sensory loss, and lack of coordination. Five cases illustrate common problems. Knowledge of the interaction between the technique of playing the instrument and the particular musician can help physicians diagnose and resolve problems.

Reilly-P.A. Approaches to RSI in the United Kingdom. **J. Musculoskelet. Pain** 1995; 3 (2) : 123-125.

Objectives: To review the factors influencing the current epidemic of work-related upper limb pain in the United Kingdom, and to discuss the role of Medicine and Law in its genesis and perpetuation. Methods: Informed observation. Findings: The epidemic has a multifactorial etiology. It is best viewed as a complex psychosocial phenomenon, with historical precedents in writers' and telegraphists' cramps of the last century. The unhelpful interaction of doctors lawyers, the media, trade unions and society as a whole has been to the detriment of sufferers. Conclusions: Greater understanding of the complex nature of chronic pain and the avoidance of confrontation and litigation are to be encouraged if the United Kingdom [UK] is not to follow the same ruinous path as Australia a decade ago.

Smutz-W. P., France-E. P., Bloswick-D. S. Measurement of Creep Strain of Flexor Tendons during Low-Force High-Frequency Activities Such as Computer Keyboard Use. **Clinical Biomechanics** 1995 Mar.; 10 (2) : 67-72.

A study was conducted on hand tendon strain during the performance of low force, high frequency activities such as keyboard use. Tendon force was measured electromyographically in five healthy volunteers (age range 28 to 37 years) during various hand activities and creep strain tests were performed on flexor digitorum tendons from cadaver hands. Flexor electromyographic (EMG) measurements were higher during the performance of finger tap activities compared with pinch or grasp activities while the extensor EMGs were similar for all three activities. Significant differences were seen between flexor digitorum muscle activity for pinch and one finger tap as well as between grasp and four finger tap. Flexor tendon forces during keyboard use were demonstrated to be as high as 60 newtons. Creep strain using three loading conditions and four load levels was found to increase faster for static conditions compared with cyclic conditions. Significant differences were seen between elastic strains for the four load levels at all three test conditions. The creep test results indicated that a flexor tendon force of 60 newtons would result in a total strain of the tendon of about 1.8%. The authors conclude that the level of strain calculated in this study does not appear to be strong enough to cause permanent tendon damage.

Taboun-SM, Dutta-SP, Kourtis-CP. A study of sewing operations with emphasis on repetitive strain injuries. In: Bittner- C. , Champney-P.C., Ed. **Advances in industrial ergonomics and safety**. London: Taylor & Francis; 1995. p.67-74.

Workers at a plant that produces high-quality steering wheels for luxury cars hace reported na unaccepably hig rate of repetitive strain injury (RSI) symptoms. The results indicate that RSI

symptoms occur due specifically to the nature of the work performed and are not accountable to indivual differences of the workers. As such, every worker in the plant is suscepitble to injury. Analysis of the sewing operations was performed with a video camera. Six sewing operators were filmed in the performance of their task. Analysis of their performance revealed little difference between categories of workers. This indicates that only way to reduce injuries is through redesign of the required work. A number of proposed improvements are also presented.

Tanaka-S, Wild-DK, Seligman-PJ, Halperin-WE, Behrens-VJ, Putz-Anderson-V. Prevalence and work-relatedness of self-reported carpal tunnel syndrome among U.S. workers: analysis of the Occupational Health Supplement data of 1988 National Health Interview Survey**. Am-J-Ind-Med.** 1995 Apr; 27(4): 451-70

UNITED-STATES

To estimate the prevalence and work-relatedness of self-reported carpal tunnel syndrome (CTS) among U.S. workers, data from the Occupational Health Supplement of 1988 National Health Interview Survey (NHIS) were analyzed. Among 127 million "recent" workers" who worked during the 12 months prior to the survey, 1.47% (95% CI: 1.30; 1.65), or 1.87 million self-reported CTS, and 0.53% (95% CI: 0.42; 0.65), or 675,000, stated that their prolonged hand discomfort was called CTS by a medical person. Occupations with the highest prevalence of self-reported CTS were mail service, health care, construction, and assembly and fabrication. Industries with the highest prevalence were food products, repair services, transportation, and construction. The risk factor most strongly associated with medically called CTS was exposure to repetitive bending/twisting of the hands/wrists at work (OR = 5.2), followed by race (OR = 4.2; whites higher than nonwhites), gender (OR = 2.2; females higher than males), use of vibrating hand tools (OR = 1.8), and age (OR = 1.03; risk increasing per year). This result is consistent with previous reports in that repeated bending/twisting of the hands and wrists during manual work is etiologically related to occupational carpal tunnel syndrome.

Van Dijk-FJH. Work-related musculoskeletal and mental disorders **. Central European Journal of Occupational and Environmental Medicine** 1995; 1(4): 292-305

The overview of work-related musculoskeletal and mental disorders is based mainly on research and occupational health practice in The Netherlands. The prevalence of work-related musculoskeletal disorders is outlined along with risk facots (lifting, pushing and pulling, static working posture, repetitive movements and whole-body vibration), prevention involving the participation of workers and management, and research and development. Work-related mental disorders include nervous breakdown, post-traumatic stress disorders and burnout. Sickness absence and disability related to mental disorders are discussed along with a clinical approach to prevention .

Welch-L.S., Hunting-K.L., Kellogg-J. Work-related musculoskeletal symptoms among sheet metal workers. **American Journal of Industrial Medicine** 1995 June; 27 (6) : 783-791.

In a survey of 18 disabled sheet metal workers, subjects with rotator cuff injury reported the greatest proportion of time spent hanging duct, an overhead task commonly carried out during field work; carpal tunnel cases reported more hand tool use than did rotator cuff cases. A questionnaire survey of 47 active and retired sheet metal workers showed that the proportion of time spent in a sheet metal shop (as opposed to field work) was associated with hand symptoms; time spent hanging duct was associated with neck and shoulder symptoms. Results highlight construction industry tasks which may increase the risk of musculoskeletal disorders.

1994

Davis-.J., Fernandez-J.E. Maximum acceptable frequencies for females performing a drilling task in different wrist postures. **Journal of Human Ergology** 1994 Dec.; 23 (2) : 81-92.

A study was made of 12 females performing a simulated drilling task using nine wrist postures at an adjustable workstation. Results revealed that flexion, extension and radial deviation all had a significant effect on maximum acceptable frequencies, while ulnar deviation did not. The postures are ranked in order of possible risk of contributing to cumulative trauma disorders, with neutral having the lowest risk and flexion having the highest risk.

Ho-SF, Lee-HS. An investigation into complaints of wrist pain and swelling among workers at a factory manufacturing motors for refrigerators. **Singapore-Med-J.** 1994 Jun; 35(3): 274-6

SINGAPORE

In 1987, a group of workers complained through their union that some of them developed wrist pain and swelling from the manual handling of heavy stators. The complaints were from the morning shift of a particular assembly line in a factory making motors for refrigerators. The precipitating factor appeared to be the change in the weight of the model assembled. The new stator weighing 5.8 kg was about twice as heavy as the previous model. Each worker on the line handled 300 to 1,000 stators per shift. The work involved including lifting the stators onto and off the conveyor belts and pushing and pulling them along horizontal planes. To evaluate the problem, workers from both shifts of the affected assembly line were interviewed and examined. A total of 79 workers (all females) was involved. The presence and severity of work-related aches, pains, numbness, swelling, etc over the last 4 weeks were enquired. The nature of the work done in the line was observed. Sixty-three out of 79 workers had some symptoms giving an overall prevalence rate of 79.8%. The two most common complains were pain (90.5%) and numbness (28.6%). The most commonly affected sites were the hands and wrist followed by the neck and shoulder. There was no significant difference in the prevalence of symptoms among workers in the 2 shifts. The symptoms were subjective and associated with job dissatisfaction and there was no difference in the average number of stators handled between those with symptoms and those without.(ABSTRACT TRUNCATED AT 250 WORDS)

Institut National de Recherche et de Securité. **Supermarket checkout personnel**. Paris : Institut national de recherche et de sécurit; 1994. Off-print of an article published in "Travail et sécurité", Jan. 1994.

An ergonomic analysis of the work of supermarket checkout personnel reveals that scanner use and bagging by tellers is associated with high task repetitivity and work speed as well as high levels of manual handling. These stress factors generate ill health effects in even such a young population as well as an increase in the incidence of occupational diseases. This report stresses the need of a dialogue between all social partners, including specialists of retail trade, builders, industrial physicians, safety professionals, workers, consumers' associations, etc., in order to be able to improve the layout of existing workstations, as well as to develop new work contexts in line with the evolution of the functions of checkout personnel.

Kakosy-T. Tunnel syndromes of the upper extremities in workers using hand-operated vibrating tools. **Med-Lav.** 1994 Nov-Dec; 85(6): 474-80

ITALY

Neurological and electrophysiological (EMG, ENG) examinations of the upper extremities were carried out in 167 patients exposed to hand-arm vibrations. All patients had typical symptoms (Raynaud's phenomenon and/or numbness, muscle weakness). The results showed that the circumscribed lesions of the tunnel nerves are far more common (92.8%) than diffuse peripheral neuropathies (22.7%). The most common alteration (71.4% below the border-line values) was the lesion of the brachial plexus in the thoracic outlet. In 16.2% of the patients compression of the subclavian artery was also demonstrated by means of a Doppler flowmeter. Cubital tunnel syndrome was observed in 42.5% of the patients. The results suggest that hand-arm vibration can play a part in the development of the thoracic outlet and cubital tunnel syndromes. On the other hand the thoracic outlet syndrome can contribute to the development of vibration-induced Raynaud's phenomenon.

Morgenstern-H., Graves-M., Kelsh-M.A. **Occupational Epidemiology of Carpal Tunnel Syndrome.** Los Angeles : Department of Epidemiology, School of Public Health, University of California at Los Angeles; 1994.

The incidence of symptoms suggestive of carpal tunnel syndrome (CTS) among trade occupations and office workers was determined. Work related factors, medical conditions, and CTS diagnostic indicators were also evaluated. Data entry operators, court reporters, clerical staff, carpenters, and sprinkle fitters were selected to represent a wide range of ergonomic exposures. The prevalence of symptoms consistent with CTS was examined among 529 county office workers, and 667 active

trade workers and 136 retired trade workers from two unions. Clerks and technical staff had the highest symptom prevalence The prevalence of hand/wrist symptoms suggestive of CTS was 12% and 17% for carpenters and sprinkler fitters. Among office workers the odds ratios for hours of keyboard use were higher among court reporters and data entry staff than among clerks and technical staff. The prevalence of CTS symptoms increase for up to 10 years of work experience, but decreased thereafter. The number of hours worked per week was inversely associated with CTS symptoms. Power tool and hand tool use were modestly associated with CTS symptoms; however, exposure response trends were not consistent. Job demand and job satisfaction were consistently associated with hand/wrist symptoms, neck/shoulder pain, and low back pain.

Ohlsson-K, Hansson-GA, Balogh-I, Stromberg-U, Palsson-B, Nordander-C, Rylander-L, Skerfving-S. Disorders of the neck and upper limbs in women in the fish processing industry. **Occup-Environ-Med.** 1994 Dec; 51(12): 826-32

ENGLAND

The aim was to study the association between personal factors and physical and psychosocial work environment factors and disorders of the neck or upper limbs among women in the fish processing industry. METHODS--A cross sectional study was performed on 206 women in the fish processing industry and 208 control women. Several physical and psychosocial work environment factors were evaluated. Subjective complaints about the neck or upper limbs were assessed by questionnaire and by a clinical examination. RESULTS--The study showed a high prevalence (35%) of diagnoses in the neck or shoulders of the exposed women. All prevalence odds ratios (POR's) were substantially higher in young women. There was a pronounced dose-response relation between disorders of the neck or shoulders and duration of employment for women < 45 years old. When studying 322 former workers, the proportion who claimed musculoskeletal complaints as the reason for leaving was highest among the older women. Muscular tension, stress or worry, work strain, and the largest fraction of the work time spent with highly repetitive work tasks were clearly associated with disorders of the neck or shoulders. The measurements of the wrist movements also showed that the work was performed almost without any pauses and that the median flexion and extension velocity was high (41 degree/s). The results of observation showed good agreement with the measurements of wrist motion. CONCLUSION--Work in the fish processing industry is a risk factor for disorders of the neck and upper limbs. Due to the homogenity of the physical work load in the exposed group, we could not show any associations between the objective measurements and disorders. In cross sectional studies the risk may be underestimated due to a healthy worker effect.

Osorio-A. M., Ames-R. G., Jones-J., Castorina-J., Rempel-D., Estrin-W., Thompson-D. Carpal Tunnel Syndrome among Grocery Store Workers. **American Journal of Industrial Medicine**1994 Feb.; 2 : 229-245.

The possibility that grocery store workers whose jobs involved highly repetitive and forceful motion of the wrist experienced a higher degree of carpal tunnel syndrome (CTS) than other workers was investigated. The study subjects included all current workers at a large supermarket in California where there had been a cluster of CTS reported in 1984 and 1985. A job classification scheme was used to measure repetitive and forceful wrist motions. Fifty six of the 69 workers participated in the study. The workers included checkers processing items through scanners, baggers who packed groceries and retrieved carts, stockroom workers, shelf stockers, butchers, bakery workers, flower shop workers and office workers. Those who appeared to be at increased risk for CTS included checkers, meat cutters and cake decorators. Among the grocery store workers the overall prevalence of CTS based on medical history reports was 23%. When the prevalence of CTS like symptoms was compared across the various exposure categories, there appeared to be a dose/response relationship with 63% of those with high risk, 10% at medium risk jobs and 0% at low risk jobs experiencing the expected symptoms. The number of years on the job was the best predictor of both right and left wrist sensory median nerve conduction velocity.

Powell-BJ, Winkley-GP, Brown-JO, Etersque-S. Evaluating the fit of ambidextrous and fitted gloves: implications for hand discomfort. **J-Am-Dent-Assoc.** 1994 Sep; 125(9): 1235-42

UNITED-STATES

Ambidextrous gloves stretch significantly more and exert greater force than fitted gloves when worn. Over time, this force could contribute to vascular constriction, nerve compression, muscle fatigue and hand pain. This study suggests that research on the effects of glove use by dental care personnel is needed.

Quintner-J.L, Cohen-M.L., Burvill-P.W. Occupation neurosis and the psychogenic connotation of repetition strain injury': The misconstruction of neurosis. **Integr. Psychiatry.** 1994; 10 (4) : 165-184.

The cervicobrachial pain syndrome known as repetition strain injury (RSI) has been the subject of considerable controversy, particularly between the proponents of somatogenic and of psychogenic theories of pathogenesis. The latter, who consider that RSI is a neurosis, namely conversion hysteria, argue further that it is a contemporary example of an occupation neurosis, as described in the late nineteenth century. In this paper the history and clinical application of the construct of occupation neurosis is reviewed. To examine the proposed analogy with RSI. It is shown that those who argued that RSI was psychogenic failed to appreciate the evolution in terminology and etiology of the older construct, a misconstruction with major consequences.

Schoenmarklin-R.W., Marras-W.S., Leurgans-S.E. Industrial wrist motions and incidence of hand/wrist cumulative trauma disorders. **Ergonomics** 1994 Sep.; 37 (9) : 1449-1459.

A study was carried out to determine which wrist motion variables were the best predictors of hand/wrist cumulative trauma disorders (CTD). Statistical techniques were performed on wrist motion data collected in an earlier study of 40 industrial workers who performed highly-repetitive, hand-intensive tasks. Acceleration in the flexion/extension plane discriminated best between groups of low and high incidence rates of CTDs. This association is compatible with results of other studies reported in the literature. The results may be used to establish relative risk values of CTDs for hand-intensive, repetitive jobs that do not require hand tools.

1991

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 1ª parte. **Rev. bras. neurol.** jan.-fev. 1991; 27 (1) : 9-12.

BRASIL

Os músicos podem ser acometidos por afecções neurológicas de natureza ocupacional. O temor de palco , um distúrbio decorrente da descarga adrenérgica excessiva relacionada a apresentações difícies e/ou importantes. O uso excessivo dos músculos ao tocar por períodos prolongados pode resultar em uma les„o ultra-estrutural de resolução demorada. A compressão de nervos periféricos pode resultar do contato direto com os instrumentos musicais ou da posição necessária para tocá-los. Mais raramente, os músicos são acometidos por uma discinesia ocupacional, de origem obscura e tratamento difícil.

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 2 parte. **Rev. bras. neurol**. mar.-abr. 1991; 27 (2) : 63-6.

BRASIL

Gonik, Renato. Afecçães neurológicas ocupacionais dos músicos: 3a. parte. **Rev. bras. neurol**. maio-jun. 1991; 27(3):87-91.

BRASIL

FISIOPATOLOGIA

1998

Friedman-PJ. Isokinetic peak torque in women with unilateral cumulative trauma disorders and healthy control subjects. **Arch-Phys-Med-Rehabil.** 1998 Jul; 79(7): 816-9

UNITED-STATES

OBJECTIVES: To compare isokinetic peak torque in the symptomatic and asymptomatic limbs of women with lateral epicondyle or forearm pain due to cumulative trauma disorders (CTDs), and to compare peak torque in women with CTDs to peak torque in healthy women. DESIGN: Case control comparison. SETTING: Private occupational rehabilitation clinic and a sports science tertiary education center. SUBJECTS: Women with CTDs involving one arm (n=17) and a convenience sample of healthy women (n=7) INTERVENTION: Subjects performed isokinetic strength testing for wrist extension and flexion, wrist supination and pronation, and knee extension and flexion. MAIN OUTCOME MEASURES: Peak torque at 120 degrees/sec on a Biodex isokinetic dynamometer. RESULTS: Control subjects had significantly higher peak torque in wrist extension, flexion, supination, and pronation than CTD subjects on the symptomatic side. Control subjects also had significantly higher peak torque of wrist flexion, pronation, and supination than CTD subjects on the asymptomatic side; wrist extension was greater, but this did not reach significance. In addition, control subjects had significantly higher peak torque in knee extension and flexion than CTD subjects. CTD subjects had significantly greater left-right asymmetry in wrist extension torque than did control subjects. CONCLUSIONS: Isokinetic peak torque is diffusely reduced in women with unilateral CTDs compared with healthy control subjects, these differences occurring in symptomatic and asymptomatic limbs.

Harada-N, Iwamoto-M, Laskar-MS, Hirosawa-I, Nakamoto-M, Shirono-S, Wakui-T. Effects of room temperature, seasonal condition and food intake on finger skin temperature during cold exposure test for diagnosing hand-arm vibration syndrome. **Ind-Health.** 1998 Apr; 36(2): 166-70

JAPAN

For diagnosing the hand-arm vibration syndrome, peripheral circulation and sensory tests immersing one hand in cold water at 10 degrees C for 10 min have been performed widely in Japan. The authors investigated the effects of room temperature, seasonal condition and food intake on the test results, especially finger skin temperature. Six healthy males were examined repeatedly under six different room temperatures at 10 degrees C, 15 degrees C, 20 degrees C, 22.5 degrees C, 25 degrees C and 30 degrees C. Eight healthy males were examined under room temperatures at 10 degrees C, 20 degrees C and 30 degrees C, repeatedly in winter, spring, summer and autumn. Six healthy males were examined in summer under room temperature at 22.5 degrees C repeatedly 1 hr after, 3 hr after meal and after fasting for 13 hr. The finger skin temperature was strongly affected by room temperature. The finger skin temperature was also affected by seasonal condition. No remarkable effect of food intake was observed. For estimating circulatory function of the upper extremities using the finger skin temperature, the room temperature should be strictly controlled and the effect of seasonal condition must be taken into consideration.

Missere-M, Lodi-V, Naldi-M, Caso-MA, Prati-F, Raffi-GB. Use of ultrasonography in monitoring work-related carpal tunnel syndrome: a case report. **Am-J-Ind-Med.** 1998 Jun; 33(6): 560-4

UNITED-STATES

Carpal tunnel syndrome (CTS) is a syndrome whose diagnosis is well established. One cause could be occupational factors, while others have no relation to work or the work environment. We present in this article a case report regarding a worker affected by CTS, which is of interest concerning the sensitivity of ultrasonography and electroneurography, applied as diagnostic methods, related in our protocol to the variations in occupational exposures. The case reports an agricultural worker, whose tasks required repetitive and high frequency movements of the hand-arm. Diagnosis of CTS used ultrasonography and electroneurography techniques. In our opinion, the clinical evolution of CTS encompasses three "work-related" phases (preclinical phase; phase of nerve compression; phase of irreversible damage). Ultrasonography provides greater information about the evolution of CTS, as well as other cumulative trauma disorders, and is able to discern tendinitis of flexors causing a compression on the median nerve in the carpal tunnel.

Keller-K, Corbett-J, Nichols-D. Repetitive strain injury in computer keyboard users: pathomechanics and treatment principles in individual and group intervention. **J-Hand-Ther**. 1998 Jan-Mar; 11(1): 9-26.

UNITED-STATES

Computer users experience high rates of injury and disability, broadly termed repetitive strain injury (RSI). With more than 60 million Americans using computers in offices and homes, the potential magnitude of the RSI problem indicates a need for increased attention to prevention and treatment. The purpose of this article is to: 1) present a conceptual model of RSI as a kinetic-chain, multifactorial disorder; 2) outline the salient features of the clinical evaluation of the RSI patient; 3) describe the role of postural deviation in the pathogenesis of RSI; 4) present the principles of individual manual therapy; and 5) discuss the rationale, admission criteria, educational principles, and outcome of a multidisciplinary group intervention.

Sakakibara-H, Hirata-M, Hashiguchi-T, Toibana-N, Koshiyama-H. Affected segments of the median nerve detected by fractionated nerve conduction measurement in vibration-induced neuropathy. **Ind-Health.** 1998 Apr; 36(2): 155-9

JAPAN

Peripheral neuropathy in the hand has often been reported in workers using hand-held vibrating tools. But the affected location in the hand is not clearly demonstrated. To elucidate the impaired segment of the median nerve within the hand, fractionated median sensory nerve conduction velocity (SCV) was measured in the digital, finger-to-palm, palm-to-wrist and wrist-to-elbow segments. Subjects were 56 patients with hand-arm vibration syndrome and 43 healthy controls of similar age. SCV in the digital and the wrist-to-palm segments was significantly slower in the patients than the controls. Slowed SCV in the digital segment was encountered in 36% of the patients, while the slowing in SCV in the wrist-to-palm segment (across the carpal tunnel) was found in 20% of them. The slowing in the digital segment was more frequently encountered in the advanced stage of the Stockholm sensorineural (SN) stage for hand-arm vibration syndrome: 10% in 0SN (no neurological symptoms) while 56% in 3SN (severe stage). The present study has demonstrated that vibration-induced nerve impairments dominantly exist both in the digits and across the carpal tunnel. Careful neurophysiological assessment is important to confirm the impaired location within the hand.

Sjogaard-G, Sogaard-K. Muscle injury in repetitive motion disorders. **Clin-Orthop.** 1998 Jun(351): 21-31

UNITED-STATES

Documentation of causality between repetitive motions and musculoskeletal disorders calls for detailed understanding of the exposure variables and the corresponding physiologic responses in the biologic tissues. Quantification of the kinetics in some jobs characterized by repetitive motions is summarized with the physiologic responses in the muscles. Muscle activity pattern was studied in different shoulder muscles or muscle parts, and in elbow and wrist flexor muscles. Activity pattern was dependent on the kinetics of the work requirements. This holds true for the compound electromyographic signal and for single motor units. Low threshold motor units have been identified that are recruited continuously, the so called Cinderella fibers. The physiologic consequences of prolonged muscle fiber activity are reviewed, revealing mechanisms for the development of necrotic changes in the muscle, which support the likelihood of work relatedness for musculoskeletal disorders.

Straaton-KV, Fine-PR, White-MB, Maisiak-RS. Disability caused by work-related musculoskeletal disorders. **Curr-Opin-Rheumatol.** 1998 Mar; 10(2): 141-5

UNITED-STATES

This article describes the magnitude, extent, and economic consequences of some of the more common, work-related musculoskeletal disorders. In addition, it provides a brief historic overview of the state-federal vocational rehabilitation program in the United States. It identifies and considers a constellation of risk factors for work-related disability because of musculoskeletal disorders, and it discusses phases of physical rehabilitation as that process relates to injured workers. The shifting disability paradigm is examined, and attention is given to terminology that has become fashionable since passage of the landmark Americans with Disabilities Act of 1990. Finally, various factors and conditions that often become barriers to an injured person's successful return to the workforce are briefly discussed.

1997

Akesson-I, Hansson-GA, Balogh-I, Moritz-U, Skerfving-S. Quantifying work load in neck, shoulders and wrists in female dentists. **Int-Arch-Occup-Environ-Health**. 1997; 69(6): 461-74.

GERMANY

OBJECTIVE: To assess the work load in neck and upper limbs of dentists. METHODS: Twelve right-handed female dentists (six with and six without a history of definite neck/shoulder disorders, pair-wise matched for age) were studied when performing authentic dental work. Electromyography (EMG) was used to quantify the muscular load of the shoulders bilaterally and of the right forearm. Positions and movements of the head and wrists were measured, using inclinometers and electrogoniometers. RESULTS: During work, the median load for the right upper trapezium muscle was 8.4% of the maximal voluntary EMG activity (MVE); during 90% of the time the load was > or = 3.3% MVE ("static" load). The figures were somewhat lower on the left side (7.0% and 2.5% MVE, respectively). Subjects with disorders had over all lower load levels for the trapezius muscles, although not statistically significant at < 0.05, than those without disorders. During a standardized reference contraction for the trapezius, the load was 17% MVE, and the quotient between MVE and torque [normalized to maximal voluntary torque (MVC)] was 0.5. These figures may be used for transformations. The muscular load on the right forearm was similar to the loads on the trapezius. The head was, on average, forward tilted > or = to 39 degrees, and during 10% of the time > or = 49 degrees. The left hand was held in more static positions, with palmar flexion and ulnar deviation, also reflected by lower angular velocities and repetitiveness, as compared with the right one, which was dorsiflexed. CONCLUSIONS: Dentists are exposed to high load on the trapezius muscles bilaterally, and steep, prolonged forward bending of the head. Further, for the wrists the postures were constrained, but the dynamic demands were low.

Doezie-AM, Freehill-AK, Novak-CB, Dale-AM, Mackinnon-SE. Evaluation of cutaneous vibration thresholds in medical transcriptionists. **J-Hand-Surg-Am**. 1997 Sep; 22(5): 867-72.

UNITED-STATES

This study was designed to determine whether vibration thresholds of transcriptionists varied significantly from the thresholds of individuals not exposed to keyboard activities. Using a multifrequency vibrometer, we obtained vibration threshold values from 31 medical transcriptionists who perform work on computer keyboards and compared them to values obtained from 40 control subjects. Thresholds tended to become more abnormal at higher frequencies, although this difference was statistically significant only at frequencies of 125 Hz, 250 Hz, and 500 Hz in the index and small fingers. Vibration thresholds were not found to increase significantly with age or years of occupation. Vibration thresholds were significantly increased in medical transcriptionists at the higher frequencies, suggesting subtle neural dysfunction.

Downs-DG. Nonspecific work-related upper extremity disorders [see comments] **Am-Fam-Physician**. 1997 Mar; 55(4): 1296-302.

UNITED-STATES

The incidence of work-related repetitive motion disorders has increased rapidly during the past 20 years. While it appears that psychosocial factors have contributed largely to the increasing incidence of these disorders, ergonomic factors and other medical conditions also play a role. The most common single diagnostic category of work-related upper extremity disorders is likely to be nonspecific. The presentation and physical findings in patients with these regional myofascial pain syndromes are often characteristic. In most cases, no measurable tissue damage or inflammatory response is found. A traditional medical approach that reduces risk factors, provides symptomatic treatment and utilizes rehabilitative techniques is usually effective in maintaining productivity in patients with nonspecific repetitive motion disorders and, thus, minimizes the personal and economic impact of these disorders.

Higgs-PE, Edwards-DF, Martin-DS, Weeks-PM. Relation of preoperative nerve-conduction values to outcome in workers with surgically treated carpal tunnel syndrome. **J-Hand-Surg-Am**. 1997 Mar; 22(2): 216-21.

UNITED-STATES

Ninety-three workers having undergone carpal tunnel decompression were assessed 16 to 100 months after surgery. The results of outcomes pertaining to symptoms of numbness, nocturnal awakening, and pain as well as job status were compared to the patients' preoperative nerve conduction study findings. Significant differences in preoperative nerve-conduction values (NCVs) were found between groups reporting poor results and those reporting good results. These differences were such that those reporting poor results had more normal NCVs. Those reporting job changes because of carpal tunnel syndrome also had more normal preoperative nerve-conduction results. Data indicate that those with terminal latencies 1 ms greater than the testing facility normal value or with sensory conduction velocity 10 ms less than the facility norm were more likely to benefit from surgery. This study suggests the need for caution when considering carpal tunnel surgery in workers with normal or near normal nerve-conduction results.

Pransky-G, Long-R, Hammer-K, Schulz-LA, Himmelstein-J, Fowke-J. Screening for carpal tunnel syndrome in the workplace. An analysis of portable nerve conduction devices. **J-Occup-Environ-Med**. 1997 Aug; 39(8): 727-33.

UNITED-STATES

Several devices have been developed for rapid motor or sensory median nerve conduction testing. We evaluated the validity and reliability of the Neurosentinel (NS) and NervePace (NP) electroneurometer for sensory and motor testing, respectively, compared with formal electrodiagnostic studies (EDS), and examined their potential role in workplace screening for carpal tunnel syndrome (CTS). Thirty-two working subjects without CTS were examined and tested with the NS, NP, and EDS, and retested one week later. Subjects were selected who did not have CTS, other hand or nerve problems, or jobs with significant ergonomic risks, in order to decrease the likelihood of changes over time in median nerve function. Mean correlations of NP and NS with EDS latencies ranged from r = 0.069 to r = 0.85, with somewhat better correlation for NS (sensory) than NP (motor). Test-retest reliability was greatest for motor EDS (r = 0.86 to 0.91) and similar for sensory EDS, NS, and NP (r = 0.72 to 0.79); mean results were very similar. Based on the observed relationship between NS or NP and EDS results, confidence intervals were calculated to represent the range of EDS results consistent with a single NS or NP measurement. These intervals ranged from +/- 0.3 milliseconds (ms) for NS to +/- 0.6 msec for NP, with similar ranges for change over time in an individual. The magnitude of these intervals for a single test or individual implies that the NS and NP are unlikely to identify individuals with CTS or to detect changes over time that are not accompanied by symptoms or signs. The screening devices are not likely to be useful in confirming early CTS, when single latency values may be normal, and detailed EDS may be necessary to detect nerve entrapment. Compared with EDS, these devices have moderate validity and similar reliability; they are probably most useful for cross-sectional or longitudinal studies of groups, but care must be taken in using them for pre-placement or surveillance tests of individual workers. False-positive results may lead to discrimination, inappropriate referrals and interventions; false-negative tests can result in inappropriate reassurance and missed opportunities for intervention.

Rayan-GM. Compression neuropathies, including carpal tunnel syndrome. **Clin-Symp**. 1997; 49(2): 2-32.

UNITED-STATES

Winzeler-S., Rosenstein-B.D. Orthopedic Problems of the Upper Extremities. Assessment and Diagnosis. **AAOHN Journal** 1997; 45 (4) : 188-200.

Orthopedic (musculoskeletal) problems of the upper extremities were reviewed, and the role of occupational health nurses in dealing with cumulative trauma disorders (CTDs) and other upper extremity musculoskeletal problems was summarized. The anatomic characteristics of the major structures of the neck and upper extremities were described. The general pathological and etiologic aspects of CTDs of the upper extremities were discussed. CTDs of the upper extremities can be classified as nerve compression syndromes, tendinitis, and conditions arising from cervical nerve root compression. Nerve compression syndromes develop as a result of the venous return being obstructed by static postures and tendon sheaths being enlarged due to swelling and fractures. Tendinitis results from microtearing of tendinous insertions due to overuse or strains of the muscles. Cervical nerve root compression results from deterioration of disks in the cervical

spine and can result in a variety of sensory and motor symptoms and areas of pain in the shoulders, upper arms, and inner forearm down to the little finger. Specific musculoskeletal disorders in the neck and upper extremities were discussed, including cervical nerve root compression, rotator cuff tendinitis, adhesive capsulitis (frozen shoulder), lateral epicondylitis, medial epicondylitis, entrapment neuropathies of the median and ulnar nerve, compressive neuropathies of the radial nerve, thoracic outlet syndrome, wrist tendinitis, ulnar sided pain, and cysts. These problems can be caused by awkward work postures, static loading of muscles, and repetitive motions. The evaluation of CTDs and other problems of the upper extremities was discussed. An evaluation should consist of obtaining a thorough medical history and performing a physical examination that focuses on the neck and upper extremities. Treating CTS and other upper extremity musculoskeletal problems was discussed.

1996

Cobb-TK, Cooney-WP, An-KN. Aetiology of work-related carpal tunnel syndrome: the role of lumbrical muscles and tool size on carpal tunnel pressures. **Ergonomics**. 1996 Jan; 39(1): 103-7.

ENGLAND

A cadaveric study was undertaken to investigate the effect of tool size and lumbrical muscle incursion on carpal tunnel pressure during active grip. Active grip was simulated by securing the specimens on an apparatus and loading each of the eight finger flexor tendons with 1 kg each. Carpal tunnel pressures were measured with and without 1- and 2-in. tubing in the hand and before and after removing the lumbrical muscles. Both variables, tool size and lumbrical muscles, were found to have a statistically significant effect on carpal tunnel pressure. Higher pressure changes were found for the 2-in. tubing, compared with 1-in. tubing, but this difference was not statistically significant.

Crook-J, Moldofsky-H. The clinical course of musculoskeletal pain in empirically derived groupings of injured workers. **Pain.** 1996 Oct; 67(2-3): 427-33

NETHERLANDS

The purpose of this paper is to examine the clinical course of musculoskeletal, soft tissue, work-related injury. An analysis of empirically derived sub-groupings of workers based on prognostically important pain and disability variables assessed on enrollment into the study is described. Multidimensional time-dependent profiles are used to characterize stages in the development of pain, impairment, disability and handicap. The clinical course over the 18 months of study of the three subgroups is examined. The conceptual model, used to examine the workers' changing responses over time, is based on the World Health Organization Classification of Impairments, Disabilities and Handicaps (1980). Methodologically, the study employed a prospective longitudinal design. A randomly selected cohort of workers who had not returned to work by 3 months post-injury were identified from the files of the Workers' Compensation Board of Ontario. The workers were interviewed and examined on enrollment into the study at 3 months and subsequently at 9 months, 15 months and 21 months after injury. The outcomes were return to work or continued work disability. The results are based on those 104 workers who attended all four assessment periods. K means clustering was used to identify homogenous subgroups of workers. Repeated measures ANOVAs were used to characterize the stages of development of pain, impairment, disability and handicap. Duncan's multiple range test was used to compare pairs of means at each assessment period. Cluster groupings, based on three prognostically important clinical variables, number of pain sites, pain behavior and functional disability, obtained at the initial assessment were valid predictors of the number of days to return to work and total number of days on work disability. Prognostic stratification can enhance confidence in predictive decisions of clinical practice and improve clinical trials of therapy.

Fernstrom-EA, Ericson-MO. Upper-arm elevation during office work. **Ergonomics**. 1996 Oct; 39(10): 1221-30.

ENGLAND

The present aim was to measure and quantify upper-arm elevation and to find how changed work organization and work tasks influence arm movement during a working day. Sixteen female office

workers participated in the study. Their main work was statistical data entry. Upper-arm elevation was measured on two occasions separated by 18 months, i.e., before and after a change of work organization. The measurements were performed during the whole of one ordinary working day. The differences between the two measurements were mostly non-significant. Arm elevation remained essentially below 30 degrees during the main time of the working day, and the subjects worked with limited arm movements. Despite new alternative office tasks, they did not achieve a change in their habitual arm postures, or in their neck-and-shoulder disorders.

Moore-LE, Wiesner-SL. Hypnotically-induced vasodilation in the treatment of repetitive strain injuries. **Am-J-Clin-Hypn**. 1996 Oct; 39(2): 97-104.

UNITED-STATES

The study examined the effectiveness of behaviorally-induced vasodilation (hypnosis with biofeedback and autogenics) in the treatment of upper extremity repetitive strain injuries (RSI). Thirty patients with recent onset of upper extremity RSI symptoms were randomly assigned to 1 of 2 treatment conditions, i.e., hypnotically-induced vasodilation or a waiting-list control. Treatments were given on an individual basis, once a week for 6 weeks. Patients in the treatment condition showed highly significant increases in hand temperature between pre- and post-treatment. Patients in the treatment condition also showed highly significant reductions in pain in comparison to the waiting list condition.

Mouze-Amady-M, Horwat-F. Evaluation of Hjorth parameters in forearm surface EMG analysis during an occupational repetitive task. **Electroencephalogr-Clin-Neurophysiol**. 1996 Apr; 101(2): 181-3.

IRELAND

The Hjorth parameters are normalized slope descriptors (NSDs) usually used in sleep EEG processing for data reducing and/or automatic sleep stage scoring. In the present study NSDs of forearm surface EMG recorded from 9 subjects performing occupational repetitive movements are compared to conventional FFT spectral analysis. The correlation coefficients between the NSD labelled mobility and the FFT mean frequency range from 0.81 to 0.93. Results show that these time domain properties can also describe the spectral content of surface EMG during repetitive movements. Moreover, the NSD method offers a low cost calculation time since it is based on the sole concept of variance.

Murata-K, Araki-S, Okajima-F, Saito-Y. Subclinical impairment in the median nerve across the carpal tunnel among female VDT operators. **Int-Arch-Occup-Environ-Health**. 1996; 68(2): 75-9.

GERMANY

Sensory nerve conduction velocities in the palm-to-finger (SCV-pf), wrist-to-finger (SCV-wf), wrist-to-palm (SCV-wp), and wrist-to-elbow (SCV-we) segments and the distribution of nerve conduction velocities in the right median nerve were determined among 27 female operators aged 19-37 and 19 healthy women (controls) aged 19-31 to estimate the prevalence of subclinical carpal tunnel syndrome (CTS). Also, the WF/PF ratio, dividing the SCV-wf by the SCV-pf, was calculated to assess abnormalities of nerve conduction within the carpal tunnel. The operators were engaged in data entry in front of a visual display terminal (VDT) for about 6 h/day, and their working duration was between 1 and 17 (mean 6) years. The SCV-wf, SCV-wp, and WF/PF ratio in the operators were significantly lower than those in the controls. The rate of persons with the WF/PF ratio of less than 90%, i.e., below normal limits in the 19 controls, was significantly higher in the operator group (37%) than in the control group (0%). The operators complained of more symptoms related to CTS than did the controls, but any symptoms were not associated with slowing of nerve conduction velocities in the operators. In the controls, the WF/PF ratio was not closely correlated with skin temperature or age despite the presence of significant relations between skin temperature and the SCV-wf, SCV-pf, and SCV-wp; the interpersonal variability of the WF/PF ratio was much smaller than that of all SCVs. In the light of the present and previous studies, the rate of VDT operators with subclinical CTS seems to be high, independent of its symptoms. Also, the WF/PF ratio will be a useful and reliable screening method for the early detection of CTS due to repetitive wrist and finger movements involved in work.

Pierre-Jerome-C, Bekkelund-SI, Mellgren-SI, Torbergsen-T. Quantitative magnetic resonance imaging and the electrophysiology of the carpal tunnel region in floor cleaners. **Scand-J-Work-Environ-Health**. 1996 Apr; 22(2): 119-23.

FINLAND

OBJECTIVES: The purpose of this study was to evaluate possible structural changes of the wrist and subclinical damage in the median nerves of healthy floor cleaners. METHODS: Twenty-four cleaners and 19 referents (noncleaners), all women, underwent bilateral magnetic resonance (MR) wrist examination and nerve conduction studies. They were all randomly selected from an occupational health service. From MR images the volumes of the wrist, carpal tunnel, and thenar and hypothenar muscles were calculated, as well as the signal intensity of the median nerve, bilaterally. RESULTS: No significant difference in the volume of the carpal tunnel was found in the two groups. The relative signal intensity of the median nerve was 0.55 for the cleaners and 0.48 for the referents (P = 0.05). The mean nerve conduction velocity values were 55.2 m.s-1 for the right median nerve of the cleaners and 57.4 m.s-1 for the right median nerve of the referents (P = 0.03). The median nerve of the cleaners had a mean sensory amplitude of 128.2 microV compared with 162.8 microV for the referents (P = 0.01). There was a tendency towards a longer distal latency of the median nerve in the cleaner group. CONCLUSIONS: This study revealed subclinical intrinsic damage to the median nerve, as demonstrated by MR, and poorer electrophysiological nerve function among workers at high risk (cleaners) compared with workers at lower risk (noncleaners).

Silverstein-B.A., Hughes-R.E. Upper extremity musculoskeletal disorders at a pulp and paper mill**.** **Applied Ergonomics** 1996; 27 (3) : 189-194.

A small cross-sectional study of upper extremity disorders was conducted in two departments of a pulp and paer mill. The objective of the study was to determine the prevalence of upper extremity disorders and identify any associated work place risk factors in long cycle jobs with multiple tasks of varying duration. Physical examinations and health status interviews were conducted on 23 employees (77%) in the paper machine department and on 17 employees (59%) of the power and recovery department. All participants completed questionnaires on physical and psychosocial job characteristics. There was a statiscally significant difference in hand wrist disorders between the two departments at the p < 0,05 level (34% in the power and recovery department, and 5,9% in the paper machine area). Multiple logistic regression models showed a significant relationship between the use of a steel lance and shoulder disorders. Elbow arthritis was also associated with lance usage. There was evidence that the job analysis was not able to fully describe the risk factors present in the paper machine department. Biomechanical exposures existing prior to the time of the study may not heve been adequately characterized. An important aspect of this study is that the jobs studied were not typical repetitive jobs that are commonly studied.

1995

Bovenzi-M, Griffin-MJ, Ruffell-CM. Vascular responses to acute vibration in the fingers of normal subjects. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 15-8.

CZECH-REPUBLIC

The aim of this experimental study was to investigate the pathophysiological mechanisms involved in the acute effects of unilateral vibration on the digital circulation of healthy men. In the fingers of both hands of eight male subjects (age 23-47 years) who had never worked with vibrating tools, finger blood flow (FBF) and finger skin temperature (FST) in thermoneutral conditions, and the percentage change of finger systolic pressure (FSP %) after local cooling from 30 to 10 degrees C were measured. The right hand was exposed for 30 min to sinusoidal vibration with a frequency of 125 Hz and an acceleration of 87.5 m.s.-2r.m.s. A control condition consisted of exposure to the same static load (10 N) but without vibration. The measures of digital circulation were taken before exposure to vibration and static load and at 0, 30, 60, and 90 min after the end of each exposure. Exposure to static load caused no significant changes in FBF, FST, or FSP % in either the test right or the control left finger. Immediately after vibration, there was a temporary increase in FBF in the vibrated right finger, while the non-vibrated left finger exhibited no vasodilation. In both the vibrated and non-vibrated fingers, FBF and FST significantly reduced during the recovery time. A large inter-subject variability was observed for FBF and, to a lesser extent, for FST. In the vibrated right finger the decrease in blood flow was significantly related to cold-induced vasoconstriction in

the digital vessels. Such a relation was not observed in the non-vibrated left finger. The results of this investigation suggest that acute vibration can disturb the function of digital vessels through two different and opposite mechanisms. Vibration appears to produce local vasodilation and to trigger a central sympathetic reflex vasoconstriction which can be recorded in the ipsilateral and the contralateral finger to vibration. Both local and central vasoconstrictor mechanisms are likely to be involved in the response to cold observed in the digital vessels of a vibrated finger.

Bystrom-S, Hall-C, Welander-T, Kilbom-A . Clinical disorders and pressure-pain threshold of the forearm and hand among automobile assembly line workers. **J-Hand-Surg-Br**. 1995 Dec; 20(6): 782-90.

SCOTLAND

The prevalence of forearm and hand disorders was examined by questionnaire and clinical examination in 199 automobile assembly line workers and in 186 controls. The pressure-pain threshold, hand grip force and hand anthropometry were also studied. There was an increased prevalence of de Quervain's disease for male automobile assembly line workers, and of carpal tunnel syndrome in female workers. The prevalence of symptoms in the forearm and hand during the last 7 days were twice as high among automobile assembly line workers than controls for both men and women. The occurrence of symptoms in the last 7 days was associated with de Quervain's disease, carpal tunnel syndrome and sick-leave due to forearm or hand problems, and it also influenced activities of daily living. Hand grip strength and anthropometrics were not associated with findings in the clinical examination or the occurrence of symptoms in the last 7 days. Low pressure-pain threshold was not associated with findings in the clinical examination, except for reported occurrence of symptoms in the last 7 days for women. Pressure-pain threshold as an indicator of tissue damage is discussed.

Cobb-TK, An-KN, Cooney-WP. Effect of lumbrical muscle incursion within the carpal tunnel on carpal tunnel pressure: a cadaveric study [see comments] Comment in: J Hand Surg [Am] 1996 Jan;21(1):**152 J-Hand-Surg-Am.** 1995 Mar; 20(2): 186-92

UNITED-STATES

Lumbrical muscle incursion within the carpal tunnel has been implicated as a possible cause of carpal tunnel syndrome. During finger flexion, surgeons have observed the presence of lumbrical muscles in the carpal tunnel. However, the significance of this incursion has not been evaluated. To evaluate the effect of lumbrical muscle incursion within the carpal tunnel as a cause of carpal tunnel syndrome, carpal canal pressures were measured in cadaver hands at the level of the hamate hook for four finger positions: (1) 100% finger flexion; (2) 75% finger flexion; (3) 50% finger flexion; and (4) full extension. After measuring carpal tunnel pressures for each position, the lumbrical muscles were excised and the pressures were again recorded. A progressive increase in carpal tunnel pressure was noted for each degree of finger flexion in the group with intact lumbricals. This is in sharp contrast to a relatively stable carpal tunnel pressure during finger flexion for the group without lumbrical muscles. Two-way repeated measures analysis of variance revealed a significant difference in carpal tunnel pressure for both variables, lumbrical muscles and finger position. One-way repeated measures analysis of variance for carpal tunnel pressures demonstrated that the effect of finger position was significant for the group with intact lumbricals but not for the group with lumbricals removed. We conclude that lumbrical muscle incursion into the carpal tunnel can result in elevation of carpal tunnel pressure in cadaver hands and could be a variable in the cause of work-related carpal tunnel syndrome.

Cohen-M.L., Sheather-Reid-R.B., Arroyo-J.F, Champion G.D. Evidence for abnormal nociception in fibromyalgia and repetitive strain injury. **J. Musculoskelet. Pain.** 1995; 3 (2) : 49-57.

Objectives: To study psychophysical changes in fibromyalgia and repetitive strain injury, respectively diffuse and regional cervicobrachial musculoskeletal pain syndromes. The clinical phenomena of tenderness (hyperalgesia) in particular but also dysesthesia, paresthesia and motor dysfunction occurring in the absence of tissue damage or disease suggest that altered nociception may be relevant to the pathogenesis of these disorders. Methods: Non-noxious electrocutaneous stimulation in the upper limbs of patients with these syndromes was used as a psychophysical tool. Results: No difference in the threshold for sensory perception but marked reduction in pain

threshold and pain tolerance were found in patients compared with control subjects. Furthermore, the electrocutaneous stimulation was accompanied by spread and persistence of dysesthesia, in painful limbs only. Conclusion: These upper limbs were thus defined psychophysically as well as clinically as regions of secondary hyperalgesia, which may imply that perturbation of central nociceptive mechanisms is involved in the pathogenesis of these syndromes.

Dell'Omo-M, Muzi-G, Cantisani-TA, Ercolani-S, Accattoli-MP, Abbritti-G. Bilateral median and ulnar neuropathy at the wrist in a parquet floorer. **Occup-Environ-Med**. 1995 Mar; 52(3): 211-3.

ENGLAND

Many cases of work related compression neuropathy of the ulnar and median nerves at the wrist have been described. This report presents a case of bilateral distal neuropathy of the median and ulnar nerves in a parquet floorer, who laid wooden block flooring by hand and used the palms and volar surface of both hands to hit the blocks into place. He also used an electric sander and polisher. Bilateral numbness and paraesthesias in all fingers had been present for about one year. Clinical examination was normal; the neurological assessment indicated slight impairment in response to tactile, heat, and pain stimuli in all 10 fingers. Electroneurography showed increased distal motor latencies of median and ulnar nerves at both wrists, although the lower limbs were normal. The results of blood, urine, and instrumental tests excluded systemic disease or local factors that could cause compression neuropathy. After stopping work for three months, the clinical picture and electroneurographic results improved. These data support the hypothesis that the damage to the median and ulnar nerves had been caused by the patient's way of working, which provoked repeated bilateral microtrauma to his wrists. To diagnose work related multiple neuropathy can be difficult and an accurate work history is necessary. Preventive measures and diligent health care are required for this category of worker.

Gerr-F, Letz-R, Harris-Abbott-D, Hopkins-LC. Sensitivity and specificity of vibrometry for detection of carpal tunnel syndrome. **J-Occup-Environ-Med**. 1995 Sep; 37(9): 1108-15.

UNITED-STATES

A cross-sectional study was performed to assess the utility of vibrotactile thresholds (VTs) obtained before and after a 10-minute period of wrist flexion as a method for detection of carpal tunnel syndrome (CTS) among adult subjects. Subjects with hand discomfort were recruited from patients referred to a university-based electromyography laboratory. Asymptomatic subjects were recruited from among office and technical staff at a professional school. In addition to electrophysiologic evaluation (EP), all subjects were offered VT measurement of the index and small fingers, bilaterally, before and after a 10-minute period of wrist flexion. A total of 144 subjects were recruited, and three hand-condition groups were established: 57 hands had symptoms and EP results compatible with CTS (Group 1), 58 hands had symptoms compatible with CTS and normal EP results (Group 2), and 123 hands had no symptoms and normal EP results (Group 3). Group 1 was considered the "disease-positive" group, and Groups 2 and 3 were both considered "disease-negative" groups. Analyses were performed separately for dominant and nondominant hands, and results were pooled when appropriate. Outcomes of interest were the VTs obtained from the index and small fingers before and after 10 minutes of maximal voluntary wrist flexion as well as variables calculated from them. Significant differences in mean VT were observed between the three hand-condition groups for most of the outcomes evaluated. At any given level of specificity, the sensitivity of vibrometry performed after 10 minutes of wrist flexion was approximately two times that obtained before wrist flexion for detection of electrophysiologically confirmed CTS.(ABSTRACT TRUNCATED AT 250 WORDS)

Gross-AS, Louis-DS, Carr-KA, Weiss-AS. Carpal tunnel syndrome: a clinicopathologic study. **J-Occup-Environ-Med**. 1995 Apr; 37(4): 437-41.

UNITED-STATES

We evaluated 44 patients with carpal tunnel syndrome and performed histological evaluations of tenosynovium taken at the time of carpal tunnel release. Age, disease and work history, radiographs, and outcome were assessed. The clinical parameters were then compared with the histologic features to determine if the histology was predictive of the clinical course of carpal tunnel syndrome. We found no significance in the histologic changes in patients with carpal tunnel

syndrome when age, duration of symptoms, work history, radiographs, and outcome were evaluated.

Hedge-A, Powers-JR. Wrist postures while keyboarding: effects of a negative slope keyboard system and full motion forearm supports. **Ergonomics**. 1995 Mar; 38(3): 508-17.

ENGLAND

Video-motion analysis was used to analyse hand/wrist posture for subjects typing at a 101-key QWERTY keyboard on a 68 cm high worksurface. Three conditions were tested: subjects typed at the keyboard without arm support, subjects typed with adjustable full motion forearm supports, and subjects typed with an adjustable negative slope keyboard support system. The average declination of the negative slope keyboard support chosen by subjects was 12 degrees below horizontal, which flattened the angle of the key tops. Ulnar deviation was comparable in all conditions and averaged 13 degrees for the right hand and 15 degrees for the left hand. Full motion forearm supports did not significantly affect any postural measures. Dorsal wrist extension averaged 13 degrees when typing with or without the full motion forearm supports, but this was reduced to an average -1 degree with the use of the negative slope keyboard support system. Subjects chose to sit at a distance of 79 cm from the computer screen when using the negative slope keyboard system compared with 69 cm without this.

Himmelstein-JS, Feuerstein-M, Stanek-EJ-3rd, Koyamatsu-K, Pransky-GS, Morgan-W, Anderson-KO. Work-related upper-extremity disorders and work disability: clinical and psychosocial presentation. **J-Occup-Environ-Med**. 1995 Nov; 37(11): 1278-86.

UNITED-STATES

Work-related upper-extremity disorders (WRUEDs) are an increasingly common cause of work-related symptoms and disability. Although most upper-extremity disorders are acute and self-limited, a small percentage of workers with symptoms go on to permanent disability and account for the majority of costs associated with these conditions. Little is known, however, about this progression from symptoms to disability and how it might be prevented. In this study, we evaluate the demographic, vocational, medical, and psychosocial characteristics of patients with WRUEDs and examine several hypotheses regarding the differences between working and work-disabled patients. One hundred twenty-four consecutive patients were evaluated in a clinic specializing in occupational upper-extremity disorders. Patients currently working (n = 55) and work-disabled patients (n = 59) were similar with regard to age, gender, and reported job demands. The work-disabled group reported less time on the job, more surgeries, a higher frequency of acute antecedent trauma, and more commonly had "indeterminate" musculoskeletal diagnoses. They also reported higher pain levels, more anger with their employer, and a greater psychological response or reactivity to pain. These findings, though cross-sectional in nature, suggest that, in addition to medical management, more aggressive approaches to pain control, prevention of unnecessary surgery, directed efforts to improve patients' abilities to manage residual pain and distress, and attention to employer-employee conflicts may be important in preventing the development of prolonged work disability in this population.

Jeng-OJ, Radwin-RG. A gap detection tactility test for sensory deficits associated with carpal tunnel syndrome. **Ergonomics.** 1995 Dec; 38(12): 2588-601

ENGLAND

An automated gap detection tactility test was investigated for quantifying sensory deficits associated with carpal tunnel syndrome (CTS). The test, which involved sensing a tiny gap in an otherwise smooth surface by probing with the finger, had functional resemblance to many work-related tactile activities such as detecting scratches or surface defects. Gap detection thresholds were measured using the converging staircase method of limits paradigm. Sixteen normal subjects between 21 and 66 years of age were tested for studying important factors affecting gap detection thresholds. Actively probing with the index finger had a threshold almost an order of magnitude more sensitive (mean = 0.19 mm, SD = 0.11 mm) than passive touch (mean = 1.63 mm, SD = 0.62 mm), which was similar to two-point discrimination. Average thresholds decreased by 24% as contact force increased from 25 to 75 g. Performance in this tactility test quickly stabilized and showed little learning effects over the period of the test, as evidenced by the lack of significant

differences between six replicates. The results were highly repeatable. No significant threshold differences were observed between test and retest trials on different days, or between dominant and non-dominant hands. A contact force of 50 g was recommended as optimal for this test since it required moderate force but resulted in a smaller threshold compared with 25 or 75 g. A companion study was conducted using eight normal subjects and ten subjects diagnosed as having CTS. Average gap detection threshold, when finger probing was allowed, was 0.20 mm (SD = 0.11 min) for the normal subjects and increased two-fold to 0.40 mm (SD = 0.19 mm) for the CTS subjects. Average gap detection threshold, when the finger probing was not allowed, was 1.71 mm (SD = 0.53 mm) for the normal subjects and increased by 48% to 2.53 mm (SD = 0.87 mm) for the CTS subjects. The results suggest that people suffering from CTS may experience similar functional deficits in daily living and work activities. The small inter-subject variability makes this test a candidate for having utility as a monitoring test for loss of cutaneous tactile sensitivity.

Lam-SJ. Repetitive strain injury (RSI) or cumulative trauma disorder (CTD) as legal and clinical entities. he need for a total reappraisal of this concept as being occupationally caused and therefore compensatable. **Med-Sci-Law**. 1995 Oct; 35(4): 279-86.

ENGLAND

Maizlish-N, Rudolph-L, Dervin-K, Sankaranarayan-M. Surveillance and prevention of work-related carpal tunnel syndrome: an application of the Sentinel Events Notification System for Occupational Risks. **Am-J-Ind-Med**. 1995 May; 27(5): 715-29.

UNITED-STATES

In response to limitations in state-based, occupational disease surveillance, the California Department of Health Services developed a model for provider- and case-based surveillance of work-related carpal tunnel syndrome. The objectives were to enhance case reporting, identify risk factors and high-risk work sites, and link preventive interventions to work sites and the broader community. Using elements from surveillance of communicable diseases and sentinel health events, a model was integrated into the pre-existing reporting system in one California county. Between 1989 and 1991, 54 Santa Clara County health care providers reported 382 suspected cases, of which 365 from 195 work sites met reporting guidelines. Risk factors were profiled from interviews of 135 prioritized cases and 38 employers. Of 24 work sites prioritized for a free, voluntary, nonenforcement inspection, 18 refused and 6 completed an on-site visit. Sentinel Event Notification System for Occupational Risks (SENSOR) captured many cases not reported to the pre-existing reporting system. Case interviews indicated a profile of symptoms and signs, treatment, and exposure to uncontrolled occupational risk factors, including a lack of training on ergonomics hazards. Employer health insurance, rather than workers' compensation, was the apparent source of payment for most medical bills. Employers lacked knowledge and motivation to reduce ergonomic risks. Governmentally mandated occupational ergonomics standards are urgently needed.

Mendes-R. **Patologia do trabalho.** São Paulo : Atheneu; 1995. 643 p. ilus, tab.

BRASIL

Compêndio de Medicina do Trabalho, apresentando sua história, conceito atualizado e tudo que se refere à saúde do trabalhador. O uso do termo "patologia do trabalho", significa uma mudança de visão em relação às doenças profissionais, abrangendo novos aspectos e ampliando a abordagem da saúde do trabalhador. Contém informações sobre doenças ocupacionais do sistema respiratório, dermatoses ocupacionais, lesões por esforços repetitivos, coluna vertebral, sangue e órgãos formadores, sistema imunológico, sistema nervoso, psicopatologia e psicodinâmica do trabalho, aparelho cardiovascular, rins e trato urinário, aparelho digestivo, audição, efeitos do trabalho sobre a reprodução, acidentes do trabalho, trabalho em turnos, câncer, pressão hiperbárica, intoxicações exógenas e perspectivas ambientais.

Oberg-T, Karsznia-A, Sandsjo-L, Kadefors-R. Work load, fatigue, and pause patterns in clinical dental hygiene. **J-Dent-Hyg**. 1995 Sep-Oct; 69(5): 223-9.

UNITED-STATES

PURPOSE: Previous studies have suggested that high frequencies of shoulder and neck complaints in dental hygienists mainly were due to longstanding, low-level static load of the neck and shoulder muscles. The purpose of the present study was to make continuous recordings of myoelectric signals from the shoulder muscles of dental hygienists in order to assess static load. METHODS: Myoelectric signals were recorded from the right trapezius muscle of 10 Swedish dental hygienists during half of a normal working day. A portable system for collection and on-line processing of myoelectric signals was used. Signal parameters were obtained, indicating muscular load, fatigue, pause frequency, and pause duration, respectively. All measurements were referred to a resting value and a reference contraction value established with the hand loaded with a 0.5 kg weight at the beginning of the recording session. RESULTS: A static load of 50 to 100% of the reference contraction (0.5 kg hand load with raised arm) was found in the trapezius muscle. The median load for the whole group was 57% of the reference level. Group data analyses of frequency EMG seldom showed significant fatigue. At individual levels, however, it was possible to identify localized muscle fatigue and relate it to a specific work task. There were many short pauses with a duration of 1 to 2 seconds, but an almost total lack of pauses of a duration longer than five seconds. CONCLUSIONS: Individual dental hygienists exhibited significant muscle fatigue that might be related to development of work related myalgias of the shoulder muscles. Future study of muscle patterns and dental hygiene tasks may lead to improved work designs and patterns for dental hygienists.

Ranney-D, Wells-R, Moore-A . Upper limb musculoskeletal disorders in highly repetitive industries: precise anatomical physical findings. **Ergonomics**. 1995 Jul; 38(7): 1408-23.

ENGLAND

Physical assessment of 146 female workers in highly repetitive jobs found 54% to have evidence of musculoskeletal disorders in the upper limb that are potentially work-related. Many workers had multiple problems, and many were affected bilaterally (33% of workers). Muscle pain and tenderness was the largest problem, both in the neck/shoulder area (31%) as expected and in the forearm/hand musculature (23%), a previously unreported site. Most forearm muscle problems were found on the extensor side. Carpal tunnel syndrome was the most common form of neuritis with 16 people affected (7 people affected bilaterally). De Quervain's tenosynovitis and wrist flexor tendinitis were the most commonly found tendon disorders in the distal forearm (12 people affected for each diagnosis). The results suggest that exposure should be measured bilaterally. They also suggest that muscle tissue is highly vulnerable to overuse. Stressors that affect muscle tissue, such as static loading, should be studied in the forearm as well as in the shoulder.

Sakakibara-H, Yamada-S. Vibration syndrome and autonomic nervous system. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 11-4.

CZECH-REPUBLIC

It is well known that hand-arm vibration affects the hand and arm which are directly exposed to vibration. However, through the sympathetic nervous system, hand-arm vibration can affect the foot which is not directly exposed to vibration. Hand-arm vibration activates the sympathetic nervous system, and induces vasoconstriction in the four extremities. And patients with vibration syndrome have circulatory disturbances of the foot as well; some patients had Raynaud's phenomenon of both fingers and toes, those with VWF were likely to complain of coldness in the feet as well as the hands, and had low skin temperature of the fingers and toes. In addition, arterial pathological changes like medial muscular hypertrophy have been observed in both fingers and toes of the patients. Prolonged repeated vasoconstriction of the foot induced by hand-arm vibration through the sympathetic nervous system is supposed to result in arterial changes like medial muscular hypertrophy in the foot and eventually circulatory disturbances of the feet. Hyperactivity of the sympathetic nervous system to cold, which is shown in patients with VWF, also probably contributes to the foot disturbances. The effect of hand-arm vibration through the sympathetic nervous system should be considered in hand-arm vibration syndrome.

Sposato-RC, Riley-MW, Ballard-JL, Stentz-TL, Glismann-CL. Wrist squareness and median nerve impairment. **J-Occup-Environ-Med**. 1995 Sep; 37(9): 1122-6.

UNITED-STATES

Previous research indicated that a wrist-squareness ratio (thickness/width) greater than .7 is likely to indicate a median nerve sensory latency greater than 3.7 ms, usually a predictor of carpal tunnel syndrome (CTS). In this study, wrist thicknesses and widths were measured and wrist-squareness ratios were calculated for a sample of 417 railroad maintenance workers. Electrodiagnostic testing, in accordance with American Academy of Electrodiagnostics Medicine guidelines, was performed on both motor and sensory fibers of the median nerve to evaluate subjects for the presence of median nerve impairment typical of CTS. Results of this study indicate that wrist squareness is not a useful predictor of median nerve impairment typical of CTS in the railroad maintenance workers tested.

Young-VL, Seaton-MK, Feely-CA, Arfken-C, Edwards-DF, Baum-CM, Logan-S. Detecting cumulative trauma disorders in workers performing repetitive tasks. **Am-J-Ind-Med**. 1995 Mar; 27(3): 419-31.

UNITED-STATES

On-site testing of 157 poultry processors disclosed that 50% had three or more abnormal upper extremity findings out of a total of 22 possibles. The average worker had five to six abnormal findings. Impaired pinch strength, decreased vibration sensitivity in the fingertips, and reports of current numbness were the most prevalent. Of workers with signs, 25% reported no symptoms, whereas only 8% of workers reported symptoms but had no signs. The investigators concluded that this measurement method has utility for assessments of worker populations to determine prevalence of CTDs and, potentially, for preclinical detection of these disorders to permit early intervention, reduce medical costs, and minimize disability. The need for accurate measurement to enhance early detection and prevention is discussed.

1994

Bystrom-S, Fransson-Hall-C. Acceptability of intermittent handgrip contractions based on physiological response. **Hum-Factors**. 1994 Mar; 36(1): 158-71.

UNITED-STATES

Our aim was to study physiological response and acceptability of intermittent muscle contractions. Seven male subjects performed eight isometric handgrip exercises with altered contraction-relaxation periods but identical tension-time products. Local blood flow (BF), heart rate, blood pressure, electromyography, maximal voluntary handgrip contraction (MVC), and venous concentration of potassium and lactate of both forearms were followed during and up to 24 hours after the exercises. Wrist force response to electrical stimulation of a forearm muscle was used to investigate low-frequency fatigue (LFF). Ratings of perceived exertion were recorded during exercise. LFF was associated with a decreased functional capacity, which may be explained by a net potassium loss. Recovery BF was linearly related to mean contraction intensity of the experiments. Physiological criteria for acceptability of isometric exercise are suggested, based on the absence of fatigue during exercise and the return to baseline values within four hours of the recovery period. Based on these physiological criteria, intermittent handgrip contractions at (or higher than) a mean contraction intensity of 17% MVC and continuous handgrip contractions at (or higher than) 10% MVC were considered unacceptable.

Franzblau-A, Werner-RA, Johnston-E, Torrey-S. Evaluation of current perception threshold testing as a screening procedure for carpal tunnel syndrome among industrial workers [see comments] **J-Occup-Med**. 1994 Sep; 36(9): 1015-21

UNITED-STATES

Eighty-four workers participated in a work-site screening program designed, in part, to estimate the prevalence of carpal tunnel syndrome (CTS). Each worker completed a discomfort survey, limited electrodiagnostic testing of the median and ulnar sensory nerves in each wrist, and current perception threshold (CPT) testing in the right 2nd digit using the NEUROMETER CPT device. A subset of study participants also completed CPT testing in digit 5 on the right (n = 33). Comparisons were made among the CPT results, symptoms consistent with CTS, and electrophysiologic findings. The CPT results correlated poorly with electrophysiologic parameters from the same nerve distribution, and CPT results were statistically unrelated to self-reported

symptoms that may be suggestive of CTS. The test performance characteristics of CPT testing (sensitivity, specificity, positive predictive value, and negative predictive value) were low in comparison with electrodiagnostic measurements and self-reported symptoms consistent with CTS. The electrophysiologic results were significantly associated with the constellation of symptoms that are consistent with CTS. On the basis of these results, CPT testing cannot be recommended as a screening procedure for identification of possible cases of CTS among active industrial workers.

Harber-P, Hsu-P, Pena-L. Subject-based rating of hand-wrist stressors. **J-Occup-Med**. 1994 Jan; 36(1): 84-9.

UNITED-STATES

Subject-based rating (SBR) methods (eg, Borg Scales) have been applied to lifting and exertion estimation. SBR methods were applied to hand-wrist motions in this controlled experimental study of rapid motion. Seven normal volunteers performed lift actions with several combinations of wrist position (flexion-extension), repetition frequency, force, and grip type (precision vs power) using an experimental apparatus. Wrist position and frequency were confirmed using an electrogoniometer. Subjects rated the tasks along 5 scales. Analysis showed that grip type had the predominant effect on the subjective ratings, but the other factors were also rated. However, cycle times between 3 and 8 seconds were not well differentiated. The study indicates that SBR does validly reflect actual stressors and suggests that SBR may be useful for "screening" jobs for more intensive study.

Kluth-K, Bohlemann-J, Strasser-H. A system for a strain-oriented analysis of the layout of assembly workplaces. **Ergonomics**. 1994 Sep; 37(9): 1441-8.

ENGLAND

A measuring system for the more thorough analysis of muscular strain at assembly workplaces was developed. These workplaces were often based on the application of systems of predetermined motion time. The new measuring system makes use of the well-established method of electromyography, and synchronous recording of the hand-arm-shoulder motions by means of ultrasonic signals. Furthermore, a new calibration apparatus was installed, and used for the recording of maximum forces of several hand-arm-shoulder muscles during dynamic arm movements. The experimental arrangement aimed to support the design of a workplace layout, which could be used to indicate low strain motions and low strain work areas for the reach of the upper extremities. The results, yielded by the application of the measuring and evaluation system, can be the basis for a system of predetermined strain. Monitoring five muscles as an example, the application of the system for the analysis of different work rates and a worker-friendly assembly area is illustrated.

Langford-ML. Poor posture subjects a worker's body to muscle imbalance, nerve compression. **Occup-Health-Saf**. 1994 Sep; 63(9): 38-40, 42.

UNITED-STATES

Forward head and shoulder postures and associated muscle imbalances are prevalent among today's workers, according to ongoing research in the physical therapy field. Information on proper posture should be used proactively to educate employees as part of injury prevention training. Maintaining muscle strength in the desirable posture will require ongoing exercise and attention from the worker. The self-direct approach will not eliminate all cases of tendonitis, epicondylitis and other disorders, but it will have a significant positive impact.

Lewicky-RT. Endoscopic carpal tunnel release: the guide tube technique. **Arthroscopy**. 1994 Feb; 10(1): 39-49.

UNITED-STATES

This article introduces a modification of the Chow double-portal endoscopic carpal tunnel release and reviews the results of 71 endoscopic carpal tunnel decompressions performed on 50 consecutive patients over a 20-month period. The guide tube technique was developed to improve patient safety and provide good ligament visualization. In the clinical study, 33 patients not receiving workers' compensation were ready to return to work at 12 days (mean). The 17 patients

receiving workers' compensation were divided into two groups: workers with carpal tunnel syndrome only and workers with carpal tunnel syndrome and associated musculoskeletal pain syndromes. The 11 workers with carpal tunnel syndrome alone returned to work by 74 days (mean). The six workers with carpal tunnel syndrome and myofascial pain took 160 days (mean) to return to work. The complication rate was 1.4%. Based on this small retrospective study, the guide tube technique achieved safe and easily reproducible surgical results.

Nathan-PA, Takigawa-K, Keniston-RC, Meadows-KD, Lockwood-RS. Slowing of sensory conduction of the median nerve and carpal tunnel syndrome in Japanese and American industrial workers. **J-Hand-Surg-Br**. 1994 Feb; 19(1): 30-4.

SCOTLAND

As part of a continuing study of the causes of carpal tunnel syndrome (CTS) in industry, we measured sensory conduction of the median nerve in 101 Japanese furniture factory workers. We used the maximum latency difference (MLD) with a critical value of > or = 0.40 msec to indicate abnormal slowing of nerve conduction. The prevalence of slowing in the Japanese workers was 17.8%, while the prevalence of probable CTS (based on symptoms only) was 2.5%, and the prevalence of definite CTS (probable CTS confirmed by slowing) was 2.0%. The most important factor predicting the MLD was the body mass index. The MLD was the most important factor predicting probable CTS. The prevalence of slowing in the Japanese workers was not significantly different from the prevalence of slowing in 316 American workers from four industries (22.0%), but the prevalences of probable CTS and definite CTS were much lower in the Japanese. The meaning of these findings is discussed.

Pelmear-PL; Taylor-W. Carpal tunnel syndrome and hand-arm vibration syndrome. A diagnostic enigma. **Arch-Neurol**. 1994 Apr; 51(4): 416-20.

UNITED-STATES

OBJECTIVE: This article serves to draw attention to the risk to workers from repetitive strain and hand-arm vibration in the workplace and to the diagnostic difficulty in distinguishing carpal tunnel syndrome from the sensorineural component of hand-arm vibration syndrome. DATA SOURCES: Journal publications, textbooks on hand-arm vibration, guidelines of the International Standards Organisation, and European Economic Community directives. STUDY SELECTION: Recent reports and current standards. CONCLUSION: Carpal tunnel syndrome can be distinguished from hand-arm vibration syndrome if all factors--anatomical, associated physiological and medical conditions, work exposure history, and ulnar nerve involvement--are evaluated. In some circumstances, the conditions may be present together. A correct diagnosis is crucial because surgical intervention is not usually beneficial if hand-arm vibration exposure has been a contributing factor. The further reduction in grip strength may constitute a serious additional handicap for a worker.

Pelmear-PL, Taylor-W. Hand-arm vibration syndrome [published erratum appears in J Fam Pract 1994 May; 38 (5) : 538] **J-Fam-Pract**. 1994 Feb; 38 (2) : 180-5.

UNITED-STATES

The hand-arm vibration syndrome affects workers who perform tasks that generate vibration. Raynaud's phenomenon and sensory impairment of the fingers are the predominant effects. A history of hand-arm vibration (HAV) exposure in a patient with these symptoms should alert the physician to the diagnosis. Referral to a special clinic or hospital department for multiple clinical tests is required to confirm the diagnosis and, using the Stockholm classification, to grade the severity in each hand. The assessment permits the patient to be monitored either for progression of or recovery from the syndrome. Avoidance of further vibration exposure is recommended, together with the prescription of a slow-release calcium channel blocker to improve peripheral circulation. Hand-arm vibration syndrome should be distinguished from carpal tunnel syndrome (CTS), which may have similar symptomatology but requires different treatments. Surgery is contraindicated in the former and should be the last resort for carpal tunnel syndrome in a worker requiring good grip-strength in future employment.

Reynolds-C. Electromyographic biofeedback evaluation of a computer keyboard operator with cumulative trauma disorder. **J-Hand-Ther**. 1994 Jan-Mar; 7(1): 25-7.

UNITED-STATES

This article describes a rehabilitation approach for a keyboard operator following radial tunnel decompression and release of the extensor origin of the right elbow. Prior to the patient's returning to work, a clinical electromyographic (EMG) biofeedback device was used to determine which work activities the patient should avoid or alter to reduce strain on her affected muscles. The patient was able to return to work and noticed a considerable reduction of muscle fatigue and pain in the involved muscles. A relatively inexpensive EMG biofeedback device was employed to evaluate the patient's muscles prior to returning to work. The rationale and suggestions for application of the biofeedback unit are discussed.

Rosecrance-JC, Cook-TM, Satre-DL, Goode-JD, Schroder-MJ. Vibration sensibility testing in the workplace. Day-to-day reliability. **J-Occup-Med**. 1994 Sep; 36(9): 1032-7.

UNITED-STATES

Loss of vibration sensibility has been suggested as an early indicator of peripheral compression neuropathy, including carpal tunnel syndrome. Although vibration sensibility has been used frequently to evaluate carpal tunnel syndrome, the day-to-day reliability of vibration measurements in an industrial population measured at the workplace has not been assessed. Vibration sensibility testing was performed at the university ergonomics laboratory on 50 volunteers (100 hands) and at a newspaper company on 50 workers (100 hands). Vibration perception and disappearance thresholds were measured on two occasions separated by 3 to 5 days. Student's t tests indicated no significant differences between the first and second tests or between the two groups. Pearson product-moment correlations for test-retest reliability were lower in the industry group but were relatively high despite the less than optimal testing conditions. Our findings suggest that vibration sensibility measurements are reliable from day to day not only in the laboratory but also in the workplace.

Roth-JH, Richards-RS, MacLeod-MD. Endoscopic carpal tunnel release. **Can-J-Surg**. 1994 Jun; 37(3): 189-93.

CANADA

OBJECTIVE: To assess the efficacy and safety of a new technique for carpal tunnel release. DESIGN: A single-group prospective cohort study. SETTING: A referral-based hand-surgery university practice. PATIENTS: Ninety-five consecutive adults; 1 patient was excluded (35 men, 59 women). They underwent 108 surgical procedures. No patients were lost to follow-up. INTERVENTIONS: Endoscopic carpal tunnel release. Outpatient surgery with neuroleptic anesthesia. Two-portal Chow technique of release. MAIN OUTCOME MEASURES: Symptom relief, return to work, medication use and complication rate. RESULTS: The average preoperative duration of symptoms was 3.9 years. Nerve conduction studies were positive in 101 of the 108 hands. Only two patients required open release. Only eight patients complained of intraoperative pain. Six patients failed to obtain relief of symptoms; two of them required secondary open release owing to persistent symptoms. Of the 61 patients who were employed, 52 returned to their previous jobs without restriction. The mean time for return to work was 36.4 days for patients who were Workers' Compensation Board cases and 19.5 days for patients who were not ($p < 0.01$). Men returned to work in 17.7 days and women in 24.7 days ($p < 0.05$). Complications occurred in four patients (3.8%). No nerve injury, vascular injury or reflex sympathetic dystrophy was noted. Patients who had undergone previous contralateral open release noted less pain and earlier return to work after endoscopic carpal tunnel release. CONCLUSIONS: Endoscopic carpal tunnel release was effective in relieving symptoms and had a low complication rate. The technique was associated with early return to work and minimal palmar pain.

Smutz-W.P., Miller-S.C., Eaton-C.J., Bloswick-D.S., France-E.P. Investigation of low-force high-frequency activities on the development of carpal-tunnel syndrome. **Clinical Biomechanics** 1994; 9 (1) : 15-20.

The objective of this study was to determine the effects of repetitive motion on the flexor tendons and synovium in the carpal tunnel. One possible mechanism of tendon damage is fraying of the tendons as they slide past each other in the carpal tunnel. Increases in tendon friction were measured in human cadaver arms. The flexor tendons were loaded using pneumatic cylinders while load cells were used to measure tendon force both distal and proximal to the carpal tunnel. Results showed that tendon force distal to the carpal tunnel decreased by over 10% after 6 h., while tendon force proximal to the carpal tunnel remainde constant.

Tanaka-S, Wild-DK, Seligman-PJ, Behrens-V, Cameron-L, Putz-Anderson-V. The US prevalence of self-reported carpal tunnel syndrome: 1988 National Health Interview Survey data. **Am-J-Public-Health**. 1994 Nov; 84(11): 1846-8.

UNITED-STATES

To estimate the prevalence of carpal tunnel syndrome among US adults, data from the Occupational Health Supplement of the 1988 National Health Interview Survey were analyzed. Based on a sample of 44,233 households (response rate, 91.5%), an estimated 1.55% (2.65 million) of 170 million adults self-reported carpal tunnel syndrome in 1988. Females and Whites had a higher prevalence of self-reporting carpal tunnel syndrome than males and non-Whites, respectively. Among 127 million adults who worked during the 12 months before the survey, 0.53% (0.68 million) reported that their "prolonged" hand discomfort was called carpal tunnel syndrome by a health care provider.

Werner-RA, Franzblau-A, Johnston-E. Quantitative vibrometry and electrophysiological assessment in screening for carpal tunnel syndrome among industrial workers: a comparison. **Arch-Phys-Med-Rehabil**. 1994 Nov; 75(11): 1228-32.

UNITED-STATES

Vibrometry has been demonstrated to be an effective adjunct to electrophysiological evaluation of nerve integrity in diffuse peripheral neuropathies but there is controversy over its value in the diagnosis of isolated compression neuropathy such as carpal tunnel syndrome (CTS). One hundred thirty factory workers were screened for peripheral nerve impairment using both vibrometry and electrophysiologic testing of digits 2 and 5 in both hands. Vibrometry had a low sensitivity in identifying individuals with symptoms of CTS or a median mononeuropathy defined by nerve conduction studies (NCS). The correlation of vibratory and the sensory evoked latencies were modest in the median nerve distribution ($r = 0.297$ to 0.370, $p = 0.001$). Using a comparison between vibration thresholds from digit 2 to 5 was not helpful in identifying cases of CTS and the difference in thresholds did not correlate with the difference in sensory evoked latencies. CTS is primarily a demyelinating process and can be easily detected with NCS. Because vibration threshold sensation is related to axonal loss it is not as sensitive in early CTS. Our results do not support the use of quantitative vibrometry as a screening tool median nerve impairment among industrial workers.

1992

Brito-AC, Orso-MB, Gomes-E, Mühlen-CA. Lesões por esforços repetitivos e outros acometimentos reumáticos em músicos profissionais. **Rev. bras. reumatol.** mar.-abr. 1992; 32 (2) : 79-83.

BRASIL

Problemas músculo-esqueléticos são comuns entre músculos profissionais. Essas queixas estão relacionadas a movimentos repetitivos, produzindo desordens em tendões, músculos e de superuso, caracterizada por dor e perda de função de grupos musculares e ligamentos articulares utilizados além de sua capacidade biológica. Estudos demonstram uma freqüência de cometimento de até 50% em orquestras. As lesões podem se apresentar sob formas distintas, como afecções musculotendínea, compressões neurológicas ou disfunções motoras, e são passíveis de tratamento efetivo quando a abordagem terapêutica , instituída precocemente. Além da revisão da literatura pertinente, os autores apresentam nove casos ilustrativos de sua casuística pessoal (AU).

HISTÓRIA

1998

Solly-S. Clinical lectures on Scriveners' palsy or the paralysis of writers (Reprinted from Lancet, vol 2, pg 709, 1864). **Clinical Orthopaedics and Related Research** 1998 Jun; 351 : 4-9

Samuel Solly, the son of a wealthy merchant, was born in London, England. He was educated at Higham Hill, Walthamstow, boarding school where one of his fellow students was Benjamin Disraeli. In 1822 Solly was apprenticed to Benjamin Travers, a surgeon at St. Thomas's Hospital. He is thought to be one of the last such students who paid the surgeon a fee for the opportunity of obtaining training and access to the hospital. Because Solly resided at home and not at the home of the surgeon, the fee was 525 guineas, a considerable sum. Travers was an associate of Sir Astley Cooper and was the first British surgeon to have specialized in ophthalmology. Solly became a fellow of the Royal College of Surgeons in 1828. After further study in Paris, France, he opened his practice in 1831. From 1833 to 1839 he lectured on anatomy and physiology at the St. Thomas's Hospital medical school. He became a full member of the surgical staff there in 1853. He was known as a good teacher and a competent surgeon. He was one of the founding fellows of the Royal College of Surgeons and served twice as its vice president. As a result of his published work on the brain, Solly was elected to membership in the Royal Society in 1836. An accomplished artist, he not only illustrated his lectures and publications, but also exhibited his paintings at the Royal College of Surgeons. He retired because of ill health in 1871, and died a short time later. Solly's description of a repetitive strain injury in male secretaries in 1864 has many similarities with the types of repetitive strain injuries seen in female secretaries laboring over their computer keyboards 130 years later.

1996

Gilbert-M.D., Tick-H., VanEerd-D. 'RSI'; What is it, and what are we doing about it? **Can. J. Rehabil.** 1996; 10 (1) : 51-63.

In the last few years, the term 'Repetitive Strain Injury' (RSI) has become commonplace in both the media and within the medical literature. The etiology and even definition of these disorders have come into question, and effective therapies and proper research studies have been lacking. This article presents an overview of the history and definition of RSI as well as the epidemiological, etiological, and clinical factors associated with RSI, and outlines a multi-disciplinary approach in the treatment of these disorders. While NOT an exhaustive review of the literature, there is emphasis placed on a complete and knowledgeable assessment of the afflicted patient, with both local andy systemic factors taken into account. The contribution of newer clinical methodologies, such as 'dry needling'of trigger points, and surface electromyography are discussed. A complete rehabilitative approach to the RSI patient, including physical, psychological, and community factors is proposed. Issues of primary prevention are mentioned. RSI is determined to be a complex, multifactorial condition that requires further research.

1995

Amadio-PC . The first carpal tunnel release? **J-Hand-Surg-Br.** 1995 Feb; 20(1): 40-1.

SCOTLAND

Correspondence is presented recording an operation for release of the carpal tunnel performed in 1924, together with biographical note on the surgeon, Herbert Galloway.

Ireland-DC. Repetition strain injury: the Australian experience--1992 update**.** **J-Hand-Surg-Am.** 1995 May; 20(3 Pt 2): S53-6.

UNITED-STATES

1994

Owen-RD. Carpal tunnel syndrome: a products liability prospective. **Ergonomics.** 1994 Mar; 37(3): 449-76.

ENGLAND

1993

Assunção-AA, Lacerda-EM, Andrade-EB. Lesões por esforços repetitivos: descrição de aspectos laborais e clínicos em casos do ADP/UFMG. **Rev. bras. saúde ocup.** out.-dez. 1993; 21(80):13-22.

BRASIL

As lesões por esforços repetitivos(L.E.R) ocupam relevância nas estatísticas de doenças do trabalho,atingindo várias categorias profissionais e ramos de produção. Este artigo trata de um estudo exploratório,que tem como objetivo a descrição de 38 casos de L.E.R. atendidos no ADP/UFMG em 1987, nos aspectos clínicos e laborais. Metodologia:foi elaborado um formulário de pesquisa após a prévia definição de variáveis clínicas e laborais. Os dados foram colhidos em prontuários e, após o seu registro, procedeu-se discussão e análise dos resultados. Conclusões: o estudo reafirma alguns dados existentes em literatura e aponta diferenças que podem estar relacionadas às especificidades do grupo estudado(AU).

IMAGEM POR RADIOISÓTOPOS

1998

Etchebehere-EC, Etchebehere-M, Gamba-R, Belangero-W, Camargo-EE. Orthopedic pathology of the lower extremities: scintigraphic evaluation in the thigh, knee, and leg. **Semin-Nucl-Med**. 1998 Jan; 28(1): 41-61.

UNITED-STATES

Radionuclide imaging (RI) of the osseous and nonosseous structures of the thigh, knee, and leg provide important diagnostic and prognostic information upon which the orthopedic surgeon can base treatment planning and management decisions. 99mTc-MDP scintigraphy is essential in overuse injuries such as stress fractures and shin splints. RI is important in assessing complications of trauma. It is the only imaging modality able to assess the magnitude of physeal stimulus caused by femoral fractures and to predict a favorable or unfavorable outcome of leg length by semiquantitative analysis; SPECT imaging can detect and locate decreased metabolism associated with posttraumatic closure of the physeal plate to predict growth arrest and deformities. Three-phase bone imaging (TPBI) is essential to differentiate hypervascular from avascular nonunions and follow delayed union. In osteonecrosis of the knee, bone scintigraphy precedes radiography changes even in stage I of the disease. 99mTc-MDP and 99mTc-HIG imaging are powerful tools in determining the outcomes of osteoarthritis and rheumatoid arthritis, respectively. Bone scintigraphy can also detect chronic ligament and acute and chronic meniscal lesions. The combined use of TPBI, gallium-67 citrate imaging, and indium-111 or 99mTc-HMPAO labeled leukocytes is important to diagnose and differentiate acute from chronic osteomyelitis, and to detect infected knee prostheses. Thallium-201 chloride imaging and 99mTc-sestamibi imaging have an important role in the assessment of tumor response to chemotherapy and in the quantification of tumor viability.

Fernandez-Ulloa-M, Klostermeier-TT, Lancaster-KT. Orthopaedic nuclear medicine: the pelvis and hip. **Semin-Nucl-Med**. 1998 Jan; 28(1): 25-40.

UNITED-STATES

Bone scintigraphy is a sensitive method useful in the diagnosis of specific skeletal problems encountered in orthopaedic and sports medicine. Often, in these situations, routine radiographic evaluation may provide negative or questionable information. Bone scintigraphy is also useful in the evaluation of patients with ill-defined or persistent bone pain not satisfactorily explained by positive radiologic evaluation. In these situations, because of its ability to image the whole body,

bone scintigraphy may reveal additional unsuspected traumatic pathology, Finally, nuclear medicine physicians need to be prepared to properly interpret findings unrelated to trauma and to direct the evaluation of patients toward the correct diagnosis and subsequent management. These goals can be achieved by using optimal imaging technique, by becoming familiar with the patient's clinical presentation, by understanding the biomechanics and pathophysiology of the entities encountered, by proper use of alternative diagnostic procedures, and by establishing good rapport with referring physicians.

Hansen-IL. Bone scintigraphy in trauma and overexertion injuries. **Ugeskr-Laeger**. 1998 Jan 19; 160(4): 401-4.

DENMARK

1997

Al-Nahhas-A.M., Jawad-A.S. M., Norman-A., McCready-V.R. $^{99}Tc^{m}$ MDP blood-pool phase in the assessment of repetitive strain injury. **Nucl. Med. Commun**. 1997; 18 (10) : 927-931.

We reviewed three-phase bone scans of the limbs of 7 patients suffering from limb pain suggestive of occupational repetitive strain injury (RSI) and compared them with 13 patients with limb pain due to various aetiologies. Doppler ultrasound measuremente of blood flow had been performed in 13 of the 20 patients. The bone scan results showed increased blood flow and pooling (second phase) in the affected limbs of patients with RSI as compared to those with algodystrophy or non-specific limb pain (sensitivity 86%, specificty 85%). Doppler ultrasound also demonstrated increased blood flow to the affected limbs (sensitivity 83%) but failed to differentiate between the different aetiologies of pain (specificity 14%). We conclude that the blood-pool phase of three-phase bone scans can play a potential role in screening RSI patients.

Roland-J, Houben-L, Vandevivere-J. Unsuspected muscular radionuclide uptake due to chronic muscular injury contracted during sports activity. **Clin-Nucl-Med**. 1997 Sep; 22(9): 632-3.

UNITED-STATES

Stabler-J. A case of traumatic myositis of the psoas in a gymnast. **Injury**. 1997 Sep; 28(7): 489-90.

ENGLAND

Wadhwa-SS, Mansberg-R, Fernandes-VB, Qasim-S. Forearm splints seen on bone scan in a weightlifter. **Clin-Nucl-Med**. 1997 Oct; 22(10): 711-2.

UNITED-STATES

1996

Kwan-W, Strauss-HW. Clinical pathological correlation: wrist pain [clinical conference] **J-Nucl-Med**. 1996 Mar; 37(3): 534-6.

UNITED-STATES

Samuelson-DR, Cram-RL. The three-phase bone scan and exercise induced lower-leg pain. The tibial stress test. **Clin-Nucl-Med**. 1996 Feb; 21(2): 89-93.

UNITED-STATES

The three-phase bone scan is finding increasing utility in acute and chronic pain syndromes in sports medicine settings. This useful technique may have significant clinical application in assessing the increasing numbers of patients with exercise induced lower leg or medial tibial pain. The authors present a case of exertional lower leg pain or medial tibial pain in which three-phase bone imaging exhibited a dramatic increase in early flow after a simple derived exercise stress. The three-phase bone scan should play a key role in the assessment of exercise pain, and may be enhanced by the addition of simple exercise intervention.

1991

Mühlen-CA, Santos-CS, Paiva-CC, Keiserman-MW, Franck-M, Silveira-IG, Ludwig-E, Anselmi-OE. Lesões por esforços repetitivos em digitadores: ineficácia do método cintilográfico na detecção de periartrites dos membros superiores. **Rev. bras. reumatol.** nov.-dez. 1991; 31 (6) : 195-8.

BRASIL

Lesões por esforços repetitivos (LER) são comuns na prática diária do reumatologista. Não há teste capaz de objetivar as queixas de reumatismos de partes moles, o que levou os autores a tentarem demonstrar objetivamente os processos pelo método cintilográfico utilizando 99m Tc-metilenodifosfonato. Vinte e um digitadores, sendo apenas quatro assintomáticos, mostraram distintos diagnósticos de periartrites, sendo mais freqüente o de tendinite. A cintilografia não foi capaz de discriminar entre sintomáticos e normais, nem de detectar corretamente o local correspondente à queixa dos pacientes. Conclui-se pela ineficácia do método cintilográfico na detecção de lesões de partes moles tipo LER de membros superiores em digitadores (AU).

PREVENÇÃO E CONTROLE

1998

Berguer-R, Gerber-S, Kilpatrick-G, Beckley-D. An ergonomic comparison of in-line vs pistol-grip handle configuration in a laparoscopic grasper. **Surg-Endosc.** 1998 Jun; 12(6): 805-8

BACKGROUND: Laparoscopic instruments incorporate both in-line and pistol-grip handle configurations, yet it is unclear which design is most advantageous for surgeons, particularly when operating at angles perpendicular to the surgeon's position. We present a detailed electromyographic (EMG) comparison of these handle configurations under different force and angle conditions. METHODS: Nine general surgeons used a Microsurge grasper with the handle in an in-line (MS-IL) and pistol (MS-PS) configuration, as well as a standard hemostat (HE), to grasp and close two spring-loaded metal plates. The task was performed randomly by each subject with the three instrument configurations at two forces levels (0.7 N, 4.2 N) and at three angles to the surgeons' body (0, 45, and 90 degrees). Surface EMG was measured from the flexor carpi ulnaris (FCU), flexor digitorum profundus (FDP), flexor digitorum superficialis (FDS), extensor carpi ulnaris (ECU), extensor digitorum comunis (EDC), and thenar compartment (TH). The peak root mean squared (RMS) EMG voltage was calculated for each instrument, force, and angle condition. Statistical comparison was carried out by ANOVA. RESULTS: Both laparoscopic handle configurations required significantly higher contractions of all muscle groups compared to the hemostat at the high force level. TH was not affected by laparoscopic handle configuration. MS-IL required higher FCU, ECU, and EDC contractions at 45 degrees compared to MS-PS. However, MS-IL decreased the flexor compartment muscle contractions (FDP, FDS, FCU) at 90 degrees compared to MS-PS. CONCLUSIONS: Laparoscopic grasping requires higher forearm and thumb muscle contractions compared to the use of a hemostat. The in-line handle configuration is no better than the pistol configuration except when grasping at 90 degrees to the surgeon, where rotation of the handle and wrist back toward the surgeon significantly decreases forearm flexor compartment muscle contractions.

Coury-HJCG. Self-administered preventive programme for sedentary workers: reducing musculoskeletal symptoms or increasing awareness? **Applied Ergonomics** 1998 Dec; 29 (6) : 415-421.

ENGLAND

The objective of this study was to evaluate an auto-instructional preventive programme designed to allow the subjects to identify critical aspects related to their work and musculoskeletal comfort, and

provide them with some simple alternatives for controlling the identified problems. The programme was evaluated by 36 secretaries and bank clerks through their symptom perception before and after the programme. The results showed that the symptoms increased in number and severity. The programme seemed to have helped the participants to become aware of the ergonomic problems present in their job and to link these problems to physical symptoms. Self-administered preventive programmes can lead to clearly negative results when applied as the only measure to control musculoskeletal symptoms.

Keller-K, Corbett-J, Nichols-D. Repetitive strain injury in computer keyboard users: pathomechanics and treatment principles in individual and group intervention. **J-Hand-Ther.** 1998 Jan-Mar; 11(1): 9-26

Computer users experience high rates of injury and disability, broadly termed repetitive strain injury (RSI). With more than 60 million Americans using computers in offices and homes, the potential magnitude of the RSI problem indicates a need for increased attention to prevention and treatment. The purpose of this article is to: 1) present a conceptual model of RSI as a kinetic-chain, multifactorial disorder; 2) outline the salient features of the clinical evaluation of the RSI patient; 3) describe the role of postural deviation in the pathogenesis of RSI; 4) present the principles of individual manual therapy; and 5) discuss the rationale, admission criteria, educational principles, and outcome of a multidisciplinary group intervention.

Kietrys-DM, McClure-PW, Fitzgerald-GK The relationship between head and neck posture and VDT screen height in keyboard operators. **Phys-Ther.** 1998 Apr; 78(4): 395-403

BACKGROUND AND PURPOSE: The purpose of this study was to determine the effect of change in video display terminal (VDT) height from desktop height (96.5 cm [38 in]) to an elevated position (109.2 cm [43 in]) on postural angles of the head and neck and the effect on cervical spine flexion moments. SUBJECTS: Twenty-seven persons (3 male, 24 female) who spent at least 3 hours per day using a computer while seated were the subjects. The subjects had a mean age of 36.7 years (SD=6.0, range=25-47). METHODS: Subjects were photographed over two 10-minute periods while seated using a computer with the VDT at two different heights. Later, a goniometer was used over images to record angles. RESULTS: There was no difference in cervical flexion moment between the two screen positions. Several postural angles of the head and neck showed changes, but the clinical relevance of these changes is questionable. CONCLUSION AND DISCUSSION: Changing the VDT height from 96.5 to 109.2 cm (floor to midscreen) has no effect on flexion moment on the cervical spine during short periods of VDT operation. If flexion moment is considered a biomechanical indicator of postural stress, it does not appear that the elevated screen position reduces postural stress on the cervical spine during short periods of VDT operation.

Lima-MEA, Araújo-JNG, Lima-FPA. **L.E.R: dimensões ergonômicas e psicossociais.** Belo Horizonte; Health; 1998. 362 p.

BRASIL

A presente obra foi concebida a partir de um trabalho de pesquisa, que contou basicamente com as abordagens da ergonomia e da psicosociologia, sem perder de vista suas articulações com a psicopatologia e a sociologia do trabalho. Sua abrangência compreende não apenas as novas tentativas de análise do fenômeno da LER, através de um extenso e minucioso trabalho de pesquisa, que vem se desenrolando desde 1992, mas também de alguns ensaios teóricos, a partir das perspectivas críticas das abordagens acima citadas, contando ainda com algumas discussões sobre as possibilidades e limites nas reais da teorização, das práticas de prevenção, do tratamento e do acompanhamento do lesionado. No conjunto da obra, o leitor poder se deparar com um significativo avanço, nos atuais esforços de compreensão da LER. (AU).

Louis-DS Are we there yet? **J-Hand-Surg-Am**. 1998 Mar; 23(2): 191-5

BRASIL

Melhorn-JM. Cumulative trauma disorders and repetitive strain injuries: The future. **Clinical Orthopaedics and Related Research** 1998 Jun; 351 : 107-126

Cumulative trauma disorders account for 56% of all occupational injuries, Currently, occupational injuries affect 15% to 20% of all Americans. The United States government predicts that hy the year 2000, 50% of the American workforce will have occupational injuries annually and 50 cents of every dollar will be spent on cumulative trauma disorders . There is common agreement on the need for reduction of cumulative trauma disorders in the workplace. However, there is little agreement on the appropriate definition for musculoskeletal pain that occurs in the workplace, or the ergonomic and epidemiologic model for cumulative trauma disorders , or on the specific exposure relationships of the individual, by the job, and occurring in the workplace. The previous treatments for, and the natural history of, cumulative trauma disorders in other countries gives some insight into the possible future of cumulative trauma disorders for the United States. Until research can provide specific dose and exposure relationships for the individual, prevention remains the best treatment for cumulative trauma disorders in the workplace.

Rempel-D, Bach-JM, Gordon-L, So-Y. Effects of forearm pronation/supination on carpal tunnel pressure. **J-Hand-Surg-Am.** 1998 Jan; 23(1): 38-42

The effects of forearm rotation and metacarpophalangeal (MP) flexion on carpal tunnel pressure were investigated in 17 healthy adults who had no evidence of carpal tunnel syndrome (CTS). Pressure was continuously recorded with a saline-filled catheter inserted into the carpal tunnel and connected to a pressure transducer while test subjects slowly rotated the forearm from full pronation to full supination. Forearm rotation was repeated with MP flexion of 0 degrees, 45 degrees, and 90 degrees. Both forearm rotation and MP flexion, and their interaction term, significantly affected carpal tunnel pressure and accounted for most of the variability in the data. Highest mean pressures (55 mmHg) were recorded in full supination and 90 degrees MP flexion and lowest pressures (12 mmHg) were recorded at 45 degrees pronation and 45 degrees MP flexion. These data may be useful in the design of tasks and hand tools in the management and prevention of CTS.

Trail-IA. The prevalence of work-related upper limb disorders in a printing factory. **Occup-Med-Oxf.** 1998 Jan; 48(1): 23-6

The association between problems of the upper limb and the workplace is complex. A large printing manufacturer in the North West of England sought the advice of both a surgeon, specializing in problems of the upper limb and an ergonomist in an attempt to control the frequency of these abnormalities amongst its workforce. The prevalence of these problems prior to and after the introduction of a number of recommendations was collated and the results are discussed. Effectively the introduction of sensible and sympathetic modifications to the workplace appeared to reduce the number of upper limb disorders.

Viikari-Juntura-E. Risk factors for upper limb disorders implications for prevention and treatment. **Clin. Orthop. Relat. Res.** 1998; 351 : 39-43.

Epidemiologic studies have revealed several associations between physical work load factors and some common upper limb disorders. In the treatment of a case of work related upper limb disorder, modifications of work that are feasible to be implemented in the field should be done as a first priority. Some case studies suggest notable effects of ergonomic measures on the occurrence of upper limb disorders. Economic analyses of individual workplaces have indicated that the investiments usually have a short playback period. In work related carpal tunnel syndrome, the physical demands of the job, especially the force demands of gripping, should be considered before deciding on surgery, because gripping force may return slowly after surgery, and may be compromised by the surgical procedure itself.

1997

Behr-CT, Altchek-DW The elbow. **Clin-Sports-Med.** 1997 Oct; 16(4): 681-704

Elbow disorders in the athletic population comprise a wide range of injuries from acute trauma to those caused by chronic overuse of the joint. Certain injuries are orthopedic emergencies that must be recognized immediately by the team physician to avoid potential complications. Other overuse injuries need to be accurately diagnosed and treated so further injury can be prevented and the

athlete can return to competition as expediently as possible. Finally, the decision to refer an athlete for surgical treatment often rests with the team physician; only with an adequate understanding of the elbow disorders in the athlete can these decisions be made.

Boggild-H, Johansen-JP. Occupational environment and strain induced gout. A review of epidemiological studies of the connection between occupational environment and coxarthrosis. **Ugeskr-Laeger**. 1997 Jul 7; 159(28): 4370-6

Osteoarthrosis of the hip is a frequent complaint with multifactorial causal relations. The causes have hitherto not been associated with the work environment. Through a systematic literature search 15 epidemiological studies dealing with the relation between occupation or factors in the work environment and coxarthrosis were found. A critical evaluation finds that farmers and construction workers have an increased risk of contracting coxarthrosis. Work that is strenuous for the hip such as lifting and ladder climbing might also be risk factors. Prevention of heavy work involving the hip is proposed as a consequence of this knowledge. The Danish Workers Compensation Act should also take these findings into consideration.

Brukner-P, Bennell-K Overuse injuries: where to now? **Br-J-Sports-Med.** 1997 Mar; 31(1): 2

Byng-J. Overuse syndromes of the upper limb and the upper limb tension test: A comparison between patients, asymptomatic keyboard workers and asymptomatic non-keyboard workers. **Man. Ther**. 1997; 2 (3) : 157-164.

Overuse syndromes of the upper limb (OSUL), also known as repetitive strain injury (RSI) remains a contentious issue that affects a large number of keyboard workers. This research used the results of a modified upper limb tension test (ULTT) performed on three independent groups to look for any similarities or discrepancies between them. The subjcts were all female aged between 25-40 years, with groups consisting of 12 OSUL patients, 20 asymptomatic keyboard users and 19 asymptomatic non-keyboard users. The ULTT was positive in 100% of the patient group supporting several hypotheses that state that the pathology of OSUL is neurogenic in origin. The results of the two asymptomatic control groups were predicted to be the same, however this was not found to be the case. Unrelated t-tests were used to analyse the data showing that the keyboard users had a significantly positive ULTT compared to non-keyboard users, which were viewed as a normal control group. This suggests that a subclinical pathological state exists in the keyboard user group. Various subclinical physiological changes caused by prolenged sitting and keyboard use are suggested as possible causes for these results. This research highlights the need for intervention in an office environment to prevent further cases of OSUL from developing.

Cawley-MF, Yarkony-GM, Bergman-SB Spinal cord injury rehabilitation. 5. Through the lifespan**.** **Arch-Phys-Med-Rehabil.** 1997 Mar; 78(3 Suppl): S73-8

This self-directed learning module highlights new advances in this topic area. It is part of the chapter on spinal cord injury rehabilitation in the Self-Directed Physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation. This section explores the medical, psychologic, and social challenges facing an individual with an acquired spinal cord injury. Special emphasis is placed on the dynamic nature of these issues as one progresses through the lifespan.

Cohen-R. Ergonomics Program Development: Prevention in the Workplace. **American Industrial Hygiene Association Journal** 1997 Fev.; 58 (2) : 145-149.

An intervention program designed to prevent work related repetitive strain disorders at an electronics manufacturing facility was described. The program consisted of hazard assessment conducted by trained department representatives who reviewed injury history data, conducted work site inspections, and surveyed workers. These data were used to prioritize departments with high numbers of injuries and high risk tasks. The hazard control interventions used to correct the identified problems included assembling a team composed of department workers, supervisors, equipment or process engineers, and a safety or medical department representative which developed intervention processes. Another team, more highly specialized in hazard assessment

and interventions, evaluated each department for hazard identification and corrective intervention. Product redesign for reduction of risk factors were recommended by the corrective active teams. In departments in which design or process changes were difficult to implement, exercises designed to improve musculoskeletal function were introduced. Training programs were targeted based on risk. Although the cost and frequency of repetitive strain injuries increased during a 10 year period from 1985 to 1995, a general reduction in repetitive strain injury severity from between the 80th and 90th percentiles to the 50th percentile was recognized. This reduction was attributed to the intervention program.

Corks-I Occupational health hazards in dentistry: musculoskeletal disorders. **Ont-Dent.** 1997 Jul-Aug; 74(6): 27-30

Dagostino-M. Wristbraces: Exercise Discretion in Distribution. **Professional Safety** 1997 Jul.; 42 (7) : 24-26.

The effectiveness of wrist braces in the treatment and prevention of repetitive strain injuries (RSI) was evaluated. Wrist braces were used based on the concept that they provided resistance to or relief from the regional demands and pain associated with hand intensive work. Soft braces relieved pain by creating numbness and restricting range of motion in the hand, which was perceived as beneficial. Numbness reflected decreased blood flow to the injured area, which was not considered to be health promoting. Hard braces, which maintained the hand in a slight degree of extension, were of value to those recovering from a regional sprain, strain, or tendinitis; however, as a treatment for finger, hand or wrist tendinitis experienced by someone who performed hand intensive tasks, the hard brace exacerbated the injury. Neither the soft nor hard brace was designed to positively influence regional physiology or biomechanics, and aggravated existing injuries. The author concludes that the prophylactic distribution of wrist braces in the workplace, as well as their distribution as a treatment for the working upper extremity, should be highly scrutinized. Instead of wrist braces, the author suggests that RSI problems be solved through evaluating work methods and the design of the work environment.

Dawson-W. J. Common problems of wind instrumentalists. **Med. Probl. Perform. Artists.** 1997; 12 (4) : 107-111.

Wind musicians are less likely to experience instrument-related problems than are string or keyboard players. Most problems are muscoloskeletal, affecting the upper extremities and spine; very few are especific or peculiar to a single type of instrument. Repetitive forces and motions are most likely to produce strains of the muscletendon units distally in the extremities, while static stresses may be experienced in many locations. Medical evaluation of the “injured” instrumental musician should include the instrument as well. The performer should be examined and observed not only while playing, but also while bolding the instrument in its typical position. IN those instances when instruments can be played either standing or sitting, both postures should be evaluated ; significant and sometimes problematic differences in supporting forces and postures may be demostrated when the performer must assume a standing positionto play. Careful scrutiny of the musician’s hands on the keys or valves may yield important information about a possible mismatch between the instrument and its player, another potential source of problems. The instrument should be made to fit the musician, not vice versa; alterations not only are permissible but often can provide the answer to treating or preventing physical difficulties. In cases where alterations are not possible, and other treatment modalities have failed, changing to a smaller member of the same instrument family may be a feasible option.

Fairfax-R., Ed. Ergonomic Hazards in the Fish Processing Industry - Part III**.** **Applied Occupational and Environmental Hygiene** 1997; 12 (6) : 400-406.

The ergonomic hazards in the salmon factory processing off the coast of Alaska at Nak Nek were evaluated. Tasks were identified that have the potential to cause upper extremity cumulative trauma disorders and low back injuries. Salmon processing involved removal of the head and internal organs and occasional filleting of the fish. The report discussed each of the various tasks and activities separately, including pushing the fish onto the conveyors for transport into the processing section of the vessels, aligning the fish using metal pegs on the conveyor belt placed in

the salmon's gill slit, examining the body cavity to assure that degutting has been complete, depositing fish guts and roe, trimming fins off the headless salmon, washing out the inside of the salmon, placing salmon into a holding tub, grading the fish, carrying the tubs for weighing, packing the salmon for freezing, operating the automatic salmon filleting machines, trimming the salmon and pulling bones from the filets, dipping frozen fish, and preparing the boxes for shipping. Ergonomic hazards for each of the work stations were described, and ergonomic controls were suggested. General comments included the need for education of the workers on the basics of body mechanics and the importance of maintaining the body in an ergonomically neutral position when performing repetitive tasks.

Fernstrom-E, Ericson-MO Computer mouse or Trackpoint--effects on muscular load and operator experience. **Appl-Ergon**. 1997 Oct-Dec; 28(5-6): 347-54.

ENGLAND

The aim of the study was to evaluate four different modes of human-computer interaction. The modes were: use of the keyboard alone as input device, use of keyboard and mouse, use of keyboard and mouse with a three-dimensional arm support, and use of a keyboard with a Trackpoint device in its centre. Ten women and 10 men volunteered to participate. Questions asked were whether working in the different modes influenced shoulder and forearm muscular load differently during word processing, and how much strain on the neck, shoulder and arms subjects perceived in the different modes. Muscular load was studied with electromyography in three shoulder muscles and three forearm muscles. The subjects also rated the different modes in one questionnaire concerning perceived strain and in one concerning preference for any of the modes tested. Intra-individual analysis for each muscle and mode showed two possible ways of decreasing the strain from computer mouse work on the shoulder muscles--either to use Trackpoint or to use the mouse combined with the movable arm support. However, both of these computer-interaction modes increased the muscular load in the hand and forearm.

Herbert-R, Plattus-B, Kellogg-L, Luo-J, Marcus-M, Mascolo-A, Landrigan-PJ. The Union Health Center: A working model of clinical care linked to preventive occupational health services. **American Journal of Industrial Medicine** 1997 Mar; 31 (3) : 263-273.

UNITED-STATES

As health care provision in the United States shifts to primary care settings, it is vital that new models of occupational health services be developed that link clinical care to prevention. The model program described in this paper was developed at the Union Health Center (UHC), a comprehensive health care center supported by the international Ladies Garment Workers Union (now the Union of Needletrades, Industrial and Textile Employees) serving a population of approximately 50, 000 primarily minority, female garment workers in New York City. The objective of this paper is to describe a model occupational medicine program in ct union-based comprehensive health center linking accessible clinical care with primary and secondary disease prevention efforts. To assess the presence of symptoms suggestive of occupational disease, a health status questionnaire was administered to female workers attending the UHC for routine health maintenance. Based on the results of this survey an occupational medicine clinic tvas developed that integrated direct clinical care with worker and employer education and workplace hazard abatement. To assess the success of this new approach, selected cases of sentinel health events were tracked and a charr review was conducted after 3 years of clinic operation. Prior to initiation of the occupational medicine clinic, 64% (648) of the workers surveyed reported symptoms indicative of occupational illnesses. However only 42 (4%) reported having been told by a physician that they had are occupational illness and only 4 (.4%) reported having filed a workers' compensation claim for art occupational disease. In the occupational medicine clinic established at the UHC, a health and safety specialist acts as a case manager; coordinating worker and employer education as well as workplace hazard abatement focused on disease prevention, ensuring that every case of occupational disease is treated as a potential sentinel health event. As examples of the success of this approach, index cases of rotator cuff tendonitis, lead poisoning, and formaldehyde overexposure in three patients and their preventative work place follow-up, affecting approximately 150 workers at three worksites, are described. Work-related conditions diagnosed during the first 3 years of clinic operation included cumulative trauma disorders (141 cases), carpal tunnel syndrome (47 cases), low back disorders (33 cases), lead poisoning (20 cases), and

respiratory disease (9 cases). This pilot project represents a new model for effective integration of clinical care and occupational disease prevention efforts within a primary care center it could serve as a prototype for development of such services in other managed and primary care settings. (C) 1997 Wiley-Liss, Inc.

Hess-D. Employee Perceived Stress. Relationship to the Development of Repetitive Strain Injury Symptoms. **AAOHN Journal** 1997; 45 (3) : 116-123.

Associations between perceived job stress and repetitive strain injury (RSI) symptoms in office workers were examined. A total of 621 employees of a state agency who used computers in their job were asked to complete a questionnaire to obtain information on demographic characteristics, their level of knowledge about RSI prevention, any actions they have taken to make their workstations more ergonomically correct, and RSI symptoms attributable to their work, and to rate their level of perceived psychosocial stress. A total of 274 persons, 174 females, mean age 43.4 years, responded to the questionnaire, representing a response rate of 44%. Over 34% of the respondents did not use computers regularly (more than 4 hours (hr) daily) and were considered to be not at risk (NAR) computer users. The remaining subjects who used computers more than 4hr daily were considered to be at risk (AR) computer users. The proportion of females in the AR computer user group was much higher than in the NAR group, 71.9 versus 46.8%. More AR computer users reported higher levels of stress than those not at risk, 57.9 versus 43.6%. AR computer users reported significantly more RSI symptoms than NAR users. Neck or shoulder pain was the most frequently reported RSI symptom in both groups. Perceived psychosocial stress was significantly, positively associated with perceived RSI symptoms. Perceived level of knowledge about preventing RSIs was significantly associated with taking a specific action to make the workstation more ergonomically correct in both groups. AR computer users who perceived an ergonomically correct workstation reported significantly fewer RSI symptoms than those who did not. The author concludes that this study suggests that perceived psychosocial stress levels are significantly associated with perceived RSI symptoms. To prevent RSIs, occupational health nurses must consider the ergonomic aspects of a worker's workstation, psychosocial stressors, and the worker's level of knowledge about RSIs.

Jones-R. J. Corporate Ergonomics Program of a Large Poultry Processor**. American Industrial Hygiene Association Journal** 1997 Feb.; 58 (2) : 132-137.

The effectiveness of a program implemented in 1990 at a large poultry processor designed to oppose continuing increases in musculoskeletal disorders and their cost was evaluated. Ergonomic risks associated with the poultry industry and the structure and function of the program were reviewed. The program involved fostering management commitment, formation of ergonomic committees, work site and task design analyses, a medical management program for musculoskeletal disorders, training programs, and annual program assessments. Following an initial increase in the rate of new workers' compensation claims, the incidence and severity rates for upper extremity musculoskeletal disorders claims decreased 46% and 20%, respectively, and those for lifting decreased by 50% and 36%, respectively, between 1990 and 1995. An association was identified between the amount of deboning activities and the cost and number of claims experienced. Ergonomic program assessment results increased from 55% to 93% over the first 3 years following implementation of the program. The author concludes that this program is effective in significantly reducing the incidence and costs of musculoskeletal disorders and made recommendations to further improve the program's effectiveness.

Koda-Y, Nishi-S, Miyazaki-S, Haginoshita-S, Sakurabayashi-T, Suzuki-M, Sakai-S, Yuasa-Y, Hirasawa-Y, Nishi-T. Switch from conventional to high-flux membrane reduces the risk of carpal tunnel syndrome and mortality of hemodialysis patients. **Kidney-Int.** 1997 Oct; 52(4): 1096-101

The use of a high-flux membrane, which eliminates larger molecular weight solutes with better biocompatibility, has steadily increased since the discovery of beta-2 microglobulin (beta 2m) amyloidosis in 1985. The long-term effects of a dialyzer membrane on morbidity and mortality are not completely understood. To examine the membrane effect as a factor of carpal tunnel syndrome onset and mortality, multivariate Cox regression analysis with time-dependent covariate was conducted on 819 patients from March 1968 to November 1994 at a single center. Two hundred and forty-eight of the patients were either switched from the conventional to high-flux membrane or treated only with a high-flux membrane. Fifty-one patients underwent a CTS operation and 206

died. Membrane status (on high-flux or on conventional) was considered as time-dependent covariate and risk was adjusted for age, gender, type of renal disease and calendar year of dialysis initiation. The relative risk of CTS was reduced to 0.503 ($P < 0.05$) and mortality 0.613 ($P < 0.05$) by dialysis on the high-flux membrane, compared to the conventional membrane. Serial measurements of beta 2m indicated significantly lower beta 2m to persist in patients on the high-flux membrane. The high-flux membrane decreased the risk of morbidity and mortality substantially. Larger molecule elimination was shown important not only for preventing beta 2m amyloidosis, but for prolonging survival of dialysis patients as well.

Kuorinka-I. The influence of industrial trends on work-related musculoskeletal disorders (WMSDs) **Int. J. Ind. Ergon**. 1997; 21 (1) : 5-9.

A review of the prevention of work-related musculoskeletal disorders (WMSDs) is presented, focusing on the manufacturing industry and the office environment. Observed or potential negative effects of some trends on the health of workers are discussed , together with the possibility of integrating positive, preventive elements into industrial pratices. The need for flexible, rapid and evidence-based preventive approaches is underlined. Strategies to promote new approaches are discussed, with emphasis on participation. Relevance to industry Rapid industrial change requires new approaches to control the continuously increasing direct and indirect costs of WMSDs. The most cost-effective way to prevent these disorders is to integrate prevention into industrial practices.

Lewis-LC, Mireles-DZ. Occupational health hazard: carpal tunnel syndrome. **Semin-Perioper-Nurs.** 1997 Apr; 6(2): 105-10

A significant portion of the American population today is exposed to computer-related illnesses. One of the most common injuries is carpal tunnel syndrome (CTS). Perioperative nurses will become increasingly exposed to computer-related illnesses with the advent of computerized patient record systems. Economic loss, physical disability, and emotional distress are frequent outcomes of computer-related illnesses. Federal legislation addressing preventive measures is currently nonexistent. Clinicians, as both employers and consumers of computer technology, must address computer-related illnesses, such as CTS, through identification of related risk factors, early symptoms, implementation of ergonomic measures, and support of federal and industrial safety standards.

Liskiewicz-ST, Kerschbaum-WE. Cumulative trauma disorders: an ergonomic approach for prevention. **J-Dent-Hyg**. 1997 Summer; 71(4): 162-7.

UNITED-STATES

Clinical practice can place the dental hygienist at risk of acquiring cumulative trauma disorders (CTD). This article describes causative factors of CTD and suggests implementation of ergonomic intervention--by way of clinical and environmental factors--as a method of preventing and/or reducing CTD in the workplace. Included is a chronology of the rehabilitation process of a dental hygienist who has been disabled by CTD. Observing this clinician's re-training process, which included utilizing an ergonomically designed operator chair, arm and wrist supports, and modification of operator positioning, prompted an investigation into strategies to prevent CTD. Ergonomic design and protective operator techniques in dental hygiene practice may be key to preventing and/or reducing CTD occurrence.

Lodon Hazards Centre. **RSI Hazards Handbook: a workers'guide to repetitive strain injuries and how to prevent them**. London : The Centre; 1997

.Tenosynovitis, carpal tunnel syndrome, tendinitis, trigger finger, tennis elbow, and writer's cramp are just some of the work-related musculoskeletal upper limb disorders grouped together as repetitive strain injuries (RSI). RSI affects an estimated 200,000 UK workers a year. Keyboard workers are suffering an RSI epidemic, but RSI also afflicts manual workers in all kinds of repetitive job-food processing, electronics, clothing, cars packing cleaning, furniture and many other industries. This handbook covers all types of work where RSI can arise Many workers realise too late that they have been disabled possibly for life. Yet methods for preventing RSI are well known. Equipment and patterns of work have to be designed to fit human beings, instead of the worker

being twisted to fit the job. In many cases workers must take the initiative in ensuring that RSI does not occur in their workplace. This handbook shows how this can be done.

Mackinnon-SE, Novak-CB. Repetitive strain in the workplace. **Journal of Hand Surgery-American Volume** 1997 Jan; 22a (1) : 2-18

Malchaire-J.B., Cock-N.A., Piette-A., Dutra Leao-R., Lara-M., Amaral-F. Relationship between Work Constraints and the Development of musculoskeletal Disorders of the Wrist: A Prospective Study. **International Journal of Industrial Ergonomics** 1997; 19 (6) : 471-482.

Results of a prospective study on the relationship between work constraints and the development of musculoskeletal disorders of the wrist were presented. The 2 year study was conducted on 184 workers representing 14 jobs in ten different companies; eight jobs were occupied by men and six were occupied by women. The jobs, which included assembling seats, sewing seat covers, glass car window handing, meatcutting, positioning of ceramic filters on oven racks, pastry making, pharmaceuticals packaging, data encoding, and clerical work, were characterized by different levels of exerted forces, repetitiveness and postures of the wrists. The development of wrist disorders and occupational constraint parameters (wrist angles, forces, repetitiveness and angular velocities) took into account personal and occupational confounding factors. A greater probability of developing wrist disorders was found in workers suffering from chronic diseases, from psychological disorders, active in a sport involving the upper limbs, and those judging their work to be tiring. All occupational constraint factors were found to be correlated with wrist disorders except for the angles. Logistic correlation analyses show that the most significant associations with a greater probability of developing wrist disorders were observed for the mean relative electromyograph value recorded on the finger and hand flexors and the time during which the velocity in flexion/extension was greater than 50 degrees/second. None of the angular parameters showed any association. The authors conclude that the most significant parameter is the force exerted by the wrist and the hand, and that the objective should be to reduce the muscular activity below 15% of the maximum activity corresponding to the maximum voluntary contraction of the finger flexors.

Mansfield-J. A., Armstrong-T. J. Library of Congress Workplace Ergonomics Program**. American Industrial Hygiene Association Journal** Feb. 1997; 58 (2) : 138-144.

An ergonomic intervention program implemented at the Library of Congress designed to improve worker comfort and efficiency was described. The program was instituted after an increase in work related musculoskeletal disorders following the introduction of video display terminals in the 1980s. The goals of the program were to identify potentially hazardous conditions, to reduce or eliminate such conditions, to provide evaluation, diagnosis, treatment, and prevention of repetitive strain disorders, and to provide education about workplace hazards. The methods used to achieve these goals included commitment from management, identification of potentially hazardous work conditions and tasks, design of intervention programs by departmental committees, and implementation of hazard intervention programs and staff training. The start up cost for the first 2 years of the program was 617,695 dollars. The results of a pilot program conducted in the summer of 1993 in the Exchange and Gift Division and recommendations made by an ergonomist regarding program implementation and procedures were described.

Marklin-R.W., Simoneau-G.G., Monroe-J. **An Ergonomics Study of Alternative Keyboard Designs**. Milwaukee, Wisconsin : Department of Mechanical and Industrial Engineering, Marquette University; 1997.

Commercially available alternative QWERTY keyboards, split and vertically inclined, were studied to determine whether they are beneficial to keyboard users with respect to the risk factor for upper extremity work related musculoskeletal disorders, wrist and forearm posture. More than 90 clerical typists participated in the study and each subject was required to practice typing on the alternative keyboard for at least 10 hours prior to testing in the laboratory. When set up correctly, the three split keyboards reduced mean ulnar deviation of the wrist from approximately 10 degrees to within 2.5 degrees of a neutral position. This reduced one risk factor. A vertically inclined QWERTY keyboard in which the keyboard halves were tilted 30 degrees reduced average forearm pronation

by about 20 degrees, bringing the forearm closer to an anatomically neutral position. Wrist position differed between the right and left upper extremities with the left wrist typically showing greater ulnar deviation and extension than the right wrist. No appreciable functional differences were noted in the kinematics of the wrist and forearm between alphabetic and alphanumeric typing tasks for either conventional or alternative keyboards. There were no appreciable differences in performance between the conventional and alternative keyboard conditions after the subjects had practiced for 10 or more hours on the alternative keyboards.

McHugh-ML, Schaller-P. Ergonomic nursing workstation design to prevent cumulative trauma disorders. **Comput-Nurs**. 1997 Sep-Oct; 15(5): 245-52; discussion 253-4.

UNITED-STATES

The introduction of computerized nursing information systems offers health care institutions an opportunity to take a new look at safety issues related to nursing workstation design. Industrial studies have investigated the injuries sustained by clerical workers who spend long periods of time at their computers. Cumulative trauma disorders (CTDs) are the most common injuries associated with computerized workstation use. They account for nearly 90,000 injuries each year in the United States. Typical CTDs include back pain, strain of the neck, shoulders and eyes, and carpal tunnel syndrome. As the information handling work of nurses is increasingly computerized, the incidence of computer-related injury is expected to increase. Injury rates can be reduced by ergonomic workstation design. An assessment of potential risks associated with the equipment installed should be done as part of workstation design. Risk identification is a prerequisite for avoiding injuries by designing workstations that protect human health. The ergonomic principles learned and tested on office workers are addressed and extrapolated to nursing workstation design. Specific suggestions for design of sitting and standing workstations are presented.

Mercer-RB, Marcella-CP, Carney-DK, McDonald-RW. Occupational health hazards to the ultrasonographer and their possible prevention. **J-Am-Soc-Echocardiogr.** 1997 May; 10(4): 363-6

Occupational health hazards in ultrasonography are becoming more prevalent as the field continues to grow. Eye strain, musculoskeletal pain or injury, carpal tunnel syndrome, repetitive strain injuries, stress, burnout, and other hazards have been addressed as concerns in other studies and surveys. These topics are discussed, as well as the possible preventive measures that may be used to maximize and maintain the ultrasonographer's well-being throughout his or her career.

Mital-A Recognizing musculoskeletal injury hazards in the upper extremities and lower back**.** **Occup-Health-Saf.** 1997 Aug; 66(8): 91-9

Murphy-DC Ergonomics and dentistry. **N-Y-State-Dent-J.** 1997 Aug-Sep; 63(7): 30-4

Since 1992 the Occupational Safety and Health Administration (OSHA) has been preparing Federal legislation concerned with ergonomic hazards in at-risk workplaces. Although multifactorial in nature, there is sufficient evidence in the scientific literature to document an association between the practice of dentistry and a variety of musculoskeletal disorders. There are preventive strategies already known and available to us. Should dentistry be considered an at-risk profession and be required to comply with the forthcoming standard, or is self-monitoring sufficient?

Pransky-G, Long-R, Hammer-K, Schulz-LA, Himmelstein-J, Fowke-J Screening for carpal tunnel syndrome in the workplace. An analysis of portable nerve conduction devices. **J-Occup-Environ-Med.** 1997 Aug; 39(8): 727-33

Several devices have been developed for rapid motor or sensory median nerve conduction testing. We evaluated the validity and reliability of the Neurosentinel (NS) and NervePace (NP) electroneurometer for sensory and motor testing, respectively, compared with formal electrodiagnostic studies (EDS), and examined their potential role in workplace screening for carpal tunnel syndrome (CTS). Thirty-two working subjects without CTS were examined and tested with the NS, NP, and EDS, and retested one week later. Subjects were selected who did not have

CTS, other hand or nerve problems, or jobs with significant ergonomic risks, in order to decrease the likelihood of changes over time in median nerve function. Mean correlations of NP and NS with EDS latencies ranged from r = 0.069 to r = 0.85, with somewhat better correlation for NS (sensory) than NP (motor). Test-retest reliability was greatest for motor EDS (r = 0.86 to 0.91) and similar for sensory EDS, NS, and NP (r = 0.72 to 0.79); mean results were very similar. Based on the observed relationship between NS or NP and EDS results, confidence intervals were calculated to represent the range of EDS results consistent with a single NS or NP measurement. These intervals ranged from +/- 0.3 milliseconds (ms) for NS to +/- 0.6 msec for NP, with similar ranges for change over time in an individual. The magnitude of these intervals for a single test or individual implies that the NS and NP are unlikely to identify individuals with CTS or to detect changes over time that are not accompanied by symptoms or signs. The screening devices are not likely to be useful in confirming early CTS, when single latency values may be normal, and detailed EDS may be necessary to detect nerve entrapment. Compared with EDS, these devices have moderate validity and similar reliability; they are probably most useful for cross-sectional or longitudinal studies of groups, but care must be taken in using them for pre-placement or surveillance tests of individual workers. False-positive results may lead to discrimination, inappropriate referrals and interventions; false-negative tests can result in inappropriate reassurance and missed opportunities for intervention.

Radwin-RG, Jeng-OJ. Activation force and travel effects on overexertion in repetitive key tapping**. Hum-Factors.** 1997 Mar; 39(1): 130-40

Key switch design parameters, including make force, make travel, and over travel, were investigated for minimizing operator-exerted force while maximizing key-tapping speed. A mechanical apparatus was designed, constructed, and used for independently controlling key switch parameters and for directly measuring finger exertions during repetitive key tapping using strain gauge load cells. The task for the 25 participants involved using the index finger of the dominant hand to repeatedly depress a single key as rapidly as possible. Participants received visual and auditory feedback upon a successful keystroke. Peak force exerted decreased 24% and key-tapping rate increased 2% when over travel was distended from 0.0 to 3.0 mm. Although peak force exerted was not significantly affected by make point travel, key-tapping rate increased 2% when make point travel was reduced from 4.0 to 1.0 mm. These results indicate that key switch mechanisms that provide adequate over travel might enable operators to exert less force during repetitive key tapping without inhibiting performance.

Ramos- ZRT, Saavedra- MAH. Anthropometric table for the Puerto Rican industrial population. **Computers Industrial Engineering** 1997 Oct; 33 (1-2) : 213-216

In this article a possible cause for the increasing number of cases of cumulative trauma disorders that one observes in the industry of the Hispanic countries is analyzed. In Puerto Rico there is an inadequate use of anthropometric data for work stations design, because these designs are based on data coming from the U.S. population which are not suitable to the physical characteristics of Hispanic workers. This paper proposes an anthropometric table for the industrial Puerto Rican population which can be used for the design of work stations requiring any of the following twelve measures: height, elbow height, sitting height, eye height (sitting), elbow height (sitting), knee height (sitting), shoulder to shoulder breadth, hip breadth, arm reach, popliteal height, weight and thigh height (sitting). This research shows that there are significant differences between the anthropometric measures of the Puerto Rican and U.S. industrial population; validating this way the hypothesis that the data currently considered for work stations design in Puerto Rican industry is inadequate. The table developed allows the design of work stations according to the ethnic characteristics of Puerto Rican workers, reducing the risk of developing cumulative trauma disorders . (C) 1997 Elsevier Science Ltd.

Ribeiro-HP. **Ler: conhecimento, prática e movimentos sociais.** São Paulo : FSP-USP/SSE-SP; 1997.

BRASIL

Rizzo-TH, Pelletier-KR, Serxner-S, Chikamoto-Y. Reducing risk factors for cumulative trauma disorders (CTDs): The impact of preventive ergonomic training on knowledge, intentions, and

practices related to computer use. **American Journal of Health Promotion** 1997 Mar; 11 (4) : 250-253

UNITED-STATES

Scheer-SJ, Mital-A Ergonomics. **Arch-Phys-Med-Rehabil.** 1997 Mar; 78(3 Suppl): S36-45

Ergonomics is the application of natural laws governing human work in order to maximize safety and efficiency in the workplace. Ergonomic assessment includes job analysis from the biomechanical, physiologic, and physical viewpoints. The three most commonly described categories of ergonomic intervention are worker training, worker selection, and job redesign. In the last analysis, workplace redesign, using both engineering and administrative methods, is likely to be the most effective intervention.

Shackleton-TL, Harburn-KL, Noh-S. Pilot study of upper-extremity work and power in chronic cumulative trauma disorders. **Occupational Therapy Journal of Research** 1997 Dec; 17 (1) : 3-24

Research designed to increase our understanding of behavioral responses to chronic pain resulting from work-related cumulative trauma disorders (CTD) has been limited. This pilot study's main purpose was to examine the test-retest reliability of self-determined work and power during maximum and submaximum efforts in the performance of wrist flexion and extension movements of the CTD-affected extremity, using the LIDO WorkSET simulator System. Data were collected from 22 subjects (11 men, 11 women) with chronic upper-extremity CTD, in two same-day sessions. Subjective reports of current pain in the CTD subjects were measured using a Visual Analogue Scale (VAS) and a Numerical Rating Scale (NRS). Upper-extremity work and power data were also collected on 12 healthy subjects as a control (6 men, 6 women). Pilot results included: acceptable test-retest reliability of the work and power measures in the CTD subjects; the CTD group demonstrated markedly lower (20% to 58%) maximum work, submaximum work, and maximum power values compared with the healthy group; gender variation was seen in the CTD and healthy groups with respect to work and power data, and women with CTD tended to report higher pain intensity than male cohorts. These results provide insight for future studies.

Sheon-RP Repetitive strain injury. 1. An overview of the problem and the patients. The Goff Group**.** **Postgrad-Med.** 1997 Oct; 102(4): 53-6, 62, 68

Assembly-line workers, house painters, and many others whose activities entail repetitive motions can end up with swelling, pain, and limited movement in the affected muscles. Often, use of the six steps described in this article brings fairly rapid functional improvement and prevents recurrences, with a minimum of medical intervention. In some cases, though, recovery is prolonged or the outcome is unusual. The authors present additional factors to consider in such cases, such as psychosocial concerns, worker fraud, and ergonomic problems. Part 2 of this article, beginning on page 72, details six common repetitive strain injuries.

Sheon-RP Repetitive strain injury. 2. Diagnostic and treatment tips on six common problems. The Goff Group. **Postgrad-Med.** 1997 Oct; 102(4): 72-8, 81, 85 passim

Repetitive strain injury is caused by recurrent overuse, resulting in microtrauma to tissues. Local pain and tenderness, weakness, inflammation, and limited function are common findings. Some of the strain injuries seen most often are carpal tunnel syndrome, trigger finger, shoulder impingement syndrome, tennis elbow, thoracic outlet syndrome, and myofascial pain disorders. Often, treatment can be started at the initial visit, after systemic disorders have been ruled out. A vital step is elimination of aggravating factors, such as improper posture, inadequate attention to ergonomic factors at work, and contributory habits (e.g., jaw or hand clenching). Use of simple joint-protection measures can alleviate much of the discomfort. Appropriate self-help strategies used at home may restore flexibility and strength with a minimum of medical intervention, but pain relief must be achieved before patients can be expected to follow through with rehabilitation efforts. Use of ice packs, massage, NSAIDs, or topical pain-relief agents is often helpful. Prompt, temporary pain relief can also be achieved with injection of a local anesthetic-corticosteroid mixture. Persistent disability should prompt consideration of psychosocial factors. In addition, fraudulent claims of disability do occur. Although physicians should make every effort to support

legitimate claims of work-related injury, they should also be aware of the possibility that activities outside of work (e.g., sports participation, accidental injuries) may be contributing factors.

Viikari-Juntura-E.R.A. The scientific Basis for making guidelines and standards to prevent work-related musculoskeletal disorders. **Ergonomics** 1997; 40 (10) : 1097-1117.

Regulations concerning the work environment, tools, and the performance of work are at their best based on scientific evidence. Existing European directives, European and North American standards, and recent guidelines with the potencial to prevent musculoskeletal are either qualitative or semiquantitative. The exception is the NIOSH lifting guide, wich is highly quantitative. Of the European directives and standards, few have been developed with the primary goal of preventing musculoskeletal disorders, whereas one North American standard have this specific aim. In a review of epidemiological studies on low-back, neck, shoulder, and upper extremety disorders, several physical load factors were identified as risk factors for the disorders. Many of these factors have been repeatedly identified, and for different types of outcome of an anatomical area (e.g. pain, disc herniation, disc degeneration of the low-back or neck). However, quantitative exposure-response relationships between physical load factors and disorders based on field studies are largely unknown. Experimental studies have provided a multitude of potentially useful data. It is concluded that both well-designed epidemiological studies with quantitative assesments of physical work load and valid measurements of musculoskeletal disorders, and experimental studies are needed for the future development of regulation. , it should be Known to what extent fatigue and other short-term responses are precursors of disorders. Regulation should be directed especially towards factors that are likely to be causative for musculoskeletal disorders. Examples of such factors are sudden overload in manual, handlind activities, heavy physical work involving manual handling tasks, and vibaration from tools. Guidelines that are acceptable and feasible can and should be developed. The effects of such guidelines on the occurrence of musculoskeletal disorders should be investigated. A short version of this paper appears in the IEA'97 Proceedings, Volume 4, pp. 8-10.

Werner-R.A., Franzblau-A., Albers-J.W., Buchele-H., Armstrong-T.J. Use of Screening Nerve Conduction Studies for Predicting Future Carpal Tunnel Syndrome. **Occupational and Environmental Medicine** 1997; 54 (2) : 96-100.

The development of carpal tunnel syndrome (CTS) among asymptomatic workers with and without a median mononeuropathy was examined. The subjects consisted of manufacturing and clerical workers at five different work sites. There were 77 cases identified with median mononeuropathy determined by a prolongation greater than or equal to 0.5 milliseconds (ms) of the median sensory evoked response. Controls were matched by age and sex. A follow up questionnaire was administered within several years of the initial examinations. The particular jobs studied were identified with a unit of repetition on a scale of 1 to 10, in which an increasing value indicated an increasing degree of repetitive work. Of the 108 respondents, 13 reported numbness, tingling, burning, or pain in the hand or fingers. Symptoms developed in 12% of the cases and 10% of the controls. Only 7% of those cases with a prolongation greater than or equal to 0.8ms of the median sensory evoked response developed symptoms during the follow up. The workers with symptoms were investigated for an average of 21.5 months and had an average repetition level of 5.6, whereas the workers without symptoms were investigated for an average of 16.8 months and had an average repetition level of 4.2. Based on backward, stepwise logistic regression analysis, only the months of follow up and the repetition level were significant predictors of symptom development. The relative risk for reporting symptoms for each additional month of follow up was 1.19, while that for reporting symptoms for each increasing unit of repetition was 1.35. The authors conclude that although median mononeuropathy does not predict CTS symptom development among workers, further study is warranted.

Wolfe-F The sensible thing to do is prevent the pain. **RDH.** 1997 May; 17(5): 34-7, 54

Wood-DD, Fisher-DL, Andres-RO Minimizing fatigue during repetitive jobs: optimal work-rest schedules. **Hum-Factors.** 1997 Mar; 39(1): 83-101

Twenty women were asked to generate forces using a dynamometer that were consistent with one of three different work-rest schedules (a low-, medium-, and high-force schedule). Each work-rest schedule consisted of 6 identical blocks of 10 work-rest cycles. Each of the 10 work-rest cycles lasted 1 min. The first work-rest cycle in each block consisted of a 6-s maximal voluntary contraction and a 54-s rest. The remaining 9 work-rest cycles in each block consisted of a submaximal contraction and a rest period. The desired force of the submaximal contraction, the length of this contraction, and the duration of the rest period remained constant within schedules but varied across schedules. The amount of physiological work was kept constant among schedules. The fatigue that developed in the medium-force schedule was significantly lower than that developed in either the low- or high-force schedule. A model was developed that predicted the amount of fatiguable strength at the beginning and end of each contraction of a work-rest cycle. When fit to the results from the experiment, the model explained 94% of the variance. The model can be used to predict the work-rest schedule that minimizes fatigue in a given repetitive job, thereby potentially increasing productivity and reducing the incidence of cumulative trauma disorders.

Yassi-A. Repetitive strain injuries [see comments] **Lancet.** 1997 Mar 29; 349(9056): 943-7

Repetitive strain injuries (RSI) present an increasingly common challenge to clinicians. They consist of variety of musculoskeletal disorders, generally related to tendons, muscles, or joints, as well as some common peripheral-nerve-entrapment and vascular syndromes. These disorders generally affect the back, neck, and upper limbs, although lower limbs may also be involved. Although RSI may occur as a result of sports and recreational activities, occupational RSIs, affecting the patient's livelihood, are particularly important. These injuries result from repetitive and forceful motions, awkward postures, and other work-related conditions and ergonomic hazards. Occupationally induced RSIs are generally costly, creating a strong incentive for physicians to become familiar with the symptoms, signs, and risk factors so that they can be diagnosed early and appropriate interventions facilitated.

Zabel-AM; McGrew-AB Ergonomics. A key component in a CTD control program. **AAOHN-J.** 1997 Jul; 45(7): 350-8; quiz 359-60

Zalk-D.M., Tolley-J.C., Kim-Y. Grassroots Ergonomics: An Effort to Modify Custodial Training. **Professional Safety** 1997; 42 (3) : 21-25.

The development of an employee driven, ergonomically based program designed to improve the health and safety of custodial workers was described. A team composed of custodians, industrial hygienists, and safety professionals was assembled and educated about ergonomic theories such as correct postures, proper shoulder and hand positions and ways to avoid extreme body positions and postures. The team then identified custodial tasks that involved extreme body positions such as dusting high shelves and dumping 55 gallon containers. Body positions, body adaptations to limited work space, and high risk postures were then analyzed via observing videotapes of 15 subjects performing tasks that were identified as high risk. Two postural video analysis methods were utilized by the observers. Analysis revealed an increased risk of repetitive motion injuries in the right wrist and shoulder, and an increased risk of back injuries. The custodial working team used these results to modify training procedures, specifically body mechanics training, emphasizing neutral posture awareness and arm balance techniques. The program had a high level of acceptance among employees and markedly increased the level of ergonomic awareness among custodians.

Zimmermann-C.L., Cook-T.M., Rosecrance-J.C. Work-related musculoskeletal symptoms and injuries among operating engineers: A review and guidelines for improvement. **Appl. Occup. Environ.Hyg.** 1997, 12, 7, 480-484.

Among construction workers, operating engineers encounter job factors considerably different from those of their counterparts in other construction trades. While many professionals in the construction trades are faced with risk factors for work-related musculoskeletal disorders (WMD) such as heavy lifting, carrying, power tool use, and forceful repeated motions , operating engineers are confronted with more subtle stressors. The sustained and awkward postures they are required

to maintain, the controls they are required to operate, and the vibrating environments in which they work are major risk factors for WMDs among operating engineers. This article reviews the current literature and recommendations for improvement. Considering symptom and disability prevalence rates along with biomechanical and physiological considerations, four primary recommendations to reduce WMDs are indicated. Equipment designs should minimize the magnitude and frequency of vibration reaching the operator. Placement of equipment controls within the cab should minimize reach distance and trunk flexion and rotation. Cab designs should provide maximum operator visibility from an upright seated posture, decreasing postural loads associated with trunk and neck flexion. Operators should be encouraged and allowed to take regular breaks during the workday, minimizing the effects of a sustained sitting posture. These modifications in equipment and work practices should reduce the rates of musculoskeletal disorders associated with the operating engineer's profession and work environment.

1996

Abuali-M, Purswell-JL, Schlegel-RE. Psychophysically determined work-cycle parameters for repetitive hand gripping. **International Journal of Industrial Ergonomics** 1996 Jan; 17 (1) : 35-42

Carpal tunnel syndrome (CTS) and other cumulative trauma disorders (CTD's) are responsible for a high cost to the industry. CTS and CTD's have been reported in many industries and their risk factors have been identified. CTD occupational risk factors include repetitive movement, forceful exertions, sustained or constrained postures, vibration, low temperature, and mechanical stress. Exertion period and work duration have also been reported as risk factors. The literature search revealed the need for analytical studies of work cycle parameters, and the need to determine empirically the safety exposure limits for these factors. Therefore this study was concerned with presenting an analysis and definition of the work cycle parameters and investigating the safety exposure limits of the work cycle parameters. The psychophysical adjustment method was used to investigate the effect of force, wrist angle, and exertion period on the maximum acceptable work cycle parameters. The work cycle parameters were defined using the engineering definitions and terminology. These parameters were the rest period, duty cycle, and rest-to-work ratio. Twelve female subjects participated in a 40-minute hand gripping task and were allowed to adjust their rest period in relation to a set exertion period. ANOVA showed that there were significant effects of force, wrist angle, exertion period, and their interaction on rest period, duty cycle, and rest-to-work ratio at alpha = 0.001. Regression analysis was used to develop prediction models for the rest period, duty cycle, and rest-to-work ratio as a function of anthropometric dimensions of the hand and wrist, age, force, wrist angle, exertion period, maximum voluntary contraction (MVC), maximum deviation angle (MDA), and the percentage of MVC. The results of the regression analysis indicated that anthropometric dimensions and age were not significant factors. Relevance to industry: Several countries have initiated prevention programs to control the prevalence of CTD's and CTS in the workplace. An important ingredient of these programs is designing the workcycle to provide adequate recovery time. This paper presents an analysis and prediction equations of the workcycle parameters for different work and task conditions.

Armstrong-T.J. Control of Upper-Limb Cumulative Trauma Disorders**. Applied Occupational and Environmental Hygiene** 1996 Apr.; 11 (4) : 275-281.

Ways in which industrial hygienists and safety personnel can provide assistance to workers and employers with problems related to cumulative trauma disorders were discussed. This assistance may include education of the people involved about cumulative trauma disorders, evaluating available safety and health data, conducting a preliminary assessment of jobs for possible risk identification, working with personnel in designing and evaluating various interventions, and working with employees and medical professionals to develop plans to rehabilitate affected workers. Cumulative trauma disorders may involve muscles, tendons, and nerves and it may develop over periods of weeks, months, or even years. Some workers have symptoms that come and go and may often go unreported. Recovery can take weeks, months, or years, and in some cases recovery may never be fully realized. Several factors are important in the cause, precipitation, or aggravation of this condition. Ergonomic stresses which contribute to cumulative trauma disorders may include repetitiveness, static exertions, forceful exertions, localized mechanical stresses, posture, low temperature, and vibration. Nearly all industries and occupations

that involve hand intensive work have reported instances of cumulative trauma disorder among their workers.

Boyd-T, Hull-ML,Wootten-D An improved accuracy six-load component pedal dynamometer for cycling**. J-Biomech.** 1996 Aug; 29(8): 1105-10

This paper describes a new six-load component pedal dynamometer designed for study of knee overuse injury in cycling. A unique capability of the dynamometer is the ability to interface with multiple pedal platforms of varying height while maintaining a desired elevation of the foot above the pedal spindle axis. The dynamometer was designed using a concept described in an earlier article by Quinn and Mote (1991, Exp. Mech. 30, 40-48) which measures shear strain across multiple, thin cross-sections. An optimal design technique was used for choosing dimensions of the load measuring cross-sections. A dynamometer was designed and built using the optimal results. Calibration, accuracy results, and sample data are presented. A comparison of accuracy reveals that the new dynamometer is more accurate than previously reported instruments.

Colombini-D, Occhipinti-E, Meroni-M, Menoni-O, Bergamasco-R, Girola-C, Grea-V, Vendola-D Guidelines for redesigning jobs with repetitive tasks. **Med-Lav.** 1996 Nov-Dec; 87(6): 728-49

Preventive measures aimed at minimising the occurrence of work-related musculo-skeletal disorders of the upper limbs (WMSDs) associated with repetitive tasks can be divided into 3 categories: structural, organisational and educational. Whenever specific risk and injury assessments have shown the need for preventive action, this is most often implemented within the framework of a range of assorted measures. In particular, structural measures pertain to optimising the layout of the work area and furnishings, and the "ergonomic" properties of work tools and equipment. Such measures serve to alleviate the problems caused by the use of excessive force and improper postures. The authors refer to the principles guiding such structural measures, in the light of the extensive literature that has been published on the subject. Organisational (or re-organisational) measures essentially relate to job design (i.e. distribution of tasks, speeds and pauses). They serve to alleviate problems connected with highly repetitive and frequent actions, excessively lengthy tasks and inadequate recovery periods. Very few relevant findings are available: the authors therefore illustrate in some detail a practical trial conducted in a major engineering firm. The objective was to lower to acceptable limits the frequency of certain repetitive tasks performed by workers using their upper limbs. The trial made it possible to identify a suitable plan and schedule of measures taking into due consideration the impact of the plan on production levels (and costs). The fundamental principles guiding the adoption of specific educational and training programmes for the workers and their supervisors are presented and discussed.

Cook-T.M., Rosecrance-J.C., Zimmermann-C.L. Work-related musculoskeletal disorders in bricklaying: A symptom and job factors survey and guidelines for improvements. **Appl. Occup. Environ Hyg** 1996; 11 (11) : 1335-1339.

Workers in the construction trades experience high rates of injury and illness, including work-related musculoskeletal disorders. As the basis for formulating and implementing ergonomics changes to reduce musculoskeletal disorders among bricklayers, a questionnaire survey was conducted regarding work-related musculoskeletal disorders and the troublesome job factors which bricklayers perceived as contributing to those disorders . A two-page questionnaire was mailed out to all members of a Midwestern bricklayers union local. The responses of 39 nonretired bricklayers, having an average age of 45 and an average of 21.8 years of work experience, were and alyzed. Results indicated that work-related symptomatic areas, and those accounting for the most reported lost work time and physician visits, were primarily back, neck, and shoulder, and secondarily, elbow and wrist/hand. The survey respondents consistently identified job factors describing awkward postures of the back and shoulder, and handling bricks and mortar in these awkward postures, as the leading causes of their work-related musculoskeletal disorders.The results of this study, along with reports of previous investigations, point to a number of important factors that must be addressed in order to reduce musculoskeletal disorders among bricklayers. These include brick supply and mortar locations, brick placement/scaffold height, brick weight and size, and rate duration of work.

Cooper-RA, Robertson-RN, VanSickle-DP, Boninger-ML, Shimada-SD Projection of the point of force application onto a palmar plane of the hand during wheelchair propulsion. **IEEE-Trans-Rehabil-Eng**. 1996 Sep; 4(3): 133-42

The objective of this study was to develop and test a method for projecting the pushrim point of force application (PFA) onto a palmar plane model of the hand. Repetitive wheelchair use often leads to hand and wrist pain or injury. The manner by which the hands grasp the pushrim and how the forces and moments applied to the pushrim are directed may contribute to the high incidence of pain and injury. The projections of the PFA onto the palmar surface model of the hand reside primarily within zone II. These results are in agreement with previous studies which have assumed the PFA to be coincident with one of the metacarpophalangeal (MP) joints. However, the results from three subjects show different PFA patterns within the palmar surface of the hand which can be related to each subject's propulsion pattern, and the PFA is not focused at a single MP joint. Projection of the world coordinates of the four hand marker system onto the palmar plane show the resolution to be within 3 mm, or one half the diameter of the passive reflective markers. The errors in the planar model assumption were greatest for the second and fifth MP markers. This was expected because as the hand grasp changes these markers do not remain coplanar. The results of this study indicate that new knowledge about how forces are applied by the hand onto the pushrim can be obtained using this method. This technical note provides insight into understanding the details within the kinetics of wheelchair propulsion and describes a technique for estimation of the PFA on the palmar surface of the hand. This technical note provides initial results from three different wheelchair users.

Donati-P, Bitsch-J Prevention of hand-arm vibration hazards: from laboratory to practice**. Cent-Eur-J-Public-Health.** 1996 May; 4(2): 127-9

Many studies were made throughout the world regarding the medical and technical aspects of hand-arm vibration since the first description by Loriga in 1911 of the vibration syndrome. Despite that the protection of operators against vibration hazards had progressed very slowly in practice with one notable exception, the case of chain saw users for whom several countries developed a comprehensive programme to eradicate the diseases successfully; regulations, antivibration tools, medical screening, preventive treatment. If all these actions are not carried out simultaneously in an industrial sector the transmission of knowledge from the laboratory to practice may be a failure or very costly in money, time and energy, as this article will show it in the case of suspended rammers and breakers.

Eksioglu-M, Fernandez-JE, Twomey-JM. Predicting peak pinch strength: Artificial neural networks vs. regression. **International Journal of Industrial Ergonomics** 1996 Dec; 18 (5-6) : 431-441

Cumulative trauma disorders (CTDs) of the upper extremities are one of the major ergonomics areas of research. Pinching is a common risk factor associated with the development of hand/wrist CTDs. The capacity standards of peak pinch strength for various postures are needed to design the tasks in harmony with the workers. This paper describes the formulation, building and comparison of pinch strength prediction models that wereobtained using two approaches: Statistical and artificial neural networks (ANN). Statistical and ANN models were developed to predict the peak chuck pinch strength as a function of different combinations of five elbow and seven shoulder flexion angles, and several anthropometric and physiological variables. The two modeling approaches were compared. The results indicate ANN models to provide more accurate predictions over the standard statistical models. Relevance to industry: The proposed ANN approach to prediction modeling, as an alternative to traditional statistical modeling approach for predicting peak pinch strength, increases prediction accuracy, and thus improves the effectiveness of task and workplace designers, toward the prevention of occupational CTDs.

Garland-FC, Garland-CF, Doyle-EJ Jr, Balazs-LL, Levine-R, Pugh-WM, Gorham-ED Carpal tunnel syndrome and occupation in U.S. Navy enlisted personnel. **Arch-Environ-Health**. 1996 Sep-Oct; 51(5): 395-407

The objectives of this study were to (a) describe demographic factors associated with high rates of carpal tunnel syndrome (CTS), cubital tunnel syndrome, and other neuritis of the arm and hand, and (2) identify the high-risk occupations associated with these disorders in the Navy. Computerized records of first hospitalizations of all active-duty Navy-enlisted personnel were

searched for all cases of CTS, cubital tunnel syndrome, and other neuritis of the arm and hand (ICD-9 CM codes 354.0-354.9) during 1980-1988. There were 1039 first hospitalizations (including 493 cases of CTS) for all neuritis of the arm and hand in 4095708 person-years in men and 186 first hospitalizations (including 90 cases of CTS) in 365668 person-years in women. Incidence rates of hospitalized cases with CTS rose with age for both sexes. Rates in white women were approximately three times those in white men ($p < .0001$), but rates in black women were not significantly different from those in black men. Rates of cubital tunnel syndrome also increased with age in both sexes and were higher in white women than white men ($p < .05$). Occupations with significantly high standardized incidence ratios ($p < .05$) for CTS in men included aviation-support equipment technician, engineman, hull-maintenance technician, boatswain's mate, and machinist's mate. In women, occupations with significantly high standardized incidence ratios included boatswain's mate, engineman, hospital corpsman, ocean-systems technician, and personnelman. Several occupations for each sex had significantly high standardized incidence ratios for cubital tunnel syndrome, with high rates in hospital corpsmen of both sexes ($p < .05$). Gender and race differences according to occupation did not account for the occupations at highest risk. Further research is needed to determine the extent to which CTS and related disorders could be prevented by modifying the motions currently performed in occupations with the highest standardized incidence ratios.

Gilad-I., Lenger-R., Rempel-D. Upper-Limb Postures and Movements during Diamond Polishing. **International Journal of Occupational and Environmental Health** 1996 Jul.; 2 (3) : 177-184.

A motion study of diamond polishing maneuvers used by professionals was conducted. Upper body movements during 207 facet cycles were filmed and analyzed. Videos were analyzed frame by frame, and with the camera clock registering actual time, timed motion of the shoulder, elbow and wrist were established. The polisher assumed a forward leaning posture, which required the support of the forearms and elbows to stabilize the hands. The left hand applied downward pressure, with occasional assistance from the right, which also kept a constant hold of the magnifier used for inspection. Pressure was applied to the same areas throughout the day. The average duration of a polishing cycle was 3.5 seconds, performed an average of 7,400 times per day. About 26 polishing cycles made up one facet cycle. Most hand movements were performed by elbow flexion/extension, forearm pronation/supination, and wrist ulnar/radial deviation. Left hand ulnar deviation greater than 15 degrees occurred an average of 33 times per facet cycle. The right hand was held in a precision grip in an effort to reduce tremors, while the left hand fluctuated between a precision and a power grip, to allow stabilization of the wrist while applying a downward force. Also, 96% of the time, the right elbow flexion angle was greater than 105 degrees, while the left elbow flexion angle was between 45 and 90 degrees, changes which often occurred in less than a second. A total of 97 repeated movements at the shoulder level, and 65 repeated movements at the elbow and 66 at wrist were determined. The researchers conclude that upper limb discomfort would be eased by tool and work station redesign, allowing for less repetitive shoulder movements, reduced ulnar deviation, and a reduction in rapid elbow movements.

Gill-TJ 4th, Micheli-LJ The immature athlete. Common injuries and overuse syndromes of the elbow and wrist. **Clin-Sports-Med**. 1996 Apr; 15(2): 401-23

Specific elbow and wrist injuries are predictable in the skeletally immature athlete based on the biomechanics of the sport and the age of the patient. The physician must be aware of the potential for overuse injuries. Modification in training regimens is essential for recovery. A greater emphasis must be placed on the prevention of these injuries. As a general rule, the young athlete should not progress more than 10% per week in the amount and frequency of training. Correction of muscle-tendon imbalances is accomplished by maintaining strength and flexibility of susceptible tissues. In throwers, a triceps-strengthening program of progressive resisted extension exercises and a forearm flexor/extensor-strengthening program using the French curl technique are helpful. Careful attention to throwing technique and proper coaching are essential. The goal for the young athlete is early recognition of the injury and thereby prevention of a long-term disability.

Guariniello-R. Occupational risks and repetitive strain injuries in the Italian legislation. **Med-Lav**. 1996 Nov-Dec; 87(6): 482-7

ITALY

Based on the experience gained from several criminal proceedings handled by the Public Prosecutor's Office in Turin, the author presents and discusses the Italian legislation covering the prevention of musculo-skeletal pathologies of the upper limbs in the workplace. In particular, the author examines the obligations associated with issuing medical reports on such disorders, and focusses attention on the obligations of the employer with respect to prevention (i.e. technical, organisational and procedural measures), monitoring employee health and the provision of training and information for employees in the light of both existing legislation (Italian Civil Code, DPR 303/56 and DPR 1124/65) and more recent regulations (D. Lgs. 626/94).

Halperin-WE, Ordin-DL Closing the surveillance gap [see comments] **Am-J-Ind-Med.** 1996 Feb; 29(2): 223-4

Since 1986 there has been substantial progress in developing surveillance systems for occupational disease and injury that meet the goals of surveillance: identification or new diseases and causes of injury; estimation of the magnitude and trend of injuries and illnesses; identification of epidemic clusters; and identification of sentinel cases representing failures of prevention. A quiltwork of surveillance systems for occupational diseases and injury has been implemented by several federal agencies; surveillance systems for many more disease and injuries are being developed by the states. The conceptual basis for "closing the surveillance gap" has been developed; national implementation is the next challenge.

Health and Safety Executive. **Upper limb disorders - Assessing the risks.** Sudbury, Suffolk, UK : HSE Books; 1996.

This leaflet provides advice for employers and supervisors on the evaluation and prevention of work-related upper limb disorders (ULDs). Contents: symptoms of ULDs; work that can cause ULDs (repetition, force, awkward posture and insufficient recovery); assessing the risk; follow-up action and selection of preventive measures. Includes an assessment checklist.

Henning-R.A., Callaghan-E.A., Ortega-A.M. Continuous feedback to promote self-management of rest breaks during computer use. **Int. J. Ind. Ergon.** 1996; 18 (1) : 71-82.

Short rest breaks at regular intervals can reduce musculoskeletal discomfort and the risk of repetitive strain injury during intensive computer work, but may seriously disrupt some tasks. As an alternative, two laboratory experiments tested if application of ergonomic principles of feedback control could improve worker self-management of discretionary rest breaks. Undergraduate typists (N = 31, N = 30) entered lines of randomized words for about 1 h. Typists received scheduled breaks unless their discretionary breaks reached a target level of 30 s. every 10 min. Typists in treatment conditions received continuos feedback indicating how their discretionary breaks compared to the target level, but typists in control conditions did not. Feedback in one experiment was task-integrated to reduce distractions. Typists in the feedback conditions controlled discretionary breaks better than controls, and also responded favorably to the continuous feedback. Typists receiving task-integrated feedback reported less task disruption and back discomfort than controls. Mood and cardiac response were unaffected in both studies, but error rates were lower in the feedback condition of one experiment. These results indicate that computer users can utilize continuous feedback about rest break behavior to improve self management of discretionary rest breaks, with no untoward effects on performance, well-being or user acceptance.

Hunt-K. Ergonomics: a case study in preventing repetitive motion injuries. **J-Dent-Technol**. 1996 Jun; 13(5): 35-7.

UNITED-STATES

Dental Services Group has designed and implemented a system for its dental laboratories to mitigate cumulative trauma injuries, such as carpal tunnel syndrome and tendinitis. In the dental laboratory, these injuries result from repetitive motions such as waxing, sandblasting, grinding and polishing. This article describes purchasing guidelines for ergonomically designed laboratory equipment and offers resources for implementing workplace safety programs.

Kearney-D. Helping the Automated Assembly. **Worker Workplace Ergonomics** May 1996; 2 (3) : 13-14.

An analysis was presented of a facility where automation of some jobs had been adopted to meet changes in quality standards. This automation and computerization increased the worker exposure at the site to ergonomic hazards including biomechanical risks to various body parts and psychosocial risks due to the new pace of work. Incidence of cumulative trauma disorders had risen every year since 1990 at this site and since 1992 the jump had been 20%. A medical management survey was begun to identify specific problems among the workers and relate these to automated tasks and specific equipment. Worksite analyses were then conducted for each individual who was deemed at risk due to the results of the medical management survey. The author concludes that repetitive movement, awkward and/or static postures, forceful movement, insufficient recovery time, vibration, cold temperatures and stress were the risk factors associated with the current cumulative trauma disorders at the site. Several recommendations were offered to reduce the exposures, including changing the line pace and set up so that different muscle groups were used and adding stretch breaks. A planning committee was formed to facilitate joint labor and union activities to support the need for ergonomic changes through worksite analysis. Long term planning, education, worksite analysis, medical management, and worker self identification of cumulative trauma disorder related symptoms were all stressed.

Kemmlert-K. Prevention of occupational musculo-skeletal injuries - Labour Inspectorate investigation. **Scandinavian Journal of Rehabilitation Medicine** 1996; 5-34

The present study was undertaken to investigate the effect on ergonomic conditions by Labour Inspectorate intervention at the work place and to follow health and employment among occupationally injured. 195 reports on occupational musculo-skeletal injury (accidents and diseases) from men and women with different occupations were collected consecutively at three Labour Inspectorate offices. Fifteen Labour Inspectors volunteered to investigate half of the reports by work place visits within three months. The other half was kept for control. The inspectors were trained in ergonomics and also got complementary training in ergonomic work place assessment. A check-list was designed for the purpose and tested for validity and reliability. Eighteen months after the time of the injury reports, all work places were visited by ergonomists to evaluate possible improvements in ergonomic conditions. Due to turnover and prolonged sick-leaves, evaluations were performed for only 92 of the injured. At 160 work places other employees had performed similar tasks as the injured at the time of the injury report. Evaluations of possible improvements in ergonomic conditions were performed also for these employees. As regards changes at the work place there were no differences between the injured in the study and control groups. The inspectors had delivered 11 inspection notices to the employers demanding improvements for the injured and 14 notices regarding the conditions of work-mates. For this latter group there was a significant association between delivered notices and improved ergonomic conditions eighteen months after the reports. Three years after the time of the reports a postal questionnaire on health, psychological well-being and employment was distributed to the injured. The response rate was 93%. Questionnaire answers were compared to results from other studies, where identical questions were used. There was a significantly higher prevalence of musculo-skeletal and psychological symptoms in the study group compared to data from population groups. Activities in daily life were more restricted in the study group. 109 persons were in active employment. The association between the two effect measures improved ergonomic conditions and active employment, and both individual and work-related characteristics was analysed. The odds for improved working conditions were increased where the employer had given an informative injury description in the injury report, probably indicating that an understanding of the mechanisms of injury is a prerequisite for effective prevention. Sick-leaves for more than 6 months during the year following the report had a significant negative association with active employment, whereas male sex and higher education, respectively, had a positive association. The studied musculo-skeletal injuries were associated with a high prevalence of physical and psychological symptoms. Identification and investigation of ergonomic hazards, as appearing in informative reports on the origin of injuries and in inspection notices, seemed to have a positive influence on the process of prevention.

Kilough-M.K., Crumpton-L.L. An investigation of cumulative trauma disorders in the construction industry. **Int. J. Ind. Ergon.** 1996; 18 (5-6) : 399-405.

Disorders associated with repeated trauma were the most common occupational illness in 1991, accounting for 61% of all occupational illnesses (Bureau of Labor Statistics). Research on

cumulative trauma injuries in the construction industry is scarce. Therefore, the purpose of this research was to investigate factors associated with the development of cumulative trauma disorders (CTDs) in the construction industry. Additionally, this research evaluates the types of CTDs most prevalent in the construction industry. Results of this research show seven common CTDs prevalent in the construction industry: Carpal Tunnel Syndrome, Tennis Elbow, Trigger Finger, Arthritis of the Thumb, Thumb/Wrist Tendinitis, Vibration Syndrome and Impingement. An index was developed to rank tasks based on possible development of CTDs by quantifying factors that contribute to the occurrence of these CTDs such as tool design, work task design, awkward posture, repetition, and application of force. Relevance to industry. This paper presents an empirical approach for quantifying the risk of developing CTDs while performing common job tasks within the construction industry.

Kohn-J. P. Ergonomics Program Management in the Workplace: A Survey of Practitioners**. Professional Safety** 1996 Jul.; 41 (7) : 26-28.

Safety professionals were surveyed regarding the importance of ergonomic programs in the workplace. A total of 46 members of the American Society of Safety Engineers completed and returned the Ergonomic Activity Survey. Of the respondents, 29% worked for manufacturing companies, 13% for construction companies, and 55% for companies consisting of over 1,000 employees. Most respondents were entitled safety specialist or industrial hygienist. While 40% reported completing over 40 hours of ergonomics related training, 68% were considered certified or licensed. Of the respondents, 83% considered ergonomics to be an important safety and health issue at their companies. Participants further indicated that they spent 19% of their work week dealing with ergonomic concerns. Over 90% cited ergonomic health problems, such as low back pain, repetitive motion injuries, sprains/strains, tendonitis, vibration injuries, and job stress, which occurred in their companies. In addition, 64% of the safety professionals reported that research concerning the extent of these problems had been initiated. Safety teams with ergonomics duties were established in most companies. Although 37% of the companies issued ergonomics programs, only 33% of those were actually implemented. Hazard control measures, such as workstation, tool, and facility redesign, automation, management and employee training, and exercise programs, were reportedly initiated in 63% of the companies. While 43% of the respondents indicated that such control measures were successful, only 20% used data to determine the benefits, which included increased morale, hazard identification, reduced expenses, and improved hazard control. The author concludes that while most safety professionals regard ergonomics problems as serious, further implementation of aggressive measures is necessary.

Lindell-H Vibration reduction on hand-held grinders by automatic balancing. **Cent-Eur-J-Public-Health.** 1996 Feb; 4(1): 43-5

By automatically balanced hand hold grinders, vibrations are reduced to at least half and thereby reducing the estimated risk for vibration injuries by a factor of four. Simultaneously less grinding disc consumption and better grinding results are obtained. Vibration from grinders originates mainly from unbalance in the grinding wheel. Grinding wheels are low price products. With uneven distribution of mass and coarse tolerances. This gives rise to out-of-balance, which changes as the wheel wears. By fitting an automatic balancer, that consists of steel balls contained in a cylindrical ball race on the shaft of the grinder, unbalances will be compensate for in the machine during grinding. The time it takes for an automatic balancer to stabilize is only a few tenths of a second. When grinding, the balancer is stable, even during substantial changes in speed. The technique is applicable to almost all grinding machines on the market and the first grinders using the technique have just been put on the market.

McCann-K.B., Sulzer-Azaroff-B. Cumulative trauma disorders: behavioral injury prevention at work. **Journal of Applied Behavioral Science** 1996; 32 (3) : 277-291.

The purpose of this study was to decrease the risk of carpal tunnel syndrome (CTS) during keyboard entry tasks through a combination of training, self-monitoring, feed-back, goal-setting, and reinforcement. Technologies from biomechanics, ergonomics, and behavioural psychology were combined effectively to construct a powerful training package. As the subject entered text on a keyboard, their postures and hand-wrist positions were recorded. After baseline data were gathered, subjects received training and self-monitored either posture or hand wrist position.

Feedback, goal-setting and reinforcement were given later on both behaviours in a staggered fashion. The results indicate dramatic increases in the percentages of correctly performed postures and neutral hand-wrist positions, for all subjects. The training components used are reviewed in detail and the impact of these results is discussed.

Melhorn-JM A prospective study for upper-extremity cumulative trauma disorders of workers in aircraft manufacturing. **J-Occup-Environ-Med.** 1996 Dec; 38(12): 1264-71

Occupational diseases affect 15 to 20% of all Americans. Cumulative trauma disorders (CTDs) account for 56% of all occupational injuries. The recognition and control of occupational injuries has become a major concern of employees, employers, medicine, and the federal government because of health risk and related costs. Upper-extremity CTDs are identified by the National Institute for Occupational Safety and Health as one of the ten most significant occupational health problems in the United States. It is estimated by the year 2000 that 50 cents on the dollar will be spent on CTDs. Although enlightened aircraft employers have developed primary prevention strategies, primary prevention can never be expected to eliminate 100% of the cases. To evaluate several preventive activities, a CTD risk-assessment program was developed and implemented in cooperation with a major aircraft manufacturer employing over 8000 workers. This program was focused on objectively identifying the relationship of work and other activities to an individual worker experiencing CTDs. Early identification has been linked, when applicable, to intervention algorithms for medical care, job task modification, workplace accommodation, and training. A prospective study group of 212 workers who used rivet guns was placed into a four-way experimental design for ergonomic posture training, exercise training, and rivet-gun type (primary factors). A statistical model was developed for the level of CTD risk and evaluated using the SAS software program (SAS Institute, Inc, Carry, NC). Statistical analysis of the primary factors without regard to associated variables (covariates) demonstrated that only posture training had a beneficial risk reduction for the individual. The impact (beneficial or detrimental) for exercise training and for vibration-dampening rivet guns was probably obscured because of the large variability of the responses regarding the associated variables (covariates). When the covariates were analyzed in conjunction with the four experimental groups, a positive benefit from ergonomic posture training and exercise training was demonstrated for the following groups: the dominant han, time spend in an awkward position, number of standard rivets bucked, number of parts routed, number of parts ground, number of vibration-dampening rivets bucked, and newly hired individuals. A negative effect (increase in individual risk level) for current employees using a vibration-dampening rivet gun was demonstrated. This prospective study helps to identify the possible benefit of education and training for controlling CTDs and demonstrates the usefulness of being able to evaluate materials, methods, machines, and environments as they relate to the individual's risk level for the development of upper-extremity CTDs.

Mitchell-CS Outcome studies in industry: cost-effectiveness of cumulative trauma disorder prevention**.** **Am-J-Ind-Med.** 1996 Jun; 29(6): 689-96

Cost-effectiveness analysis (CEA) is a method for choosing between alternative strategies to achieve a specified outcome in an environment of limited resources. This paper discusses the use of CEA in evaluating prevention strategies in industrial settings, using cumulative trauma disorder (CTD) prevention programs as an example. Methodologic issues in designing studies of cost-effectiveness for preventive interventions are discussed. A decision analysis model of a CTD prevention program is described as a means of studying the program's cost-effectiveness. The relationship between CEA and outcomes research, and the strengths and limitations of CEA in evaluating occupational health prevention programs is considered.

Moore-J.S., Garg-A. The Strain Index: A proposed method to analyze jobs for risk of distal upper extremity disorders. **American Industrial Hygiene Association Journal** 1995 May; 56 (5) : 443-458.

A job analysis methodology was developed for the analysis of the risk of distal upper extremity disorders (cumulative trauma disorders affecting the upper extremities). It involves the measurement or estimation of 6 task variables (intensity of exertion, duration of exertion per cycle, efforts per minute, wrist posture, exertion speed, duration of task per day). A rating was assigned to each variable based on exposure data, then a multiplier value was assigned to each variable as well. The Strain Index (SI) is the product of these six multipliers. Preliminary testing suggests that

the methodology accurately identifies jobs with a risk of distal upper extremity disorders. In appendix: user's guide for the Strain Index.

Musser-W. H., Rempel-D., Coulson-C. **Effect of Squeegee Design on Carpal Tunnel Pressure**. Florence, Oregon: Squeegee Plus; 1996.

A multitask study was conducted in an effort to examine the relationship between squeegee handle designs and their potential impact on carpal tunnel syndrome and other cumulative trauma disorders (CTDs). The study group was composed of screen print workers. Two important factors in determining perceived comfort and exertion during the hands on evaluation were handle shape and width. The best performing handle made full contact with the fingers and the palmar surface of the hand with the hand in a somewhat open and relaxed position. The grip was also wider than the industry standard handle. There were 42 participants who had used padded handles; 60% indicated a marked decrease in hand fatigue and 55% indicated a marked decrease in hand pain. A mean carpal tunnel pressure value was calculated for each subject using each squeegee handle. There was a trend for the ergonomic handle designs to reduce carpal tunnel pressure relative to the industry standard design. The authors conclude that an ergonomically shaped squeegee handle with a relatively wide grip may increase comfort and decrease CTDs.

Occhipinti-E., Colombini-D. Musculo-Skeletal Disorders of the Upper Limbs Due to Mechanical Overload: Methods and Criteria for the Descripition and Assessment of Occupational (In Italian.) **Medicina del Lavoro** 1996; 87 (6) : 491-525.

This article presents and discusses a model for describing and evaluating the principal risk factors characterising occupational exposure: frequency and repetitiveness of movements, use of force, type of posture and movements, distribution of recovery periods, presence of other influential (complementary) factors. For each risk factor, the authors propose a method of practical detection in the field, as well as criteria for classifying and interpreting the results based on a critical review of the available literature on the subject. Numerous examples are supplied to better illustrate the concepts presented. The various factors considered are classified using numbers or indexes, so that they can be integrated into a concise exposure index described by the authors elsewhere in this volume.

Parker-K.G. Ergonomics programs: Current issues related to safety and health. **Orthop. Phys. Ther. Clin. North Am.** 1996; 5 (3) : 325-345.

The occurrence of CTDs and back injuries has been increasing each year. Accordingly, corporate ergonomics efforts and responsabilities also are increasing. Frustation over the lack of control afforded by the present workers'compensation system can paralyze a company or force it to pursue the lasted ergonomics fad. Practioners must realize that corporate hesitancy regarding ergonomics is rooted in the lack of problem definition that is expected in every other aspect of running the business. Non proven science exists to define cause and effect between risk factors and CTDs, and no specific standards exists by which company policy and procedures can be established. Futhermore, no guarantee can accompany every ergonomic control that may be recommended based on a simple OSHA log review and a basic jobs analysis. More often than not, the ergonomics-related problems experienced by a company represent a complicated mesh of production inefficiencies, less than adequate administrative practices, and poor medical management of workers'compensation cases. The case studies reported in this article reflect common frustations that accompany many ergonomics programs. The first case study involved a plant that, after spending millions on reengineering the high-risk jobs, still experienced CTDs in these same jobs because of its poor administrative practices. The second case study involved a plant that followed ergonomic principles in its workplace design, production planning, and administrative practices but did not manage its workes'compensation cases. Until a coordenated profile of all the factors at play can be established, the production floor, workforce, training, and injury and illness experiences will continue to be approched in a fragmented manner with inconsistent results. The careful implementation of a comprehensive ergonomics program should help in coordinating these factors and controlling work related CTDs and low back injuries.

Pheasant-S. **Bodyspace - Anthropometry, ergonomics and the design of work**. Hampshire , UK : Taylor & Francis; 1996.

Contents of this manual: introduction to ergonomics, anthropometry, human proportion and design; principles and practice of anthropometry; workspace design in relation to reach, clearance and posture; sitting posture and seat design; anthropometry of the hand, handle design, and biomechanics of tool design; ergonomics in the office (design of desks and chairs, visual demands of screen-based work, keyboard use); ergonomics in the home; health and safety at work (human factors in industrial safety, ergonomic injuries, back injuries, lifting and handling, upper limb disorders); anthropometry characteristics of different populations; tables of anthropometry data.

Pollack-R Dental office ergonomics: how to reduce stress factors and increase efficiency. **J-Can-Dent-Assoc.** 1996 Jun; 62(6): 508-10

Ergonomics, the science that studies human stress and strain related to activities, has one primary objective-to prevent work related musculoskeletal disorders, or symptoms that aggravate these disorders. Smart business owners have adopted the practice of ergonomics as an integral element in their ongoing strategies to increase productivity and ensure reduced workers' compensation liability. In British Columbia, however, potentially expensive ergonomic draft regulations created by the province's Workers' Compensation Board in 1993, have been put on hold. These ergonomic standards-described as the stiffest in the world -were to have been implemented across the province in early 1995. Nonetheless, ergonomic practices are alive and thriving in Canadian businesses that are devoted to ensuring a reduction in work-related injuries and salvaging potentially lost productivity. Although it is difficult to document lost productivity, Ontario's Workers' Compensation Board reported that it received 707 repetitive stress injury claims from office workers in 1992, with a per person cost of $7,703. In addition to these costs, each claimant took about 93 days off work. In dentistry, poor working habits, along with repetitive tasks, such as scaling and root planing, contribute greatly to musculoskeletal disorders, stress claims and lost productivity. Our tendency is to adapt awkward and illogical physical postures to access the oral cavity. The key objective for clinicians is to find a position that allows them to achieve optimum access, visibility, comfort and control at all times. With the professional goal to deliver the highest quality of care for a reasonable profit, the practice of ergonomics becomes a core focus in determining how to achieve practice success with less stress.

Robertson-RN; Boninger-ML; Cooper-RA; Shimada-SD Pushrim forces and joint kinetics during wheelchair propulsion. **Arch-Phys-Med-Rehabil.** 1996 Sep; 77(9): 856-64

OBJECTIVE: To investigate pushrim forces and joint kinetics during wheelchair propulsion and to discuss the differences between inexperienced and experienced wheelchair users. DESIGN: Cohort study. SETTING: Human engineering laboratory at a state university. SUBJECTS: Four men who use manual wheelchairs for mobility and four nondisabled men who did not have extensive experience pushing a wheelchair; all subjects were asymptomatic for upper extremity pain or injury. METHODS: Subjects pushed a commonly used wheelchair fitted with a force-sensing pushrim on a stationary wheelchair dynamometer. Video and force data were collected for 5 strokes at one speed of propulsion. Pushrim forces and net joint forces and moments were analyzed. MAIN OUTCOME MEASURES: Pushrim forces, radial (Fr) and tangential (Ft), were analyzed and compared for both groups in relation to peak values and time to peak values and as ratios of overall forces generated. Net joint forces and moments were analyzed in a similar fashion. RESULTS: Pushrim forces and joint moments were similar to those previously reported, with radial forces averaging between 34 and 39N and tangential forces ranging on average between 66 and 95N. Tangential forces were higher than radial forces, and mean ratios of tangential forces to the resultant force were approximately 75%, whereas mean radial force ratios were approximately 22%. All subjects showed higher joint moments at the shoulder than at the elbow or wrist. A large component of vertical reaction force was seen at the shoulder. Significant differences ($p < .05$) were found between groups for peak tangential force and time to peak tangential and peak vertical forces, with wheelchair users having lower values and longer times to reach the peak values. CONCLUSIONS: Discrete variables from the force-time curves can be used to distinguish between wheelchair users and nonusers. The experienced users tended to push longer, used forces with lower peaks, and took longer time to reach peak values. This propulsive pattern may have been developed to reduce the chance of injury by minimizing the forces at the joints, as a means of maximizing efficiency or as a combination of these factors. More work investigating 3-dimensional forces and the influence of seating position and various conditions of propulsion such as speed changes, ramps, and directional changes on injury mechanisms needs to be completed.

Roquelaure-Y., Asselin-A., Foucher-A., Dano-C., Fanello-S., Penneau-Fontbonne-D. Risk Factors in Work-Related Upper Limb Disorders. **Performances Humaines & Techniques** 1996; 82 :18-26.

Rozmaryn-LM The workplace athlete. Md-Med-J. 1996 Aug; 45(8): 647-54

Repetitive strain injury is rapidly becoming a problem of epidemic proportions in today's high technology workplace. It can take many forms and require a variety of different treatments. However, it is only with a combined, multidisciplinary approach that this problem can be prevented and tackled.

Sakai-N., Liu-M. C., Su-F.C., Bishop-A. T., An-K.N. Motion Analysis of the Fingers and Wrist of the Pianist . **Medical Problems of Performing Artists** 1996 Mar.; 11 (1) : 24-29.

A system was developed for measuring hand motions during piano playing based on the Expert Vision System, consisting of four video cameras, a VP 320 video processor, and a SUN 4-110 system capable of tracking the motion of reflective markers in three dimensions with less than 0.1% error in the field of view. For studying hand motions in this application, 2 millimeter diameter white plastic beads were covered with adhesive tape and 14 such markers were placed in a specific pattern on the dorsal side of the middle finger, the dorsal surface of the hands, and on the forearms. Each marker was tracked by the video cameras which enabled the joint angles to be calculated by customized computer software. The joint angles were calculated using vectors formed by the markers and the data generated by the video tracking system. The system was evaluated using 10 pianists, six females, mean age 29.1 years. Five were professional or semiprofessional pianists and five were amateur pianists. The extension/flexion angles of the distal interphalangeal (DIP), proximal interphalangeal (PIP), and metacarpophalangeal (MCP) joints at the middle finger and the extension/flexion angles of the wrist joint were determined while pianists played a scale and a chord passage. While playing the scale passage, most of the motion involved flexion of the MCP joint at the striking key and extension of the PIP joint. Playing the chord passage involved predominantly flexion at the wrist joint. The maximum extension angle at the wrist increased and was significantly larger when playing the chord than when playing the scale passage. Extension of the MCP and PIP joints was significantly smaller than when playing the scale. The maximum flexion angle of the DIP joint was much larger when playing the scale. The authors conclude that although there are many variations of finger motion and position when playing the piano, specific joints that are affected by repetitive motions can be identified. This system represents a feasible method for studying joint movements during piano playing.

Scientific Committe for Musculoskeletal Disorders of the International Commission on Occupational health (ICOH). Musculoskeletal disorders: work-related risk factors and prevention**. Journal of Occupational and Environmental Health** 1996; 2 : 239-246.

Work-related musculoskeletal disorders cause chronic pain and functional impairment, impose heavy costs on society, and reduces productivity. In this position paper from the Scientific Committe for Musculoskeletal Disorders of the ICOH, the most important risk factors at work are described. Work-related musculoskeletal disorders have high incidences and prevalences among workers who are exposed to manual handling, repetitive and static work, vibrations, and poor psychological and social conditions. The application of ergonomics principles in the workplace is the best method for prevention. International organizations should develop standards, common classifications, and terminologies. Surveillance systems should be further developed nationally and in workplaces, and more effort should be directed to information dissemination, education, and training.

Smith-A. Upper limb disorders - Time to relax? **Physiotherapy** 1996; 82 (1) : 31-38.

Experiments with a small number of people showed that keyboard operators tended to find working with na arm rest more comfortable than having no support, though the results were not conclusive and further research is required.

Smith-M; Matheson-GO; Meeuwisse-WH Injuries in cross-country skiing: a critical appraisal of the literature. **Sports-Med.** 1996 Mar; 21(3): 239-50

This study comprehensively reviews and critically appraises recent literature on cross-country skiing injuries. Particular attention was paid to the study design when reviewing the literature, thereby producing a measure of internal and external validity. From these data, the factors associated with the aetiology, frequency, site distribution and types of cross-country skiing injuries are examined. The incidence of injury in cross-country skiing is estimated to be between 0.49 and 5.63 per 1000 skier days. The most common injuries are medial collateral ligament sprains of the knee, and ulnar collateral ligament sprains of the thumb. Overuse and cold injuries (e.g. hypothermia and frostbite) appear to be common as well, although the data do not provide an estimate of incidence. Comments in the literature on prevention of these injuries are mainly empirical: they recommend safer equipment, wise choice of terrain and a general increase in skier awareness of ways to prevent injury. However, rigorous studies that adequately evaluate preventive intervention strategies have yet to be conducted. Cross-country skiing is relatively safe and a suitable activity for physical fitness and rehabilitation. In the future, studies employing an analytical design will be required to evaluate the effectiveness of injury prevention intervention strategies.

Stevens-E Carpal tunnel syndrome: a dental hygienist's fate? Facts you should know and practice. **NDA-J.** 1996 Summer; 47(1): 14-5

Stobbe-T.J. Occupational Ergonomics and Injury Prevention**. Occupational Medicine: State of the Art Reviews** 1996; 11 (3) : 531-543.

Issues related to occupational ergonomics and injury prevention were discussed. A broad overview and the history of ergonomics were first provided. The symptoms and treatment options of musculoskeletal incidents were reviewed. Low back pain was considered an extremely common medical condition, especially pervasive in particular industries. The application of ergonomic principles to back pain was regarded as a means of understanding how and why the injurious incidents occurred and of modifying future events and conditions. Possible system based interventions included employee screening, task elimination, changes in package weight, location or lifter coupling, posture changes, the use of mechanical aids, and the removal of the worker. Overloading, sudden movement or unexpected loading, and asymmetric loading were viewed as three major causes of back injuries. Disorders of the musculoskeletal and nervous systems resulting from repetitive work were termed cumulative trauma disorders (CTDs). A list of the common CTDs included carpal tunnel syndrome, tendinitis, ulnar nerve entrapment, tension neck syndrome, and epicondylitis. The main risk factors for CTDs were given as the muscular force exerted during work, the duration and frequency of the task, and awkward posturing during task performance. Other risk factors included vibration, thermal stress, and pressure. The minimization or elimination of as many of the above risk factors as possible, by way of ergonomic intervention, was considered the best approach to controlling CTDs. The author concludes that ergonomic intervention is the most suitable way to reduce the occurrence of musculoskeletal incidents in the workplace.

Stock-SR, Cole-DC, Tugwell-P, Streiner-D. Review of applicability of existing functional status measures to the study of workers with musculoskeletal disorders of the neck and upper limb. **Am-J-Ind-Med.** 1996 Jun; 29(6): 679-88

Both epidemiologic studies of the factors that contribute to the development of work-related musculoskeletal disorders of the neck and upper limb and intervention studies that test the effectiveness of workplace ergonomic and organizational changes are needed to provide empiric evidence for preventive strategies. This study reviews the relevance and comprehensiveness of existing functional status instruments for epidemiologic studies of work-related neck and upper limb disorders. Twelve domains were identified as the major areas of life affected by workers' neck and upper extremity disorder(s): work, household and family responsibilities, self-care,

transportation/driving, sexual activity, sleep, social activities, recreational activities, mood, self-esteem, financial effects, and iatrogenic effects of assessments and treatment. Fifty-two functional status instruments were identified. Of these, 21 met the specified criteria as potentially relevant and were rated on the 3-point scale for relevance and comprehensiveness for each domain. None of the instruments covered all 12 domains adequately.

Sunell-S, Maschak-L Positioning for clinical dental hygiene care. Preventing back, neck and shoulder pain. **Probe.** 1996 Nov-Dec; 30(6): 216-9

Pransky-G; Himmelstein-J Outcomes research: implications for occupational health. Am-J-Ind-Med. 1996 Jun; 29(6): 573-83 AB: Concerns about quality, cost, and unnecessary medical care have led to substantial interest and growth in outcomes research with studies to determine the full range of effects of disease and comparative effectiveness of treatments. Investigators have developed new conceptual models of health-related quality of life and associated questionnaires, study designs that maximize use of administrative databases and the generalizability of results, and methods to control for severity and co-morbidity. As similar concerns about occupational health care have emerged, these approaches are being adapted for use in the occupational setting, and studies are beginning to address the concerns of working populations. These investigations will require development of new models of outcome, interdisciplinary research teams, adaptation of data collection methods to address the unique concerns of workers and the unique aspects of the workplace, use of new information databases, and methods of analysis. The implications of these concepts for a hypothetical study of carpal tunnel syndrome and a proposed agenda for future studies in occupational health outcomes research are presented.

Tan-GL Ergonomic task analysis in electronics industries: some case studies. **J-Hum-Ergol-Tokyo.** 1996 Jun; 25(1): 49-62

The analyses of a few tasks were carried out in an electronics factory. The main objectives are to identify the ergonomic and biomechanical hazards of problem work tasks, to analyze each task systematically in order to evaluate the workers' exposures to the risk factors of force, posture pressure and repetition and to make recommendations to reduce the risks and hazards. The methodology includes objective measures--detailed analysis by going through training manuals, job description and production records. Subjective measures include interviewing the operator and supervisors informally, the operators were also required to fill in a structured questionnaire. The paper concludes by making recommendations to reduce the ergonomic hazards by engineering solutions, redesign or administrative controls or the implementation of procedures.

Yassi-A, Sprout-J, Tate-R. Upper limb repetitive strain injuries in Manitoba. **Am-J-Ind-Med.** 1996 Oct; 30(4): 461-72

A review of workers' compensation board (WCB) claims in Manitoba, Canada identified an estimated 382 upper limb repetitive strain injury (RSI) claims or 9.3% of all upper limb WCB claims accepted in 1991. Tendonitis and carpal tunnel syndrome (CTS) were the most frequent diagnoses (27.5% and 19.3%, respectively). Rates of RSI were not significantly different by gender and age. RSI claimants had been experiencing symptoms for an average of 8 months prior to filing a compensation claim. While clerical occupations accounted for 13.6% of all upper limb RSI claims, the rates for RSIs in these occupations were low (0.67/1,000 workers), in contrast to occupations with the highest RSI rates: food, beverage, and related processing occupations (14.68/1,000 workers) and fabricating, assembling, and repairing of metal products (9.32/1,000). The highest risk industries were meat and poultry processing-related (23.48/1,000) and the manufacturing of airplanes (9.06/1,000). RSI claims were significantly more costly (+5,569 vs. +2,480, $p < 0.0001$) and required more time loss (71.4 vs. 33.6 d, $p < 0.0001$) than similar musculoskeletal non-RSI claims. Similarly, RSI claimants were less likely to return to the same job (67.3% vs. 81.0%, $p < 0.0001$) than non-RSI claimants. It was concluded that the cost and severity of RSI claims militate for intensified preventive measures.

Yu-I.T.S, Wong-T.W. Musculoskeletal problems among VDU workers in a Hong Kong bank. **Occup. Med.** 1996; 46 (4) : 275-280.

A survey of musculoskeletal problems among visual display unit (VDU) users was carried out in a bank using a self-administered questionnaire. The prevalence of complaints in various body parts

were: neck - 31,4%, back - 30,6%, shoulder - 16,5%, hand and wrist - 14,9% and arm - 6,6%. Frequent users of VDU had significantly more musculoskeletal problems in the neck and shoulder regions than infrequent users. Individual musculoskeletal complaints were associated with various risk factors including personal attributes, working posture, repetitive movements and work station design. Back, neck and shoulder problems were more related to unfavourable working postures, while arm, hand and wrist problems were more affected by repetitive movements. Some risk factors for musculoskeletal problems were specifically related to the nature or design of VDU work. Modification of the workstation design and improvement in work organization should be able to reduce the prevalence of these disorders.

1995

[Anonymus]. **About work-related upper limb disorders**. Alton, Hants, UK : Scriptographic Publications; 1995.

Training booklet on work-related upper limb disorders (repetitive strain syndrome) and their prevention. Test for self assessment.

Bovenzi-M, Griffin-MJ, Ruffell-CM, Doheny-M, Linden-P, Sedlak-C. Reducing orthopaedic hazards of the computer work environment. **Orthop-Nurs**. 1995 Jan-Feb; 14(1): 7-15; quiz 16.

UNITED-STATES

The rate of repetitive strain injuries (RSI) in the workplace is rising at an alarming rate. People using computers and working at keyboards for long periods of time are particularly at risk. Prevention of orthopaedic injuries can make the work environment less stressful and more productive as well as help to avoid needless human suffering and costly medical and legal bills. Knowledge of the causes of RSI and preventive measures to reduce orthopaedic hazards of the computer work environment is important for orthopaedic nurses.

Bovenzi-M, Griffin-MJ, Ruffell-CM. Vascular responses to acute vibration in the fingers of normal subjects. **Cent-Eur-J-Public-Health**. 1995; 3 Suppl: 15-8

CZECH-REPUBLIC

The aim of this experimental study was to investigate the pathophysiological mechanisms involved in the acute effects of unilateral vibration on the digital circulation of healthy men. In the fingers of both hands of eight male subjects (age 23-47 years) who had never worked with vibrating tools, finger blood flow (FBF) and finger skin temperature (FST) in thermoneutral conditions, and the percentage change of finger systolic pressure (FSP %) after local cooling from 30 to 10 degrees C were measured. The right hand was exposed for 30 min to sinusoidal vibration with a frequency of 125 Hz and an acceleration of 87.5 m.s.-2r.m.s. A control condition consisted of exposure to the same static load (10 N) but without vibration. The measures of digital circulation were taken before exposure to vibration and static load and at 0, 30, 60, and 90 min after the end of each exposure. Exposure to static load caused no significant changes in FBF, FST, or FSP % in either the test right or the control left finger. Immediately after vibration, there was a temporary increase in FBF in the vibrated right finger, while the non-vibrated left finger exhibited no vasodilation. In both the vibrated and non-vibrated fingers, FBF and FST significantly reduced during the recovery time. A large inter-subject variability was observed for FBF and, to a lesser extent, for FST. In the vibrated right finger the decrease in blood flow was significantly related to cold-induced vasoconstriction in the digital vessels. Such a relation was not observed in the non-vibrated left finger. The results of this investigation suggest that acute vibration can disturb the function of digital vessels through two different and opposite mechanisms. Vibration appears to produce local vasodilation and to trigger a central sympathetic reflex vasoconstriction which can be recorded in the ipsilateral and the contralateral finger to vibration. Both local and central vasoconstrictor mechanisms are likely to be involved in the response to cold observed in the digital vessels of a vibrated finger.

Canadian Centre for Occupational Health and Safety. **Preventing Repetitive Motion Injuries [CD-ROM ISSA BBB6].** Hamilton, Ontario, Canada : The Centre; 1995.

This multimedia software on CD-ROM is aimed at everyone whose work involves repetitive montions, staff representatives and health and safety specialists. It covers the prevention, nature,

causes, detection and elimination of repetitive motion injuries. The CD-ROM can be used for individual self-study or small group work on a computer. It includes 5 modules: understanding repetitive motion injuries and their effects on the body, causes, detection and treatment. Exercises and games are also included.

Cobb-T. K., An-KN., Cooney-W. P., Rochester-M. N. Externally Applied Forces to the Palm Increase Carpal Tunnel Pressure. **Journal of Hand Surgery** 1995 Mar.; 20A (2) : 181-185.

The magnitude of carpal tunnel pressure change relative to the location and amount of an externally applied force on the palm of the hand was discussed. Five cadaveric specimens were examined. MIKRO-TIP transducers were percutaneously placed into the carpal tunnel at the level of the hook of the hamate. At 16 separate locations, a 1 kilogram force was applied to the palm of the hand. For external forces applied over the flexor retinaculum and for the hypothenar and thenar areas adjacent to the distal aspects of the carpal tunnel, significant elevations in carpal tunnel pressure were noted. Intermediate pressures were noted for the proximal hypothenar area. The region of the thenar eminence resulted in higher carpal tunnel pressures than those of the hypothenar eminence. The region over the flexor retinaculum in the central aspect of the proximal region of the hand had the greatest effect on the carpal tunnel pressures. These findings have helped explain the results of other pressure studies in which unexplainable high pressures were noted within the canal when a component of external pressure at the base of the hand was included as a portion of the variable assessed. These findings will also be important in the design of tools for hand use.

Codo-W, Almeida-MCCG., Lima-AB, Monteiro-AL, Prado-CVA, Oliveira-F, Lin-TY, Antunes-ME, Settimi-M M, Silvestre-MP, Mattar Junior-R, Maciel-RH, Azze-RJ. **LER : diagnóstico, tratamento e prevenção uma abordagem interdisciplinar.** Petrópolis : Vozes; 1995.

BRASIL

Dempsey-P.G., Leamon-T.B. Bending the Tool and the Effect on Productivity: An Investigation of a Simulated Wire-Twisting Task. **American Industrial Hygiene Association Journal** 1995 Jul.; 56 (7) : 686-692.

A study was conducted on the effect of using ergonomically designed tools on productivity. Task performance was assessed in subjects performing a screw turning task using a standard needle nose pliers or a bent handle ergonomically designed pliers. The mean number of revolutions per minute accomplished using the bent handle pliers was 8.25% lower than that seen using standard pliers. A significant interaction was seen between plier type and work height. The largest performance decrement seen using the bent handle pliers was at elbow height. Almost twice as many subjects reported that they would select the standard pliers if given a choice and several reported that the bent handle pliers were more comfortable but slower to use. More negative assessments of the bent handle pliers were reported compared with the standard pliers. The implications of these findings for industrial research regarding wrist positions associated with the use of pliers and the development of cumulative trauma disorders were discussed.

Doheny-M; Linden-P; Sedlak-C Reducing orthopaedic hazards of the computer work environment. **Orthop-Nurs.** 1995 Jan-Feb; 14(1): 7-15; quiz 16

The rate of repetitive strain injuries (RSI) in the workplace is rising at an alarming rate. People using computers and working at keyboards for long periods of time are particularly at risk. Prevention of orthopaedic injuries can make the work environment less stressful and more productive as well as help to avoid needless human suffering and costly medical and legal bills. Knowledge of the causes of RSI and preventive measures to reduce orthopaedic hazards of the computer work environment is important for orthopaedic nurses.

Eichner-ER Overtraining: consequences and prevention. **J-Sports-Sci.** 1995 Summer; 13 Spec No: S41-8

Overtraining refers to prolonged fatigue and reduced performance despite increased training. Its roots include muscle damage, cytokine actions, the acute phase response, improper nutrition, mood disturbances, and diverse consequences of stress hormone responses. The clinical features

are varied, non-specific, anecdotal and legion. No single test is diagnostic. The best treatment is prevention, which means (1) balancing training and rest, (2) monitoring mood, fatigue, symptoms and performance, (3) reducing distress and (4) ensuring optimal nutrition, especially total energy and carbohydrate intake.

Elsner-G., Nienhaus-A., Beck-W. Occupational risk factors for epicondylitis lateralis (In German). **Ergo-Med** 1995; 19 (3) : 76-81.

Frank-BC. Risk of injuries, symptoms of excessive strain and preventive possibilities in cross-country skiing. A comparison between classical technique and skating technique. **Sportverletz-Sportschaden.** 1995 Dec; 9(4): 103-8

A standardised questionnaire was drawn up and submitted to 690 cross-country skiers active in popular (pastime) sports, competitive sports and high-performance sports, between 1990 and 1993, covering a total of 189 injuries and 1,281 cases of complaints caused by overstrain. Over and above this, muscular imbalance and postural characteristics (for example, signs of vestibular syndrome) were examined in 94 of these skiers. Three times as many skiers (69.3%) reported on complaints than skiers reporting on injuries (20.3%). Complaints concerned particularly the lower extremities (45.9%), whereas injuries were more frequent at the upper extremities (47.6%). Minor injuries predominated (77%) such as sprains and distortions (23.8%), contusions (25.9%), skin injuries (13.7%) and muscle injuries (13.7%) as well as mild complaints (45.1%) such as blisters at the hand and feet. High-performance sportsmen (14.4%) are significantly most frequently injured when employing the skating technique, whereas in competitive sports the "classical" technique results in a greater incidence of accidents (16.1%). Most accidents occur during downhill skiing, on rutty and icy tracks, collisions, due to inadequate technique, lack of balance and unskilled handling. Complaints are significantly reported by competitive (70.8%) and high-performance sports people (74.8%) for both techniques. Whereas complaints at the lower extremities occur more often during skating technique (56.8%) than during the classical technique (34.5%), complaints concerning the trunk are seen more often with the classical technique (29.7%) than with the skating technique (8.9%). Complaints are caused by icy, rutty tracks, inadequate equipment, deficient training, muscular imbalances and previous damage. A large number of pointers on how to avoid pitfalls when employing the skating and classical techniques can be obtained via analysis of the injuries and complaints.

Fransson-Hall-., Bystrom -S, Kilbom- A. Self-Reported Physical Exposure and Musculoskeletal Symptoms of the Forearm-Hand among Automobile Assembly-Line Workers. **Journal of Occupational and Environmental Medicine** 1995; 37 (9) : 1136-1144.

A study of physical exposure factors and forearm/hand musculoskeletal symptoms in automobile assembly line workers was conducted. The cohort consisted of 521 assembly line workers (393 males) at a Swedish automobile factory. The controls consisted of 186 persons (96 males) selected from among the general population of Stockholm. The subjects in both groups ranged in age from 18 to 65 years. They completed a questionnaire package to obtain information on work history, work related factors including use of hand tools, perceived general exertion at work and home, hand and finger movements made during work, wrist positions adopted during work, hand grips used, forearm/hand symptoms, sick leave taken for forearm/hand problems, type-A personality traits, and perceived work satisfaction and social relations with colleagues. Body weight and heights were measured, from which body mass indices (BMIs) were computed. The prevalence of forearm/hand symptoms among male and female assembly line workers was 38 and 46%, respectively. The prevalence of these symptoms in the controls was 17 and 28%, respectively. The assembly line workers made significantly more repetitive hand and finger movements for longer durations and reported significantly more perceived physical exertion at work than the controls. During the past 6 months, 11% of the male and 27% of the female assembly line workers took sick leave for forearm/hand problems that averaged 8 and 11 days, respectively. Type-A personality traits were significantly associated with an increased risk for forearm/hand problems in the cohort. Obese females, those having a BMI greater than 28.3, reported significantly more forearm/hand symptoms than females with normal BMIs. Use of awkward wrist postures was significantly associated with an increased risk for forearm/hand

problems in all assembly line workers. The authors conclude that automobile assembly line workers appear to be at increased risk for work related musculoskeletal problems of the forearm and hand.

Genaidy-A.M., Delgado-E., Bustos-T. Active Microbreak Effects on Musculoskeletal Comfort Ratings in Meatpacking Plants. **Ergonomics** 1995 Feb.; 38 (2) : 326-336.

The effects of active microbreaks on the arm and hand discomfort experienced by workers in a meat packing facility were investigated. Subjects included 16 Caucasian and 12 Hispanic male workers selected at random. Ratings of perceived discomfort (RPD) were made with a ten point scale for the neck and upper extremity, spine and lower extremity. Subjects were instructed to determine the frequency and length of each microbreak, based on perceived discomfort. Subject performed a set of stretching exercises during microbreaks, self selected based on perceived discomfort. RPD of the shoulder, upper arm and lower arm were significantly lowered by microbreaks. Anthropometric measurements of strength, endurance, and background were significantly correlated with RPD. The Hispanics perceived greater PRD and tested lower on physical characteristics than the Caucasians. The authors conclude that the effects of microbreaks on injury control need further study in larger groups of workers.

Gilad-I. A Methodology for Functional Ergonomics in Repetitive Work**. International Journal of Industrial Ergonomics** 1995 Feb.; 15 (2) : 91-101.

A method for resolving the biomechanical causes of cumulative trauma disorders induced by job tasks was proposed. The frequencies and performance time of selected motion acts were analyzed for the derivation of a biomechanical profile of each motion element. Guidelines for the screening and analysis of repetitive work elements included breakdowns of job tasks and work cycles as well as recommended limitations for motion selection. Subject movements would be recorded on a video camera. The recommended procedure for the analysis of a repetitive job task involved the determination of manual job demands, breakdown of the job into working routines, selection and definition of repetitive routines and work cycles, and selection and division of the repetitive motions by examining motion duration, static effort, and force exertions. The determination and presentation of the biomechanical profiles of body joints from the evaluation of angular and time factors constituted the final step of the procedure. Repetitive motion patterns and the application of the biomechanical factors in cumulative trauma disorders in the diamond industry were discussed. An analysis was conducted of the working tasks of diamond polishers. Most movements during polishing were performed by elbow flexion/extension, forearm pronation/supination, and wrist ulnar/radial deviation. The information from the analysis could then be used in working routine redesign. The author concludes that the method can be applied for the analysis of highly manual jobs and is specifically effective in ergonomic evaluations of hazardous risk factors associated with repetitious tasks.

Guinter-R, Eagels-S, Harringer-R, Trusewych-T. AT&T Bell Lab's ergonomic program aims to cure VDT workstation ills. **Occup-Health-Saf**. 1995 Feb; 64(2): 30-5**.**

UNITED-STATES

Hedge-A, Powers-JR Wrist postures while keyboarding: effects of a negative slope keyboard system and full motion forearm supports. **Ergonomics.** 1995 Mar; 38(3): 508-17

Video-motion analysis was used to analyse hand/wrist posture for subjects typing at a 101-key QWERTY keyboard on a 68 cm high worksurface. Three conditions were tested: subjects typed at the keyboard without arm support, subjects typed with adjustable full motion forearm supports, and subjects typed with an adjustable negative slope keyboard support system. The average declination of the negative slope keyboard support chosen by subjects was 12 degrees below horizontal, which flattened the angle of the key tops. Ulnar deviation was comparable in all conditions and averaged 13 degrees for the right hand and 15 degrees for the left hand. Full motion forearm supports did not significantly affect any postural measures. Dorsal wrist extension averaged 13 degrees when typing with or without the full motion forearm supports, but this was reduced to an average -1 degree with the use of the negative slope keyboard support system.

Subjects chose to sit at a distance of 79 cm from the computer screen when using the negative slope keyboard system compared with 69 cm without this.

Helander-M. **A guide to the ergonomics of manufacturing**. Hampshire, UK : Taylor & Francis; 1995.

Contents of this manual: introduction to ergonomics; case studies of implementation of ergonomics in manufacturing; anthropometry in workstation design; physical work and heat stress; manual lifting; choice of work posture; repetitive motion injury; hand tool design; illumination at work; design of VDT workstations; design of controls; design of symbols, labels and visual displays; development of training programmes and skill development; noise; shift work; whole-body vibration; design for manufacturing assembly; design for maintainability; machine and robot safety; use of an ergonomics checklist in manufacturing.

Hjortsberg-U, Karlsson-JE PIMEX--an instructive way to study vibration exposure and work posture**. Cent-Eur-J-Public-Health.** 1995; 3 Suppl: 135-6

The PIMEX-method (PIcture-Mix-EXposure) involves measurement of exposure with a direct-reading instrument. The signal from the instrument is superimposed to the recording from a video camera to produce a video film which continuously shows the subject at work and how exposure varies. Application can be a physical factor such as vibration. We used this new method to study vibrations from hand held grinders. Using Bruel and Kjaer miniaturized accelerometer 4374 and vibration meter 2513 we measured vibrations at the grinders main and support handles. We studied different grinders at work on the metal surface as well as at idle speed. Workers posture such as arms in under-up position was evaluated. The PIMEX-method has been encouraging to show correlation between vibration exposure, work technique and different grinders.

Hochanadel-C.D. Computer workstation adjustment: a novel process and large sample study. **Appl. Ergon.** 1995; 26 (5) : 315-326.

The use of computers in the US workforce is expected to grow throughout the 1990s. Prolonged computer use, repetitive keying, awkward postures and psychosocial issues have been associated with injuries described as cumulative trauma disorders (CTDs). The incidence and reporting of occupationally induced CTDs has increased dramatically sice 1980. Proper adjustment of individual computer workstations requires time and thecnical knowledge. An automated process for computer workstation adjustment was developed used linking-segment anthropometry. Over 3300 employees in a large industrial complex voluntarily participated in this programme by completing a computer workstation questionnaire. Significant relationships were demonstrated comparing both hours and years of computer use with symptoms. A follow-up questionnaire was completed by 531 programme participants. Ninety percent indicated an improved understanding of proper computer adjustment. Eighty percent of those making recommended adjustments indicated benefits in reduced symptoms and greater work efficiency.

Johansen-RL, Callis-M, Potts-J, Shall-LM. A modified internal rotation stretching technique for overhand and throwing athletes. **J-Orthop-Sports-Phys-Ther.** 1995 Apr; 21(4): 216-9

Strength, stretching, and rehabilitation methods for the shoulder have been previously described and have been universally applied; nevertheless, many throwing athletes continue to develop overuse injuries. The pitching process tends to increase external rotation and limit internal rotation of the shoulder joint. Our technique involves a modified stretching method of the posterior shoulder musculature. The athlete lies prone with the elbow flexed 90 degrees. With the shoulder abducted 90 degrees, in neutral flexion/extension, and 90 degrees or more of internal rotation, the scapula protrudes posteriorly. By depressing the inferior angle of the scapula toward the thoracic wall, the infraspinatus muscle and posterior joint capsule are effectively isolated and stretched. Manual stabilization of the scapula onto the chest wall transfers the internal rotation movements to the glenohumeral joint, as opposed to sharing the movement with the scapulothoracic articulation. This method improves the efficacy of the internal rotation stretching exercise for the glenohumeral joint. Such an addition to traditional stretching methods may increase the efficiency of the least effective component. We conclude that this modification to traditional programs should be an integral part of the training and rehabilitation program of any athlete requiring near maximal performance of the shoulder.

Kossler-F. Trends in the investigation of occupational musculoskeletal disorders (In German). **Ergo-Med** 1995; 19 (1) : 2-9.

GERMANY

Kuorinka-I, Alaranta- H., Erich-I . Prevention of musculoskeletal disorders at work: validation and reliability in a multicenter intervention study. **International Journal of Industrial Ergonomics** 1995; 15 (6), 437-446.

During the years 1986-1989 the Finnish Work Environment Fund initiated a multicentre intervention study (programme) to prevent musculoskeletal diosrders at work. The programme consisted of four different projects comprising methodological, epidemiological, and interventive themes. The main results were as follows; (1) More than half of the occupational physiotherapists and physisicians involved in the project felt that they did not have adequate trianing for testing the performance capacity of the musculoskeletal system. Several of the most commonly used musculoskeletal tests had eithers poor validity in predicting future musculoskeletal troubles or had poor reliability. (2) A controlled intervention study showed that active training of neck-shoulder muscles can prevent musculoskeletal troubles, even more than ergonomics actions. (3) It is possible to reduce sick-leave due low-back disorders by intervention measures directed toward both the work (environment tools) and the workers (working methods, positive attitude to work, preparedness to keep fit). (4) The identification of ergonomic hazards with the help of teamwork proved to be feasible. The practical improvements , however, were difficult to implement in the prevailing conditions. Some of the improvemtents increased the work load and the stress of the workers. This aspect needs further consideration. Active training of neck-shoulder muscles can prevent industrial musculoskeletal troubles.

Kuorinka-I., Forcier-L., Ed**. Work related musculoskeletal disorders (WMSDs): a reference book for prevention.** London: Taylor & Francis; 1995.

This book arose from an initiative by the Quebec Research Institute on occupational health and safety which launched a number of initiatives to prevent WMSDs including an international expert group to prepare a scientific evaluation of work related musculoskeletal problems.The title of the book is somewhat misleading as it does not encompass the most prevalent work related musculoskeletal disorder, that is back pain, the authors stating that it is too large a subject to be included. Thus, this book really only deals with work related upper limb disorders. The book states that its main aim is to help prevent WMSDs. The book covers four main areas, definition and evidence of WMSD, evaluation of risk factors, solutions and managing change, and the effect of training and medical management.In the early chapters a conceptual framework of WMSDs, their natural history and the extent to which the group of conditions that fall under the umbrella of WMSD are work related is presented. The evidence of work relatedness is discussed at some length in relation to specific conditions of the body, for example evidence of association between work and tension neck syndrome, work and carpal tunnel syndrome, work and RSI, etc.From the fourth chapter onwards the book begins to concentrate on its given aim - prevention. Included are methods of identifying risk factors which are extensively referenced to present the evidence linking a vast range of risk factors to specific disorders. Much of the data are clearly presented in tabular form making it easy to retrieve the relevant information. Mention is made of many commonly used techniques such as the RULA (Rapid Upper Limb Assessment) and OWAS systems but no details are given, leaving the reader to have to read elsewhere before they could actually implement one of these techniques. It would be useful if the authors had given some indication of the comparative benefits of the different systems as 18 different techniques are listed. Surveillance systems to provide early identification of the risk of WMSD are presented under the headings of work surveillance, health surveillance and risk factor surveillance, with examples of systems for each presented. A hypothetical example of a surveillance process is given which suceeds in encompassing the contents of the chapter in a clear and meaningful manner. In solutions to WMSDs, a macroscopic solution is taken covering such areas as the systems concept, complex systems, ergonomics and the work system, work organisation and achieving a balanced work system. This is followed by advice on how to manage change which covers planning, implementation and evaluation. However , the emphasis is much more general and less focused on WMSD than the title of the book may lead one to expect. The evidence that training plays an important part in preventing WMSD is presented although little has been published on this subject and the authors have to draw on much of the research relating to training and manual materials

handling. Different training methods are presented and the relevant benefits discussed.The book concludes by presenting an overview of the medical management of the WMSD. This chapter presents a very North American View focusing on pre-employment screening, work hardening and health promotion programmes and does not reflect management in the UK. Overall the book presents an extensively refenced overview of the subject of upper limb WMSDs. Although it has been written by a panel of experts there is good continuity in the style, structure and content of the chapters and much cross-referencing exists between chapters. With the vast amount of information contained in this book it would be a valuable addition to the library of all those with an interest in WMSD and at œ19.99 represents excellent value for money. (Karen Barker - Nuffield Orthopaedic Centre)

Lundstrom-R, Nilsson-T, Burstrom-L, Hagberg-M. Vibrotactile perception sensitivity and its relation to hand-arm vibration exposure. **Cent-Eur-J-Public-Health.** 1995; 3 Suppl: 62-5

Vibrotactile perception thresholds (VPT) at seven test frequencies (8-500 Hz) have been measured and evaluated among 170 male employees at a heavy engineering production workshop, 125 of them were at present, or in the past, exposed to hand-arm vibration. All participants were examined by a physician and none had symptoms of diseases or were exposed to other factors known to cause sensory neuropathies. VPTs [for the three lowest (8-32 Hz; non-Pacinian), for the four highest (63-500 Hz; Pacinian) and for all test frequencies together] and a sensitivity index (SI) has been individually graded in four (normal, slightly deteriorated, deteriorated and seriously deteriorated) and two (normal, abnormal) stages, respectively, and put in relation to individual exposure of vibration. The results do not show any clear relationship on an individual basis between vibration exposure and degraded vibrotactile perception. On a group basis, however, there is a clear tendency towards detoriorated VPTs when the study group is divided in exposure categories. The detorioration is most pronounced in the frequency range mediated by Pacinian corpuscles. In this range an approximately four-fold increase of relative risk for elevated VPT for those in the highest exposure category was observed compared to the non-exposed group. Corresponding relative risk estimate for SI is about 6. Therefore, the results suggest an existence of an exposure-response relationship.

Maizlish-N, Rudolph-L, Dervin-K, Sankaranarayan-M. Surveillance and prevention of work-related carpal tunnel syndrome: an application of the Sentinel Events Notification System for Occupational Risks. **Am-J-Ind-Med.** 1995 May; 27(5): 715-29.

In response to limitations in state-based, occupational disease surveillance, the California Department of Health Services developed a model for provider- and case-based surveillance of work-related carpal tunnel syndrome. The objectives were to enhance case reporting, identify risk factors and high-risk work sites, and link preventive interventions to work sites and the broader community. Using elements from surveillance of communicable diseases and sentinel health events, a model was integrated into the pre-existing reporting system in one California county. Between 1989 and 1991, 54 Santa Clara County health care providers reported 382 suspected cases, of which 365 from 195 work sites met reporting guidelines. Risk factors were profiled from interviews of 135 prioritized cases and 38 employers. Of 24 work sites prioritized for a free, voluntary, nonenforcement inspection, 18 refused and 6 completed an on-site visit. Sentinel Event Notification System for Occupational Risks (SENSOR) captured many cases not reported to the pre-existing reporting system. Case interviews indicated a profile of symptoms and signs, treatment, and exposure to uncontrolled occupational risk factors, including a lack of training on ergonomics hazards. Employer health insurance, rather than workers' compensation, was the apparent source of payment for most medical bills. Employers lacked knowledge and motivation to reduce ergonomic risks. Governmentally mandated occupational ergonomics standards are urgently needed.

Meyers-J., Bloomberg-L., Faucett-J., Janowitz-I., Miles-J.A. Using ergonomics in the prevention of musculoskeletal cumulative trauma injuries in agriculture: Learning from the mistakes of others. **Journal of Agromedicine** 1995; 2 (3) : 11-24.

A review is presented of the size and nature of the problem related to musculoskeletal cumulative trauma disorders. Examples of successful control strategies in general industry are described in terms of engineering controls, administrative controls and behavioural controls. The application of ergonomic principles in agriculture is described with specific examples from the nursery industry.

Elimination or reduction of ergonomic hazards promises greater success in controlling cumulative musculoskeletal injuries than worker training alone or prescreening.

Nakladalova-M, Fialova-J, Korycanova-H, Nakladal-Z. State of health in dental technicians with regard to vibration exposure and overload of upper extremities. **Cent-Eur-J-Public-Health.** 1995; 3 Suppl: 129-31

The authors examined 120 dental technicians, 111 women, 9 men, of mean age 44.8 years, mean duration of exposure 24.9 years. Cold water test, plethysmographic investigation, and EMG (in indicated persons), X-ray, neurological and orthopedic examinations were performed. Combination of exposure to vibration above the limit value, with overload of upper extremities, was proved by hygienic measurement. The most frequent subjective complaints included vertebral complaints (52.5%), paresthesiae in the hand fingers (47.4%) and pain in the joints of upper extremities (elbow 26.6%, shoulder 10.8%, wrist 6.6% and small joints of hand 6.6%). Four workers reported history of white fingers, but the cold water test did not prove it. Deteriorated plethysmographic curve was in 11 cases only. Pathological motor conduction in nervus medianus was found (by EMG investigation) in 13 persons. Carpal tunnel syndrome was acknowledged in 4 individuals as an occupational disease. The results of these investigations show the hazard of dental technicians work and the necessity of improvement of their work conditions.

North-GL Avoiding injury from repetitive movement. **Am-J-Health-Syst-Pharm**. 1995 Apr 1; 52(7): 688-9

UNITED-STATES

Ong-CN; Chia-SE; Jeyaratnam-J; Tan-KC Musculoskeletal disorders among operators of visual display terminals. **Scand-J-Work-Environ-Health.** 1995 Feb; 21(1): 60-4

Using a visual display terminal (VDT) is today a common occupational task with both benefits and hazards. One of the hazards is the occurrence of musculoskeletal disorders. This paper examines the possible causes of such disorders and suggests some preventive strategies. The debate on the relationship between musculoskeletal disorders and VDT usage usually centers around occupational factors (eg, constrained posture, poor ergonomic design of the workplace, equipment design), work-related psychological factors (eg, perceived high job demands, mundane, boring and repetitive job activity, little control, poor support from colleagues and superiors), and psychosocial factors (eg, biodemographic characteristics such as age, previous musculoskeletal injuries, emotional stress, family burden, environmental factors). Improving the ergonomic design of VDT workstations, changing occupational legislation, and improving occupational health services have been suggested as means to decrease the incidence of musculoskeletal disorders among VDT workers. Much research with a multidisciplinary approach is still needed.

Ostrem-CT. Strong, balanced muscles can prevent CTS. **Occup-Health-Saf.** 1995 Sep; 64(9): 47-9

Park-D-h. Cumulative Trauma Disorders: Their Recognition and Ergonomic Intervention. **Korean Journal of Occupational Medicine** 1995 Feb.; 7 (1) : 169-185.

Strategies for the prediction and prevention of occupational cumulative trauma disorders (CTDs) were described and discussed. Different types of CTDs and their causative factors were examined. A conceptual model designed to predict CTDs and facilitate the development of prevention guidelines was presented. This model was based on the idea that three primary factors, work related, personal, and biomechanical, contribute to the development of CTDs. The work related factors were then divided into three groups describing job characteristics based upon frequency of repetitive actions, body position, and miscellaneous attributes such as general working environment and the use of hand tools. Personal factors included sociodemographic data and anthropometric and impairment information. The use of analytic biomechanical modeling for either pinch or grasp tasks was proposed. The analysis in the model involved studying incidence trends of the CTDs using a Life Table procedure. Relationships of the variables to survival time as well as to the incidence/nonincidence of CTDs were investigated using nonparametric and parametric proportional hazard modeling as well as logistic modeling. This information was then integrated to

obtain preventive guidelines for CTDs. The author concludes that such a model will assist in quantifying risk factors of CTDs and in determining the effectiveness of intervention programs.

Ranney-D, Wells-R, Moore-A. Upper limb musculoskeletal disorders in highly repetitive industries: precise anatomical physical findings. **Ergonomics**. 1995 Jul; 38(7): 1408-23.

Physical assessment of 146 female workers in highly repetitive jobs found 54% to have evidence of musculoskeletal disorders in the upper limb that are potentially work-related. Many workers had multiple problems, and many were affected bilaterally (33% of workers). Muscle pain and tenderness was the largest problem, both in the neck/shoulder area (31%) as expected and in the forearm/hand musculature (23%), a previously unreported site. Most forearm muscle problems were found on the extensor side. Carpal tunnel syndrome was the most common form of neuritis with 16 people affected (7 people affected bilaterally). De Quervain's tenosynovitis and wrist flexor tendinitis were the most commonly found tendon disorders in the distal forearm (12 people affected for each diagnosis). The results suggest that exposure should be measured bilaterally. They also suggest that muscle tissue is highly vulnerable to overuse. Stressors that affect muscle tissue, such as static loading, should be studied in the forearm as well as in the shoulder.

Rice-A. **Breaking point : a guide to preventing occupational overuse syndrome**. London : Pluto Press; 1995.

Manual aimed directly at workers. Contents: definition, symptoms and classification of overuse injuries (those affecting tendons, nerves, muscles; vibration-induced injuries); causes (force, frequency and duration of movement, posture, contributing factors; types of activity at risk; persons at particular risk - tall and short people, women); problem assessment (health survey, workplace assessment); prevention (work design, work organization, role of safety representatives); treatment and compensation; role of trade unions. In appendices: model health questionnaire; model workplace checklist.

Richez-J.P. Prevention of carpal tunnel syndrome. **Janus** 1995; (19) : 19-20.

The ‘ergonomic risk’ associated with repetitive work movements is difficult to measure, yet a good knowledge of the risk factors is required before effective preventive strategies can be devised. With this is mind the Institut National de Recherche et de Securité (INRS) has developed techniques for investigating physiology and biomechanics, as a useful complement to the techniques used for analysing the ergonomic process.

Schneider-S., Punnett-L., Cook-T. M. Ergonomics: Applying What We Know**. Occupational Medicine: State of the Art Reviews** 1995 Apr.; 10 (2) : 385-394.

The application of ergonomics to the construction industry was discussed. Statistics from the Bureau of Labor showed an increase in work related diseases associated with repeated trauma from 18% in 1981 to 61% in 1991. Estimates put the cost of work related musculoskeletal disorders (WMD) to be between 20 and 40 million dollars each year. Risk factors for WMD included repetitive movements, abnormal postures, physical pressure, machinery vibrations, and the environmental factors of extreme temperatures. The architects, designers, project owners, contractors, material suppliers, and construction workers affected the ergonomic parameters of a construction project. Although solutions existed for many ergonomic problems, the short term nature of projects and lack of incentives did not encourage the changing of procedures. The transience of construction employment made long term studies difficult. Few workers may be willing to complain about present or future health considerations in times of economic stress. Methods used in the control of ergonomic risk factors discussed included engineering controls, administrative controls, and personal protective equipment. A team approach to initiating ergonomic interventions such as drywall installation, concrete reinforcement, overhead painting, and laying of masonry blocks was considered. Improved materials handling, proper physical conditioning, and training were suggested. The authors conclude that implementation of WMD control measures requires the education of all parties, regulation to ensure proper use, and communication of safety applications.

Schreibers- K.B.J., Huppes-G., Peereboom-K.J., Koningsveld-E.A.P., Osinga-D.S.C. A New Undertaking for Prevention of RSI Associated with VDU-Based (In Dutch). **Tijdschrift voor Ergonomie** 1995; 20 (6) : 25-29.

Nowadays most VDU-users work in an ergonomic and organizationally acceptable environment. The view is that a combination of factors induce a static load in the musculoskeletal system in the neck and shoulder. As a result RSI-related complaints can develop through a chemical/physiological mechanism. Therefore the following approach is suggested to prevent RSI-related complaints of VDU-users. First, all occurring major external straining factors should be improved to a level which is ergonomically acceptable. Then, less harmful conditions could be further improved. However the surplus value of further improving ergonomics and organisation in a VDU-users to cope physically and mentally with the strains and loads and how to organize their own working conditions. The aim of the training is the optimisation of the working technique and to teach VDU-users how to act upon their working environment.

Simmons-C., Lloyd-E. Risk factors in the development of upper limb disorders in keyboard users. In: Robertson-S.A., Ed. **Contemporary ergonomics 1995**. London : Francis & Taylor; 1995. p. 567-572.

The role of ergonomic risk factors in the onset of various types of upper limb disorder in computer keyboard workers remains poorly understood. The study described in this paper considers the relationship netween 12 ergonomic risk factors and the incidence of upper limb disorders in 18 keyboard users. The number of problems identified ranged from 3 to 10 per user. Incidence rates on the ergonomic criteria ranged from 11% (keyboard too low) to 100% (no health and safety training). A positive association was found between ‘inadequate back support’ and a diagnosis of ‘diffuse upper limb pain’. As a result of this study further research is suggested to investigate the possible multi-factorial relationship between the ergonomic criteria and certain types of injury.

Snook-SH, Vaillancourt-DR, Ciriello-VM, Webster-BS. Psychophysical studies of repetitive wrist flexion and extension. **Ergonomics.** 1995 Jul; 38(7): 1488-507.

The purpose of this experiment was to investigate the feasibility of using psychophysical methods to determine maximum acceptable forces for various types and frequencies of repetitive wrist motion. Four adjustable work stations were built to simulate repetitive wrist flexion with a power grip, wrist flexion with a pinch grip, and wrist extension with a power grip. The study consisted of two separate experiments. Subjects worked for two days per week during the first experiment, and five days per week during the second experiment. Fifteen women completed the first experiment, working seven hours each day, two days per week, for 20 days. Repetition rates of 2, 5, 10, 15 and 20 motions per minute were used with each flexion and extension task. Maximum acceptable torques were determined for the various motions, grips, and repetition rates without dramatic changes in wrist strength, tactile sensitivity, or number of symptoms. Fourteen different women completed the second experiment, performing a wrist flexion motion (power grip) fifteen times per minute, seven hours per day, five days per week, for 23 days. There were no significant differences in maximum acceptable torque from day to day. However, the average maximum acceptable torque for a five days per week exposure was 36.3% lower than for the same task performed two days per week. Assuming that maximum acceptable torques decrease 36.3% for other repetition rates and motions, tables of maximum acceptable force were developed for female wrist flexion (power grip), female wrist flexion (pinch grip), and female wrist extension (power grip).

Stauber-W. T. **Cumulative Trauma Disorder: Skeletal Muscle Dysfunction**. Morgantown, West Virginia: Department of Physiology, West Virginia University; 1995.

Experiments were designed to develop a reproducible technique for producing chronic strain injury to rat skeletal muscles as a model for cumulative trauma disorder (CTD), and to measure the functional outcome of repeated microtrauma in order to develop strategies and programs for its prevention. A dynamometer was designed and built to control the velocity and range of movement of the rat foot during a strain overload and test the functional outcome in terms of muscle strength, endurance, and stiffness in-vivo. Changes in the extracellular matrix and sarcolemma of skeletal muscles which could result in muscle pathology or adaptation were measured. Cumulative microtrauma was administered three times a week for 4 weeks to one leg of female rats. Muscles became myopathic after 1 month of exposure to repeated strains. The appearance of muscle pathology was related to the strain rate. Repeated high velocity strains were accompanied by myofiber heterogeneity and apparent fibrosis while low velocity strains produced muscle hypertrophy and positive adaptations. These two responses were noted in muscles commonly

recruited for low level endurance activity. The authors conclude that appropriate rest periods are important for recovery from metabolic fatigue and repair of tissue damage.

Thibodeau-PL; Melamut-SJ Ergonomics in the electronic library. **Bull-Med-Libr-Assoc.** 1995 Jul; 83(3): 322-9

New technologies are changing the face of information services and how those services are delivered. Libraries spend a great deal of time planning the hardware and software implementations of electronic information services, but the human factors are often overlooked. Computers and electronic tools have changed the nature of many librarians' daily work, creating new problems, including stress, fatigue, and cumulative trauma disorders. Ergonomic issues need to be considered when designing or redesigning facilities for electronic resources and services. Libraries can prevent some of the common problems that appear in the digital workplace by paying attention to basic ergonomic issues when designing workstations and work areas. Proper monitor placement, lighting, workstation setup, and seating prevent many of the common occupational problems associated with computers. Staff training will further reduce the likelihood of ergonomic problems in the electronic workplace.

Thomas-DR, Plancher-KD, Hawkins-RJ. Prevention and rehabilitation of overuse injuries of the elbow. **Clin-Sports-Med.** 1995 Apr; 14(2): 459-77

Rehabilitation from injury and prevention of injury are terms that describe differing aspects of the same challenge. The clinician must be continually aware of the principles of rehabilitation and their order of priority (prevent further damage, restore motion, restore strength, reestablish coordination) while supervising patients' progress toward their goals. If patients are made aware of these principles at an early stage, and taught to take as much responsibility as possible for their own rehabilitative course, they will be more likely to reach their own ideal compromise of safety and speed of progress. In addition to helping with rehabilitation from injury, knowledge and self-awareness that patients obtain during this process may help in the prevention of future injuries.

Van Dijk-FJH. Work-related and mental disorders **. Central European Journal of Occupational and Environmental Medicine** 1995; 1(4): 292-305

The overview of work-related musculoskeletal and mental disorders is based mainly on research and occupational health practice in The Netherlands. The prevalence of work-related musculoskeletal disorders is outlined along with risk facots (lifting, pushing and pulling, static working posture, repetitive movements and whole-body vibration), prevention involving the participation of workers and management, and research and development. Work-related mental disorders include nervous breakdown, post-traumatic stress disorders and burnout. Sickness absence and disability related to mental disorders are discussed along with a clinical approach to prevention .

Wasserman-D. E. Vibration. In: Brooks S. M., Gochfeld M., Herzstein J., Jackson R. J., Schenker M. B., Editors. **Environmental Medicine.** St. Louis, Missouri: Mosby-Year Book; 1995. p. 557-562.

A review was conducted of the effects of vibrations on humans. Exposure to sources of hand/arm vibration (HAV), as through direct contact with pneumatic tools, is known to produce finger blanching, tingling and numbness, symptoms known collectively as Raynaud's phenomenon or vibration white finger. Osteoarthritis, bone cysts and repetitive trauma disorders have also been associated with HAV exposure. Whole body vibration (WBV) exposures tend to involve vibrations of lower accelerations over a much narrower frequency range. Symptoms of such exposure are diffuse and subtle, and include irritability, performance decrement and kinetosis. Clinical complications of WBV include degenerative disk disease, chronic back pain and prostatitis. Menstrual disruption, pregnancy complications and varicosities have been reported from WBV exposed women. Control of human vibration exposure involves isolation or damping of the vibration source, the use of personal protective equipment such as antivibration gloves, and adherence to adequate work and safety practices.

1994

[Anonymus]. It's all in the wrist! **J-Tenn-Med-Assoc.** 1994 Jul; 87(7): 298

Barreira-THC. **Fatores de risco de lesoes por esforcos repetitivos em uma atividade manual.** São Paulo, 1994. 112p. + anexos. [Dissertação de Mestrado - Faculdade de Medicina da USP]

BRASIL

Identifica os fatores de risco relacionados ao trabalho predisponente as lesoes por esforcos repetitivos - ler em uma atividade manual repetitiva com alta prevalencia de ler. Os ss sao 9 funcionarias de uma unidade fabril de preservativos. Utiliza analise ergonomica da atividade, atraves de observacao direta e analise de gravacao em video das posturas e movimentos e entrevistas semi-dirigidas com as operadoras (ambas as atividades no posto de trabalho). Os resultados mostram a presenca de fatores bio-mecanicos e psicossociais predisponentes a ler. Os bio-mecanicos sao: alta repetitividade (ciclo de tempo da tarefa menor que 30"), emprego repetitivo de forca em dedos e pulso associado a posturas criticas de pulso, posturas inadequadas de ombros, antebracos, pulsos e dedos e contato mecanico da bainha do preservativo com as porcoes laterais dos dedos. Os fatores psicossociais sao: pouca variedade no conteudo da atividade; controle limitado da operadora sobre seu trabalho; pressao para atingir alto volume de producao; responsabilidade na deteccao de defeitos nos preservativos e nao possibilidade de apoio mutuo entre as operadoras. Sugere: reducao de jornada de trabalho e/ou rodizio de atividades, diminuir a velocidade das maquinas, periodos de pausa para aliviar as dores, retorno da pratica voluntaria da ginastica no inicio das atividades, melhora no projeto de posto de trabalho.

Bjorksten-M.G., Almby-B., Jansson-E.S. Hand and Shoulder Ailments among Laboratory Technicians Using Modern Plunger-Operated Pipettes. **Applied Ergonomics** 1994 Apr.; 25 (2) : 88-94.

A study of hand and shoulder complaints among laboratory technicians using modern plunger operated pipettes was conducted. The cohort consisted of 128 women, mean age 41.1 years, employed as laboratory technicians in research laboratories at the University of Uppsala, Uppsala, Sweden. They completed a questionnaire package to obtain information on demographic characteristics, the amount of time they spent doing pipetting, other work tasks performed including microscopy, video display terminal (VDT) use, and administrative work, general musculoskeletal complaints, complaints specific to the hands, and work related psychosocial factors, work content, workload, and perceived social support. Data on the prevalence of musculoskeletal problems in 25,378 females employed by the Swedish government were used as the reference. A nested case referent study was conducted to assess the risk for hand and shoulder problems for laboratory technicians who spent more than 300 hours (hr) per year (yr) pipetting. The cohort had performed pipetting work for a mean of 15yr. The annual time spent pipetting varied from 1 to 2,016hr/yr, mean 495hr/yr. Approximately 53% of the laboratory technicians also performed microscopic work, 45% worked with VDTs, and 68% performed some administrative work. The laboratory technicians reported a significantly greater prevalence of shoulder and hand or wrist complaints, 58 and 44% versus 48 and 24%, respectively, than the government employees. The prevalence of lower back complaints was lower in the laboratory technicians than the government employees, 34 versus 43%. Work related psychosocial factors were not related to the development of musculoskeletal problems. Laboratory technicians who spent more than 300hr/yr pipetting had significantly elevated risks for hand and shoulder complaints compared to those who performed 300hr/yr or less pipetting work, odds ratios 5.0 and 2.4, respectively. The authors conclude that laboratory technicians who perform more than 300hr/yr of pipetting work have a significantly elevated risk for developing hand and shoulder problems.

Brandimiller-P.A. Caixas: Segmento de impacto da automação bancária. **Revista Brasileira de Saúde Ocupacional** Jan.-Mar. 1994; 22 (81) : 33-41.

This statistical study, based on interviews, involved 585 bank employees in the State of Sao Paulo, 88 (15%) of whom were tellers. When compared with bank employees as a whole, tellers had a statistically significant increase in health problems in general, and in the incidence of gastrointestinal, musculoskeletal, eye and repetitive strain problems. Among the preventive

methods suggested: more rest breaks; limitation of working time at tellers' workstations to 3h at a time; limitation of work load (expressed in terms of number of verifications registered at the computer terminal); improved ergonomic conditions.

Carson-R. Reducing cumulative trauma disorders: use of proper workplace design. **AAOHN-J**. 1994 Jun; 42(6): 270-6

UNITED-STATES

Cumulative trauma disorder can be reduced by applying four ergonomic approaches: applying anthropometric data, reducing the number of repetitions, reducing the force required, and eliminating awkward postures as much as possible. 2. Selecting the proper work surface height will help reduce fatigue, pain, and discomfort and will allow the employee to be at the right height in relation to the task. Ideally, an adjustable height work surface should be provided that will accommodate all potential users. 3. Prolonged standing and sitting are physically stressful to the body. However, by providing a well designed work area with the appropriate accessories, such as antifatigue mats, ergonomic chairs, and footrests, fatigue and discomfort can be minimized. 4. In addition to providing a properly designed work area, a successful ergonomics program should include training, administrative actions, and exercise programs.

Carter-J.B., Banister-E.W. Musculoskeletal problems in VDT work : a review. **Ergonomics** 1994; 37 (10) : 1623-1648.

This paper discusses the possible causes of musculoskeletal pain in VDT workers and outlines strategies to minimize it. The paper reviews workstation, chair, and keyboard design, and makes recommendations to improve user comfort. Also discussed are worker selection, training, posture, conditioning, and rest breaks. Short term musculoskeletal discomfort is experienced by many result in the long term. It is important that the ergonomist and office manager work toogether to improve the working conditions in this important occupational area.

Christmansson-M. Repetitive and manual jobs: conten and effetcs in terms of physical stress and work-related musculoskeletal disorders**.** **International Journal of Human Factors in Manufacturing** 1994; 4 (3) : 281-292.

Several studies have shown that there exists a relationship between work-related muscusloskeletal disorders and repetitive, manual jobs. However, this relationship has not been fully investigated. The aim of this study was to discuss the relationship between repetitive, manual tasks and work-related disorders in the neck and upper limbs. The study was carried out in a manufacturing company. Five assembly tasks were analyzed by means of the Hand-Arm-Movement-Analysis (HAMA) method. The results show that the tasks resulted in a constrainde but varying use of the hands and arms. Four of the tasks resulted in a static woarking posture for the shoulders and neck. The disorders that the workers suffered from were mainly located in the shoulders and neck, giving support for the relationship between work-related musculoskeletal disorders and repetitive, manual tasks. The HAMA method proved to be a useful method for task analysis, giving a detailed description and analysis of the use of the upper limbs.

Coury-HJCG. **Trabalhando sentado: manual para posturas confortáveis.** São Carlos : EDUFSCAR; 1994. 114p.

BRASIL

Cullum-DE; Molloy-CJ Occupation and the carpal tunnel syndrome [published erratum appears in Med J Aust 1994 Dec 5-19;161(11-12):727] [see comments] **Med-J-Aust.** 1994 Nov 7; 161(9): 552-4

Repetitive physical tasks, particularly executed with force or using vibrating hand tools, carry the chief risk of carpal tunnel syndrome for workers. Treatment may require removing the worker from the task or redesigning the task for the worker, while proper attention to ergonomics can prevent carpal tunnel injuries in the first place.

Etiene-P, Herve-J.B., Privet-, L. Zerbib-J.C. **Prevention of musculoskeletal problems due to repetitive motion (In French).** Paris : Institut pour l'Amélioration des Conditions de Travail; 1994.

This booklet on the prevention of musculoskeletal problems (MSP) due to repetitive motions at work contains : statistical data on the prevalence of repetitive work in France; physiology and anatomy of the problem; survey of the problem in enterprises, and the resulting preventive and corrective action; prevention policies; real-life examples of prevention action.

Franzblau-A, Werner-RA, Johnston-E, Torrey-S. Evaluation of current perception threshold testing as a screening procedure for carpal tunnel syndrome among industrial workers [see comments] **J-Occup-Med.** 1994 Sep; 36(9): 1015-21.

Eighty-four workers participated in a work-site screening program designed, in part, to estimate the prevalence of carpal tunnel syndrome (CTS). Each worker completed a discomfort survey, limited electrodiagnostic testing of the median and ulnar sensory nerves in each wrist, and current perception threshold (CPT) testing in the right 2nd digit using the NEUROMETER CPT device. A subset of study participants also completed CPT testing in digit 5 on the right (n = 33). Comparisons were made among the CPT results, symptoms consistent with CTS, and electrophysiologic findings. The CPT results correlated poorly with electrophysiologic parameters from the same nerve distribution, and CPT results were statistically unrelated to self-reported symptoms that may be suggestive of CTS. The test performance characteristics of CPT testing (sensitivity, specificity, positive predictive value, and negative predictive value) were low in comparison with electrodiagnostic measurements and self-reported symptoms consistent with CTS. The electrophysiologic results were significantly associated with the constellation of symptoms that are consistent with CTS. On the basis of these results, CPT testing cannot be recommended as a screening procedure for identification of possible cases of CTS among active industrial workers.

Garg-A. Spinal Biomechanics. In: Bleecker, M. L. , Hansen J. A., Editors. **Occupational Neurology and Clinical Neurotoxicology.** Baltimore, Maryland: Williams and Wilkins; 1994. p. 283-333.

An overview of spinal biomechanics was presented, with emphasis on intervertebral disc compression as determined in cadaveric examination as an index of biomechanical stress in the spine, and as a guide for task design and determination of a load handling limit. Injury of the lumbar spine may be the result of multiple cumulative painless stresses. Individual differences in the amount of stress tolerated made determinations of safe load weights difficult. It was reported that jobs that place a compressive force greater than 6.37 kilonewtons (kN) on the low back are hazardous to all but the most healthy workers, and that jobs which place a compressive force of 3.4kN on the low back may not be protective for all workers, particularly those over 60 years of age. Factors that determine safe weight of load included vertical and horizontal location of the load and lifting technique. It was reported that lifting from low levels or from floor level results in a greater compression force on the lumbar vertebral discs and can be hazardous to the low back. Lifting of objects horizontally distant from the spine increases flexion movement of the lower spine and degree of kyphosis of the spine, resulting in increased compression forces. Although different lifting techniques produce different compressive forces, techniques whereby the load is kept close to the body and lifted in a slow, controlled manner, as in the squat technique, were generally agreed upon as safer. Asymmetric lifting was reported to be less safe than symmetric lifting. The author concludes that compressive force is directly related to the horizontal movement arm of the load and that asymmetric, repetitive, rapid movements and poor foot traction are unsafe.

Gjessing-C.C., Schoenborn-T.F, Cohen-A. **Participatory ergonomic interventions in meatpacking plants**. Cincinnati, Ohio : Publication Dissemination, DSSDTT, NIOSH; 1994.

Intervention projects to reduce ergonomic hazards at three meatpacking plants are described. The projects used a participatory approach involving personnel from various plant departments working together to identify and improve ergonomic problem areas. Major lessons learned include: successful participatory ergonomics programs require strong in-house direction, support and ergonomic expertise; training programs must develop both teamwork and ergonomic skills among participants; teams should include supervisors, maintenance and/or engineering staff as well as

production workers; access to information is vital to proper team functioning. A review of worker participation literature is included.

Gorton-C. An ounce of prevention... **RDH.** 1994 Sep; 14(9): 26-8

Grant-C., Brophy-M. **An ergonomics guide to VDT workstations**. Fairfax, VA. : American Industrial Hygiene Association; 1994.

This guide describes hazards associated with work at video display terminals (VDTs) (cumulative trauma disorders, back and neck pain, eyestrain, the effects of heat, electrostatic fields, electromagnetic radiation, and psychological stresses). Suggested control measures include: rest breaks, periodic posture changes, correctly designed seating and equipment, good lighting and elimination of glare, correct viewing distances, and adequate ventilation.

Grant-K.A., Habes-D.J., Baron-S.L. An ergonomics evaluation of cashier work activities at checker-unload workstations. **Appl. Ergon.** 1994; 25 (5) :310-318.

The ergonomic suitability of the 'over-the-counter' (OTC) or 'checker unload' workstation for grocery-scanning operations has been questioned by a number of ergonomists, safety and health professionals, and retail food industry executives in the USA. There is concern that requiring cashiers to remove grocery items directly from the customer's cart for scanning exacerbates the risk of musculoskeletal disorders associated with this job. For this reason, a study was conducted to determine whether supermarket cashiers are exposed to increased biomechanical stress due to the use of checker-unload workstations for standing work. The work activities of 12 grocery cashiers from three supermarkets were recorded on videotape. Postures and movements associated with the scanning task were visually evaluated and compared with those of 10 grocery cashiers using a front -facing, customer-unload workstation examined in a previous study. The results indicate that use of the checker-unload workstation places additional stresses on the cashier beyond those imposed by customer-unload checkstands. Specifically, the task of removing groceries directly from the cart for scanning increases the frequency of long reaches, awkward shoulder postures, and lifts. These stresses can be mitigated by eliminating checker-unload operations and providing checkstands with conveyor belts for delivering groceries to the cashier. Implementing additional workstation modifications and encouraging cashiers to adopt alternative work practices also may reduce the frequencies of awkward postures and stressful motions associated with this checkstand design.

Harber-P, Hsu-P, Pena-L. Subject-based rating of hand-wrist stressors. **J-Occup-Med.** 1994 Jan; 36(1): 84-9

Subject-based rating (SBR) methods (eg, Borg Scales) have been applied to lifting and exertion estimation. SBR methods were applied to hand-wrist motions in this controlled experimental study of rapid motion. Seven normal volunteers performed lift actions with several combinations of wrist position (flexion-extension), repetition frequency, force, and grip type (precision vs power) using an experimental apparatus. Wrist position and frequency were confirmed using an electrogoniometer. Subjects rated the tasks along 5 scales. Analysis showed that grip type had the predominant effect on the subjective ratings, but the other factors were also rated. However, cycle times between 3 and 8 seconds were not well differentiated. The study indicates that SBR does validly reflect actual stressors and suggests that SBR may be useful for "screening" jobs for more intensive study.

Harris-NR-2nd; Gianacakes-N. Repetitive motion disorders of the upper extremity. Strategies for computer keyboard operators. **J-Fla-Med-Assoc**. 1994 Dec; 81(12): 831-2.

UNITED-STATES

Health and Safety Commission, Printing Industry Advisory Committee**. Work-related upper limb disorders in the printing industry**. **Programme for prevention.** Sudbury, Suffolk : HSE Books; 1994.

This booklet describes types of upper limb disorders and their treatment and presents a programme for action in the workplace based on: deciding whether a firm has a problem with upper limb disorders; assessing the risk (examination of tasks, review of medical information); reducing the risk (job and equipment design, work organization, the work environment); keeping risks under control. Legal requirements are also outlined.

Institut National de Recherche et de Securité. **Supermarket checkout personnel**. Paris; 1994. Off-print of an article published in "Travail et sécurité", Jan. 1994.

An ergonomic analysis of the work of supermarket checkout personnel reveals that scanner use and bagging by tellers is associated with high task repetitivity and work speed as well as high levels of manual handling. These stress factors generate ill health effects in even such a young population as well as an increase in the incidence of occupational diseases. This report stresses the need of a dialogue between all social partners, including specialists of retail trade, builders, industrial physicians, safety professionals, workers, consumers' associations, etc., in order to be able to improve the layout of existing workstations, as well as to develop new work contexts in line with the evolution of the functions of checkout personnel.

Karlqvist-L., Hagberg-M., Selin-K. Variation in upper limb posture and movement during word processing with and without mouse use. **Ergonomics** 1994; 37 (7) : 1261-1267.

Work posture and movements of the upper limb were analysed for 12 'mouse' operators and 12 'non-mouse' computer operators employed in word-processing work. Measurements were carried out during correction of a given text. 'Mouse' operators spent 64% of the working time with the operative wrist deviating more than 15^{o} towards the ulnar side, while 'non-mouse' operators spent 96% of the time with the corresponding wrist in neutral position towards radial deviation. The rotation in the shoulder was at all times in neutral position towards inward rotation for 'non-mouse' operators, while 'mouse'operators worked 81% of the time with the shoulder rotated outward more than 30^{o}. 'Mouse' operators corrected a longer text during the given time. Our observations showed long periods of strenuous working postures for 'mouse' operators compared to 'non-mouse' operators. We believe that further investigations need to be carried out on the effects of word-processing techniques and to develop ergonomic work station designs for the 'mouse' and other non-keyboard input devices.

Kemmlert-K. Preventive effects of work place investigations in connection with musculo-skeletal occupational injuries. **Scand. J. Rehabil. Med.** 1994; 26 (1) : 21-26.

One hundred and ninety-five reports on musculo-skeletal occupational injuries were collected and randomised into two groups: one group where the work places of the injured were visited by labour inspectors (LIs) and one control group. The inspectors were instructed to issue inspection notices (INs) where appropriate. Ninety-two such visits were paid and resulted in 20 INs. Approximately 15 months later all 195 work places were visited by 3 ergonomists and the ergonomic situations were assessed. When compared with the control group neither the visits from the LIs nor the INs issued were associated with reduced work load among the injured. However, at most work places also other employees were performing the same tasks as the injured persons. Among these employees there was a significant reduction of work load where INs had been issued to the employers. Thus, the main effects of the LI interventions were in primary preventive measures.

Kilbom-A. Repetitive Work of the Upper Extremity: Part I - Guidelines for the Practitioner**.** **International Journal of Industrial Ergonomics** Aug. 1994; 14 (1-2) : 51-57.

A review of guidelines for practitioners involved in the analysis and control of upper extremity repetitive work problems was presented. Repetitive work of the upper extremity can be defined as the performance of similar work cycles, again and again. A potential problem of repetitive work is evident when a repetitive task is performed for more than 1 hour during the work day and/or a case of musculoskeletal disorder of the upper extremity is encountered at the workplace with no evidence of external cause. There is epidemiological evidence of an association between frequency and duration of repetitive work and disorders of tendons and related tissues, which appear to be linked to the frequency of movements. External force, posture, speed, duration, and psychosocial factors also appear to interact epidemiologically and experimentally with repetitiveness. If a repetitive work task has been identified or if cases of musculoskeletal disorders

occur, the task should be analyzed with respect to time, force, posture, and speed characteristics. Surveys of disorder rates and clinical exams should be performed for screening purposes, so that suspected cases can be referred for treatment. The author concludes that repetitive work of the upper extremities should be avoided due to the high risk of musculoskeletal disorders. Primary and secondary prevention implies that repetitiveness and other risk factors should be addressed when they appear.

Krause-TR, Langston-GW, Hidley-JH. Behavior-based task analysis prompts early response to ergonomic problems. **Occup-Health-Saf.** 1994 Jan; 63(1): 55-9

Langford-ML. Poor posture subjects a worker's body to muscle imbalance, nerve compression. **Occup-Health-Saf.** 1994 Sep; 63(9): 38-40, 42.

Forward head and shoulder postures and associated muscle imbalances are prevalent among today's workers, according to ongoing research in the physical therapy field. Information on proper posture should be used proactively to educate employees as part of injury prevention training. Maintaining muscle strength in the desirable posture will require ongoing exercise and attention from the worker. The self-direct approach will not eliminate all cases of tendonitis, epicondylitis and other disorders, but it will have a significant positive impact.

Lavender-S.A., Marras-W.S. The use of turnover rate as a passive surveillance indicator for potential low back disorders. **Ergonomics** June 1994; 37 (6) : 971-978.

Data on trunk motions, back injury rate and turnover rate in repetitive manual material handling jobs were analyzed in order to evaluate the relationship between jobs showing a turnover rate and low back cumulative trauma disorders (LB-CTD). A model was used to determine whether jobs with turnover resemble those with a high historical risk of LB-CTD. The analysis indicates that jobs with turnover will probably contain components similar to those found in high LB-CTD jobs. Turnover may therefore serve as a forecasting tool, thus making it useful for surveillance programmes.

Lidehell-P., Rehn-M. **Change of work practices strengthens people and businesses**. Stockholm, Sweden : Arbetsmilj”fondens Publikationstjenst; 1994.

During 1988-1993 the Swedish Work Environment Fund organized projects on measures to prevent strain injuries at about 70 different workplaces in different industrial sectors. The aim of the projects was to prevent strain injuries by the implementation of total solutions including organizational as well as technical and ergonomic measures. The most important factor is to give employees influence on their own work. Monotonous work must be changed. This requires changes of work organization such as delegating responsibilities, development of competence and new salary systems. During the projects, documentation, evaluations and experiences were exchanged via networks. Employers, employees and trade unions cooperated in the projects. The most important message from the projects is: change must involve both people and work in order to fight effectively against strain injuries.RSI hazards handbook: A workers' guide to repetitive strain injuries and how to prevent them. London : London Hazard Centre, Interchange Studios, 1997.AB : Repetitive Strain Injury (RSI) is a collective name for musculoskeletal diseases caused by excessive work loads or rates using poorly designed equipment. Workers in food processing, electronics, clothing, cars, packing, cleaning, furniture and many other industries are affected as well as keyboard operating staff. Disability, if not recognized in time, can become permanent. Adequate information and prevention programmes should be arranged by trade unions and other workers' organizations.

Marras-W.S., Marklin-R.W., Greenspan-G.J. Lehman-K.R. Quantification of wrist motions during scanning. **Hum. Factors** 1995; 37 (2) : 412-423.

A laboratory study was performed to help assess the risk of cumulative trauma disorders (CTDs) associated with the use of scanners in the grocery store environment. In this study experienced and inexperienced cashiers scanned a set of 12 standard grocery items using 19 different combinations of scanners, scanner orientations, and check stands. The motion characteristics of

both wrists in three-dimensional space were documented and used as dependent measures of performance. These motions were compared with wrist motion benchmarks of high-and low-risk wrist accelerations. It was found that, in general, scanning motions are of sufficient magnitude to contribute to CTDs of the wrist. It was also found that wrist motion characteristics were greatly influenced by the different combinations of scanners, scanner orientations, and check stand designs. It was concluded that the 'front-style' check stand minimizes potentially injurious wrist motions because it permits the checker to split the scanning task between the two hands. The type of scanner and scanner orientation that minimized potentially injurious wrist motions was much more unique to the individual workstation condition. Additionally, it appears that scanners perceived by the checkers as needing fewer wrist deviations, such as those with slanted windows, also minimize wrist motions. The implications of these findings for the ergonomic design of the workplace are discussed.

Melhorn-JM CTD: carpal tunnel syndrome, the facts and myths. **Kans-Med.** 1994 Sep; 95(9): 189-92

Recognition of the need for risk control of occupational injuries and prevention programs has led to many new studies demonstrating that occupational diseases are multifactorial in etiology, and that a specific job may not be the primary cause for occurrence. As a result of the many causes, myths about work-related injuries have developed. CTDs are the majority of occupational injuries. Individual risk factors are a better predictor of development of CTD and CTS than are job-related factors. Risk for carpal tunnel syndrome is closely related to general physical condition. Improved general health and health prevention programs may reduce an individual's risk level for developing a cumulative trauma injury. Risk measurement systems now allow employers to establish programs with measurable results. Since assessing the individual risk factors provides the best opportunity to attain the goal of prevention, the next step is for employee, employers, insurance carriers and the medical profession to establish concurrent prevention programs based on human risk factor evaluation systems.

Melhorn-JM. Occupational injuries: the need for preventive strategies. **Kans-Med**. 1994 Nov; 95(11): 248-51.

UNITED-STATES

Merritt-T.W., Gopalakrishnan-S. An Application of Fuzzy Set Theory to the Prediction of Cumulative Trauma Disorders of the Upper Extremity. **International Journal of Industrial Ergonomics** 1994 Apr.; 13 (2) : 95-105.

A mathematical model designed to predict the occurrence of cumulative trauma disorders (CTDs) using fuzzy set methodology was presented. A fuzzy relation was used to define the initial relationship between various CTDs and several occupational risk factors. The risk factors were then evaluated for being present or absent in a specific CTD as well as for their severity, if present. A set covering algorithm was described which was used to determine the smallest subset of all CTDs which covered all the risk factors having a positive severity level. A test case of a factory assembly job was presented as an example of the application of this model. A learning module designed to update the model by incorporating new information on the relationship between CTDs and risk factors was described. The model was applied to actual CTD cases described in the literature and was accurate in predicting the outcome of five of the seven tested cases. The authors conclude that the model described is useful for predicting CTDs.

Miller-J.M. Cumulative trauma disorders and ergonomics : a vendor's perspective. **Work** 1994; 4 (3) : 180-186.

By tracing office (computer-related) trends from yhe 1960s through the 1990s, one can extract the reasons for the drmatic rise in workplace injuries that result from poor ergonomic conditions. Much confusion continues to exist surrounding the notion of ergonomics, and employers are afraid to plunge in and implement an ergonomics programme. Ergonomists have highlighted three key areas for consideration: motion/exercise, support, and neutral positioning. This article examines several products that meet those recommendations and promote proper work habits.

National Occupational Health and Safety Commission (Worksafe Australia). **National code of practice for the prevention of occupational overuse.** Canberra : Australian Government Publishing Service; 1994.

AUSTRALIA

This code of practice replaces the National Code of Practice for the Prevention and Management of Occupational Overuse Syndrome [NOHSC:2001(1990)] (see CIS 93-696). It provides practical guidance on the identification, assessment and control of risks arising from tasks involving repetitive or forceful movement and/or maintenance of constrained or awkward postures. Control options include job design, modification of workplace layout and equipment, and training. The code should be used in conjunction with the assessment and control strategies addressed in the National Code of Practice for Manual Handling

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Ohlsson-K. et al. Disorders of the neck and upper limbs in women in the fish processing industry. **Occupational and Enviromental Medicine** 1994 ; 51 (12): 826-832.

The aim of this study was to examine the association between personal factors and physical and psychosocial work environment factors and disorders of the neck or upper limbs. A cross-sectional studt was performed on 206 women in the fish processing industry and 208 controls. Subjective complaintswere assessed by questionnaire and clinical examination. The styudt showed a high prevalence (35%) of diagnoses in the neck or shoulders of the exposed women. There was a pronounced dose-response relation between disorders of the neck or shoulders and duration of employment for women under 45 years old. Muscle tensions, stress or worry, work strain, and the largest fraction of the work time soent with highly repetitive tasks were clearly associated wiht disorders of the neck or shoulders.

Ong-CN. Musculoskeletal disorders in operators of visual display terminals. **World-Health-Forum**. 1994; 15(2): 161-4

Musculoskeletal disorders of the hands and arms are common among operators of visual display units. They are usually associated with poorly designed workplaces and with psychological factors. With a view to preventive action a multidisciplinary approach is needed in order to arrive at improved methods for identifying and evaluating health problems related to the use of visual display units.

Ounpuu-S. The biomechanics of walking and running. **Clin-Sports-Med.** 1994 Oct; 13(4): 843-63.

An increased knowledge of the biomechanics of normal walking and running will improve our understanding of the possible mechanisms of pathology and ultimately improve the treatment of pathology and injury. Running, a natural extension of walking, involves increased velocities, joint range of motion, forces, muscle activity, joint moments, and joint powers as compared with walking. These differences not only stress the mechanics of the body to a greater extent but also contribute to the development of injury due to overuse. With the use of modern computerized gait analysis techniques that provide objective information, comprehension of normal and also pathologic walking and running patterns can be improved.

Palm-N "Ergonomics"--OSHA's next regulatory frontier? **J-Mich-Dent-Assoc.** 1994 Jun; 76(5): 28-30

Ergonomics is an increasing health concern for all work environments in the 1990s. Ergonomic stresses do exist in the dental office for all personnel, and proposed regulatory activity will include dentistry. Hopefully, the pace of regulation will be met by scientific investigation that quantifies these stresses and defines their proper management and prevention. If so, ergonomics will become well-understood and will not develop as a new frontier of misapplied regulation.

Parmet-AJ. Repetitive use injury: diagnosis, treatment and prevention. **Kans-Med**. 1994 Sep; 95(9): 193-4.

UNITED-STATES

Peate-W.F. Occupational Musculoskeletal Disorders. **Primary Care**. 1994 Jun; 21 (2) : 313-327.

Occupational musculoskeletal disorders rank second among work related injuries and are the most frequent cause of disability in working age populations. The expenses and recovery times for injuries at work may be double those for similar nonwork related injuries. Injured workers should be provided with a specific rehabilitation program that is initiated early and includes exercise. Restoration of function rather than absence of pain should be the standard for measuring recovery. Pain is not a contraindication for a progressive return to productive activity. Suggestions are made of the kinds of information required by the physician to obtain from the patient in order to make a valid conclusion that the condition is work related. Specific physical tests and measurements are mentioned to assist in the diagnosis and treatment of low back pain and cumulative trauma disorders such as carpal tunnel syndrome. Occupational factors that contribute to cumulative trauma disorders include repetitive movement, awkward position, excessive force, torquing maneuvers and improper body mechanics. Cold environments and vibration can precipitate cumulative trauma disorders. The author suggests that the work site be examined for excess heat and humidity, proper lighting and well designed work stations, and that workers receive training concerning the proper way of carrying out some of the physical activities associated with their work so as to prevent injuries.

Pravikoff-DS, Simonowitz-JA. Cumulative trauma disorders: developing a framework for prevention. **AAOHN-J**. 1994 Apr; 42 (4) : 164-70

UNITED-STATES

1. The mechanism of a special order by a regulatory agency is an effective tool to reduce workplace CTD injuries. 2. Occupational health nurses can make a major contribution to the health of workers in their companies by developing an ergonomic program to identify the scope of the problem and by providing early identification and conservative treatment. 3. A workplace prevention program for CTD injuries consists of job analysis, recordkeeping, and corrective measures including engineering controls, administrative controls, personal protective equipment, treatment, and training components. 4. The goals of any program to control CTD are to prevent injury and disability to the employee, control costs of such injury to the employee and company, and comply with OSHA regulations.

Rempel-D, Manojlovic-R, Levinsohn-DG, Bloom-T, Gordon-L. The effect of wearing a flexible wrist splint on carpal tunnel pressure during repetitive hand activity**.** **J-Hand-Surg-Am.** 1994 Jan; 19(1): 106-10

We investigated how repetitive hand activity normally affects carpal tunnel pressure and whether a flexible wrist splint can influence this effect. Nineteen healthy subjects were evaluated under four test conditions: at rest with and without a wrist splint (baseline) and while performing a repetitive task with and without a wrist splint. The task involved loading and unloading 1 lb. cans from a box at a rate of 20 cans per minute for period of 5 minutes. Carpal tunnel pressure and wrist angles were continuously monitored by means of a fluid-filled catheter inserted into the carpal canal and a two-channel electrogoniometer mounted on the dorsum of the hand and forearm. Without the splint, carpal tunnel pressure rose from a median baseline level of 8 +/- 6 mmHg to 18 +/- 13 mmHg during activity. With the splint, carpal tunnel pressure rose from a baseline of 13 +/- 5 mmHg to 21 +/- 12 mmHg during activity. Median carpal tunnel pressure during activity with the splint was no different from that without the splint. Our data indicate that the median nerve is subjected to increased pressure within the carpal tunnel during repetitive hand activity. Wearing a flexible wrist splint during activity limits the range of wrist motion but has no significant effect on carpal tunnel pressure.

Reynolds-J.L., Drury-C.G., Broderick-R.L. A Field Methodology for the Control of Musculoskeletal Injuries. **Applied Ergonomics** 1994 Feb.; 25 (1) : 3-16.

A field strategy for identifying jobs prone to cumulative trauma disorders (CTDs) and manual materials handling injuries was presented. The strategy was based on a participative philosophy and involved a team consisting of operators and factory officials. The goals of the procedure were to provide quantitative data that would demonstrate the effectiveness of ergonomic interventions in a short period of time at a small number of workplaces, provide a self sustaining means for

evaluating and changing an entire factory in a systematic manner, and ensure that factory personnel would become the primary resource for future analysis and evaluation. The procedure was based on ten steps: review of musculoskeletal injury data, ergonomic review, task and operator selection, data collection and analysis, design requirements, alternative solutions, selection and prioritization of alternatives utilizing cost benefit analyses, fitting trials, reanalysis and evaluation, and implementation. A case study in which the strategy was applied to redesigning the half felled inseam sewing task in a clothing manufacturer was discussed as an example. This job which was performed by 18 operators resulted in 14 injuries during the past year. The injuries resulted in 6,480 lost work hours and 72,361 dollars in injury costs. The job required the operators to work in postures that caused significant neck and back flexion and lateral bending and shoulder and wrist flexion and adduction. The job task was redesigned by installing new or tilting sewing machines, having the operator stand instead of sit to perform the task, and installing automatic thread cutters. After these changes were implemented, no injuries were reported during a 5 month followup. Productivity, measured as average hourly earnings, increased during the period.

Ribeiro-HP. **Conversando sobre L.E.R. Lesões por Esforços Repetitivos.** São Paulo: Opção Assessoria de Comunicação; 1994. 54 p.

BRASIL

Parte de uma série de estratégias e ações conjuntas desenvolvidas pelo Núcleo de Saúde e Trabalho da AFUBESP (Associação dos Funcionários do Conglomerado Banespa e Cabesp) que elabora propostas e estudos sobre os principais problemas que afetam a saúde dos bancários. Relaciona perguntas e respostas sobre Lesões por Esforços Repetitivos (L.E.R.) (MC).

Romero-H.A., Wilhelmsen-C.A. Cumulative trauma disorders in advanced manufacturing environments. In: Kidd-P.T., Karwoski-W., Editors. **Advances in agile manufacturing environments: integrating, technology, organisation and people.** Amsterdam : IOS Press; 1994. p. 535-538.

Repetitive motion injuries (RMIs) or cumulative trauma disorders will be an issue within advanced manufacturing environments just as they are within standard manufacturing environments. The reasonis that the risk factors associated with RMIs are not always reduced by changin to advanced manufacturing environments. This paper examines the development of a work practices guideline equation for TMIs. The form recommended is analogous to the work practices guideline equation developed and use by the National Institute for Occupational Safety and the Health (NIOSH) in the United States applied to manual lifting tasks. This paper recommends using the four factors associated with RMIs (force, repetition, fatigue breaks, and posture) and individual specific contributors (physical condition, and outside activities) as factors within the equation . This equation has yet to quantified, but this is obviously the next step. The function of the equation will be to establish a Task Index for repetitive motion tasks. Task indices below an established Action Limit would be considered of low risk for developing a RMI. Tasks with indices between the Action Limit and an established Maximum Permissible Limit would require engineering modifications to the task to reduce the likelihood of developing a RMI. The purpose of this paper is to demonstrate the need and recommend a methodology for quatification and testing of an equation.

Rosecrance-JC, Cook-TM, Zimmermann-CL. Active surveillance for the control of cumulative trauma disorders: a working model in the newspaper industry.**J-Orthop-Sports-Phys-Ther**. 1994 May; 19(5): 267-76

UNITED-STATES

Health and risk factor surveillance is a critical aspect of an effective ergonomics process. Physical therapists are becoming increasingly involved in many components of the ergonomics process, including health and risk factor surveillance. The purpose of this study was to develop and implement a multistaged active surveillance program for the management and control of cumulative trauma disorders. The surveillance program was established at three newspaper companies consisting of 1,150 employees. This study focused on the first three stages of the multistage surveillance model, which incorporates the use of symptom and job factor questionnaires, specific anatomical surveys, and clinical detection tests. The results of the study indicated that 1) musculoskeletal symptoms in the back, neck, and hands accounted for the

majority of reported missed work among the newspaper workers; 2) production workers had a higher prevalence of musculoskeletal symptoms than office workers; and 3) the prevalence of probable carpal tunnel syndrome among the newspaper workers was 1.5%.

Rosecrance-JC, Cook-TM, Satre-DL, Goode-JD, Schroder-MJ. Vibration sensibility testing in the workplace. Day-to-day reliability. **J-Occup-Med.** 1994 Sep; 36(9): 1032-7.

Loss of vibration sensibility has been suggested as an early indicator of peripheral compression neuropathy, including carpal tunnel syndrome. Although vibration sensibility has been used frequently to evaluate carpal tunnel syndrome, the day-to-day reliability of vibration measurements in an industrial population measured at the workplace has not been assessed. Vibration sensibility testing was performed at the university ergonomics laboratory on 50 volunteers (100 hands) and at a newspaper company on 50 workers (100 hands). Vibration perception and disappearance thresholds were measured on two occasions separated by 3 to 5 days. Student's t tests indicated no significant differences between the first and second tests or between the two groups. Pearson product-moment correlations for test-retest reliability were lower in the industry group but were relatively high despite the less than optimal testing conditions. Our findings suggest that vibration sensibility measurements are reliable from day to day not only in the laboratory but also in the workplace.

Ross-P. Ergonomic hazards in the workplace: assessment and prevention. **AAOHN-J**. 1994 Apr; 42(4): 171-6

UNITED-STATES

Ergonomic hazards impact employers and workers and their families. Poor workplace design, awkward body mechanics or postures, repetitive movements, and other ergonomic hazards induce or contribute to a staggering number of cumulative trauma disorders. 2. Cumulative trauma disorders (CTD) affect hands, wrists, elbows, arms, shoulders, the lower back, and the cervical spine area. Structures involved include tendons, muscles, bones, nerves, and blood vessels. One can plan strategies for abatement by learning to recognize the hazards that contribute to CTD. 3. OSHA has published the Ergonomic Program Management Guidelines. OSHA has also given Advance Notice of Proposed Rulemaking for an Ergonomic Standard that will affect all industries. 4. A company wide ergonomic assessment should be developed, followed by a well written ergonomic plan. Ergonomic abatement will decrease the costs associated with CTD and ultimately impact the corporate "bottom line."

Rudolph-M.T. Typing risk - Computer keyboards are the stepchildren of ergonomics**. C't - Magazin für Computer-Technik** Feb. 1994; (2) : 42, 44, 46-47.

A recent study of 200 office employees in Darmstadt, Germany, confirmed results of earlier studies in Australia, the United Kingdom and the USA: first symptoms of repetitive strain injury (RSI) appear after more than 5 years of keyboard operations. Pains in the fingers, wrist, shoulder and neck are typical. The first ergonomically designed computer keyboards on the market are described. Initial tests seem to indicate that they do not prevent harmful bending of the wrist.

Schneider-S., Susi-P. Ergonomics and Construction: A Review of Potential Hazards in New Construction. **American Industrial Hygiene Association Journal** Jul. 1994; 55 (7) : 635-649.

Ergonomic aspects of potential hazards in new construction environments were reviewed. Ergonomic problems were studied during the construction of a four story office building in Washington, DC over a 15 month period, and the observations were assessed in the light of literature data. The problems were identified in relation to various progressive stages of the construction project. At the excavation and site preparation stage, problems identified included lower body stress through awkward postures and continuous walking by carpenters who assisted heavy equipment operators and vibration associated muscular and skeletal problems including back injuries by heavy equipment operators. During the masonry building stage bricklayers experienced significant lower back stress, both during the laying of bricks and grouting. Formwork had ergonomic hazards due to the repetitive lifting and use of heavy saws, resulting in vibration injuries and hand and wrist disorders. Structural steel work involved welding operations often done in squatting or kneeling positions. Crane operators developed ergonomic problems relating to

moving and placing dangerously heavy loads with precision. Reinforcement work caused repetitive wrist twisting, as well as lumbar problems. Concrete finishing led to vibration related problems. Spray fireproofing caused fatigue, neck pain, and vibration related disorders. Interior work with sheet metal, pipes and plumbing, electrical work, drywall stud installation and elevator construction led to wrist and posture problems. Roofworkers faced many ergonomic hazards due to materials handling and bent over posture. Building exterior work involved work on scaffoldings with risks for neck and hand/wrist injury. Walls and ceiling work, installation of floors/carpets, and trim and finish work led to several postural and musculoskeletal problems. Solutions to most problems existed through tool and materials engineering. The authors conclude that workers in the construction industry need training in the use of the new tools aimed at reducing ergonomic injury risks.

Schoenmarklin-R.W., Marras-W.S., Leurgans-S.E. Industrial Wrist Motions and Incidence of Hand/Wrist Cumulative Trauma Disorders. **Ergonomics** 1994 Sep.; 37 (9) : 1449-1459.

A quantification of known kinematic risk factors for hand/wrist cumulative trauma disorders (CTD) in industrial jobs and their incidence was investigated. Forty industrial workers aged 25 to 62 years (22 males, 18 females) employed at eight industrial facilities in the United States Midwest area were monitored. The minimum acceptable number of fundamental wrist movements for eligibility was 13,000 during an 8 hour shift. Wrist motion and forearm rotation were measured by a wrist monitor and a pronation/supination device, respectively. The experimental protocol consisted of at least ten trials lasting 10 seconds each for each worker at a normal job pace. Kinematic data were analyzed using discriminant function analysis and multiple logistic regression. Results showed that average peak flexion/extension (flex/ext) acceleration predicted CTD incidence rate better than any other variable, with odds ratios (OR) of 6.05 and 5.03, respectively. The second best predictor was flex/ext average velocity and radius/ulna acceleration, with ORs of 3.8 and 3.3, respectively. Position values predicted CTD poorly (OR 1.23 to 1.52). Acceleration in the flex/ext plane was the strongest predictor of groups of low and high CTD incidence rate. The 75th percentile peak acceleration from the high incidence (HI) group was greater than all but a few of the peak accelerations from the low incidence (LI) group. Above the 75th percentile level, there was a 98% probability that the job had a HI of CTD. At peak acceleration less than the 50th percentile, there was about a 67% probability than the job had a LI of CTD. The authors conclude that the relative risks for repetitive jobs that do not use hand tools can be worked out using the values from this study. The authors recommend that the methodology be used for ergonomic assessments.

St-Vincent-M., Chicoine-D., Beaugrand-S. Development and validation of a job tool for repetitive work (In French). **Travail et Santé** 1994; 10 (1) : S2-S8.

The project presented consisted of developing and validating a job analysis tool intended for the prevention of musculoskeletal disorders related to repetitive work. The analysis tool consists of five modules: the first deals with collecting preliminary data from interviews carried out with workers doing this job; the second module helps in establishing a sampling plan for the observations; the third module deals with the identification of risk factors from videos of the work and uses an observational grid; the fourth module helps in identifying determinats of the risk factors; while the fifth guides in finding solutions. The tool was validated in a electrical appliance manufacturing plant with two joint working groups of 6 participants. The groups analyzed four jobs with the analysis tool. The result obtained show that the tool can be readily used by workers with very training in ergonomics. For the four jobs studied, concrete solutions found were implemented during the project, while for the two other jobs, the solutions were accepted by management at the end of the project. The comparison of the results obtained by the experts and those obtained by the working groups shows that when using the observational grid, the people in the industry are fairly reliable in identifying the risk factors. For the different parameters evaluated, the agreement between the experts and the groups varied from 61% to 84%.

Viikari-Juntura-E., Hietanen-M., Kurppa-K., Huuskonen-M., Kuosma-E., Mutanen-P. Psychomotor Capacity and Occurrence of Wrist Tenosynovitis. **Journal of Occupational Medicine**1994 Jan.; 36 (1) : 57-60.

A possible relationship between psychomotor capacity and the occurrence of tenosynovitis among meat processing factory workers was studied. Meatcutters, sausage makers, and packers who had a history of at least two episodes of tenosynovitis or peritendinitis of the wrist or forearm and matched referents were given a series of psychomotor capacity tests including reaction and

movement time tests, the Purdue pegboard test, a test of finger dexterity, a test of visuospatial ability, and a visual attention test using the Critical Flicker Fusion Frequency. No significant differences were seen between the subjects and referents in any of the measures of psychomotor capacity. The authors conclude that the psychomotor test battery used to determine psychomotor capacity in this group of workers is not useful in the prediction of a history of tenosynovitis.

Wells-R., Moore-A., Potvin-J., Norman-R. Assessment of risk factors for development of work-related musculoskeletal disorders (RSI). **Appl. Ergon.** 1994; 25 (3) : 157-164.

This paper describes an approach to assessing the exposure to risk factors for the development of work-related chronic musculoskeletal disorders (repetitive strain injuries) of the upper limbs and low back. Instrumentation has been developed that combines a video image of the worker performing the task with superimposed quantitative information on risk factors. A description of the methodology, the rationale for the quantities displayed and workplace examples are presented. Continuous monitoring with both muscle activation and video has been found to be useful for identifying risk factors for both acute and chronic injuries in many workplaces. The approach gives information on chronic low-level loading not easily identified with observational methods. The methods presented give quantified information necessary for exposure measures in epidemiological studies. They also give semi-quantified information useful for identifying risks and justifying changes as well as for presentation to non-technical audiences.

Whaley-KE. Foam products plant institutes policies for reducing repetitive motion illnesses. **Occup-Health-Saf**. 1994 May; 63(5): 68-71.

UNITED-STATES

Williams-N. Hand arm vibration syndrome. **Occup-Health-Lond**. 1994 Mar; 46(3): 89-90

ENGLAND

As the UK's commonest prescribed disease hand arm vibration syndrome presents a considerable risk to a large sector of the working population. Dr Nerys Williams examines the condition and offers advice for its management.

1993

Lech-O, Varnieri-S., Alvarenga-I, Valenzuela-C. Apoiador móvel para braço (AMPB) análise na prevenção das lesões por esforços repetitivos. **Rev. Bras. Ortop.** mar. 1993; 28 (3) : 155-9.

BRASIL

Os autores apresentam novo aparelho ergonômico utilizado para repouso dos membros superiores durante o período de digitação. O "apoiador móvel para braço" (AMPB) determina uma diminuição do esforço muscular estático e corrige a postura, aliviando a tensão muscular e o stress localizado do membro superior. Trinta e um digitadores foram utilizados na avaliação do AMPB; 10 (32,26 por cento) homens e 21 (67,74 por cento) mulheres, com idade variando entre 24 e 41 anos. Vinte e seis (83,87 por cento) possuíam queixas nos membros superiores relacionadas ao serviço. O tempo médio de utilização do aparelho foi de 39 dias. Houve diminuição ou eliminação dos sintomas em todos os indivíduos sintomáticos. Vinte e nove (93,54 por cento) utilizariam regularmente este novo aparelho ergonômico durante sua jornada de trabalho. (AU).

1992

Ferreira-LL, Barreira-THC**. Lesões por esforços repetitivos com ritmos elevados numa empresa metalúrgica**. São Paulo: FUNDACENTRO; 1992. 18 p.

BRASIL

Relatório elaborado pelo Setor de Ergonomia da FUNDACENTRO, a pedido do Sindicato dos trabalhadores nas Indústrias Metalúrgicas, Mecânicas e de Material Elétrico de Osasco, para

esclarecer o problema de queixas de "tenossinovite" entre os trabalhadores da empresa Mallory do Brasil, em Itapevi.

1991

Salles-M.M. Tenossinovite: doença ocupacional ou social. **Rev. bras. saúde ocup.** abr.-jun. 1991; 19 (73) : 86-90.

BRASIL

As lers (Lesões por Exposições Repetitivas) e as LTCs (Lesões por Traumas Cumulativos) têm sido negligenciadas ou supervalorizadas pelos serviços de Saúde Ocupacional das empresas com conseqüências ruins para o empregado, empregador e para o país quando ocorre aposentadoria por doença ocupacional. O presente artigo faz uma revisão crítica dessa situação como colocações diagnósticas e preventivas, sugerindo medidas para minimizar tal impacto social (AU).

PSICOLOGIA

1998

Atroshi-I, Johnsson-R, Ornstein-E. Patient satisfaction and return to work after endoscopic carpal tunnel surgery. **J-Hand-Surg-Am**. 1998 Jan; 23(1): 58-65.

One hundred twenty-eight patients with idiopathic carpal tunnel syndrome were evaluated before surgery and 3 and 6 months after unilateral endoscopic carpal tunnel release. The variables analyzed included patient demographics, symptoms and signs, activities of daily living (ADL), sensibility and strength measurements, preoperative distal motor latency of the median nerve, operating surgeon, postoperative palmar pain and tenderness, return to work, and patient satisfaction with the results of surgery. Multivariate statistical analyses were performed, with patient satisfaction at 6 months after surgery and the time until return to work after surgery as the dependent variables. On stepwise logistic regression analysis of all preoperative variables, significant predictors of patient dissatisfaction at 6 months after surgery were higher age, heavy vibration exposure, worse ADL score, and better distal motor latency. Analysis of all preoperative and 3-month postoperative variables showed heavy vibration exposure, better distal motor latency, and worse 3-month postoperative ADL score to have the strongest independent correlation with patient dissatisfaction at 6 months. No significant independent association was found between any of the preoperative variables studied and the length of time until return to work after surgery.

Leclerc-A, Franchi-P, Cristofari-MF, Delemotte-B, Mereau-P, Teyssier-Cotte-C, Touranchet-A . Carpal tunnel syndrome and work organisation in repetitive work: a cross sectional study in France. Study Group on Repetitive Work. **Occup-Environ-Med**. 1998 Mar; 55(3): 180-7.

OBJECTIVES: To study the determinants of signs of carpal tunnel syndrome (CTS) in repetitive industrial work, with special attention to occupational constraints at group level and management practices of the companies. METHOD: A cross sectional study was conducted in three sectors: assembly line; clothing and shoe industry; food industry. A total of 1210 workers in repetitive work, from 53 different companies, was compared with a control group of 337 workers. Constraints at the workplace were partly self declared, and partly assessed by the occupational physicians in charge of the employees of the company. The definition of CTS was based on a standardised clinical examination. RESULTS: CTS was associated with repetitive work, especially packaging. It was more frequent among subjects who declared psychological and psychosomatic problems and those with a body mass index > or = 27. Dissatisfaction with work, lack of job control, short cycle time, and having to press repeatedly with the hand were associated with the syndrome. An odds ratio (OR) of 2.24 was found for "just in time" production. CONCLUSION: The results emphasise the complexity of the determinants of CTS, the role of psychosocial factors at work and the potentially negative effects of some practices of the companies aimed at enhancing their competitiveness.

Lima-MEA, Araújo-JNG, Lima-FPA. **L.E.R: dimensões ergonômicas e psicossociais.** Belo Horizonte; Health; 1998. 362 p.

BRASIL

A presente obra foi concebida a partir de um trabalho de pesquisa, que contou basicamente com as abordagens da ergonomia e da psicosociologia, sem perder de vista suas articulações com a psicopatologia e a sociologia do trabalho. Sua abrangência compreende não apenas as novas tentativas de análise do fen“meno da LER, através de um extenso e minucioso trabalho de pesquisa, que vem se desenrolando desde 1992, mas também de alguns ensaios teóricos, a partir das perspectivas críticas das abordagens acima citadas, contando ainda com algumas discussões sobre as possibilidades e limites nas áreas da teorização, das práticas de prevenção, do tratamento e do acompanhamento do lesionado. No conjunto da obra, o leitor poderá se deparar com um significativo avanço, nos atuais esforços de compreensão da LER... (AU).

Oliveira-C.R. **Manual prático de LER.** Belo Horizonte : Health; 1998. 403 p.

BRASIL

1997

Bessette-L, Keller-RB, Lew-RA, Simmons-BP, Fossel-AH, Mooney-N, Katz-JN. Prognostic value of a hand symptom diagram in surgery for carpal tunnel syndrome. **J-Rheumatol**. 1997 Apr; 24(4): 726-34

OBJECTIVE: To evaluate symptom patterns on a hand diagram as predictors of surgical outcome in carpal tunnel syndrome (CTS). METHODS: 202 patients with CTS enrolled in a prospective, community based cohort study in Maine completed a hand symptom diagram before surgery and at 6 month followup. They were asked to mark on the hand diagram the location of 3 symptoms: pain, numbness/tingling (NT), and "other" symptoms. The diagram was first divided into 6 regions following a standardized procedure. For the 6 regions, symptom patterns were identified separately for each of the 3 symptoms. Outcomes 6 months after surgery were expressed as the percentage of change on the Symptom Severity Scale and Function Status Scale of the Carpal Tunnel Syndrome Assessment Questionnaire, and the satisfaction with the results of the surgery. RESULTS: Several distinct symptom patterns were associated with the 3 principal outcomes in univariate and multivariate analysis. In linear regression models controlling for the baseline severity of symptoms and function, as well as other predictors, the hand symptom pattern variables accounted for 30, 14, and 24%, respectively, of the total explained variance in satisfaction, symptom severity, and functional status. Patients receiving Workers' Compensation (37% of the cohort) had more wrist pain and NT of the arm, and less pain involving the arm and upper palm. This group also had worse outcomes and were less satisfied with surgery. Drawing expansion was associated with a low score on the SF-36 mental health subscale. However, psychological impairment was not associated with a worse outcome. CONCLUSION: Symptom patterns identified preoperatively with a hand symptom diagram help to predict the outcome of carpal tunnel release.

Bonzani-PJ, Millender-L, Keelan-B, Mangieri-MG. Factors prolonging disability in work-related cumulative trauma disorders. **J-Hand-Surg-Am**. 1997 Jan; 22(1): 30-4.

Workers' compensation costs for management of soft tissue disorders continue to increase. The complexity of medical management of these cases has increased due to social factors. The purpose of this study is to improve the physician's ability to recognize nonmedical issues that prevent a rapid return to employment. A classification system is presented that will allow the clinician to identify administrative and pyschosocial issues that prolong disability. Additionally, the patients' job demands were classified by known ergonomic risk factors. The system was applied retrospectively to 50 random cases referred to two occupational hand clinics over a 1-year period. The results indicated that the psychosocial classification of the patient and the current employment status are the most important factors in prolonging disability workers.

Buckle-P. Upper limb disorders and work: the importance of physical and psychosocial factors. **J-Psychosom-Res**. 1997 Jul; 43(1): 17-25.

Upper limb, shoulder, and neck disorders cause both acute and chronic pain, as well as significant functional impairment. They impose a heavy financial burden on societies, industries, and individuals. Our understanding of the pathology of many of the disorders is poor. The epidemiological pursuit of causal relationships is hampered by the nature of the disorders and by

the diverse and interactive exposures both at, and away from, the workplace. Current studies suggest that forceful, repetitive manual work, along with prolonged static loading and exposure to vibration are established areas of risk. Much less is known about the possible contribution of psychological factors. Perception of work characteristics, for example, low decision latitude and lack of social support, appear to show increased associations with a number of upper limb disorders, although mechanisms to explain these observations are still broadly theoretical. Research into individual factors is limited, but age and gender both appear to be important.

Ford-CV. Somatization and fashionable diagnoses: illness as a way of life. **Scand-J-Work-Environ-Health** 1997; 23 (Suppl 3) : 7-16.

FINLAND

The history of “nondisease”dates back, at least 4000 years, to early descriptions of hysteria. More recently somatization became a part of the official diagnostic nomenclature by creation of DSM III category, “somatoform disorders”. Somatization can serve as a rationalization for psychosocial problems or as coping mechanism, and for some illness, becomes a way of life. On variation of somatization can be the “fashionable diagnosis”, for example, fibromyalgia, multiple chemical sensitivities, dysautonomia, and, in the past, “reactive hypoglycemia’. These disorders are phenomenologically related to environmental or occupational syndromes and mass psychogenic illness. Fashionable illnessess are characterized by (i) vague, subjective multisystem complaints, (ii) a lack of objective laboratory findings. (iii) quasi-scientific explanations, (iv) overlap from one fashionable diagnosis to another, (v) symptons consistent with depression or anxiety or both, (vi) denial of psychosocial distress or attribution of it to the illness. Fashionable diagnosis represent a heterogeneous collection of physical diseases, somatization, and anxiety or depression. They are final common symptomatic pathways for a variety of influences including environmental factors, intrapersonal distress and solutions to social problems. A fashionable diagnosis allows psychosocial distress to be comfortably hidden from both the patient and physician, but premature labeling can also mask significant physical disease. Hysteria remains alive and well and one contemporary hiding place is fashionable illness.

Hagg-GM, Astrom-A. Load pattern and pressure pain threshold in the upper trapezius muscle and psychosocial factors in medical secretaries with and without shoulder/neck disorders. **Int-Arch-Occup-Environ-Health**. 1997; 69(6): 423-32.

OBJECT: A current hypothesis for the genesis of muscular complaints in the shoulder/neck region postulates that short periods with a completely relaxed muscle are essential to avoid complaints. Another hypothesis is that these disorders are related to psychosocial conditions at work. In order to test these hypotheses, 23 medical secretaries were investigated. METHODS: The load pattern during work in the upper trapezius muscle bilaterally was assessed with electromyographic (EMG) technique and exposure variation analysis (EVA). In addition, pressure pain threshold (PPT) was measured on the trapezius muscle bilaterally and on the sternum. Psychosocial conditions at work were assessed with a questionnaire. RESULTS: The medical secretaries with complaints had significantly fewer episodes with totally or close to totally relaxed muscle compared with the healthy group. The group with complaints tended to have a more monotonous load pattern at low levels (approx. 1%-5% maximum voluntary contraction) while the healthy group had more frequent pauses but also somewhat more frequent short load peaks. The group with complaints showed lower PPT readings compared with the healthy group. However, the whole group had considerably lower PPTs than is usually reported in the literature. Of the 12 questions in the psychosocial questionnaire only one regarding work task satisfaction showed a significant difference between the two groups. CONCLUSION: Support is found for hypothesis that secretaries without complaints have more frequent episodes with totally relaxed muscle. A significant difference is found regarding work task satisfaction.

Hess-D. Employee perceived stress. Relationship to the development of repetitive strain injury symptoms. **AAOHN-J**. 1997 Mar; 45(3): 115-23.

Repetitive strain injuries (RSIs), specifically carpal tunnel syndrome, are the fastest growing type of occupational injury. Research about precipitating factors and prevention has been controversial and inconclusive. Preventive measures typically have addressed ergonomic changes. The purpose of this research article is to describe the effects of several variables on the perceived development

of RSI symptoms, particularly those of carpal tunnel syndrome. Emphasis was placed on the role of perceived stress. The study design was a descriptive survey using a nonprobability sampling method. The study focused on four variables related to perceptions of symptoms: 1) perceptions of level of knowledge related to the prevention of RSIs; 2) taking a specific action to make one's workstation more ergonomically correct; 3) perceptions of having ergonomically correct workstations; and 4) perceptions of being stressed. Study results indicated that perceived stress was significantly associated with perceived RSI symptoms. Workers who use a computer 4 or more hours per day reported significantly more symptoms than those who did not. At risk computer users who perceive an ergonomically correct workstation reported fewer symptoms. To prevent RSIs, occupational health nurses must address ergonomics, stress levels, and knowledge levels.

1996

Byl-N.N., Merzenich-M.M., Jenkins-W.M. A primate genesis model of focal dystonia and repetitive strain injury: I. Learning-induced dedifferentiation of the representation of the hand in the primary somatosensory cortex in adult monkeys. **Neurology**. 1996 Aug; 47(2): 508-520

Tested a neuroplasticity/learning origins hypothesis for repetitive strain injuries (RSIs), including occupationally induced focal dystonia. Repetitive movements produced in a specific form and in an appropriate behavioral context cause a degradation of the sensory feedback information controlling fine motor movements, resulting in the "learned" genesis of RSIs. Two adult owl monkeys were trained at a behavioral task that required them to maintain an attended grasp on a hand grip that repetitively and rapidly opened and closed over short distances. The monkeys completed 300 behavioral trials per day with an accuracy of 80-90%. A movement control disorder was recorded in both monkeys. Training was continued until the performance accuracy dropped to below 50%. Subsequently an electrophysiologic mapping study of the representations of the hand within the primary somatosensory (SI) cortical zone was conducted. The hand representation in the true primary somatosensory cortical field, SI area 3b, was found to be markedly degraded in these Ss.

Gilbert-M.D., Tick-H., VanEerd-D. "RSI"; What is it, and what are we doing about? **Canadian-Journal-of-Rehabilitation**. 1996 Jun; 10(1): 51-63

Presents an overview of the history and definition of repetitive strain injuries (RSI) as well as the epidemiological, etiological, and clinical factors associated with RSI, and outlines a multidisciplinary approach in the treatment of these disorders. There is emphasis placed on a complete and knowledgeable assessment of the afflicted patient, with both local and systemic factors taken into account. The contribution of newer clinical methodologies, such as "dry needling" of trigger points, and surface electromyography, are discussed. A complete rehabilitative approach to the RSI patient, including physical, psychological, and community factors is proposed. Issues of primary prevention are mentioned. RSI is determined to be a complex, multifactorial condition that requires further research.

Mood-S.D., Sauter-S.L., eds. **Beyond biomechanics - Psychosocial aspects of musculoskeletal disorders in office work.** Hampshire : Taylor and Francis; 1996.

AB : This book comprises a series of papers concerning the interaction between psychosocial and physical factors in the occurrence of musculoskeletal diseases in office work. Theoretical models and mechanisms are presented and issues for management, prevention and further research are discussed. Papers include: an ecological model of musculoskeletal disorders in office work; work organization, stress and cumulative trauma disorders (CTDs); effects of psychological demand and stress on neuromuscular function; pathophysiology of CTDs; a psychosocial view of cumulative trauma disorders and implications for occupational health and prevention; a cognitive-behavioural perspective on pain in CTDs; workstyle and the prevention, evaluation and rehabilitation of upper-extremity disorders; psychosocial epidemiology in CTD research.

Moore-LE, Wiesner-SL. Hypnotically-induced vasodilation in the treatment of repetitive strain injuries. **American-Journal-of-Clinical-Hypnosis**. 1996 Oct; 39(2): 97-104

Examined the effectiveness of behaviorally induced vasodilation (hypnosis with biofeedback and autogenics) in the treatment of upper extremity repetitive strain injuries (RSI). 30 patients with

recent onset of upper extremity RSI symptoms were randomly assigned to 1 of 2 treatment conditions, i.e., hypnotically-induced vasodilation or a waiting-list control. Treatments were given on an individual basis, once a week for 6 wks. Patients in the treatment condition showed highly significant increases in hand temperature between pre- and post-treatment. Patients in the treatment condition also showed highly significant reductions in pain in comparison to the waiting list condition. ((c) 1997 APA/PsycINFO, all rights reserved)

Quintner-JL, Cohen-ML, Burvill-PW et al. Occupation neuroses and the psychogenic connotation of repetition strain injury: the misconstruction of neurosis. **Aus- Integr-Psychiatry**, 1994 ; 10(4): 165-184)

The cervicobrachial pain syndrome known as repetition strain injury (RSI) has been the subject of considerable controversy, particularly between the proponents of somatogenic and of psychogenic theories of pathogesis. The latter, who consider that RSI is a neurosis, namely conversion hysteria, argue furthers that is a contemporary example of na occupation neurosis, as described in the late nineteenth century. In this paper the history and clinical application of the construct of occupation neurosis is reviewed. To examine the proposed analogy with RSI. It is shown that those who argued that RSI was psychogenic failed to appreciate the evolution in terminology and etiology of the older construct, a misconstructuon with major consequences.

Skov-T., Borg-V., Orhede-E. Psychosocial and physical risk factors for musculoskeletal disorders of the neck, shoulders, and lower back in salespeople. **Occupational and Environmental Medicine** 1996; 53 (5) : 351-356.

The authors aim to analyse the association between symptoms from the muskuloskeletal system and many psychosocial and other physical stressors in the job demand-control-support model, also to analyse the influence of personality charateristics. Thirteen hundred and six salespeople answered a self administered questionnaire on job characteristics, exposures, personality characteristics, social network, smoking and drinking habits, and symptoms of the neck, shoulders and low back. Both psychosocial and physical factors were associated with musculoskeletal symptoms. Only one personality characteristic, tendency to fell overworked, significantly influenced the prevalence of musculoskeletal symptoms.

Stephens-C., Smith-M. Occupational overuse syndrome and the effects of psychosocial stressors on keyboard users in the newspaper industry. **Work and Stress** 1996 Apr.-June; 10 (2) : 141-153.

In a survey of 550 keyboard users working in different offices of the same newspaper company, 29.3% of workers reported experiencing neck, shoulder or arm pain. Differences between high- and low-pain reporting office groups were significantly related to perceptions of the quality of the work environment. Factors associated with low-pain reporting environments included higher peer cohesion, higher staff support, higher control, less work pressure, less stress, greater autonomy and more physical comfort. Consideration should be given to psychosocial factors in the design of work and workplaces.

1995

Himmelstein-JS, Feuerstein-M, Stanek-EJ-3rd, Koyamatsu-K, Pransky-GS; Morgan-W; Anderson-KO. Work-related upper-extremity disorders and work disability: clinical and psychosocial presentation. **J-Occup-Environ-Med**. 1995 Nov; 37(11): 1278-86.

Work-related upper-extremity disorders (WRUEDs) are an increasingly common cause of work-related symptoms and disability. Although most upper-extremity disorders are acute and self-limited, a small percentage of workers with symptoms go on to permanent disability and account for the majority of costs associated with these conditions. Little is known, however, about this progression from symptoms to disability and how it might be prevented. In this study, we evaluate the demographic, vocational, medical, and psychosocial characteristics of patients with WRUEDs and examine several hypotheses regarding the differences between working and work-disabled patients. One hundred twenty-four consecutive patients were evaluated in a clinic specializing in occupational upper-extremity disorders. Patients currently working (n = 55) and work-disabled patients (n = 59) were similar with regard to age, gender, and reported job demands. The work-disabled group reported less time on the job, more surgeries, a higher frequency of acute

antecedent trauma, and more commonly had "indeterminate" musculoskeletal diagnoses. They also reported higher pain levels, more anger with their employer, and a greater psychological response or reactivity to pain. These findings, though cross-sectional in nature, suggest that, in addition to medical management, more aggressive approaches to pain control, prevention of unnecessary surgery, directed efforts to improve patients' abilities to manage residual pain and distress, and attention to employer-employee conflicts may be important in preventing the development of prolonged work disability in this population.

Ireland-DC. Repetition strain injury: the Australian experience--1992 update. **J-Hand-Surg-Am**. 1995 May; 20(3 Pt 2): S53-6.

Marley-RJ, Fernandez-JE. Psychophysical frequency and sustained exertion at varying wrist postures for a drilling task. **Ergonomics**. 1995 Feb; 38(2): 303-25.

Two laboratory experiments were conducted; first, to utilize the psychophysical approach (method of adjustment) to establish maximum acceptable frequency (MAF) for a sheet metal drilling task and, second, to examine the effect of sustained, static exertion upon objective and subjective measures under similar task conditions. In both experiments, the wrist posture (flexation, ulnar deviation) required by the task was varied. Twelve healthy females served as subjects. Results show that the psychophysically adjusted task frequency was significantly lower when wrist deviation was required, particularly flexion. MAF for one-third (25 degrees) and two-thirds (50 degrees) flexion were 88% and 73%, respectively, of those selected in the neutral posture. Furthermore, these results were supported by trends in grip strength, heart rate, blood pressure, EMG and perceived exertion. Results from the sustained exertion trials revealed that significant increases in physiological parameters occurred during 3-minute sessions and that this trend was exasperated with deviated wrist posture, particularly flexion. Considering results of both experiments, it was concluded that while the neutral wrist posture may be preferred for a drilling operation, task frequency should be reduced for deviated postures when redesign is not feasible and it is further recommended that deviation be limited to one-third maximum flexion (25 degrees) and two-thirds maximum ulnar deviation (30 degrees). It is also suggested that the psychophysical approach may be utilized to establish 'acceptable' parameters for other industrial tasks involving upper extremity stress, particularly in the current absence of more objective biomechanical and/or physiological criteria for reducing the risk of exposure to cumulative trauma disorders.

Reilly-PA. Repetitive strain injury': from Australia to the UK. **J-Psychosom-Res**. 1995 Aug; 39(6): 783-8.

The UK is now experiencing an epidemic of upper limb pain similar to that which affected Australia in the 1980s. The pain is often non-specific, and does not conform to the pattern of various well-recognized rheumatological entities. The syndrome is known by a number of terms, some of which imply an aetiological link to workplace activities unsubstantiated by hard evidence. The syndrome may well be largely psychosocial, and analogous to the chronic fatigue syndrome. It is currently the cause of many contentious and well-publicized medico-legal cases. Possible factors behind the epidemic will be discussed, and an approach to management suggested.

Smith-MJ, Carayon-P. Psychosocial aspects of cumulative trauma disorders. In: Rantanen J., Lehtinen S., Hernberg S., K Lindstrom., Morsa M., Starck J. Vikari-Juntura E.. Editors. **From research to prevention : managing occupational and environmental health hazards**. Helsinki: Finnish Institute of Occupational Health; 1995. p.90-92.

Voiss-DV. Occupational injury. Fact, fantasy, or fraud? **Neurol-Clin**. 1995 May; 13(2): 431-46.

The preceding describes some of the confusion which abounds in practically all areas of clinical medicine and particularly in occupational injuries. In essence, this confusion devolves to a primary

failure on our part as clinicians; the failure to differentiate fact from fantasy. In the clinical arena, this is the failure to differentiate between that which is clinical pathology in the peripheral neuromusculoskeletal system and that which is no less real for the patient, a fantasy arising from image-driven, adaptively-initiated activation of specific neuronal groups in the somatosensory or somatomotor cortex, descriptively referred to as "hysterical" or "psychogenic." A common experience of neurologists and other clinicians conducting a sensory examination of the extremities is the presence of nondermatomal or glovelike sensory changes of the feet or hands. Nondermatomal sensory changes are known to engage any part of the body surface. These have often been referred to as hysterical; however, in the clinical sensory examination for touch, vibration, and pinprick, the patient has no control over the area or boundaries of the activated receptive fields in the somatosensory cortex. Fantasies of the patient, provoked by the context of examination, initiate an adaptive response which can expand or contract the boundaries of the somatosensory receptive fields. These sensory changes are unconscious and represent alteration of receptive fields in the somatosensory cortex. The brain is re-entrantly connected. Activation in one area promotes activation in adjacent and associated areas remote from the primary receptive field. The brain organizes its own activity. "Perception thus is not imposed on the brain; rather the brain selects the perceptual mode.... stimulus energy, according to numerous studies from brain-activation, is only a weak determinant of the magnitude of response in primary sensory areas. . . ." The most intense brain activation in the somatosensory cortex is provoked, not by peripheral stimulation, but by adaptive preparation referred to as somatotopical tuning, probably due to an increase in excitatory post-synaptic potentials (EPSPs). Many patients present to neurologists and other clinicians with complaints of numbness and tingling in the fingers, hands, arms, or face and occasionally, as in one of my patients, the entire body.

1994

Krause-TR, Langston-GW, Hidley-JH. Behavior-based task analysis prompts early response to ergonomic problems. **Occup-Health-Saf**. 1994 Jan; 63(1): 55-9.

Westgaard-RH, Jensen-C, Berg-K, Waersted-M, Veiersted-KB. Occupational and individual risk factors of muscular pain. **Tidsskr-Nor-Laegeforen**. 1994 Mar 20; 114(8): 922-7.

It is suggested that occupational exposure to muscle load should be described by three factors to indicate health risks: level, repetitiveness and duration. A reduction in level is beneficial if the level is high (> 10-15% MVC). However, even a low level involves risk of musculoskeletal complaints if the exposure is repetitive. A reduction of the occupational exposure from 7-8 hours to 4-5 hours per day delays the development of musculoskeletal complaints, but does not provide long-term reduction of risk with frequent repetitions. When interventions are carried out to reduce the risk of occupational musculoskeletal complaints, it is necessary to consider psychosocial and individual constitutional factors in addition to the three factors constituting the occupational exposure to muscle load.

1993

Sato-L, Araujo-LU, Franco-MAJ, Nicotera-FN, Daldon-MTB, Settimi-MM, Silvestre-MP Atividades em grupo com portadores de L.E.R. e achados sobre a dimensão psicossocial. **Rev. Bras. Saude Ocup**. 1993, 21 (79): 49-62

As Lesões por Esforços Repetitivos (L.E.R.) são um conjunto de afecções musculo-tendinosas que atingem principalmente os membros superiores até a região vérvico-brachial, sendo decorrentes de um conjunto de fatores existentes no trablaho. A magnitude dessa moléstia entre trabalhadores coloca-a como um importante problema de saúde pública. Opresente trabalho discute achados sobre a dimensão psicossocial da L.E.R., a partir de atividade em grupo com portadores, desenvolvida em serviços públicos de saúde do trabalhador, objetivando discutir possibilidades de melhoria da qualidade de vida. Identificou-se que o sofrimento vivido pel;os portadores de L.E.R. está associado à culpa e revolta por ter adquirido a doença, à impossibilidade de retomar afazeres antes assumidos, à incerteza da melhora e da cura. Com o desenvolvimento do trabalho em grupo constatou-se que há temas sobre os quais os portadores sentem necessidades de discutir, quais sejam: o que é L.E.R., causas, repercussões e

perspectivas de vida em função da L.E.R. Concluiu-se que a atividade em grupo com portadores de L.E.R. facilita a construção de estratégias individuais e coletivas no sentido de melhorar a qualidade de vida, requerendo tais estratégias a adoção de uma postura ativa diante da situação.

RADIOGRAFIA

1998

Glajchen-N, Schwartz-ML, Andrews-JR, Gladstone-J. Avulsion fracture of the sublime tubercle of the ulna: a newly recognized injury in the throwing athlete. AJR-Am-J-Roentgenol. 1998 Mar; 170(3): 627-8

UNITED-STATES

OBJECTIVE: The purpose of this report is to describe the imaging features in three cases of avulsion injury of the sublime tubercle of the ulna that occurred in throwing athletes. CONCLUSION: Avulsion fracture of the sublime tubercle of the ulna is a potential cause of chronic medial elbow pain in the throwing athlete. This entity is best evaluated with a combination of plain radiographs and coronal MR images, particularly gradient-echo images that show the continuity of the avulsed fragment with the ulnar collateral ligament.

1997

Masciocchi-C, Maffey-MV, Mastri-F. Overload syndromes of the peritalar region. **Eur-J-Radiol**. 1997 Dec; 26(1): 46-53.

IRELAND

INTRODUCTION: The purpose of this study was to identify the diagnostic possibilities of the different diagnostic techniques in the evaluation of the pathological conditions affecting the peritalar region. MATERIALS AND METHODS: Between September 1995 and December 1996, 58 patients, with a painful syndrome at peritalar level were submitted to MRI, which was performed using a 'dedicated system' consisting of 0.2 and 0.5 T equipment. Spin-Echo T1-weighted and Gradient-Echo T2-weighted sequences were used on sagittal, coronal and axial planes, with slice thickness of 3-5 mm. Conventional radiography was previously performed in all patients, while 18 of them underwent CT. Surgery or arthroscopy was performed in 22 cases. 36 patients underwent clinical follow-up associated with conventional radiography in six cases, MRI in 11 and to both of them in six patients. RESULTS: After arthroscopy and surgery, an involvement of the tibio-talar joint was found (one pathogenic synovial plica, three meniscoid syndrome and 12 anterior impingement) in 16 patients. Concerning the subtalar joint, surgical examination revealed a cellulo-adipostis of the sinus tarsi in two patients, while in three cases osteochondral damage of the subtalar joint was identified. In the last patient, degenerative changes of the posterior tibial tendon associated with osteochondral pathology of the talo-navicular joint were found. MRI findings agreed with the surgical and arthroscopic ones in all patients except for the synovial plica; in this case, the MRI was negative. Follow-up performed on 36 patients revealed 12 tibio-talar joint, 17 subtalar joint and 7 talo-navicular joint pathological conditions. DISCUSSION: Concerning the tibio-talar joint, MRI findings were confirmed by arthroscopy in all cases of anterior impingement. Magnetic resonance (MR), due to its capability in detecting osteochondral damage and identifying osteophyte sites, results in the best imaging method for evaluating this condition. Meniscoid syndrome is easily detected by MRI only in the presence of sufficient scar tissue, while conventional radiography reveals the calcific stage. In sinus tarsi syndrome, the ligamentous damage associated with sero-hemorrhagic effusion at fatty tissue level may lead to a 'chopping' effect on the nerve endings: this condition is well demonstrated by MRI. In all cases of osteochondral alterations affecting both the subtalar and talo-navicular joint, it has been possible to obtain correct diagnosis with MRI, which also depicted well the tenosynovitis of the posterior tibial tendon. In cases of stress fracture of the navicular bone, both CT and MRI demonstrated the lesions well, even when, in the early phases, conventional radiography produced a negative result. In conclusion, MRI may be considered the choice method in the study of different pathological alterations affecting the peritalar region, also providing detailed information useful for a therapeutic approach.

Stabler-A, Heuck-A, Reiser-M. Imaging of the hand: degeneration, impingement and overuse. **Eur-J-Radiol**. 1997 Sep; 25(2): 118-28.

IRELAND

Degenerative and overuse diseases as well as impingement syndromes of the hand are illustrated and discussed in this review article. Osteoarthritis of the interphalangeal joints as described by Heberden and Bouchard is a ubiquitous articular disease often associated with synovitis and erosive joint destruction. Osteoarthritis of the trapeziometacarpal joint is classified into four stages for proper indication of operation. Overuse can result in stenosing tenosynovitis around the wrist and in synovitis with or without impingement of the flexor or extensor tendons of the digitis or ruptures of the annular and cruciform pulleys. Although diagnosis of these entities is usually made by history and clinical investigation, ultrasound and MRI can be helpful tools in imaging of these diseases. Scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC) are the characteristic degeneration pattern of the wrist and represent the degeneration mechanisms in scapholunate insufficiency and nonunion of the scaphoid. SLAC wrist is a gradual degeneration classified in three stages and found in posttraumatic scapholunate rupture, calcium pyrophosphate dehydrate deposition disease (CPPD), rheumatoid arthritis, neuropathic diseases, trauma, and beta 2-microglobulin associated amyloid deposition. Ulna impaction syndrome is increasingly recognized as a cause of ulnar sided pain and exhibits a characteristic MRI appearance.

Strasser-P, Hauser-M, Hauselmann-HJ, Michel-BA, Frei-A, Stucki-G. Traumatic finger polyarthrosis in judo athletes: a follow-up study. **Z-Rheumatol**. 1997 Dec; 56(6): 342-50.

GERMANY

Osteoarthritis is the most common joint disease. In addition to known risk factors e.g. genetics, age and hormonal status it has been suggested that chronic-repetitive micro- and substantial (macro-) injury may play an important pathogenetic role. In a longitudinal case-study we examined Judo-players for clinical and radiological changes of the finger joints over the course of 16 years. All examined 8 players demonstrated soft tissue changes including Heberden nodes and radiological changes typical for osteoarthritis of the finger joints. Changes were symmetrical and were not restricted to joints with tendon ruptures or fractures in the anamnesis. Degenerative changes were progressive and more pronounced in active players. Subjectively, symptoms were usually mild. Extensive Judo seems to be a risk factor for the development of osteoarthritis of the finger joints due to chronic-repetitive micro- and substantial (macro-) injury.

1994

Ishikawa-H, Sakurai-A, Hirata-S, Ohno-O, Kita-K, Sato-T, Kashiwagi-D. Painful bipartite patella in young athletes. The diagnostic value of skyline views taken in squatting position and the results of surgical excision. **Clin-Orthop**. 1994 Aug; (305): 223-8.

UNITED-STATES

Nine patients with painful bipartite patella associated with young athletes were evaluated clinically and radiologically at an average of 60 months (range, 21 to 145 months) after excision of accessory nucleus of the patella. All patients were male and between 14 and 21 years of age when they were operated on. The indications for excision of separated fragments of the patella included: failure of nonoperative treatment for more than 3 months; radiographic evidence of significant irregularities of the articular surface of the separated fragment of the patella; and symptoms severe and prolonged enough to warrant surgery. Skyline views taken with the patient in a squatting position with weight bearing showed a wider separation of the accessory fragment from the main patella than did the nonweight bearing skyline views. This appears to be an important and useful diagnostic feature in a painful bipartite patellae; the authors propose that this radiographic examination should be called a "squatting position test". Histologically, the interface between the accessory and main patella was fibrocartilaginous, and the adjacent bone tissue was clearly demarcated by a dense lamina, indicating that the initial lesion was probably a traction lesion. All patients returned to full sports activity at their previous highest level within 4 to 7 weeks. The excision of accessory bone appears to be a simple and reliable procedure for avoiding prolonged postoperative treatment, reducing the length of incapacitation, and minimizing the danger of permanent stiffness of the joint.

Van-de-Meulebroucke-B, Dereymaeker-G. Stress lesions of the forefoot in ballet dancers. **Acta-Orthop-Belg**. 1994; 60 Suppl 1: 47-9.

BELGIUM

REABILITAÇÃO

1998

Atroshi-I, Johnsson-R, Nouhan-R, Crain-G, McCabe-SJ. Use of outcome instruments to compare workers' compensation and non-workers' compensation carpal tunnel syndrome. **J-Hand-Surg-Am.** 1997 Sep; 22(5): 882-8

UNITED-STATES

Validated outcome instruments were used to compare treatment outcomes of carpal tunnel syndrome (CTS) in workers' compensation and non-workers' compensation patients. A self-administered questionnaire consisting of the generic Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and the disease-specific Carpal Tunnel Syndrome Instrument was mailed to 277 patients randomly selected from all 1050 new patients treated for CTS during a 1-year period. A total of 212 patients (61 workers' compensation and 151 non-workers' compensation) responded to the survey 7-22 (mean, 14) months after the initiation of treatment, yielding a response rate of 76%. Workers' compensation patients had worse mean scores than non-workers' compensation patients in 6 of the 8 SF-36 scales and in the 2 Carpal Tunnel Syndrome Instrument scales, but validating multivariate analysis could not verify significant score differences in any of the scales. Thus, this study could not demonstrate inferior treatment outcomes of CTS in workers' compensation patients as measured by standardized generic and disease-specific outcome instruments.

Friedman-PJ. Isokinetic peak torque in women with unilateral cumulative trauma disorders and healthy control subjects. **Archives of Physical Medicine and Rehabilitation** 1998 Jul; 79 (7) : 816-819

Objectives: To compare isokinetic peak torque in the symptomatic and asymptomatic limbs of women with lateral epicondyle or forearm pain due to cumulative trauma disorders (CTDs), and to compare peak torque in women with CTDs to peak torque in healthy women. Design: Case control comparison. Setting: Private occupational rehabilitation clinic and a sports science tertiary education center. Subjects: Women with CTDs involving one arm (n = 17) and a convenience sample of healthy women (n = 7) Intervention: Subjects performed isokinetic strength testing for wrist extension and flexion, wrist supination and pronation, and knee extension and flexion. Main Outcome Measures: Peak torque at 120 degrees/sec on a Biodex isokinetic dynamometer. Results: Control subjects had significantly higher peak torque in wrist extension, flexion, supination, and pronation than CTD subjects on the symptomatic side. Control subjects also had significantly higher peak torque of wrist flexion, pronation, and supination than CTD subjects on the asymptomatic side; wrist extension was greater, but this did not reach significance. In addition, control subjects had significantly higher peak torque in knee extension and flexion than CTD subjects. CTD subjects had significantly greater left-right asymmetry in wrist extension torque than did control subjects. Conclusions: Isokinetic peak torque is diffusely reduced in women with unilateral CTDs compared with healthy control subjects, these differences occurring in symptomatic and asymptomatic limbs. (C) 1998 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation.

Gard-G, Sandberg-AC. Motivating factors for return to work. **Physiother-Res-Int.** 1998; 3(2): 100-8

ENGLAND

BACKGROUND AND PURPOSE: A new concept to increase return to work for patients listed as sick with chronic musculoskeletal pain has been used at a rehabilitation centre in Lulea, Sweden. The programme includes work for three days a week and intensive rehabilitation for two days a week, for 12 weeks, as a combination of 'on the job' training and rehabilitation after a period off

work sick. The rehabilitation programme focused on pain reduction, identifying and finding solutions to pain problems in actual work and life situations and training of the functional capacities needed in the work and life situation. The aim of the study was to describe patients' perceptions of motivating factors for return to work. METHODS: A phenomenological method was used. A naive reading of interview notes was followed by structural analyses and reflections on the interpreted whole. Inclusion criteria for the study were musculoskeletal pain for at least one year and a period of at least four weeks' sick leave during that time. Ten patients, aged 30-54 years, participated in the study. An initial conceptual framework was developed to inform the scope of the study and to guide data collection and analysis. RESULTS: Different factors in the study framework influenced motivation to return to work. Among structural factors the division of labour at work was the most important motivator, particularly the ability to do as much as work colleagues, quantitatively and qualitatively. All the patients had jobs in the healthcare or service sectors, jobs with many social contacts. They perceived their work task content as being of minor importance compared to whether the tasks were perceived as meaningful or highly needed by others. All wanted a meaningful job content and a job which they could do in a satisfactory way according to their own norms and compared to colleagues. This highly increased motivation for return to work. Relationships (in terms of co-operation with colleagues and service to patients or clients) were important motivating factors for return to work. Self-confidence was a new factor of importance for return to work; work tasks had to be meaningful and needed by others, work must be done in a way satisfactory for the individual and in a way that was acceptable to others in the group. Everyday responsibility, feedback and support in daily work tasks were important. These aspects increased self-confidence. The results supported the development of a new conceptual framework for possible motivating factors for return to work. CONCLUSIONS: Structure, content, relationships, health and self-confidence were all important motivating factors for return to work.

Oth-Fejel-GE, Toth-Fejel-GF, Hedricks-CA. Occupation-centered practice in hand rehabilitation using the experience sampling method. **Am-J-Occup-Ther.** 1998 May; 52(5): 381-5

UNITED-STATES

Spence-S.H. Cognitive-behavior therapy in the management of upper extremity cumulative trauma disorder. **J. Occup. Rehabil.** 1998; 8 (1) : 27-45.

Cognitive-behavioral have a great deal to offer in the prevention and remediation of upper extremity cumulative trauma disorder (CTD) in the workplace in relation to prevention, cognitive-behavioral methods offer promise as adjuncts to educational programs and ergonomic practices that aim to increase workers use of safe work postures, movements, and procedures. Cognitive-behavior therapy (CBT) is also na important component of the rehabilitation process for the minority of workers who proceed to a chronic pain condition. However, CBT forms just one aspect of the rehabilitation process, along with multidisciplinary interventions that tackle physical fitness, ergonomic factors, and work practices. CBT techniques, such as goal setting problem solving cognitive restructuring attention diversion, communication skills, and assertiveness training aim to enhance coping skills and reduce psychopathology and disability. As each patient presents with a different pattern of cognitive and behavioral strengths and weaknesses, an individualized assessment is important. This will permit the development of an individually tailored approach to CBT as part of the rahabilitation process.

1997

Byl-NN, Melnick-M. The neural consequences of repetition: clinical implications of a learning hypothesis. J-**Hand-Ther.** 1997 Apr-Jun; 10(2): 160-74

UNITED-STATES

Repetitive strain injuries (RSIs) are difficult to treat. Some individuals with RSIs may ultimately develop chronic pain syndromes or movement problems like focal hand dystonia (FDh), a disorder of motor control manifested in a specific context during skilled, hand tasks. This paper reports on the results of four neuroplasticity studies suggesting that repetitive hand opening and closing can lead to motor control problems, measurable somatosensory changes, and problems in graphesthesia and stereognosis. The experiments support a learning hypothesis for the origin of severe RSIs, particularly FDh. This degradation in the sensory representation of the hand may not

only explain the therapeutic challenge of returning these patients to work, but also provide a foundation for developing more effective physical rehabilitation strategies. Implications and conjectures for the applications of this learning hypothesis to conditions of chronic pain are also discussed.

Katz-JN, Keller-RB, Fossel-AH, Punnett-L, Bessette-L, Simmons-BP, Mooney-N. Predictors of return to work following carpal tunnel release [see comments]. **Am-J-Ind-Med.** 1997 Jan; 31(1): 85-91

UNITED-STATES

Little is known about factors that predict return to work following carpal tunnel release. Patients enrolled in a prospective, community-based study of carpal tunnel syndrome in Maine were evaluated with standardized questionnaires preoperatively and 6 months following carpal tunnel release. Univariate and multivariate analyses were performed to identify baseline factors associated with work disability 6 months following surgery. Thirty-one of 135 patients (23%) were out of work because of CTS 6 months following surgery. The predominant preoperative variables associated with work absence due to CTS 6 months postoperatively in logistic regression analyses were Workers' Compensation, work absence preoperatively, and worse mental health status ($p <$ or $= 0.01$ for each). In analyses that considered postoperative as well as preoperative variables, persistence of symptoms following surgery was the most striking predictor of failure to return to work due to CTS ($p < 0.0001$). Preoperative correlates of less complete relief of symptoms in multivariate models included involvement of an attorney, milder preoperative symptom severity, preoperative work absence ($p < 0.005$ for each) and exposure to hand intensive work ($p = 0.04$). These data indicate that economic and psychosocial variables have a strong influence upon both return to work and the extent of symptom relief 6 months following surgery for carpal tunnel syndrome.

Kinney-P, Keskula-DR, Perry-JF. The effect of a computer assisted instructional program on physical therapy students. **J-Allied-Health.** 1997 Spring; 26(2): 57-61

UNITED-STATES

The purpose of this study was to assess the efficacy and efficiency of CAI for students learning evaluation and treatment skills for carpal tunnel syndrome (CTS). Ten volunteer physical therapy students were randomly assigned into either CAI or interactive lecture instructional groups. Each student completed a 36-item pretest on CTS. The CAI group used the Physical Therapy Patient Simulator CAI and the instructional group participated in lecture/discussion to complete the case studies. Following completion of instruction, an identical 36 item posttest was administered to all students. Individual start and finish times for the two groups were recorded by the instructor. A 2 x 2 ANOVA revealed no significant difference in pretest/posttest scores between CAI and interactive lecture. A t-test determined the CAI group completed the case assignment 30 minutes (24% faster than the interactive group. The findings suggest that using a CAI simulation program may be as effective and more efficient than traditional methods of instruction.

Lawler-AL, James-AB, Tomlin-G. Educational techniques used in occupational therapy treatment of cumulative trauma disorders of the elbow, wrist, and hand. **Am-J-Occup-Ther.** 1997 Feb; 51(2): 113-8

UNITED-STATES

OBJECTIVE: This study examined patient education techniques used by occupational therapists when treating cumulative trauma disorders (CTDs) of the elbow, wrist, and hand. METHOD: A self-administered survey was sent to 232 registered occupational therapists whose primary area of practice was hand therapy. The questionnaire sought information about specific content areas and methods (i.e., media, format) used to educate patients about preventing the recurrence of CTDs in the elbow, wrist, and hand. RESULTS: One hundred twenty-eight therapists responded to the survey. A majority of respondents (n = 116) reported that patient education content area consisted of anatomy of the joint, the CTD disease process, and job modification. Verbal instruction, illustrations, and pamphlets and handouts were the most frequently used forms of educational media. A majority of respondents (n = 111) also reported that individual interaction was the most common format of patient education. CONCLUSION: The findings indicate that a majority of

therapists use the same patient education techniques with regard to content areas, media, and format, regardless of the area being treated (i.e., elbow, wrist, hand). Furthermore, it appears that therapists with specialty training in CTDs more frequently include anatomy of the elbow, job modification, and proper body mechanics in the content of their patient education about the elbow.

Pransky-G, Feuerstein-M, Himmelstein-J, Katz-JN, Vickers-Lahti-M. Measuring functional outcomes in work-related upper extremity disorders. Development and validation of the Upper Extremity Function Scale**. J-Occup-Environ-Med.** 1997 Dec; 39(12): 1195-202

UNITED-STATES

Questionnaire-based measures of function have been validated extensively in studies of chronic illness and work-related low back pain. These measures have only recently been developed for upper extremity disorders (UEDs), and there is little information on their utility in evaluation of injured workers. We developed the Upper Extremity Function Scale (UEFS), an eight-item, self-administered questionnaire, to measure the impacts of UEDs on function. This instrument was tested in a cohort of 108 patients with work-related UEDs and 165 patients with the carpal tunnel syndrome (CTS); both groups were enrolled in prospective follow-up studies. The UEFS demonstrated excellent psychometric properties, including good internal consistency (Cronbach's alpha > 0.83), relative absence of floor effects, and excellent convergent and discriminant validity, compared with measures of symptom severity and clinical findings. In the CTS group, the UEFS was more responsive to significant improvements over time than clinical measures such as grip and pinch strength. These data support the use of a self-reported functional scale as a measure of outcome in studies of work-related UEDs. Further investigations in working populations are needed to substantiate its utility in workers with UEDs who have not yet sought medical care.

Sheon-RP. Repetitive strain injury. 2. Diagnostic and treatment tips on six common problems. The Goff Group. **Postgrad-Med.** 1997 Oct; 102(4): 72-8, 81, 85 passim

UNITED-STATES

Repetitive strain injury is caused by recurrent overuse, resulting in microtrauma to tissues. Local pain and tenderness, weakness, inflammation, and limited function are common findings. Some of the strain injuries seen most often are carpal tunnel syndrome, trigger finger, shoulder impingement syndrome, tennis elbow, thoracic outlet syndrome, and myofascial pain disorders. Often, treatment can be started at the initial visit, after systemic disorders have been ruled out. A vital step is elimination of aggravating factors, such as improper posture, inadequate attention to ergonomic factors at work, and contributory habits (e.g., jaw or hand clenching). Use of simple joint-protection measures can alleviate much of the discomfort. Appropriate self-help strategies used at home may restore flexibility and strength with a minimum of medical intervention, but pain relief must be achieved before patients can be expected to follow through with rehabilitation efforts. Use of ice packs, massage, NSAIDs, or topical pain-relief agents is often helpful. Prompt, temporary pain relief can also be achieved with injection of a local anesthetic-corticosteroid mixture. Persistent disability should prompt consideration of psychosocial factors. In addition, fraudulent claims of disability do occur. Although physicians should make every effort to support legitimate claims of work-related injury, they should also be aware of the possibility that activities outside of work (e.g., sports participation, accidental injuries) may be contributing factors.

Weinstein,SM; Robinson-JP; Rondinelli-RD; Scheer-SJ. 3. Case studies in upper extremity cumulative trauma disorders**. Archives of Physical Medicine and Rehabilitation** 1997 Mar; 78 (3 Sups) : S16-S20

This self-directed learning module highlights new advances in this topic area, It is part of the chapter on industrial rehabilitation medicine in the Self-Directed physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation, This section contains three case studies discussing nerve, joint, and soft tissue pathology and work disability due to upper extremity pain, New areas of interest covered in this section include the controversy regarding the work causality of upper extremity disorders, a detailed review of the impact of upper quadrant postural dysfunction on symptom perpetuation, and the assessment and nonsurgical management of thoracic outlet syndrome. (C) 1997 bg the American Academy of Physical Medicine and Rehabilitation.

Weinstein-SM, Robinson-JP, Rondinelli-RD, Scheer-SJ. Industrial rehabilitation medicine. 3. Case studies in upper extremity cumulative trauma disorders. **Arch-Phys-Med-Rehabil.** 1997 Mar; 78 (3 Suppl) : S16-20

UNITED-STATES

This self-directed learning module highlights new advances in this topic area. It is part of the chapter on industrial rehabilitation medicine in the Self-Directed Physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation. This section contains three case studies discussing nerve, joint, and soft tissue pathology and work disability due to upper extremity pain. New areas of interest covered in this section include the controversy regarding the work causality of upper extremity disorders, a detailed review of the impact of upper quadrant postural dysfunction on symptom perpetuation, and the assessment and nonsurgical management of thoracic outlet syndrome.

1996

Cole-DC, Hudak-PL. Prognosis of nonspecific work-related musculoskeletal disorders of the neck and upper extremity. **Am-J-Ind-Med.** 1996 Jun; 29(6): 657-68

UNITED-STATES

Reviews of work-related musculoskeletal disorders (WMD) of the neck and upper extremity have typically supplied little information on prognosis. This paper reports on the methods and results of a systematic search for evidence on clinical course and prognosis of nonspecific WMD i.e., those without specific clinical diagnoses. Articles were deemed relevant if they provided primary data on current or former worker cases of WMD followed over time. WMD status had to be based on clinical evaluations. The 13 studies which met these criteria were evaluated using clinical epidemiological criteria for validity of prognostic studies. None of the studies was sufficiently strong across the criteria to provide more than weaker evidence on prognosis. Prognostic factors with promise include duration of symptoms and workplace demands. In order to improve the evidence on prognosis of WMD, we recommend closer attention to the following: clear operational definition of cases; documentation of prognostic factors including duration of symptoms and severity at baseline; incorporation of multiple follow-up assessments; inclusion of a range of outcomes; and analysis using stratified or multivariate methods.

Colombini-D, Occhipinti-E, Meroni-M, Menoni-O, Bergamasco-R, Girola-C, Grea-V, Vendola-D. Guidelines for redesigning jobs with repetitive tasks. **Med-Lav.** 1996 Nov-Dec; 87(6): 728-49

ITALY

Preventive measures aimed at minimising the occurrence of work-related musculo-skeletal disorders of the upper limbs (WMSDs) associated with repetitive tasks can be divided into 3 categories: structural, organisational and educational. Whenever specific risk and injury assessments have shown the need for preventive action, this is most often implemented within the framework of a range of assorted measures. In particular, structural measures pertain to optimising the layout of the work area and furnishings, and the "ergonomic" properties of work tools and equipment. Such measures serve to alleviate the problems caused by the use of excessive force and improper postures. The authors refer to the principles guiding such structural measures, in the light of the extensive literature that has been published on the subject. Organisational (or re-organisational) measures essentially relate to job design (i.e. distribution of tasks, speeds and pauses). They serve to alleviate problems connected with highly repetitive and frequent actions, excessively lengthy tasks and inadequate recovery periods. Very few relevant findings are available: the authors therefore illustrate in some detail a practical trial conducted in a major engineering firm. The objective was to lower to acceptable limits the frequency of certain repetitive tasks performed by workers using their upper limbs. The trial made it possible to identify a suitable plan and schedule of measures taking into due consideration the impact of the plan on production levels (and costs). The fundamental principles guiding the adoption of specific educational and training programmes for the workers and their supervisors are presented and discussed.

Franklin-GM, Fulton-Kehoe-D. Outcomes research in Washington state workers' compensation**.** **Am-J-Ind-Med.** 1996 Jun; 29(6): 642-8

UNITED-STATES

The extensive claim and medical bill payment databases of the Washington state workers' compensation system have been used to conduct epidemiologic and outcome studies of work-related conditions. Computerized administrative data must be supplemented with medical record review and structured interview of workers in outcome studies in order to adequately adjust for baseline severity and to address functional and patient satisfaction outcomes, respectively. Three examples of surgical outcome studies are described (carpal tunnel, lumbar fusion, thoracic outlet). Duration of disability prior to surgical intervention is an important predictor of duration of disability following surgery, even when other biologic markers of severity are included in multivariate modeling. Sufficient follow-up time is required to adequately assess longer-term outcomes, such as return-to-work status and the substantial effects of residual impairment even after claim settlement. Finally, well-conducted outcome studies may be linked to the development of surgical treatment guidelines in workers' compensation.

Gibbs-KE, Rand-W, Ruby-LK. Open vs endoscopic carpal tunnel release. **Orthopedics.** 1996 Dec; 19(12): 1025-8

UNITED-STATES

We examined a consecutive group of patients who had undergone either open (34 patients) or single portal endoscopic (12 patients) carpal tunnel release performed by one surgeon over a period of 3 years. Fifty-seven total procedures were performed. There were no operative complications. Retrospective evaluation was done by questionnaire. We were unable to demonstrate any statistically significant difference between the two groups in terms of return to work, return to activities of daily living, or on a symptom severity scale.

Lee-H, Jackson-TA. Carpal tunnel release through a limited skin incision under direct visualization using a new instrument, the carposcope [see comments]. **Plast-Reconstr-Surg**. 1996 Aug; 98(2): 313-9; discussion 320

UNITED-STATES

A new surgical technique with a set of instruments has been developed for the release of carpal tunnel. The technique allows division of the transverse carpal ligament through a short transverse skin incision (1.5 to 2 cm) of the wrist flexion crease under direct visualization. The technique has been used on 237 patients for 275 cases of carpal tunnel release (38 bilateral). Following the release, median time to activities of daily living was 7 days for 60 compensation patients and 6 days for 193 noncompensation patients (22 patients provided no information on the activities of daily living). The median time to return to work was 49 days for 51 compensation workers and 20 days for 64 noncompensation workers. The overall relief rate of preoperative symptoms was 86 percent (90 percent for noncompensation patients, 82 percent for compensation patients). There were no intraoperative complications among our studies of 275 cases by two surgeons (176 cases by the senior author). The described technique of carpal tunnel release is a useful alternative to open carpal tunnel release because of decreased short-term postoperative morbidity and to the endoscopic carpal tunnel release because of the simplicity and the lower cost of instrumentation.

Li Tsang Wai Ping-C., Chan Fuk Keung-S., Lui Wan Yee-P. Functional assessment of repetitive strain injuries: Two case studies. **J. Hand Ther**. 1996; 9 (4) : 394-398.

More patients with repetitive strain injuries (RSIs) are being seen in occupational therapy clinics in Hong Kong. To reduce the incidence of work-related RSIs, it is necessary to identify problem jobs and/or specific tasks that are associated with an increased risk of these disorders. Physical assessment, videotaping, ergonomic evaluations, and analyses of workstation designs are used for this purpose. In Hong Kong, however, these methods cannot be implemented at the jobsite without the approval of the employer. This restriction constitutes a major problem in planning the rehabilitation of workers who have RSIs. A self-assessment method using the Work Evaluation Systems Technology (WEST) Tool Sort and the LLUMC Activity Sort was adopted as part of the evaluation of clients with RSIs. The questionnaires were translated into Chinese and reviewed and revised for content validity by ten occupational therapists. Two case studies are presented to ilustrate the occupational therapy intervention program based on this self-report instrument. The

questionnaires were found to be efficient and useful in assessing the client's abilities at work and in explaining to the client the relationship of his or her working conditions to the RSIs.

Millender-LH, Tromanhauser-SG, Gaynor-S. A team approach to reduce disability in work-related disorders. **Orthop-Clin-North-Am.** 1996 Oct; 27(4): 669-77

UNITED-STATES

Work-related disorders require a multidisciplinary approach. One must understand musculoskeletal disorders, job issues, and psychosocial issues that prolong disability. This introductory article presents an overview of the approaches to management that will be detailed in the articles that follow.

Ping-CL, Keung-SC, Yee-PL. Functional assessment of repetitive strain injuries: two case studies. **J-Hand-Ther.** 1996 Oct-Dec; 9(4): 394-8

UNITED-STATES

More patients with repetitive strain injuries (RSIs) are being seen in occupational therapy clinics in Hong Kong. To reduce the incidence of work-related RSIs, it is necessary to identify problem jobs and/or specific tasks that are associated with an increased risk of these disorders. Physical assessment, videotaping, ergonomic evaluations, and analyses of workstation designs are used for this purpose. In Hong Kong, however, these methods cannot be implemented at the jobsite without the approval of the employer. This restriction constitutes a major problem in planning the rehabilitation of workers who have RSIs. A self-assessment method using the Work Evaluation Systems Technology (WEST) Tool Sort and the LLUMC Activity Sort was adopted as part of the evaluation of clients with RSIs. The questionnaires were translated into Chinese and reviewed and revised for content validity by ten occupational therapists. Two case studies are presented to illustrate the occupational therapy intervention program based on this self-report instrument. The questionnaires were found to be efficient and useful in assessing the client's abilities at work and in explaining to the client the relationship of his or her working conditions to the RSIs.

Stanek-EJ-3rd, Pransky-G. Unilateral vs. bilateral carpal tunnel: challenges and approaches. **Am-J-Ind-Med.** 1996 Jun; 29(6): 669-78

UNITED-STATES

Conditions affecting either or both extremities offer unique opportunities and challenges for investigators and clinicians. When the condition is purely unilateral, observations on the unaffected extremity may be used as a within-patient control, and thereby strengthen the ability to identify changes in the affected limb. However, such use presumes that the condition will not subsequently develop in the unaffected extremity. Bilateral presentations or subsequent development of disease in the unaffected extremity is common in conditions such as the carpal tunnel syndrome (CTS). Treatment of one extremity may lead to development or aggravation of CTS in the other extremity. Since both extremities may be necessary to perform certain activities, it can be difficult to clearly identify treatment effects when looking at functional outcomes. In an effort to avoid these complexities, investigators have used one of two approaches in studying CTS: either selecting only those patients with unilateral disease, or analyzing results by extremity, often avoiding any outcome measures that might depend upon both extremities (such as driving). We illustrate some of the shortcomings of this approach, such as loss of patients and data, with preliminary information from our ongoing prospective study of carpal tunnel surgery outcomes. We develop a dynamic model that incorporates etiologic factors and treatment effects to describe changes in CTS over time. This model accounts for extremity-specific and systemic factors, as well as possible interaction of the disease process in both hands. The advantages of this model include a more rational approach to research and care of extremity disorders, and research strategies which address a wider scope of patients and outcomes; however, its application is limited by the need for more extensive data collection.

Stiens-S. A., Haselkorn-J. K., D. Peters-J., Goldstein-B. Rehabilitation Intervention for Patients with Upper Extremity Dysfunction: Challenges of Outcome Evaluation. **American Journal of Industrial Medicine** Jun. 1996; 29 (6) : 590-601.

This report examined different perspectives of upper extremity (UE) rehabilitation outcome in order to critically analyze various approaches to effectiveness evaluation. The impact of the patient's perspective and expectations on the outcome of treatment was discussed. Contributions made to classification bias from etiologic and anatomic heterogeneity were outlined. A conceptual framework was developed which relates the impact of interventions on the disease, impairments, the person and the environment. The worker's own perceptions of UE dysfunction and the expectations that person has were explored using various individual based designs of outcome quantification, including an illustration of the tension between individual and group perspectives on outcome. A model for population based outcome evaluation was presented which addresses diagnosis specific as well as individual goal specific evaluation. The authors suggest that to successfully measure the outcome of the rehabilitation process, one must take into account the achievement of individual goals as well as the objective scalar quantification of impairments, disabilities, and handicaps that are comparable between groups.

Stiens-SA, Haselkorn-JK, Peters-DJ, Goldstein-B. Rehabilitation intervention for patients with upper extremity dysfunction: challenges of outcome evaluation. **Am-J-Ind-Med.** 1996 Jun; 29(6): 590-601

UNITED-STATES

Upper extremity (UE) dysfunction attributed to overuse is an increasingly prevalent problem managed with interdisciplinary rehabilitation. Outcome evaluation of these programs is limited by a number of factors. First, patients with UE dysfunction include a wide variety of pathophysiologic processes and diagnoses that are associated with multiple secondary impairments, disabilities, and handicaps that limit personal performance. Second, the particular experience of disablement and expectations each person brings to the rehabilitation process necessitates an individualized program with unique goals. Successful outcome measurement of the rehabilitation process must take into account the achievement of individual goals as well as objective scalar quantification of impairments, disabilities, and handicaps that are comparable between groups. Understanding of the relationships between UE impairments and given functional outcomes will come from controlled, dosed treatment studies in "pure" diagnostic patient groups. Outcomes research applied to UE rehabilitation as it is currently practiced should include individually devised patient assessments of accomplishment and satisfaction in addition to long-term quantitative reassessment of the person under all domains of disablement and work performance.

1995

Crook-J., Moldofsky-H. **Prognostic indicators of disability after a work-related musculoskeletal injury**. Journal of Musculoskeletal Pain 1995; 3 (2) : 155-159.

The aim of the study was to determine specific clinical and behavioural fctors that prognostically influence return to work following a musculoskeletal work related injury. A longitudinal cohort study was conducted on 148 randomly selected workers who had not returned to work in 3 months following musculoskeletal strain or sprain injury. The workers were interviewed at 3, 9, 15 and 21 months after injury. The WHO Classification of Impairment, Disabilities and Handicap was used as the conceptual frawork. The analysis employed the Cox Proportional Hazards Regression m odel with allowance for time-dependent covariates. The relative rate of return to work for males was one-and-a-half times that for females and 20% less for every 10-year increase in age. After controlling for gender and age, psychologic distress and functional disability were negatively associated with the rate of return to work. Psychologic distress associated with symptoms of fibromyalgia was prognostically important in the failure to return to work. Additionally, there was two times the rate of return to work for workers who were provided with light jobs. These prognostic indicators require consideration for rehabilitation programmes for workers who suffer musculoskeletal soft tissue injuries.

Nathan-PA, Keniston-RC, Meadows-KD. Outcome study of ulnar nerve compression at the elbow treated with simple decompression and an early programme of physical therapy. **J-Hand-Surg-Br.** 1995 Oct; 20(5): 628-37

SCOTLAND

Cubital tunnel syndrome is the second most common entrapment neuropathy of the upper limb. This paper presents the experience of treating cubital tunnel syndrome with simple decompression in 131 patients (164 ulnar nerves) over the past 12 years. 85% of these patients had mild or moderate ulnar nerve disease. In 146/164 ulnar nerves (89%), simple decompression resulted in good or excellent immediate post-operative relief of symptoms. After an average follow-up of 4.3 years (range, 0.8-12.0 years), 130/164 (79%) still reported good or excellent relief. The independent predictors of a better long-term outcome were absence of post-operative subluxation, greater body weight, normal pre-operative two-point discrimination (2-PD), and a more recent date of operation. A physical therapy rehabilitation program generally began on the day after surgery. Active participation in this predicted a rapid return to work or activities of daily living. The average time to return to work with simple decompression was 20 workdays.

Warwick-L, Seradge-H. Early versus late range of motion following cubital tunnel surgery. **J-Hand-Ther**. 1995 Oct-Dec; 8(4): 245-8

UNITED-STATES

The purpose of this study was to evaluate the effects of early versus late range of motion exercises following cubital tunnel release and medial epicondylectomy. Fifty-seven consecutive cases were studied and divided into two groups. Physical therapy consisting of active and passive range of motion exercises was started 14 days postoperatively for the first group and 3 days postoperatively for the second group. Fifty-two percent of the patients in group 1 sustained flexion contractures of more than 5 degrees compared with only 4% of the patients in group 2. Early initiation of therapy did not adversely affect the grip strength and/or other functions of the upper extremity, and the patients in group 2 returned to work sooner than the patients in group 1 (in fact, in half the time). Institution of range of motion exercises immediately postoperatively is more effective in preventing flexion contractures of the elbow than is delayed treatment.

Weitbrecht-WU; Schafer-W; Walter-A Is physiotherapy useful following surgery for carpal tunnel syndrome? (see comments) Comment in: Z Orthop Ihre Grenzgeb 1996 Nov-Dec;134(6):576. **Z-Orthop-Ihre-Grenzgeb.** 1995 Sep-Oct; 133(5): 429-31

GERMANY

A prospective follow-up-study of 97 patients operated because of a carpal tunnel syndrome was carried out to investigate postoperative use of physiotherapy. Postoperative 32 patients were treated at least 12 times and 65 patients were not treated physiotherapeuticly. Physiotherapists postoperatively treated by activating joints of fingers and hand. We examined the patients one day preoperative and on an average of 9 months postoperative. Complaints of the patients, local findings, vigorimetrically measured strength and electromyography were registered. The vigorimetrically measured strength of the operated hand improved significantly less in patients treated physiotherapeutically compared to not treated patients. All other complaints and findings improved equally. We interpreted this difference as a result of spare caused by awareness of a sick hand.

1994

Bammer-G., Calcino-P., Chadwick-Master-J. The experience of rehabilitation from RSI: What determines sucess? **J. Occup. Health Saf. Aust. New Zealand.** 1994; 10 (4) : 353-358.

The process of rehalitation for 10 people with repetition strain injuries (RSI) is described, including na assessment of satisfaction with case managers, rehabilitation service providers, Comcare and general practitioners. The rehabilitation process was reported to be succeeding for about one-third of participants who had all been able to achieve a high degree of control over the process. They also tended to have more supportive supervisors and more interesting and varied tasks than those for whom rehabilitation was not succeeding. The study shows that Comcare and others responsible for rehabilitation need to evaluate their operations and make changes which will maximise the possibilities for success.

Banta-CA. A prospective, nonrandomized study of iontophoresis, wrist splinting, and antiinflammatory medication in the treatment of early-mild carpal tunnel syndrome. **J-Occup-Med.** 1994 Feb; 36(2): 166-8

UNITED-STATES

Carpal tunnel syndrome (CTS) has become the industrial epidemic syndrome of the decade and its incidence is continuing to rise. Because of public awareness. CTS is being diagnosed much earlier in the course of the disease. Iontophoresis of dexamethasone sodium phosphate has been used for years in the treatment of many musculoskeletal inflammatory disorders and clinicians have reported using this modality in the treatment of CTS. Iontophoresis is a method of transdermal administration of ionized drugs in which electrically charged molecules are propelled through the skin by an external electrical field. However, conditions of treatment and evaluation have not been standardized. A prospective, nonrandomized study utilizing a standardized treatment protocol incorporating wrist splinting with nonsteroidal antiinflammatory medications and iontophoresis of dexamethasone sodium phosphate revealed a success rate comparable with splinting plus injection of dexamethasone into the carpal tunnel space. In a 6-month follow-up of 23 cases (hands) of early-mild CTS, 4 of 23 hands (17%) were successfully treated with splints plus nonsteroidal antiinflammatory medications alone. Of those that failed this treatment program and chose to proceed with iontophoresis of dexamethasone, 11 of 19 hands (58%) had a positive response rate to iontophoresis, leaving a combined failure rate (failing both splints, nonsteroidal antiinflammatory medications and iontophoresis) of 35%. Iontophoresis may become an alternative to steroid injections to the carpal tunnel region if further studies substantiate these findings. It provides an excellent complication and side-effect profile compared with other methods of delivering dexamethasone. No complications occurred (including no significant elevation of serum glucose in insulin-dependent diabetics.)

Braun-RM, Jackson-WJ. Electrical studies as a prognostic factor in the surgical treatment of carpal tunnel syndrome [see comments]. **J-Hand-Surg-Am.** 1994 Nov; 19(6): 893-900.

UNITED-STATES

We attempted to determine if a prognostic value could be associated with preoperative electrodiagnostic testing in patients with carpal tunnel syndrome. Three groups of patients were included in the study of 151 workers whose symptoms were thought to be causally related to their jobs. A clinical diagnosis was made without electrical testing in 26 of the 151 patients. Normal electrical test values were present in 50 of the 125 patients tested, and abnormal values were noted in 75 patients. Pinch, power, and static grasp function were recorded monthly. Similar recovery patterns after operation were seen between the groups and within each group. Return to work time correlated well with measured functional recovery to preoperative levels, but some workers returned to their jobs before they had regained full function. Electrodiagnostic test results did not provide significant data for prediction of functional recovery or re-employment after carpal tunnel release.

Burke-DT, Burke-MM, Stewart-GW, Cambre-A. Splinting for carpal tunnel syndrome: in search of the optimal angle**.** **Arch-Phys-Med-Rehabil.** 1994 Nov; 75(11): 1241-4

UNITED-STATES

Carpal tunnel syndrome (CTS) is the most common of the compression neuropathies. Several studies have demonstrated the efficacy of wrist splinting in relieving the symptoms of CTS; however, the chosen angle of immobilization has varied. Wick catheter measurements of carpal tunnel pressures suggest that the neural position has less pressure and, therefore, greater potential to provide relief from symptoms. This study is a prospectively gathered, blind trial comparing the symptom relief experienced by wearers of splints immobilized at 20 degrees extension and at neutral. The results indicate that the neutral angle provided superior symptom relief, and that the relief did not often improve between 2 weeks and 2 months of wear. Relief of symptoms was not related to the length of time that the patient had experienced of CTS symptoms. The results also indicate that the results of the electromyography/nerve conduction study (EMG/NCS) do not provide information about the subjects' likely response to splinting.

Jack-S., Lenko-S. Rehabililtation of occupational overuse syndrome in keyboard operators using the Voice Recognition System. **J. Occup. Health Saf. Aust. New Zealand**. 1994; 10 (2) : 151-156.

The Voice Recognition System was developed in Telecom Australia as a meanns of providing suitable employment to telefhone operators suffering occupational overuse syndrome. The effectiveness of the Voice Recognition System in rehabilitation of 20 operators with occupational overuse syndrome has been assessed. The Voice Recognition System permits a computer to recognise na operator's voice and thereby work initially without the use of arms. A rehabilitation regime was developed using the Voice Recognition System as a suitable means of providing alternative duties. Using this regime, the objective to fulfil all legal medical and award requirements has been met. It is also considered to be a cost effective addition to the rehabilitation process.

Kerr-CD, Gittins-ME, Sybert-DR. Endoscopic versus open carpal tunnel release: clinical results. **Arthroscopy**. 1994 Jun; 10(3): 266-9

UNITED-STATES

This article reviews the results of endoscopic carpal tunnel release surgery. Comparison with a matched population of patients undergoing standard open carpal tunnel release was performed with respect to safety and return to work times. The newer technique was found to be safe because no surgical complications were noted in the study group. Patients undergoing the endoscopic technique with private insurance returned to work 15.6 days sooner than their open counterparts. Patients with workers' compensation claims returned to work at the same time regardless of the technique used.

Langford-ML Poor posture subjects a worker's body to muscle imbalance, nerve compression. **Occup-Health-Saf.** 1994 Sep; 63(9): 38-40, 42

UNITED-STATES

Forward head and shoulder postures and associated muscle imbalances are prevalent among today's workers, according to ongoing research in the physical therapy field. Information on proper posture should be used proactively to educate employees as part of injury prevention training. Maintaining muscle strength in the desirable posture will require ongoing exercise and attention from the worker. The self-direct approach will not eliminate all cases of tendonitis, epicondylitis and other disorders, but it will have a significant positive impact.

Nagle-D, Harris-G, Foley-M. Prospective review of 278 endoscopic carpal tunnel releases using the modified chow technique. **Arthroscopy**. 1994 Jun; 10(3): 259-65

UNITED-STATES

The results of 278 endoscopic carpal tunnel releases using the extrabursal dual portal Chow technique were analyzed prospectively. The majority of patients were pain free by the 57th postoperative day. The perioperative complication rate was 1.7%. The late complication rate was 2.8%. Two cases were converted to open carpal tunnel release. The average time to return to full-duty work was 65 days in those patients covered by worker's compensation, whereas it was 21 days in the privately insured (non-worker's compensation) patients. The endoscopic release of the transverse carpal ligament is an effective technique for the treatment of carpal tunnel syndrome with a low complications rate. Return to full employment requires more time in those patients covered by worker's compensation.

Reynolds-C. Electromyographic biofeedback evaluation of a computer keyboard operator with cumulative trauma disorder. **J-Hand-Ther.** 1994 Jan-Mar; 7(1): 25-7

UNITED-STATES

This article describes a rehabilitation approach for a keyboard operator following radial tunnel decompression and release of the extensor origin of the right elbow. Prior to the patient's returning to work, a clinical electromyographic (EMG) biofeedback device was used to determine which work activities the patient should avoid or alter to reduce strain on her affected muscles. The patient was able to return to work and noticed a considerable reduction of muscle fatigue and pain in the involved muscles. A relatively inexpensive EMG biofeedback device was employed to evaluate the patient's muscles prior to returning to work. The rationale and suggestions for application of the biofeedback unit are discussed.

Strasberg-SR, Novak-CB, Mackinnon-SE, Murray-JF. Subjective and employment outcome following secondary carpal tunnel surgery. **Ann-Plast-Surg.** 1994 May; 32(5): 485-9

UNITED-STATES

Forty-five patients (50 hands) who had undergone secondary carpal tunnel surgery participated in a telephone questionnaire survey. The mean follow-up time from the second carpal tunnel surgery was 31 months (range, 9-92 mo). Only 24 patients (53%) reported significant improvement in their symptoms. Thirty-nine patients were unemployed workers who had experienced an average time off work of 28.7 months (+/- 4) before their secondary carpal tunnel surgery. Eleven of the 39 previously unemployed workers (28%) returned to work after the secondary carpal tunnel surgery. Factors associated with poor subjective and employment outcome included worker's compensation case involvement ($p < 0.003$). Occupations associated with repetitive hand movements or vibrating tools were associated with poor employment outcomes ($p < 0.006$). Although secondary surgery for carpal tunnel syndrome can be effective in relieving symptoms, patients and surgeons must have realistic expectations of the procedure, especially with respect to long-term employment goals.

Valente-R, Gibson-H. Chiropractic manipulation in carpal tunnel syndrome. **J-Manipulative-Physiol-Ther.** 1994 May; 17(4): 246-9

UNITED-STATES

OBJECTIVE: To determine if chiropractic manipulation could relieve carpal tunnel syndrome (CTS). CLINICAL FEATURES: A 42-yr-old female suffered from pain, tingling and numbness in the right wrist. Paresthesia along the C6 dermatome, a positive Phalen's test and Tinel's sign was present. EMG testing confirmed the clinical diagnosis of CTS. INTERVENTION AND OUTCOME: Chiropractic manipulations were rendered 3 times per week for 4 wk, to the subject's cervical spine, right elbow and wrist using a low amplitude, short lever, low force, high velocity thrust. Significant increase in grip strength and normalization of motor and sensory latencies were noted. Orthopedic tests were negative. Symptoms dissipated. CONCLUSION: In this case study, chiropractic made a demonstrable difference through objective and subjective outcomes. Further investigations using double-blind, cross-over designs with larger samples are warranted.

Williams-R, Westmorland-M. Occupational cumulative trauma disorders of the upper extremity [see comments]. **Am-J-Occup-Ther.** 1994 May; 48(5): 411-20

UNITED-STATES

The umbrella term cumulative trauma disorders (CTDs) (also known as repetitive strain injuries, overuse syndromes, and repetitive motion disorders) covers a number of similar conditions arising from overuse of the joints or soft tissues of the upper extremity. Occupational CTDs have become a common problem in the workplace. These disorders are costly to the employer, the worker, and society in terms of time lost from work and resulting disability. Within the past decade, occupational therapists and physical therapists specializing in rehabilitation of work-related musculoskeletal injuries have seen an increase in the incidence of CTDs of the upper extremity in the workplace. Therapists are called upon not just to treat these injured workers, but also to help them regain a functional level for work reentry and to educate them to prevent reinjury. This article reviews the literature on the epidemiology, etiology, pathophysiology, and management of upper-extremity occupational CTDs. Because the ultimate goal of the workplace is to maintain the health and safety of the employee, an educational approach to hand, wrist, elbow, and shoulder use is essential to prevent, decrease, or eliminate the risk of occupational CTDs of the upper extremity.

TERAPIA/TRATAMENTO

1998

Davis-PT, Hulbert-JR. Carpal tunnel syndrome: Conservative and nonconservative treatment. A chiropractic physician's perspective. **Journal of Manipulative and Physiological Therapeutics** 1998 Jun; 21 (5) : 356-362

Objective: To discuss the treatment of carpal tunnel syndrome (CTS) including indications for referral to medical evaluation and/or comanagement. Data Source: More than 200 articles

published in the health care literature from 1963 to 1997 and indexed on Medline concerning conservative and surgical intervention for CTS. Indexing terms used were "Carpal Tunnel," combined with keywords "Conservative" and "Surgery." Study Selection: Reports involving either conservative or nonconservative treatment for CTS or original descriptive reports of surgical techniques of carpal tunnel release. Data Extraction: Indications and contraindications for each conservative and surgical option. Concise and general descriptions of manual, medical and surgical interventions in current use, including summaries of the benefits and risks of each treatment. Data Synthesis: The review is presented as a discussion of diagnostic technique and conservative and surgical treatments for CTS currently used in North America. Conclusions: Recommendations are that CTS, accompanied by demyelination but without axonal degeneration, can be treated initially with conservative medical or manual procedures.

Oliveira-C.R. **Manual prático de LER**. Belo Horizonte; Health; 1998. 403 p.

BRASIL

1997

Bonzani-PJ, Millender-L, Keelan-B, Mangieri-MG. Factors prolonging disability in work-related cumulative trauma disorders. **J-Hand-Surg-Am**. 1997 Jan; 22(1): 30-4.

UNITED-STATES

Workers' compensation costs for management of soft tissue disorders continue to increase. The complexity of medical management of these cases has increased due to social factors. The purpose of this study is to improve the physician's ability to recognize nonmedical issues that prevent a rapid return to employment. A classification system is presented that will allow the clinician to identify administrative and pyschosocial issues that prolong disability. Additionally, the patients' job demands were classified by known ergonomic risk factors. The system was applied retrospectively to 50 random cases referred to two occupational hand clinics over a 1-year period. The results indicated that the psychosocial classification of the patient and the current employment status are the most important factors in prolonging disability workers.

Dagostino- M. Wristbraces: Exercise Discretion in Distribution. **Professional Safety** 1997 Jul.; 42 (7) : 24-26.

The effectiveness of wrist braces in the treatment and prevention of repetitive strain injuries (RSI) was evaluated. Wrist braces were used based on the concept that they provided resistance to or relief from the regional demands and pain associated with hand intensive work. Soft braces relieved pain by creating numbness and restricting range of motion in the hand, which was perceived as beneficial. Numbness reflected decreased blood flow to the injured area, which was not considered to be health promoting. Hard braces, which maintained the hand in a slight degree of extension, were of value to those recovering from a regional sprain, strain, or tendinitis; however, as a treatment for finger, hand or wrist tendinitis experienced by someone who performed hand intensive tasks, the hard brace exacerbated the injury. Neither the soft nor hard brace was designed to positively influence regional physiology or biomechanics, and aggravated existing injuries. The author concludes that the prophylactic distribution of wrist braces in the workplace, as well as their distribution as a treatment for the working upper extremity, should be highly scrutinized. Instead of wrist braces, the author suggests that RSI problems be solved through evaluating work methods and the design of the work environment.

Grayzel-EF, Finegan-AM, Ponchak-RE. The value of in-house physical therapy. **J-Occup-Environ-Med**. 1997 Apr; 39(4): 344-6.

UNITED-STATES

This article describes the benefits of an in-house physical therapy pilot program. The program was initiated in 1994 to improve employees' functional capacity after occupational and nonoccupational musculoskeletal injury, shorten total disability time, use restrictive duty more productively, and reduce total disability costs. The pilot program's initial success led to the establishment of a permanent program.

Lawler-AL, James-AB, Tomlin-G. Educational techniques used in occupational therapy treatment of cumulative trauma disorders of the elbow, wrist, and hand. **American Journal of Occupational Therapy** 1997 Feb; 51 (2) : 113-118

Objective. This study examined patient education techniques used by occupational therapists when treating cumulative trauma disorders (CTDs) of the elbow, wrist, and hand. Method. A self-administered survey was sent to 232 registered occupational therapists whose primary area of practice was hand therapy. The questionnaire sought information about specific content areas and methods (i.e., media, format) used to educate patients about preventing the recurrence of CTDs in the elbow, wrist, and hand. Results. One hundred twenty-eight therapists responded to the survey. A majority of respondents (n = 116) reported that patient education content areas consisted of anatomy of the joint, the CTD disease process, and job modification. Verbal instruction, illustrations, and pamphlets and handouts were the most frequently used forms of educational media. A majority of respondents (n = 111) also reported that individual interaction was the most common format of patient education. Conclusion. The findings indicate that a majority of therapists use the same patient education techniques with regard to content areas, media, and format, regardless of the area being treated (i.e., elbow, wrist hand). Furthermore, it appears that therapists with specialty training in CTDs more frequently include anatomy of the elbow, job modification, and proper body mechanics in the content of their patient education about the elbow.

Sheon-RP. Repetitive strain injury. 1. An overview of the problem and the patients. The Goff Group. **Postgrad-Med**. 1997 Oct; 102(4): 53-6, 62, 68.

UNITED-STATES

Assembly-line workers, house painters, and many others whose activities entail repetitive motions can end up with swelling, pain, and limited movement in the affected muscles. Often, use of the six steps described in this article brings fairly rapid functional improvement and prevents recurrences, with a minimum of medical intervention. In some cases, though, recovery is prolonged or the outcome is unusual. The authors present additional factors to consider in such cases, such as psychosocial concerns, worker fraud, and ergonomic problems. Part 2 of this article, beginning on page 72, details six common repetitive strain injuries.

Sheon-RP. Repetitive strain injury. 2. Diagnostic and treatment tips on six common problems. The Goff Group. **Postgrad-Med**. 1997 Oct; 102(4): 72-8, 81, 85 passim.

UNITED-STATES

Repetitive strain injury is caused by recurrent overuse, resulting in microtrauma to tissues. Local pain and tenderness, weakness, inflammation, and limited function are common findings. Some of the strain injuries seen most often are carpal tunnel syndrome, trigger finger, shoulder impingement syndrome, tennis elbow, thoracic outlet syndrome, and myofascial pain disorders. Often, treatment can be started at the initial visit, after systemic disorders have been ruled out. A vital step is elimination of aggravating factors, such as improper posture, inadequate attention to ergonomic factors at work, and contributory habits (e.g., jaw or hand clenching). Use of simple joint-protection measures can alleviate much of the discomfort. Appropriate self-help strategies used at home may restore flexibility and strength with a minimum of medical intervention, but pain relief must be achieved before patients can be expected to follow through with rehabilitation efforts. Use of ice packs, massage, NSAIDs, or topical pain-relief agents is often helpful. Prompt, temporary pain relief can also be achieved with injection of a local anesthetic-corticosteroid mixture. Persistent disability should prompt consideration of psychosocial factors. In addition, fraudulent claims of disability do occur. Although physicians should make every effort to support legitimate claims of work-related injury, they should also be aware of the possibility that activities outside of work (e.g., sports participation, accidental injuries) may be contributing factors.

Silversides-A . Confusion surrounding repetitive strain injury highlighted at conference. **CMAJ**. 1997 May 15; 156(10): 1459-60.

CANADA

Uncertainty about disorders that account for many of the claims related to job injury at work became clear during a recent meeting, when speakers referred to the same disorders by several

different names, including repetitive strain injury. Speakers discussed different types of injuries and reasons why they appear to be coming more common.

Winzeler-S, Rosenstein-BD. Orthopedic problems of the upper extremities. Assessment and diagnosis. **AAOHN-J**. 1997 Apr; 45(4): 188-200; quiz 201-3.

UNITED-STATES

Cumulative trauma or repetitive motion disorders are among the most commonly reported occupational illness, and mainly affect the neck and upper extremities. 2. The etiology of cumulative trauma disorders includes nerve compression secondary to inflammation and tendinitis secondary to microtearing at tendon insertions and/or friction irritation of the tendons. 3. Work postures, such as forward flexed position of head, neck, and shoulders; static loading of muscles; as well as repetitive motions can cause cumulative trauma disorders or aggravate pre-existing problems. 4. The occupational health nurse is in a unique position to encourage early reporting of these problems so that conservative treatment can be initiated, identify ergonomic issues at the worksite and institute change, and work closely with the orthopedist to manage clients effectively with clear communication and collaboration.

1996

Aquilante-K, Kern-T, Courtney-A . Long-cane modification for carpal tunnel syndrome: a case report. **J-Am-Optom-Assoc**. 1996 Jun; 67(6): 316-8.

UNITED-STATES

BACKGROUND: Low vision rehabilitation services should be multidisciplinary and should provide patients with as many options as are necessary to help partially sighted individuals maintain independence and quality of life. METHODS: A case report is presented of a 30-year-old insulin-dependent diabetic patient with carpal tunnel syndrome. Team management resulted in referral for occupational therapy evaluation and resulted in long cane modification. RESULTS: Modification of a long cane was accomplished using a piece of PVC plastic glued at a right angle to the long cane, thus acting as a handle. Fabric straps with Velcro fasteners made the cane movable with forearm rather than wrist motion and allowed the patient to maintain independent travel. CONCLUSIONS: This case presents an example of appropriate referral for an occupational therapy evaluation. Low vision rehabilitation demands an interdisciplinary approach.

Belmonte-K. Carpal tunnel syndrome. **J-Am-Acad-Nurse-Pract**. 1996 Nov; 8(11): 511-7.

UNITED-STATES

The incidence of carpal tunnel syndrome (CTS) appears to be increasing since the advent of computers in the workplace. People performing repetitive wrist movements over period of time appear to be at particular risk for this syndrome. Prevention of this common entrapment neuropathy can increase the productivity of the workplace as well as avoid needless human suffering. Nurse practitioners play a key role in the education of the client who is at risk, and in the diagnosis and treatment of CTS itself. The author addresses these issues in this overview of diagnosis, treatment, and education of the client with CTS.

Budnick-LD. Clinical strategies for work-related carpal tunnel syndrome. **N-J-Med**. 1996 Jun; 93(6): 27-31.

UNITED-STATES

Higgs-PE, Young-VL. Cumulative trauma disorders. **Clin-Plast-Surg**. 1996 Jul; 23(3): 421-33.

UNITED-STATES

The relationship between work activities and the diagnostic entities discussed in this article is poorly understood, but their development is probably multifactorial. The enormous cost to industry and society is driving many investigators to study the causes and pathologic manifestations of CTDs, and this research should lead to improved strategies for treating and preventing work-related injuries. Prevention, however, will work only if both management and labor participate in

preventive efforts. When a task force approach can be implemented and senior management gives it the power to make effective changes, CTDs often can be reduced dramatically, as has been shown in numerous studies illustrating the success of this approach. It is unfortunate that many in senior management are reluctant to permit such task forces due to fear of increased injury claims. Our worry is that, in the end, the solution to problems believed to be associated with repetitive trauma at work may be shaped more by regulatory bodies and attorneys rather than scientists. Hand surgeons, who see patients with complaints that are perceived to be work related, often find themselves in the middle of this complicated problem, being asked to determine whether a patient's symptoms are caused by the performance of job tasks. To treat our patients with hand and wrist symptoms, we must stay abreast of the current understanding of CTDs and be familiar with the diagnosis and management of recognized disease entities such as those reviewed in this article. In most cases, a diagnosis of a specific clinical condition can be established that is based on strict criteria. If this is not possible and the picture is unclear, it is important not to guess at a diagnosis. Labeling a patient with a diagnosis such as thoracic outlet syndrome or nonspecific tendonitis without clear-cut and objective clinical signs can have lasting economic and employment consequences. For this reason, diagnosis of a specific clinical entity should be made only when the findings of the history, physical examination, and ancillary tests firmly support it.

Katz-JN, Punnett-L, Simmons-BP, Fossel-AH, Mooney-N, Keller-RB. Workers' compensation recipients with carpal tunnel syndrome: the validity of self-reported health measures. **Am-J-Public-Health**. 1996 Jan; 86(1): 52-6.

UNITED-STATES

OBJECTIVES. This study compared the reliability, validity, and responsiveness of self-reported measures of health related quality of life in recipients and non-recipients of workers' compensation who have carpal tunnel syndrome. METHODS. Patients with carpal tunnel syndrome complete questionnaires at study enrollment and 6 months later scales measuring symptom severity functional status, and satisfaction were included. The scales internal consistency, validity, and responsiveness were assessed. RESULTS. The internal consistencies for each scale were high (Cronbach's alpha .88 to .96) and virtually identical in recipients and nonrecipients of workers' compensation. The correlations between self-reported and objectively measured grip strength were .32 in recipients and .30 in nonrecipients; these correlations were not influenced by whether workers' compensation recipients were out of work. Correlations between changes in scale scores and three indicators of perceived improvement were higher in recipients (.48 to .69) than in nonrecipients (.19 to .41) CONCLUSIONS. The reliability, validity, and responsiveness of these measures were comparable in nonrecipients and recipients of workers compensation, these data support the use of self-report measures in studies of workers.

Louis-DS, Calkins-ER, Harris-PG. Carpal tunnel syndrome in the work place. **Hand-Clin**. 1996 May; 12(2): 305-8; discussion 308-11.

UNITED-STATES

The management of patients with the CTS that appears to be related to occupational tasks is a complex issue. At this time, there is no definite evidence to show that any job is the sole cause of an individual worker's symptom complex. Management of patients in this situation requires surgical restraint coupled with an understanding of the worker's overall lifestyle. The most effective outcomes for all concerned appear to occur when there is cooperation among the patient, the physician, and the employer or his or her representatives. The recent prospective study by MacDougal that attempted to correlate job classifications with surgical outcome may be a very positive step in this direction.

Terrono-AL, Millender-LH. Management of work-related upper-extremity nerve entrapments. **Orthop-Clin-North-Am**. 1996 Oct; 27(4): 783-93.

UNITED-STATES

Peripheral nerve symptoms are common in the worker. Great care must be given to obtain an accurate diagnosis. Diagnostic labels should not be used unless one is sure of the diagnosis. A detailed evaluation of the worker, job, and medical and psychosocial conditions must be performed. Nonoperative treatment is primary. Understanding at-risk patients and managing them

carefully can decrease disability and improve results following treatment. The results from surgery are less successful in work-related disorders and disability is often prolonged. Surgery should only be performed for clear diagnoses and clear indications after adequate nonoperative treatment, with careful consideration of the job to which the worker will return.

Verdon-ME. Overuse syndromes of the hand and wrist. **Prim-Care**. 1996 Jun; 23(2): 305-19.

UNITED-STATES

Overuse syndromes are one of the most common occupational illnesses treated by primary care providers. Their pathophysiology parallels that of tenosynovitis. Occupational risk factors for overuse syndromes include repetition, high force, awkward joint posture, direct pressure, and vibration. Initial treatment is aimed at preventing fibrosis through rest, immobilization, and anti-inflammatory agents. Treatment must include identification and adjustment of occupational risk factors. Specific overuse syndromes are discussed, including tenosynovitis of the dorsal wrist extensor compartments and flexor tendons of the wrist, trigger finger, and carpal tunnel syndrome.

Winzeler-S, Rosenstein-BD. Occupational injury and illness of the thumb. Causes and solutions. **AAOHN-J**. 1996 Oct; 44(10): 487-92.

UNITED-STATES

The special functions of the thumb (opposition, retroposition, palmar abduction, and radial abduction) account for up 50% of overall hand use. 2. Knowledge of specific questions to ask on history taking and proper initial evaluation can help with timely and appropriate referrals for suspected thumb fracture, dislocations, and/or torn ligaments. 3. Repetitive and/or forceful thumb movements can aggravate or cause the following cumulative trauma disorders: stenosing tenosynovitis ("trigger thumb"), de Quervain's tenosynovitis, and carpometacarpal joint arthritis. 4. The occupational health nurse can suggest many ergonomic solutions to decrease thumb motions and forceful thumb pressures encountered at work.

1995

Childre-F, Winzeler-A . Cumulative trauma disorder: a primary care provider's guide to upper extremity diagnosis and treatment. **Nurse-Pract-Forum**. 1995 Jun; 6(2): 106-19.

UNITED-STATES

This article gives an overview of the nonmedical aspects of cumulative trauma disorder (CTD) such as workers' compensation and hazard evaluation. The pathophysiology and presenting symptoms of CTDs are addressed, including entrapment neuropathies of the median, ulnar, and radial nerves; thoracic outlet syndrome; and tendinitis of the elbow, shoulder, wrist, and thumb. History and specific examination techniques are discussed. There is a focus on primary care treatment options, which includes ergonomic interventions.

Codo-W., Almeida-M.C.C. G., Lima-AB, Monteiro-AL, Prado-C.V.A., Oliveira-F, Lin-T.Y., Antunes-M. E., Settimi-M.M., Silvestre-M.P., Mattar Junior-R., Maciel-R.H., Azze-R.J. **L.E.R.: diagnóstico, tratamento e prevenção: uma abordagem interdisciplinar.** Petrópolis; Vozes; 1995. 355 p.

BRASIL

Fredericson-M, Bergman-AG, Hoffman-KL, Dillingham-MS. Tibial stress reaction in runners. Correlation of clinical symptoms and scintigraphy with a new magnetic resonance imaging grading system. **Am-J-Sports-Med.** 1995 Jul-Aug; 23(4): 472-81

UNITED-STATES

Medial tibial pain in runners has traditionally been diagnosed as either a shin splint syndrome or as a stress fracture. Our work using magnetic resonance imaging suggests that a progression of injury can be identified, starting with periosteal edema, then progressive marrow involvement, and ultimately frank cortical stress fracture. Fourteen runners, with a total of 18 symptomatic legs, were evaluated and, within 10 days, referred for radiographs, a technetium bone scan, and a magnetic resonance imaging scan. In 14 of the 18 symptomatic legs, magnetic resonance imaging findings

correlated with an established technetium bone scan grading system and more precisely defined the anatomic location and extent of injury. We identified clinical symptoms, such as pain with daily ambulation and physical examination findings, including localized tibial tenderness and pain with direct or indirect percussion, that correlated with more severe tibial stress injuries. When clinically warranted, we recommend magnetic resonance imaging over bone scan for grading of tibial stress lesions in runners. Magnetic resonance imaging is more accurate in correlating the degree of bone involvement with clinical symptoms, allowing for more accurate recommendations for rehabilitation and return to impact activity. Additional advantages of magnetic resonance imaging include lack of exposure to ionizing radiation and significantly less imaging time than three-phase bone scintigraphy.

Gordon-L. Hand and Wrist Disorders. In: Herington-T. N.. Morse-L. H., Editors**. Occupational Injuries. Evaluation, Management, and Prevention**. St. Louis, Missouri: Mosby-Year Book; 1995. p. 103-124.

An approach to the diagnosis and treatment of work related injuries in the hand were outlined. Specific topics discussed included acute injuries (soft tissue injuries, splinting, flexor tendon injuries, extensor tendon injuries, nerve injuries, high pressure injection injuries, fingertip injuries, and vascular injuries); bone and joint injuries (fracture and dislocation of the thumb, phalangeal fracture and dislocation, and interphalangeal joint injuries); and amputations and crush injuries. Cumulative trauma disorders were discussed, including the etiology, diagnosis, and treatment. Repetition, stressful postures and factors which are not even associated with the work situation can be causative agents. Specific cumulative trauma disorders discussed included entrapment neuropathies (carpal tunnel syndrome, pronator syndrome, ulnar nerve syndrome, ulnar tunnel syndrome, radial tunnel syndrome, and posterior interosseous nerve syndrome), tendonitis, and synovitis.

Higgs-PE, Mackinnon-SE. Repetitive motion injuries. **Annu-Rev-Med**. 1995; 46: 1-16.

UNITED-STATES

Repetitive motion injuries have presented clinicians with a significant challenge over the past two and a half decades. Acceptable treatment of inflammatory disorders is well established, but compressive neuropathies and nonspecific complaints of numbness, tingling, and discomfort in the upper extremity present vexing dilemmas. Current research and experience point to multilevel problems, including posturally induced muscular imbalance. Although surgical solutions to these problems are sometimes indicated, conservative approaches successfully treat many individuals and have narrowed the scope and indications for surgical intervention. These approaches include ergonomic changes at the workstation, postural changes, and muscle stretching and strengthening to correct imbalance.

Lin-T.Y. **Distrofia simpático-reflexa e causalgia dos membros superiores: estudo clinico e terapêutico.** São Paulo, 1995. [Dissertação de Mestrado - Faculdade de Medicina da USP]

BRASIL

São apresentados os aspectos clínicos, comportamentais, funcionais e os resultados de uma seqüência terapêutica protocolar que consistiu de medidas farmacológicas e de medicina física, bloqueios anestésicos e procedimentos neurocirúrgicos de 84 doentes portadores de distrofia simpático-reflexa e causalgia (síndrome complexa de dor regional tipo i e tipo ii, respectivamente). Constatou-se que as anormalidades psíquicas ocorrem na maioria dos doentes, as limitações funcionais são mais freqüentes quando a duração da síndrome álgica e de longa duração. A instituição precoce de uma seqüência de programa de tratamento reabilitacional e fundamental para a recuperação completa dos doentes.

Maizlish-N, Rudolph-L, Dervin-K, Sankaranarayan-M. Surveillance and prevention of work-related carpal tunnel syndrome: an application of the Sentinel Events Notification System for Occupational Risks. **Am-J-Ind-Med**. 1995 May; 27(5): 715-29.

UNITED-STATES

In response to limitations in state-based, occupational disease surveillance, the California Department of Health Services developed a model for provider- and case-based surveillance of work-related carpal tunnel syndrome. The objectives were to enhance case reporting, identify risk factors and high-risk work sites, and link preventive interventions to work sites and the broader community. Using elements from surveillance of communicable diseases and sentinel health events, a model was integrated into the pre-existing reporting system in one California county. Between 1989 and 1991, 54 Santa Clara County health care providers reported 382 suspected cases, of which 365 from 195 work sites met reporting guidelines. Risk factors were profiled from interviews of 135 prioritized cases and 38 employers. Of 24 work sites prioritized for a free, voluntary, nonenforcement inspection, 18 refused and 6 completed an on-site visit. Sentinel Event Notification System for Occupational Risks (SENSOR) captured many cases not reported to the pre-existing reporting system. Case interviews indicated a profile of symptoms and signs, treatment, and exposure to uncontrolled occupational risk factors, including a lack of training on ergonomics hazards. Employer health insurance, rather than workers' compensation, was the apparent source of payment for most medical bills. Employers lacked knowledge and motivation to reduce ergonomic risks. Governmentally mandated occupational ergonomics standards are urgently needed.

Resch-H, Breitfuss-H. Spontane Sehnenrupturen. Atiologie, Pathogenese und Therapie. **Orthopade**. 1995 Jun; 24(3): 209-19.

GERMANY

Spontaneous tendon ruptures are ascribed to recurrent microtrauma resulting from continuous mechanical loading in a critical zone, to muscular imbalance combined with poor coordination as a result of inappropriate training, and also to deteriorating circulation with increasing age. Ruptures of the rotator cuff occur more frequently with increasing age, and the size of the rupture also correlates with age. The frequency of the complaint in men, the predominant involvement of the dominant shoulder, and also the above-average occurrence in occupations involving strenuous physical work indicate that degenerative change plays a role. In about 50% of patients presenting with a ruptured rotator cuff, the genesis is clearly traumatic. A trauma will almost always be the cause of an isolated rupture of the subscapularis tendon. The choice of reconstruction technique for a ruptured rotator cuff depends on the patient's age and level of activity in daily life. In the case of young patients, further surgical measures to repair the defect are indicated following failure of primary suture of the tendon, but in older patients subacromial debridement alone is considered the appropriate procedure. Rupture of the long head of the biceps tendon is usually a sequela of a rotator cuff rupture and the resulting loss of protective cover. Isolated ruptures of the long head of the biceps tendon are much rarer. They tend to occur in middle-aged patients and are usually the result of a relatively minor trauma. Ruptures of the distal biceps tendon are also relatively rare (3%) and are always of traumatic origin. There is no absolute indication for surgical intervention for a ruptured long head of the biceps tendon. Surgical repair is essential in the case of rupture of the distal biceps tendon. Transosseous reinsertion at the tuberosity of the radius is the recommended method of repair. Today's frequent cases of rupture of the Achilles tendon in the framework of sports activities are ascribed to inappropriate training procedures in combination with poor muscular coordination. An exogenous cause is the administration of local injections for pain relief in the form of a so-called tendon anesthetic. Today an increasingly important role is assigned to functional therapy with ultrasound support, although suturing the tendon is still the intervention of choice to meet the high functional demands imposed in the framework of top-level sports.

Rolf-C. Overuse injuries of the lower extremity in runners. **Scand-J-Med-Sci-Sports**. 1995 Aug; 5(4): 181-90.

DENMARK

The purpose of this article is to review the literature on overuse injuries of the lower extremity in runners and to discuss briefly today's knowledge concerning etiology, diagnosis and treatment. Running is a natural entity in many sports and a majority of runners will sustain one or more overuse injuries throughout the career, in most cases affecting the lower extremity. A runner may be regarded as an athlete who regularly runs as the predominant physical activity. From that point, we should subdivide the definition "runner" considering the character of different sports or recreational activities performed. Overuse injuries are often described merely from symptoms,

including several different etiological and pathoanatomic correlates covering a variety of ailments. The clinical approach should be focused on a thorough history and physical examination. Analysis of possible injury mechanisms, correction of associated extrinsic and intrinsic factors and advice on alternative training should be given. A knowledge of specific demands from the type of running performed is necessary to evaluate the symptoms presented. Overuse etiology has to be considered multifactorial with a yet unsolved exact pathophysiology needing further research. The definition of a "runner", of "running" and of "overuse injury" should be established and agreed upon. This review attempts to draw attention to the huge multidisciplinary work that has to be done to better understand the mechanisms causing an overuse injury in a runner and to define diagnoses on a scientific base, whether or not excentric or intrinsic factors predispose or trigger.

Seradge-H, Jia-YC, Owens-W. In vivo measurement of carpal tunnel pressure in the functioning hand. **J-Hand-Surg-Am**. 1995 Sep; 20(5): 855-9.

UNITED-STATES

We recorded directly the pressure within the carpal tunnel during nine different functional positions of the hand and wrist in 102 hands of 92 subjects. Carpal tunnel syndrome was present in 81 hands, and 21 served as controls. A significant rise in pressure was recorded not only with wrist flexion but also with wrist extension, making a fist, holding objects, and isolated isometric flexion of a finger against resistance. Intratunnel pressure dropped after 1 minute of hand and wrist exercises and remained below the resting pressure for over 15 minutes of continuous measurement. We did not observe a rebound phenomenon. Clinical Application: Non-surgical treatment of carpal tunnel syndrome should also include a significant reduction in making a fist, holding objects, pushing, and isolated finger work such as key punching and typing. Activities that require sustained contracture of finger flexor muscles (eg, grasp and hold) also should be avoided. Brief intermittent wrist and hand exercise is recommended to reduce the intratunnel pressure.

Sipos-DA. Carpal tunnel syndrome. **Orthop-Nurs**. 1995 Jan-Feb; 14(1): 17-20.

UNITED-STATES

Carpal tunnel syndrome is a common work-related injury that has become a major cause of disability. The causes are varied, and prevention is the goal in the workplace. For established cases of CTS, conservative measures such as splinting and medication are the primary treatment with surgery an option when conservative treatment fails.

Szabo-RM. Guía de manejo para el síndrome del tunel carpiano. **Trib. méd. (Bogotá)** mayo 1995; 91 (5) : 261-9.

COLOMBIA

La neuropatía periférica compresiva más comúnmente hallada, el s¡ndrome del túnel carpiano (STC), engloba toda una combinación de síntomas y signos resultantes de la compresión del nervio mediano a nivel de la mu eca. Aunque anteriormente se consideraba como una afección de la edad media o avanzada de la vida, en la actualidad se observa que STC afecta más y más personas jovenes, especialmente aquellas que tienen que ejecutar labores manuales repetitivas. EL hallazgo en estudios recientes de STC en edades más temprenas obedece al empleo de modernas pruebas diagnósticas muy sensibles y una mayor conciencia del público sobre la existencia de dicha afección. La terapia inicial del STC debe basarse en un diagnóstico exacto, tanto desde el punto de vista neurofisiológico como etiológico, teniendo en cuenta la presencia de alteraciones anatómicas, enfermedades sistémicas y patrones de utilización de la manos..

Wong-E., Lee-G., Zucherman-J., Mason-D.T. Successful management of female office workers with repetitive stress injury'or'carpal tunnel syndrome'by a new treatment modality - Application of low level laser. **Int. J. Clin. Pharmacol. Ther.** 1995; 33 (4) : 208-211.

Female office workers with desk jobs who are incapacitated by pain and tingling in the hands and fingers are often diagnosed by physicians as 'repetitive stress injury'(RSI) or'carpal tunnel syndrome'(CTS). These patients usually have poor posture with their head and neck stooped forward and shoulders rounded; upon palpation, they have pain and tenderness at the spinous processes C5 - T1 and the medial angle of the scapula. In 35 such patients we focused the

treatment primarily at the posterior neck area and not the wrists and hands. A low level laser (100 mW) was used and directed at the tips of the spinous processes C5 - T1. The laser rapidly alleviated the pain and tingling in the arms, hands and fingers, and diminished tenderness at the involved spinous processes. Thereby, it has become apparent that many patients labelled as having RSI or CTS have predominantly cervical radicular dysfunction resulting in pain to the upper extremities which can be managed by low level laser. Successful long-term management involves treating the soft tissue lesions in the neck combined with correcting the abnormal head, neck and shoulder posture by taping, cervical collars, and clavicle harnesses as well as improved work ergonomics.

1994

Armstrong-T.J., Lackey-E.A. **Cumulative trauma disorders of the hand and wrist.** Fairfax. : American Industrial Hygiene Association; 1994. 20 p.

Grobocopatel-D., Azrdo-E., Silva-J.B. Síndrome do túnel. **Acta Med. (Porto Alegre)** 1994; 15 : 63-71.

BRASIL

Os autores fazem uma revisão bibliográfica sobre a Síndrome do Túnel Carpiano, dando ênfase para etiopatogenia, diagnóstico e tratamento. A correlação da Síndrome com atividade profissionais e ocupações também é abordada (AU).

Katz-RT. Carpal tunnel syndrome: a practical review [see comments] **Am-Fam-Physician**. 1994 May 1; 49(6): 1371-9, 1385-6.

UNITED-STATES

Carpal tunnel syndrome is the most common focal entrapment syndrome. Forceful repetitive activity and vibration may be important workplace risk factors for carpal tunnel syndrome. Although systematic study has suggested that carpal tunnel syndrome is work-related, no clear "dose-response" curve has been found between the amount or severity of work and the incidence or severity of the syndrome. Nocturnal pain is a hallmark of the syndrome, and Phalen's test, the carpal compression test and the Flick test are useful indicators of the diagnosis. The most commonly used confirmatory test is the nerve conduction study, with or without electromyography. The primary care physician can treat many cases successfully with simple ergonomic modifications, splinting and steroid injections. Surgical therapy is reserved for recalcitrant cases and patients with more severe nerve impingement. In addition to traditional open procedures, carpal tunnel release may be performed endoscopically.

Melhorn-JM. CTD: carpal tunnel syndrome, the facts and myths. **Kans-Med**. 1994 Sep; 95(9): 189-92.

UNITED-STATES

Recognition of the need for risk control of occupational injuries and prevention programs has led to many new studies demonstrating that occupational diseases are multifactorial in etiology, and that a specific job may not be the primary cause for occurrence. As a result of the many causes, myths about work-related injuries have developed. CTDs are the majority of occupational injuries. Individual risk factors are a better predictor of development of CTD and CTS than are job-related factors. Risk for carpal tunnel syndrome is closely related to general physical condition. Improved general health and health prevention programs may reduce an individual's risk level for developing a cumulative trauma injury. Risk measurement systems now allow employers to establish programs with measurable results. Since assessing the individual risk factors provides the best opportunity to attain the goal of prevention, the next step is for employee, employers, insurance carriers and the medical profession to establish concurrent prevention programs based on human risk factor evaluation systems.

Miller-RS, Iverson-DC, Fried-RA, Green-LA, Nutting-PA. Carpal tunnel syndrome in primary care: a report from ASPN. Ambulatory Sentinel Practice Network. **J-Fam-Pract**. 1994 Apr; 38(4): 337-44.

UNITED-STATES

BACKGROUND. Carpal tunnel syndrome (CTS) is a common condition in primary care, yet little is known about its presentation and management. This study was designed to provide a better understanding of the frequency of CTS in a primary care population, and its presentation, diagnosis, and management. METHODS. Clinicians in 74 Ambulatory Sentinel Practice Network (ASPN) practices from 30 states and three Canadian provinces collected data on all patients presenting with symptoms of CTS during a 30-month period. RESULTS. The adjusted frequencies of all visits and of first visits for symptoms of CTS were 1.01 and 0.68 per 1000 patient visits, respectively. Women visited more frequently than men with new onset symptoms of CTS (0.81 vs 0.55 per 1000 visits), and homemakers accounted for 15.9% of all new cases. Clinicians judged 43.1% of all CTS incident visits to be job-related. The diagnostic evaluation of patients seldom included nerve conduction studies (12.9%) or electromyography (11.8%). The most frequent treatments were splints (56.3%) and nonsteroidal anti-inflammatory agents (50.8%). Four-month follow-up data were obtained for 68.5% of the patients, and symptom relief was reported by 55.2% of patients. Ninety percent of patients were able to continue working at the same job, and 96% were able to continue their usual activities. CONCLUSIONS. Carpal tunnel syndrome symptoms are common in primary care, and most cases occur among women, many of whom are homemakers. Most patients with CTS symptoms are treated conservatively by their primary care clinicians with minimal testing or referral, and most patients report improvement or resolution of symptoms at 4 months.

Monsivais-JJ, Bucher-PA, Monsivais-DB. Nonsurgically treated carpal tunnel syndrome in the manual worker. **Plast-Reconstr-Surg**. 1994 Oct; 94(5): 695-8.

UNITED-STATES

This study evaluates the course of carpal tunnel syndrome in a group of manual laborers who declined surgery for personal or social reasons. Thirty-five patients and 67 extremities with carpal tunnel syndrome were evaluated in a group of manual laborers. The carpal tunnel syndrome was classified as mild, moderate, or severe on the basis of initial evaluation data. Sensory batteries, motor and sensory conduction velocities, and electrical studies were performed on a scheduled basis. Follow-up ranged between 14 and 58 months, with an average of 34.3 months. Three patients became worse and one improved during the study period. All others remained unchanged. Six patients returned to work, but only three returned to their original jobs. Although carpal tunnel syndrome does not appear to be a progressive condition once the triggering cause is removed, nonsurgical treatment does not seem to be the treatment of choice for patients who must continue in a manual labor position.

Pelmear-PL, Taylor-W. Carpal tunnel syndrome and hand-arm vibration syndrome. A diagnostic enigma. **Arch-Neurol**. 1994 Apr; 51(4): 416-20.

UNITED-STATES

OBJECTIVE: This article serves to draw attention to the risk to workers from repetitive strain and hand-arm vibration in the workplace and to the diagnostic difficulty in distinguishing carpal tunnel syndrome from the sensorineural component of hand-arm vibration syndrome. DATA SOURCES: Journal publications, textbooks on hand-arm vibration, guidelines of the International Standards Organisation, and European Economic Community directives. STUDY SELECTION: Recent reports and current standards. CONCLUSION: Carpal tunnel syndrome can be distinguished from hand-arm vibration syndrome if all factors--anatomical, associated physiological and medical conditions, work exposure history, and ulnar nerve involvement--are evaluated. In some circumstances, the conditions may be present together. A correct diagnosis is crucial because surgical intervention is not usually beneficial if hand-arm vibration exposure has been a contributing factor. The further reduction in grip strength may constitute a serious additional handicap for a worker.

Weiss-AP, Sachar-K, Gendreau-M. Conservative management of carpal tunnel syndrome: a reexamination of steroid injection and splinting [see comments] **J-Hand-Surg-Am**. 1994 May; 19(3): 410-5.

UNITED-STATES

The awareness of carpal tunnel syndrome by the lay public has increased dramatically in recent years, with an apparent shift in patient-population presentation. We prospectively studied steroid injection and wrist splinting in 76 hands in 57 patients, presenting without advanced disease or associated medical conditions, by standard evaluation and protocol of treatment. The average age of the patients was 38 years; 50 women and 7 men were included. Follow-up examination after simultaneous steroid injection and splinting averaged 11 months. Ten hands were noted to be symptom-free at the final evaluation. Women were noted to have a significant decrease in the rate of symptom resolution when compared to men. Patients, 40 years of age or younger, were also noted to have a significant decrease in the rate of symptom resolution when compared to patients over 40 years of age. No significant differences were noted when comparing symptom duration prior to treatment or workers' compensation insurance status to final symptom resolution. Young women are the least likely to have resolution of carpal tunnel syndrome symptoms when treated conservatively.

1992

Brito-A.C., Orso-M.B., Gomes-E,, Mühlen-C.A. Lesões por esforços repetitivos e outros acometimentos reumáticos em músicos. **Rev. bras. reumatol.** mar.abr. 1992; 32 (2) : 79-83.

BRASIL

Coury-H.J.C.G. Perspectivas e requisitos para atuação preventiva da fisioterapia nas lesões músculo-esqueléticas. **Fisioter. mov.** out. 1992-mar. 1993; 5 (2) : 63-8,.

BRASIL

O artigo tem como objetivo discutir as perspectivas e requisitos para a atuação preventiva a partir da experiência pessoal da autora na área. As lesões músculo-esqueléticas são enfatizadas devido ao seus altos índices de acometimentos. Uma nova abordagem metodológica , sugerida como instrumental para o trabalho preventivo (AU).

Cunha-C.E.G., Queiroz-P.S., Hatem-T.P., Guimarães-V.Y.M. L.E.R. Lesões por esforços repetitivos: revisão / R.M.I. **Rev. Bras. Saúde Ocup.** jul.-dez. 1992; 20 (76) : 47-59**.**

Para verificar como anda a saúde do trabalhador, e principalmente no que tange a LER(Lesões por Esforços Repetitivos), houve a agregação de conhecimentos de vários artigos, autores e opiniões, resultando em uma revisão abrangente sobre o tema. As análises foram feitas sob vários ângulos e perspectivas e culminaram com uma observação epidemiológica e legislativa sobre a situação da LER no Brasil.(AU).

1991

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 1ª parte. **Rev. Bras. Neurol.** jan.-fev. 1991; 27 (1) : 9-12.

Os músicos podem ser acometidos por afecções neurológicas de natureza ocupacional. O temor de palco , um distúrbio decorrente da descarga adrenérgica excessiva relacionada a apresentações difícies e/ou importantes. O uso excessivo dos músculos ao tocar por períodos prolongados pode resultar em uma les„o ultra-estrutural de resolução demorada. A compressão de nervos periféricos pode resultar do contato direto com os instrumentos musicais ou da posição necessária para tocá-los. Mais raramente, os músicos são acometidos por uma discinesia ocupacional, de origem obscura e tratamento difícil.

Gonik-R. Afecções neurológicas ocupacionais dos músicos: 2 parte. **Rev. Bras. Neurol.** mar.-abr. 1991; 27 (2) : 63-6,

BRASIL

Gonik-R. Afecçäes neurológicas ocupacionais dos músicos: 3a. parte. **Rev. Bras. Neurol.** maio-jun. 1991; 27 (3) : 87-91,.

BRASIL

Salles-M.M. Tenossinovite: doença ocupacional ou social. **Rev. Bras. Saúde Ocup.** abr.jun. 1991; 19 (73) : 86-90.

BRASIL

As lers (Lesões por Exposições Repetitivas) e as LTCs (Lesões por Traumas Cumulativos) têm sido negligenciadas ou supervalorizadas pelos serviços de Saúde Ocupacional das empresas com conseqüências ruins para o empregado, empregador e para o país quando ocorre aposentadoria por doença ocupacional. O presente artigo faz uma revisão crítica dessa situação como colocações diagnósticas e preventivas, sugerindo medidas para minimizar tal impacto social (AU).

1990

Oliveira-I., Brito-A.S., Calil-R. Estudo comparativo entre o Tenoxicam e Diclofenaco sódico "Retard" em pacientes com lesões por esforços repetitivos. **Folha méd.** jul. 1990; 101 (1) : 55-62.

BRASIL

Os autores realizaram um estudo duplo-cego, randomizado, com grupos paralelos, fazendo uma análise comparativa de eficácia e tolerabilidade entre dois AINE's comumente prescritos: o tenoxicam e o diclofenaco sódico "retard". Os pacientes estudados apresentavam doenças classificadas como Lesões por Esforços Repetitivos (LER), que são alterações articulares próprias de determinadas profissões e que vêm ganhando grande espaço entre aquelas afecções consideradas como Doenças Profissionais. Cinqüenta e sete desses pacientes concluíram o estudo e, pela avaliação final dos parâmetros clínicos, a eficácia e tolerabilidade foram consideradas boas e comparáveis com ambos os tratamentos, em termos relativos. Considerando-se, porém, os resultados absolutos deste ensaio, nos parâmetros clínicos analisados, o tenoxicam mostrou-se superior ao diclofenaco sódico "retard" (AU).

ULTRASSONOGRAFIA

1998

Missere-M, Lodi-V, Naldi-M, Caso-MA, Prati-F, Raffi-GB. Use of ultrasonography in monitoring work-related carpal tunnel syndrome: A case report. **American Journal of Industrial Medicine**, 1998 Jun; 33 (6) : 560-564

UNITED-STATES

Carpal tunnel syndrome (CTS) is a syndrome whose diagnosis is well established. One cause could be occupational factors, while others hale no relation to work or the work environment. We present in this article a case report regarding a worker affected by CTS, which is of interest concerning the sensitivity of ultrasonography and electroneurography: applied as diagnostic methods, related in our protocol to the variations in occupational exposures. The case reports an agricultural worker, whose tasks required repetitive and high frequency movements of the hand-arm. Diagnosis of CTS used ultrasonography and electroneurography techniques, bl our opinion, the clinical evolution of CTS encompasses three "work-related" phases (preclinical phase; phase of nerve compression; phase of irreversible damage). Ultrasonography provides greater information about the evolution of CTS, as well as other cumulative trauma disorders , and is able to discern tendinitis of flexors causing a compression on the median nerve in the carpal tunnel. (C) 1998 Wiley-Liss, Inc

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1997

Al-Nahhas-AM, Jawad-AS, Norman-A, McCready-VR. 99Tcm-MDP blood-pool phase in the assessment of repetitive strain injury. **Nucl-Med-Commun.** 1997 Oct; 18(10): 927-31

ENGLAND

We reviewed three-phase bone scans of the limbs of 7 patients suffering from limb pain suggestive of occupational repetitive strain injury (RSI) and compared them with 13 patients with limb pain due to various aetiologies. Doppler ultrasound measurement of blood flow had been performed in 13 of the 20 patients. The bone scan results showed increased blood flow and pooling (second phase) in the affected limbs of patients with RSI as compared to those with algodystrophy or non-specific limb pain (sensitivity 86%, specificity 85%). Doppler ultrasound also demonstrated increased blood flow to the affected limbs (sensitivity 83%) but failed to differentiate between the different aetiologies of pain (specificity 14%). We conclude that the blood-pool phase of three-phase bone scans can play a potential role in screening RSI patients. MESH: Adolescence-; Adult-; Aged-; Aged,-80-and-over; Bone-and-Bones-radionuclide-imaging; Cumulative-Trauma-Disorders-physiopathology; Cumulative-Trauma-Disorders-ultrasonography; Extremities-blood-supply; Gated-Blood-Pool-Imaging; Middle-Age; Pain-etiology; Pain-radionuclide-imaging; Radiopharmaceuticals-diagnostic-use; Regional-Blood-Flow-physiology; Technetium-Tc-99m-Medronate-diagnostic-use

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Mercer-B, Marcella-CP, Carney-DK, McDonald-RW. Occupational health hazards to the ultrasonographer and their possible prevention. **Journal of The American Society of Echocardiography** 1997 May; 10 (4) : 363-366

Occupational health hazards in ultrasonography are becoming more prevalent as the field continues grow. Eye strain, musculoskeletal pain or injury, carpal tunnel syndrome, repetitive strain injuries , stress, burnout, and other hazards have been addressed as concerns in other studies and surveys. These topics are discussed, as well as the possible preventive measures that may be used to maximize and maintain the ultrasonographer's well-being throughout his or her career.

1995

Al-Nahhas-AM, Jawad-AS, McCready-VR, Kedar-R . Detection of increased blood flow to the affected arm in repetitive strain injury with radionuclide and Doppler ultrasound studies. A case report. **Clin-Nucl-Med.** 1995 Jul; 20(7): 615-8

UNITED-STATES

A case of clinically diagnosed repetitive strain injury was referred for investigation to rule out the possibility of an occult bone disease. The patient was a female keyboard operator who had pain and tenderness over the flexor muscles of the right hand and arm. The pain was severe and almost constant. The authors observed an increase in Tc-99m MDP delivery to the affected forearm during the dynamic sequence of a three-phase bone scintigram, indicating increased blood flow compared to the contralateral side. The same result was achieved using quantitative blood flow measurements with the Doppler technique and Tc-99m HMPAO perfusion imaging. These findings agree with recent studies that suggest increased total arm blood flow in repetitive strain injury and may provide an easy screening method.

PRINCIPAIS SITES NA INTERNET (LOCALIZADOS ATÉ SETEMBRO 98)

- **http:// www.amara.com/aboutme/rsi.html**
A doença vista por um portador de LER. Traz informações sobre dados estatísticos, sintomas, causas e tratamento. (Estados Unidos)

- **http://www.hermanmiller.com/research/papers/ctds/general.html**
Comercial, com informações sobre diagnóstico, fatores de risco, estatísticas e aspectos econômicos. (Estados Unidos)

- **http://www.micronite.com**
Comercial. Traz informações de livros recentes, publicados sobre LER e equipamentos para prevenção . (Estados Unidos)

- **http:// www.bst.com.br/ler1.htm**
Comercial . Produtos preventivos. Traz dados estatísticos sobre LER no Brasil.

- **http:// www.cdc.gov/niosh/ergoref.html**
Site do NIOSH, National Institute of Occupational and Safety Health, (EUA) com bibliografia sobre LER.

- **http://www.ccohs.ca/oshanswers/**
Serviço do Canadian Centre for Occupational Health and Safety, (CCOHS)com perguntas e respostas sobre saude ocupacional .

- **http:// www.tifaq.com/**
Educacional com perguntas e respostas sobre LER. Traz uma grande variedade de informações e outros links de interesse. (Estados Unidos)

- **http://www.febraban.org.br/LER.HTM**
Traz informações sobre o Programa Preventivo das LER, implantado nos bancos filiados à FEBRABAN (Brasil).

- **http://wwwspbancarios.com.br/saude/ler.htm**
Sindicato dos Bancários, sobre o Programa Preventivo de LER. (Brasil)

- **http://www.niwl.se/konf/icoh96/key5.htm**
25º Congresso Internacional em Saúde Ocupacional, 1966 - (Suécia)

- **http://gfs.com.br/ler3368/framedir.htm**
Traz informaçoes sobre LER (diagnostico, fatores de risco, tratamento), norma técnica brasileira e outros links. (Brasil)

- **http://sindbancariospe.com.br/ler.htm**
Informaçoes gerais sobre LER. Abrange também o aspecto legal e traz informaçoes sobre a Norma Técnica do INSS. (Brasil)

- **http://www.marco.eng.br/ler.htm**
Pagina de um portador de LER., com orientações para usuários de computador. Traz uma lista de outros links. (Brasil)

- **http://ccohs.ca/**
Página do Canadian Centre for Occupational Health and Safety (CCOHS).

- **http://cdc.gov/niosh/homepage.html**
Página do NIOSH - National Institute for Occupational Safety and Health (Estados Unidos)

- **http://cncut.com.br/politsocial/ CartilhaLer/cat.htm**
Página da CUT, com informações sobre a emissão da CAT. (Comunicação de Acidente de Trabalho) Brasil

- **http://www.ime.usp.br/~enec/eventos/snler96.html**
I Seminário Nacional sobre Lesões por Esforços Repetitivos - L.E.R , Brasília, 6-8 de maio de 1996

- **http://sechrest.com/mmg/cts/ctsintro.html**
Página do Medical Multimedia Group, com informações sobre a Sindrome do Tunel Carpal, com imagens coloridas . Muito interessante, vale a pena visitar. (Estados Unidos)

- **http://occuphealth.fi/research/97/eng/re9738.html**
Site do FIOH - Finnish Institute of Occupational Health, com os projetos de pesquisa de 1997 , MUSKELI II, sobre LER. (Finlandia)

- **http://wwwcdc.gov/niosh/ergosci1html**
Musculoskeletal Disorders (MSDs) and Workplace Factors. Publicação do NIOSH, disponível na Internet para download. Contem 7 capítulos , referências e apêndices. Muito interessante, com contribuições de autores conhecidos como Vern Putz-Anderson. É necessário ter o programa Adobe Acrobat Reader, que está grátis na Internet,.

- **http://engr-www.unl/ee/eeshop/rsi.html**
Artigo online, abrangendo diagnóstico e prevenção de LER. , com outros links .

- **http://www.LSI.usp.br/pee/LER.html**
Página do Departamento de Engenharia Eletronica da USP, com informações gerais e links na Internet.

- **http://www.occuphealth.fi/e/oshlinks.phtml**
Página do Finnish Institute of Occupational Health, (Finlandia) com links de instituiçoes internacionais na área de Saude Ocupacional.

- **http://niwl.se/**
Página do National institute for Working Life, da Suécia. Traz informações sobre a Conferência Work Life 2000, que será realizada na Suecia, de 22-25 de janeiro, 2001, e outras programadas para 1999, em Bruxelas, que abrangem aspectos de prevenção, reabilitação e tratamento de LER/DORT.

- **http://www.ilo.org/**
Página da Organização Internacional do Trabalho (OIT)

- **http://who.int/**
Página da Organização Mundial da Saúde (OMS)