Editorial

Welcome to the April issue of Ergonomics Australia.

Ian Gibson wins the prize for Ergo-historian Ian points out that John R Brown “Manual Lifting and Related Fields - An Annotated Bibliography” 1972 (Ontario: Ministry of Labour) mentions in his preface that in the 1930s the straight back bent knees method of lifting was heavily promoted. And he notes that a paper by EG Brackett (1924, JAMA 83, 1088-1075, Low back strain: with particular reference to industrial accidents) refers “perhaps for the first time to the inadvisability of using the bent back for lifting.”

I’ve not yet had a chance to track down the 1924 JAMA paper, but I will…. This issue will, as usual, appear in electronic form as Ergonomics Australia On Line. I’m pleased to report that most weeks somewhere around 100 download requests for EAOL are logged. One result of this is that this issue of EAOL will, for the first time, contain paid advertising. Congratulations to Flexliner for taking this step.

As I’ve mentioned before, I will be stepping down from my role as editor of Ergonomics Australia at the end of the year. The board is seeking nominations from members who are willing to take on the job, and I encourage you to contact David Caple (dcape@mir.net) if you are interested. The position requires a reliable email connection, and some computer literacy but mainly enthusiasm and a commitment of about 2 days every second month.

Best wishes,
Robin Burgess-Limerick
robin@hms.uq.edu.au

Obituary – Dr. John Lane

John Charles Lane, AM
Aviation medicine and road safety pioneer
Born, Sydney, 9 January 1918
Died, Melbourne, 21 January 1999

In 1962, as John Glenn orbited Australia in Friendship 7, Dr. John Lane monitored his heartbeat, blood pressure and other vital signs. He was one of the Australian aeromedical monitors for the United States’ manned space flight program and performed this important task for John Glenn’s first flight and the other astronauts in both the Mercury and Gemini space programs.

John Lane is recognised as the father of aviation medicine in Australia and as a pioneer in road safety. His work in both fields was highly respected and acclaimed internationally. It was he, with his eloquent turn of phrase, who formulated the term ‘crashworthiness’. In the book “Unsafe at any speed” safety campaigner Ralph Nader described John Lane as “a pioneer in the field of crash protection”.

John was the only child born to Charles and Eva Lane. He received his early education at Scots College in Sydney where he was Dux of the school. He graduated with honours in medicine from University of Sydney in 1941, and then joined the RAAF. Shortly after being discharged from the RAAF, John married Lucy Mackenzie who herself had a distinguished career in the RAAF Nursing Service. They had three sons and a daughter, who were inspired not only by his multifaceted career, but also by his endless fund of esoteric knowledge and keen interest in old movies. John was very devoted to his family.

As a medical officer in the RAAF, Dr John Lane developed his interest in aviation medicine and the problems of high altitude flying. He was involved with the Catalina aircraft crews and maintained some of these friendships throughout his life.

In 1948, John was appointed the inaugural Director of Aviation Medicine in the Commonwealth Department of Civil Aviation. He continued to develop the scientific approach and expanding contribution to air safety of the Branch until his retirement in 1983. He represented Australia at various meetings of the International Civil Aviation Organisation over a period of 25 years. During
the 1950s John was also involved in the development, at Aeronautical Research Laboratories, of the "T-vasia" visual safe aircraft landing system which is still in use today.

In 1957, John was awarded a Harkness Commonwealth Fellowship, which enabled him to qualify for a Master of Public Health Degree at Harvard University in the U.S.A. This provided the foundation for much of the excellent epidemiological research which he was to undertake during the next 40 years. In 1960 he was trained as a space surgeon by the U.S. Airforce and the National Aeronautics and Space Administration which led to his appointment as Australian aeromedical monitor in the manned space flight program.

John introduced an aviation forensic pathology program in 1960, many years before most other countries. In addition to the role of alcohol, drugs and other pilot factors, the relationship between injuries sustained in an aircraft crash and the aircraft structure were recorded and analysed. An example of the outcome of such analyses was the installation of overturn trusses on Tiger Moth aircraft converted for crop dusting, which enabled many pilots to survive a crash. John was the motivating force in establishing an aircraft crash injury prevention research program at the Aeronautical Research Laboratories.

John was a founding member of the Aviation Medical Society of Australia and New Zealand, and of the Ergonomics Society of Australia, being its second President. He was very actively involved in both Societies' activities throughout his career and was still preparing papers for presentation at their meetings at the time of his death. He was a Fellow of many other learned societies, including the Royal Aeronautical Society, and the U.S. Aerospace Medical Association from whom he received the J.H. Tamplin Award. In 1986 he received the Association for Advancement of Automotive Medicine's Award of Merit.

In addition to his duties in the Department of Civil Aviation, John developed an interest in applying a scientific approach to road safety. In 1961, he became a foundation member of the Human Factors Committee of the Australian Road Research Board. During the 18 years of his membership, that committee sponsored much of Australia's early road safety research including the first in-depth study of road accidents in Adelaide and many of the techniques initially developed in aviation forensic pathology were adapted for this study. From 1981 to 1975 he was a member of the Traffic Injury Committee of the National Health and Medical Research Council. He was one of the pioneers who persuaded the Department of Shipping and Transport in 1966 to establish a committee to formulate new vehicle safety standards and made a valuable contribution to the work of that committee until 1982.

Many of Australia's leading road safety researchers and administrators began their careers through John Lane's encouragement. His own knowledge and the collection of publications obtained through frequent visits to the U.S.A., as part of the manned space flight program, were invaluable for road safety at a time when few Australians had access to the U.S.A.

After his retirement as Director of Aviation Medicine, John became a Principal Research Fellow at the Monash University Accident Research Centre, where he continued his research and acted as mentor to many younger researchers. He also developed a great interest in the Royal Flying Doctor Service and was a Councillor of its Victorian Section.

In 1985 John became a Member, Order of Australia "for services to aviation medicine and road safety standards".

John had a brilliant, incisive mind and was often able to find simple solutions to complex problems. He was an articulate contributor to committees, a good listener and had a fountain of knowledge. His extraordinary ability to assemble the relevant facts and present them with compelling logic made him a powerful advocate. Yet John was a self effacing man and did not seek public recognition for his many achievements.

John was an avid reader and took great pleasure in sending his colleagues copies of any text which may be relevant to their interests. He was a very considerate person with a gentle nature and a great sense of humor. He always found time in his busy schedule to help his many friends.
Letters

From Ian Mitchell

As I leave ESA today, I particularly want to thank the members of the ESA Executives under whom I have had the privilege of working over the past years.

The phrase "the privilege of working" is not rhetoric but deliberate. As you know, I have over the past 10 years been a management consultant specialising in the not-for-profit sector, when I have come across some pretty frightening. Executives who are driving the office staff to distraction and their associations to oblivion. Fortunately this has not been my experience here. On the contrary, I can honestly say that the ESA has been very fortunate (indeed sometimes more fortunate than it perhaps deserves) to have had the office holders that I have known and worked alongside since 1983. Thanks for one and all; I could not have wished for greater support.

Thanks you too, to those of you have penned letters of encouragement and well-wishing. As we are now building on our little acreage 30 minutes from Canberra, I expect you to drop in and have a drink (or do some shearing for those not in the drinking habit). We expect the building to be completed for the kidding season in September.

As you know, apart from the regular and routine work, I have been compiling an updated and greatly enlarged Administration Manual. It is actually more like a Policy Manual but it represents the off-time labours over the years. To prove it, and as my "last will and testament to ESA", I have pleaded with Christine to post you a copy once she has printed it out. It will be a little awhile, as she is engaged in the tedious task of compiling a new Directory while still coping with the machinations of the office left to her by Margot and me. Nonetheless, please use the document to keep the Society on the straight and narrow and continue to grow it.

Wish best wishes and thanks again for your considerable help.

Ian Mitchell

President’s Message

Greetings to all our ESA members.

It is tremendous to work in a profession with so many dedicated and active ergonomists. During the first quarter of 1999, our members have participated in a wide range of projects to promote ergonomics both within, and outside the ESA. Some of these projects have been summarised below in line with our four key strategic planning areas.

1. Membership

Our current membership as at the 31st January 1999 was 534. This includes 22 new members and 11 new affiliates since July 1998. It is encouraging to see the number of ergonomics graduates from the various Universities around Australia continuing to seek professional recognition through membership of ESA. Welcome to our new members and we hope that you find your participation in ESA activities professionally rewarding.

Our international ergonomics association delegate, Emeritus Professor Margaret Bullock, from The University of Queensland is actively involved in the IEA’s Education and Training Committee. Margaret has been assisting the ESA in our discussions relating to certification of ergonomics practitioners. Details of her recommendations are provided elsewhere in this journal. On behalf of the Board I encourage feedback from members, particularly in relation to the process of Certification of an ergonomist and the consequences if we choose to adopt the minimum criteria as specified and endorsed by the IEA.

The excellent work co-ordinated through Jim Carmichael on the ESA Competencies Project during 1997/98 for ESA is an important component for us to build into the certification process.

The certification issues also have some implications for ESA membership criteria for ESA. It is important that our professional association continues to monitor the international requirements to ensure that we are maintaining and promoting a professional level of qualification and competence for those who receive full membership of our society. At the same time, the Board is keen to encourage those affiliates who have yet to complete appropriate tertiary studies to join the activities of the society and, through the Professional
Development Program and education seek a further upgraded membership status.

2. Promotion of Ergonomics

Various members of ESA have been effectively using the media in Australia to promote their research outcomes, and ergonomics issues more generally.

One recent example related to Dr Leon Straker from Curtin University WA, relating to his joint study on the ergonomic issues associated with school children and their use of laptop computers. Certainly in the printed and radio media, this subject has continued to come up as a major issue of community concern. Ergonomists can play a pivotal role in providing quality research to help the community debate appropriate strategies to deal with such issues. I encourage any members who have been researching and developing outcomes which are of significance to the community to seek opportunities to publicly discuss and promote their findings. I have often heard that one of the main difficulties in shaking the old public image of Ergonomics as desks and chairs, relates to the lack of subsequent publicity on the wide range of other areas of application where ergonomists are actively working. Please send any details of media contacts, or cutttings from publications relating to your ergonomics work that have received promotion and publicity to Christine Stone at our Federal Office in Canberra so that we may collectively share a wider understanding of how ergonomics is being portrayed and promoted.

During the next quarter, as President of ESA, I have been invited to be a speaker at:

The 40th Anniversary of IIE (International Industrial Engineering) Conference in Canberra from the 27th - 28th of May The Australian Physiotherapy Conference in Cairns from the 1st - 5th of June.

(I now realise why having lots of frequent flyer points is handy when ESA President)

3. Professional Development

Currently, each branch of ESA is developing their professional development program for 1999-2000. Looking through the programs summarised in the branch report, it is clearly evident that the branch committees are being innovative and resourceful in developing an excellent professional development program for members. Your support by attending these sessions is an integral component of Professional Developing of being an ESA member. Also, use these opportunities to invite colleagues whom you feel may benefit from the specific subjects being discussed. This is an excellent way of promoting ergonomics beyond our membership and possibly encouraging others to consider studies and potential membership of our society.

A further way of professional development amongst our members amongst our members is through participating in research conferences and publishing research in refereed publications. This journal, Ergonomics Australia has continued to provide an avenue for members to promote their professional work. The board has been notified that our current Editor, Dr Robin Burgess-Limerick is to relinquish this role at the end of 1999.

I encourage members to consider nominating as his successor and reshaping the journal in a way that suits their interests and the technological opportunities available.

4. Financial Management

The finances of the ESA have stabilised during 1998/99 and full details will be provided at the AGM to be held in Fremantle during the 1999 Annual Conference in October.

With the retirement of our Executive Officer, Ian Mitchell, savings will be made with the Federal office function in Canberra. At our last teleconference, the Board decided not to have a face to face meeting in May 1999, as a further initiative to contain expenses spent on the Board. Instead, the significantly less expensive teleconference will be held in its place.

Further, with the investment in a new computer at the ESA office, our Administrative Officer, Christine Stone has been able to undertake a number of publication projects internally rather than submitting them out to external contractors. One example, is the preparation of the 1999 Membership Directory. This directory will soon be sent to all members of the society as part of their membership entitlements. Thanks to Christine's initiative, the cost of this publication has been reduced.
Board News

With the consolidation of funds, it will be an exciting opportunity for the branches in 1999-2000 to develop innovative and challenging programs which reflect the four key areas of our strategy and to maintain a strong financial focus to our long term viability.

Best wishes to our Executive Officer, Ian Mitchell as he now returns to his goat farm and enjoys his retirement without the stressors of ergonomists hassling his day to day life.

We look forward to another exciting quarter during 1999 with the many projects currently under development across Australia by members of the ESA.

Regards,
David C Caple
President
PO Box 2135
East Ivanhoe
Victoria 3079
Australia
Telephone: 03 9499 9011
Fax: 03 9499 9022
Email: dcaple@miranet

Please note the new email address for the federal secretariat: esa@interact.net.au

Extracts from the minutes of the last Board meeting held 15 February 1999 are presented below.

Membership Numbers:
It was noted that the Current Membership numbers as at 31 January 1999 were:

<table>
<thead>
<tr>
<th>Type of Membership</th>
<th>Total Membership as at 31-1-99</th>
<th>New Members 1 July to 1 January</th>
<th>Resignations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellows</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPE’s</td>
<td>38</td>
<td></td>
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<tr>
<td>Members</td>
<td>421</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Affiliates</td>
<td>62</td>
<td>11</td>
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<tr>
<td>Corporate</td>
<td>4</td>
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</tbody>
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Structure & Role of the PAB:

At a previous meeting, the Board indicated that there could be the need to restructure the work and role of the PAB and asked the PAB to recommend possible changes to the Constitution in the light of changes to the arrangements.

The PAB met by teleconference on February 2 and Bob Stacy reported that the PAB was examining the recertification process which would have a bearing on the Structure and the Role of the PAB.

Bob agreed to e-mail all Directors with the results of the PAB deliberations and it was agreed that the item be placed on the next Board Agenda.

Membership Qualifications:

As a result of the Workshop on professional development held at the 1998 Annual Conference and other discussions, there is continuing pressure (notably from the academic members) for the Society to demand formal qualifications from its new members. Obviously, if there are changes to the criteria for membership there will need to be an appropriate clause to preserve the status of existing members who do not have the qualifications.
LEADERS IN INDUSTRIAL SAFETY SEATING

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The major arguments for the demand for higher entry standards to the Society are:

a. to demonstrate professionalism
b. to raise the standard of debate in the Society’s meetings
c. to encourage better ergonomics in the community
d. to add to the discipline
e. to weed out charlatans and those ill-equipped

The disadvantages include -

a. the numbers of the Society will decline dramatically (unless the Affiliate status is given more prominence)
b. if numbers decline, the membership fees will rise markedly to maintain services
c. existing members, even if their status is preserved, lose morale
d. the difficulty of determining the relative worth of the courses used as requirements for membership (especially those obtained from overseas universities)

Directors agreed to await the report listing criteria for membership with overseas ergonomics societies from Owen Evans and visit again at the next meeting.

**PROFESSIONAL DEVELOPMENT**

Professional Enquiries & Complaints:

Following the Board’s agreement at an earlier meeting, the draft Guidelines and a notice seeking members’ views were inserted in the October issue of *Ergonomics Australia*.

No comments were received from members and in accordance with the previous decision, the Board resolved to adopt the draft Guidelines.

Change to ESA Constitution re SIG membership;

The Constitution at present does not require a member of a SIG to have ESA membership although the SIG Committee must have a full ESA member on it.

At a previous Board meeting, Michael Michaliades asked that the Society review these arrangements and change the Constitution so that all SIG members are also at least Affiliates of the Society. One of the aims was to incorporate CHISIG more closely into the orbit of the Society.

The management arrangement between ESA and CHISIG has been extended for the duration of 1999 but it is understood that the new CHISIG committee is reluctant to agree to CHISIG members also being required to be Affiliates of ESA.

The Board resolved that

1. it would defer this item until the next face-to-face Board meeting;
2. in the meantime, the Executive as a sub-committee would negotiate with the CHISIG committee on the matter of Affiliate Membership for those in CHISIG;
3. it could not keep deferring the issue for much longer and therefore it would seek to resolve the matter by the end of this year (1999).

**FOLLOW-UP OF STRATEGY WORKING GROUPS ARISING FROM BUSINESS PLAN WORKSHOP**

Following the Business Plan Workshop, sub-committees were set up to consider specific objectives. The sub-committees comprised:

- **Membership:**
  - Tony Payne; Jenni Miller; Caroline Dingle; Ian Gibson

- **Professional Development:**
  - Kerry Plunkett; Neil Adams; Roxanne Egeskov

- **Promotion**
  - David Caple; Christine Aickin; Annabelle Cooper

- **Finance:**
  - Ros Kushinsky; Margaret Juhasz; Rod Powell

1. the Board affirmed the four strategy areas of membership; professional development; promotion; finance.
2. Board members who were not listed on the sub-committees were invited to join one of the groups to facilitate in the amplification of the Objectives.

- Tony & Ian G were already on the Membership sub-group and Tony agreed to act as Convenor;
• Christine was already on the Promotion sub-group and agreed to act as Convenor and Mark and Mike agreed to join that group;
• Justin agreed to Convene the sub-group on Professional Development;
• Ros as Treasurer was already on the Finance sub-group and agreed to Convene it and Tim agreed to join that sub-group.

3. Board members undertook to communicate via the Internet and use the model already circulated by Christine Aickin as a template for addressing the questions -
   a. elements of the strategy
   b. priority of the elements
   c. resources required to facilitate implementation
   d. timelines expected
   e. outcomes which will enable the measurement of the elements
   f. names of members who could be nominated to follow through various elements.

Certification Standards Workshop:
The Executive has been discussing the issue, raised in the Melbourne Conference Certification Workshop, that the Australian Competencies be brought into line with international standards - most of which are reputedly higher than those set in Australia.

Owen Evans had undertaken to develop a matrix comparing the various certification requirements from other countries (notably Canada, the USA and the UK) with those from Australia.

Bob Stacy agreed to work with Owen and to report back to the next Board meeting.

Dr John Lane Memorial

Mark Dohrmann advised that Peter Vulcan had written a moving tribute for inclusion in the next issue of Ergonomics Australia.

Mike McCracken has suggested that the Society offers a prize in honour of Dr Lane. Mike proposed that the prize be given to “the member who advances the cause of ergonomics in Australia.” This is consistent with the views of the Honours & Awards Committee which recommended that future prizes be named after one of the five earliest members of the Society. Dr Lane was one of those.

It was agreed that the Honours & Awards Committee would be asked to provide advice to the Board as to the appropriateness of the prize and to draw up relevant criteria for its application.

NEXT MEETINGS

Board Meetings:
The next Board meetings will be held on Monday 24 May 1999 and 16 August - both as teleconferences. A face-to-face meeting on 9-10 October.

Executive Meetings:
The next Executive meeting will be held in Melbourne during April 1999 and thereafter in July and September.
The Sit-Stand Seat

Ideal for people requiring temporary seating and freedom of movement around their workplace.

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- The forward tilting seat (0° to 10°) ensures the hip flexion and lower back spinal flexion needed for seated work khuẩn or computer use.

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  - Height adjustable armrests
  - Swivel tilt adjustment
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  - Seat swivel

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IEA Minimum Criteria for Certification

IEA Minimum Criteria
The IEA suggests that all Federated Societies establish a process of certification of ergonomists and offers the following guidelines for the process and the minimum criteria to be applied.

A. EVALUATION OF THE APPLICANT

Purpose
The purpose of evaluating the applicant is to ensure that the person is competent to practise as an ergonomist and can demonstrate an appropriate standard of professional performance.

Reference Standards
Expected standards of ergonomics practice should be defined clearly by the evaluating body* and should relate to defined ergonomics competencies.
Reference should be made to the IEA Core Competency Standards for a Practising Ergonomist and evidence should be sought that would demonstrate that the applicant possessed those core competencies or a defined sub-set of them appropriate to a specific area of expertise and practice.

* The evaluating body should meet the requirements of the specific IEA criteria or those of CEN/CENELEC European Standard 45013.

Methods of Evaluation of Competencies
The certification process must apply a range of effective measures to determine the person’s competence as an ergonomist.
Competency in core areas of ergonomics may be demonstrated in a variety of ways and a suitable combination should be used to ensure appropriate appraisal of core competencies. These may include, but not be limited by the following possibilities:

• Evidence of completion of an educational program in ergonomics which has successfully demonstrated its coverage and assessment of a set of core competencies. (See section B for further details).

• Evidence of substantial professional experience in ergonomics.

• Presentation of appropriate products, work samples or descriptions of work projects and evidence of their successful outcome, to demonstrate specified relevant ergonomic competencies.

• Examination of selected core competencies. The provision of an examination acknowledges the diverse background of applicants and the ability to reach a level of competent ergonomics practice by a variety of means. Forms of examination may vary depending on the competencies being evaluated and could include written papers, oral interviews or practical tests.

Assessors
Evaluation of applications for certification should be carried out by qualified and multiple assessors and, for each form of evaluation, specified criteria should be applied.

A. MINIMUM CRITERIA TO BE SATISFIED BY APPLICANT

1. Educational Qualifications
a. Ergonomics qualification from a tertiary (university level) institution. It is anticipated that in due course, the educational program would be accredited according to national standards).

i. Tertiary (undergraduate) qualification in ergonomics of no less than three years’ duration, which has included comprehensive preparation in ergonomics competencies.

ii. Tertiary (postgraduate) qualification in ergonomics of a minimum of one year duration, following prior completion of a tertiary (university level) educational program in a relevant specialist field (involving a minimum of three years education).

b. Tertiary (university level) qualification in a related field (of a minimum duration of four years), which has included a major component of ergonomics and has addressed a comprehensive set of core competencies and has required completion of a major ergonomics project.
c. Tertiary (university level) qualification in a related field (of a minimum duration of 3 years), followed by continuing education (CE) programs to ensure comprehensive preparation in ergonomics competencies and substantial experience in the practice of ergonomics.

*Evaluation of applicants in this category must be designed to ensure that ergonomics competencies can be demonstrated and a variety of evaluative methods should be used for this purpose. If a formal examination is not offered, then other methods such as oral interview, preparation of written essays or examples of work products should be required.

Note:

i. "related area" or "relevant specialist field" may be in any professional field that prepares the student in a substantial set of the core competencies.

ii. Ergonomics competencies not achieved through formal education should be developed specifically during post-qualification experience and appropriate evidence should be sought to confirm this.

iii. It is preferable that the educational program should include appropriate periods of ergonomics practice supervised and validated by a qualified educationalist and/or a practising ergonomist to achieve competency in specified core areas. Where this has not occurred, evidence of access to a mentor or supervisor during initial periods of professional practice (for example for no less than two years) should be sought.

1. POST-QUALIFICATION EXPERIENCE IN ERGONOMICS PRACTICE

Experience may include:

• Working as an ergonomics practitioner.

• Educating others about ergonomics or doing ergonomics research, where ergonomics practice and experience forma part of the person’s total activity.

Where supervised training in ergonomics has not occurred during the educational program, the initial two year period of practice should include opportunities for the ergonomist to seek advice from experienced practitioners.

The outcome of post-qualification experience should be achievement of competencies in defined core areas and would normally be expected to cover no less than three years of full-time practice in ergonomics or the part-time equivalent.

A. RECERTIFICATION

The IEA recommends that certification be provided for a finite period (for example five years) and that a suitable process for Recertification be defined by the certifying body in which the applicant must demonstrate their continuing work in ergonomics.

B. CODE OF CONDUCT

The IEA commends that the Code of Conduct for professional ergonomists be applied to those who receive certification. The IEA has previously established guidelines for a Code of Conduct.

PAB News

From Marcia Lusted (mlusted@pbq.net.au)

The PAB are interested in developing mentoring in the society particularly as it relates to improving the standards of being an ergonomist. Initially we would like to obtain comments on the subject by both potential mentors and persons seeking mentoring.

I would like persons to comment on one or all of the following questions:

1. Would you appreciate the assistance of a mentor.
   If so how often would you need to consult with one.

2. Would you be prepared to be a mentor?
   What expectations would you have of mentorees.
   What conditions would you expect to be met.

3. Could you relate to me a good mentoring experience you have had at any time in your life. Can you give names of persons in the ESA who you would include in this.

You could email me on mlusted@pbq.net.au
or fax 0248 852027
Or ring me for a chat after hours on 0248 852168
Ergonomics International

IEA/Liberty Mutual Prize
(from Dec. 98 HFES Bulletin)

Andy Imada has received the IEA/Liberty Mutual prize of $5000 for his paper "A Macroergonomic Approach to Reducing Work-Related Injuries". The paper suggests that traditional interventions alone (training, awareness, ergonomics and technical safety programs) are insufficient to reduce accidents and injuries. Poor safety performance may be viewed as symptomatic of a larger organisational problem. Safety must be analysed and treated from a systems perspective.

New IEA Web Address

The IEA web pages can now be found at: ergonomics-iea.org. Included at the site is Ergonomics International, which appears on the web some weeks before it is distributed in printed format. Information about the IEA and its activities and other news can be found there, and an electronic journal is also in preparation.

Latest publication about gerontotechnology

In this investigation we measured the physical (58 variables), psycho-motor (12 variables) sensory (7 variables) and cognitive (2 variables) capacity of 627 independent living elderly and compared this with a group of 123 younger people, age 20-30. For every variable we tried to formulate: applications, examples, warnings, tips and tricks and design guidelines. The book contains 435 pages and is written in English. There is more information about this book on our web-site: www.io.tudelft.nl/research/ergonomics

Design-relevant characteristics of ageing users; backgrounds and guidelines for product innovation.

Editors: L.PA. Steenbekkers and C.E.M. van Beijsterveldt
Series Ageing and Ergonomics 1 Delft University Press, 1998 fax + 31-152781661 phone: + 31-2783254 email:dup@dup.tudelft.nl

Board of Certification in Professional Ergonomics

The Board of Certification in Professional Ergonomics (BCPE), founded in 1988, has certified almost 1000 candidates. Now the part-time executive director, Dieter Jahn, has passed the baton to a new full-time Executive Director, Ms. Krismen Alvord. The email address (bcpehq@bcpe.org) and web site (bcpe.org) have not changed.

Ergonomics In Indonesia

Ergonomics and Exercise Physiology Seminar

A one day seminar on Ergonomics and Exercise Physiology was held on 18 November 1998 in Denpasar, Bali, Indonesia. It was organised by the Post Graduate Studies programmes in Ergonomics and in Sports Physiology together with Alumni and the Laboratory of Physiology at the School of Medicine, University of Udayana. The organising committee was chaired by Dr Susila and Dr Sutjana, under the auspices of Prof. Adnyana Manuaba.

All together, 60 papers were presented, including 34 on ergonomics and 20 on Sport/Exercise Physiology. The keynote speaker was Professor John Carlson, from CRESS, University of Victoria, Melbourne, Australia, who gave a presentation entitled. The Role of Ergonomics and Sport Science in Enhancing Human Performance: Detrimental or Beneficial?

Around 100 delegates attended from various parts of Indonesia, representing academia, medicine, the aircraft industry and the government. It was a successful meeting seen in both the quality and quantity of papers presented, and numbers of participants. This was especially so given the recent economic and political conditions in Indonesia, which has had a great negative impact on the work of scientists and their products.

Aviation Medicine Symposium

A symposium on Aviation Medicine was held 12 December 1998 also in Denpasar, Bali. This was a joint activity by the Faculty of Medicine, University of Udayana, the Indonesian Airforce, and the Aviation and Air Space Health Association.

The objective was to introduce aviation medicine to the health communities in Bali in particular, and the community at large in general. The Symposium was opened by the Chief of Staff of the Airforce and followed by signing a Memorandum of Understanding between the Rector of the university and the Airforce Chief of Staff, related to joint researches, education and training, and public services.
There were 7 papers presented and discussed, 5 from the airforce and 2 from the university. The last two related to Ergonomics and Safety and Occupational Health, presented by Prof. A. Manuaba and Prof. Adiputra. The other topics included flight safety evacuation, clinical application and postgraduate curriculum on Aviation Medicine.

There were 220 participants from various health offices, schools, and organisation besides medical and postgraduate students on ergonomics and sport physiology. This symposium was also enlivened by an exhibition related to Aviation Medicine.

It was an interesting symposium, held for the first time in Bali and with no registration fees for the delegates.

Adyana Manuaba

Psychophysiology in Ergonomics (PIE)

PIE has grown to a membership of about 185. The IEA Technical Group’s 2nd autonomous international conference, PIE’98, took place 7-8 October 1998 at Kehanna Plaza, Japan. To obtain a copy of the 200 page Proceedings, mail a check for 30 $US (includes shipping) to Prof. Fumio Yamada, Laboratory of Psychology, Osaka Prefectural College of Nursing, 3-7-30, Habikino, Habikino, Osaka 583-8555, JAPAN.

The 3rd international PIE Conference, PIE 2000, will be held in San Diego, California in conjunction with IEA2000 on July 28-August 4, 2000.

In 1998, elections for PIE officers were held. The results were: President Wolfram Boucsein (Wuppertal, Germany) President-Elect John Hinton (Glasgow, Scotland) Directors at large Richard Backs (Mt. Pleasant, MI, USA), Arthur Kramer (Champaign, IL, USA), Shinji Miyake (Kitakyushu, Japan), Holger Ursin (Bergen, Norway)

Officer’s terms are two years. John Stern (St. Louis, MO, USA) will remain in the Past President’s office for another two years. Robert Hanning (Storrs, CT, USA) will remain Secretary/Treasurer until 1999 because his term is 3 years.

Our web site is www.uni-wuppertal.de/ FB3/psychologie/physio/pie.htm

PROF. WOLF BOUCSEIN
President PIE
boucsein@uni-wuppertal.de

Occupational Health

The 26th triennial congress of the International Commission on Occupational Health (ICOH) will be held 27 August - 1 September 2000 in Singapore. The 25th (1996) was held in Stockholm and the 24th (1993) was held in Nice. The 35 ICOH Scientific Committees and Working groups will be organizing symposia. There will be plenary lectures, mini-symposia, scientific and poster sessions, and study tours as well as the opportunity to see the sights of Singapore. Contact ICOH2000, Dept. of COFM, Faculty of Medicine, MD3, National University of Singapore, Lower Kent Road, Singapore 119074. Email: ICOH2000@postt.com

PROF. J. JEFFATRATAN
President, ICOH2000

IEA 2000

The 14th IEA Congress, 30 July to 4 August 2000, will be in San Diego, CA, USA.

Paper sessions will be 14 minutes each (including questions); electronic proposals (submitted via the IEA 2000 Web site) are due June 18, 1999. For those unable to submit electronically, proposals are due earlier, on May 25. Those whose proposals have been accepted will be required to send payment for registration with their proceedings papers by 15 January 2000.

The congress proceedings, in both paper and CD-ROM format, will be given to all attendees who register for the full week. They will have the option to decline the paper proceedings, with a $50 savings on their registration fee.

Some rooms will be available free for groups who wish to hold meetings; reservations will be on a first-come first-served basis.

Each of the 21 HFES Technical Groups will hold a meeting on either Tuesday or Wednesday of the conference; international colleagues with similar interests are invited. Following most of these meetings, there will be a social hour with refreshments.
Plan to bring your family and enjoy Disneyland, Sea World, Hollywood and the other California attractions. The Conference hotel, the Marriott, is on the beach. Mexico is just 30 minutes away.

There will be an extensive technical visit program.

The IEA 2000 web site is iea2000.hfes.org

The IEA Secretariat is headed by Lynn Strother, HFES, PO Box 1369, Santa Monica, CA 90406-1369, USA; fax: + 1 310 394 2410;

Email: Lynn Strother@compuserve.com; Web: hfes.org

HAL HENDRICK
Chair, IEA 2000
HHendrick@AOL.com

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**Branch News**

**WA**

Better Skills, Better Future:

Practical Skills for Work 1999

Conference Update 11th - 13th October 1999 Fremantle, Western Australia

Please mark the conference date in your diaries. The registration brochures will be with you shortly. Thanks to all members who responded to the Expression of Interest brochures - the preferences expressed for workshops have helped shape the program and it is looking great.

The main focus of the Conference will be on workshop participation covering a range of ergonomics and other topical issues. We are aiming to give participants the opportunity to improve their practical ergonomics skills.

The keynote speakers are Dr Arne Aaras of Norway and Dr Kee Yong Lim of Singapore.

The social program is shaping up nicely and should provide a great opportunity for networking and getting to know Fremantle.

For further information, please contact:

Keynote Conferences
PO Box 1126
West Leederville
WA 6901

PH: (08) 9382 3799 or email: keynote@ca.com.au

See you in October.

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**SA**

To be held in Adelaide from Oct 9 - 11, 2000, the ESA 2000 Conference will be aimed at bringing research and practical ergonomics together. Apart from the formal proceedings of the scientific meeting, we are planning some industry-based sessions and sessions aimed at the general community.

The timing is not within University holidays - the Olympics and school holidays have taken all of that - however, we ask that academics plan their time around the conference given we are able to give plenty of warning.
October in Adelaide is really lovely and we plan to show it to conference participants at its best. Be prepared for a warm welcome!

Please let your overseas colleagues know the conference is on, too. They might like to combine their attendance at ESA 2000 with a look-in at the Olympics!

QLD
The Queensland Branch has been successful in the last couple of months in obtaining representation to Government. We were successful in having three members appointed to Industry Sector Standing Committees as established under the Workplace Health and Safety Act 1995. The Branch nominated a member to each of the 7 Standing Committees. Members appointed are:

Ann Nugent - Rural Industry Sector Standing Committee
Elizabeth Bunker - Health and Community Services Industry Sector Standing Committee
Jim Carmichael - Hospitality, Recreation and Other Industry Sector Standing Committee

The role of these committees is to provide advice and to make recommendations to the Workplace Health and Safety Board about workplace health and safety in their respective Industry Sectors.

It is also pleasing to note that two members of the ESA were appointed to the Workplace Health and Safety Board - although not appointed in their capacity as members of the ESA.... I warmly congratulate Geoff McDonald and Margaret Cook and wish them the best in this challenging role.

The Queensland Branch of the ESA has also sought and received the right of comment into the Draft Manual Tasks Advisory Standard being compiled by the Division of Workplace Health and Safety.
Epidemiologic Review

Appendix A of Musculoskeletal Disorders (MSDs) and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back
Edited by: Bruce P. Bernard, M.D., M.P.H. July 1997

Various investigators have used different occupational epidemiologic methods to identify the patterns of work-related MSD occurrence in different working groups, as well as the factors that influence these disease patterns. The following section briefly summarizes these study designs and then addresses the most common biases (such as misclassification or selection) that can affect the results of these studies.

TYPES OF EPIDEMIOLOGIC STUDY DESIGNS REVIEWED
The NIOSH reviewers have first addressed studies that use a prospective approach. Prospective cohort studies, identify groups of subjects (exposed and nonexposed) and observe them over a period of time to compare the number of new work-related MSD cases in the two groups. All subjects are initially disease-free. The rate (or risk) of new cases (the incidence) is calculated for both groups, and the ratio of these two incidences (the relative risk or rate ratio, RR) can be used to assess the association of the exposure with the occurrence of the MSD. A RR greater than 1.0 implies that the incidence of cases was higher in the exposed group than in the nonexposed group and that an association has been observed between the exposure and the disease. A confidence interval (CI) is derived, which is an estimated range of values within which the true RR is likely to fall. The CI reflects the precision of the effect observed in the study. Ordinarily, if the CI includes 1.0, the association between the exposure and the MSD could be due to chance alone and the elevated odds ratio (OR) is not considered statistically significant.

The cohort study ensures that the exposure to work-related factors occurs before the observation of the MSD, thereby allowing a causal interpretation of the observed association. Cohort studies are often done prospectively; they follow a group of current workers forward in time.

The length of time required for a prospective study depends on the problem studied. With adverse health conditions that occur as a result of long-term exposure to some factor in the workplace, many years may be needed. Extended time periods make prospective studies costly. Arguing causation is more difficult with extended time periods because other events may affect outcome.

Prospective studies that require long periods of time are especially vulnerable to problems associated with worker follow-up, particularly worker attrition (workers discontinue participation in the study) and worker migration (diseased workers move to other employment before investigators ascertain their disease).

The second type of epidemiologic study evaluated for this document is the case-control study, which is retrospective and examines differences in exposures among workers with (cases) and without (controls) MSDs. In such studies, cases should be all incident (new) cases in a given population over a defined period or a representative sample of the cases. Controls should be a representative sample of non-cases from the same population. The ratio of the odds of exposed cases to the odds of exposed controls is called the OR. An OR above 1.0 indicates an association between the exposure and the work-related MSD, and a 95% CI indicates the probable range of the true OR. Case control studies are useful for evaluating rarely occurring conditions or small numbers of cases. One limitation of case control studies is the difficulty of obtaining accurate information about past exposures. In occupational studies of MSDs, a further limitation of case-control studies is the difficulty of identifying cases who are representative of all cases that occurred in a defined period (many of these workers will have left the workforce). Another problem with case-control studies is the selection of an inappropriate control group.

Third, the reviewers considered cross-sectional studies. Cross-sectional studies provide a "snapshot in time" of a disease process; that is, they measure both health outcomes and exposures at a single point in time. These studies usually identify occupations with differing levels of exposure and compare the prevalences of MSDs in each group. Cross-sectional studies are most useful for identifying risk factors of a relatively frequent disease.
with a long duration that is often undiagnosed or unreported [Kleinbaum et al. 1982]. Typically, cross-sectional studies do not provide the evidence of the correct temporal relationship between exposure and disease inherent in prospective studies, but they nevertheless can be valuable. Some cross-sectional studies discussed here had inclusion criteria such as working at a specific job for a defined period of time before onset of symptoms. This condition adds a dimension of temporality to the studies. A common problem with cross-sectional studies that use surveys is obtaining sufficiently large response rates; many people who are asked to participate decline because they are busy, not interested, etc. The conclusions are therefore based on a subset of workers who agree to participate, and these workers may not be representative of or similar to the entire population of workers. Furthermore, cross-sectional studies are often confined to current workers who may not be representative of true prevalence rates if workers with disease have left the workforce. (The problem of representativeness is not confined to cross-sectional studies and may occur in the other study designs mentioned whenever subjects are selected, decline, or drop out.) Either ORs or prevalence ratios (PRs) (proportion of diseased in exposed divided by the proportion of diseased in unexposed) may be used to report results in cross-sectional studies.

The last type of observational study used is the case-series study, in which certain characteristics of a group (or series) of cases (or patients) are described. The simplest design is a set of case reports for which the author describes some interesting or intriguing observations that occurred in a small number of patients. Cases included in case series have usually been drawn from a single patient population, whose makeup may have influenced the observations noted because of selection bias. Case-series studies frequently lead to a generation of hypotheses that are subsequently investigated in a cross-sectional, case-control, or prospective study. Because case-series do not involve comparison groups (who do not have the condition or exposure to the risk factors being studied), some investigators would not consider them epidemiologic studies because they are generally not planned studies and do not involve any research hypotheses.

BIASES AND OTHER ISSUES IN EPIDEMIOLOGIC STUDIES

In interpreting the validity of epidemiologic studies to provide evidence for work-relatedness of MSDs, several assumptions and sources of bias must be considered when analyzing the findings from such studies.

1. Selection bias (internal validity). In occupational health studies, at least two types of selection bias may occur: (a) a selection of "healthy workers" in the work population studied, and (b) an exclusion of "sick" workers who leave the active workforce. Both of these biases tend to cause an underestimate of the true relationship between a workplace risk factor and an observed health effect because the workers who are in better health tend to be those in the workforce and available for study.

A basic assumption underlying the analysis of these studies is that the selected cases of work-related MSDs in the specific studies are representative of all workers at that worksite with work-related MSDs. In a single study, representativeness generally increases with increasing population size and participation rate. A parallel assumption is that the nondiseased groups are representative of the entire nondiseased population. The fact that some cases leave the workforce causes the disease prevalence among currently employed workers to be underestimated. However, if cases are missing from the current workforce in equal proportion for both nonexposed and exposed workers, the underestimate of prevalence will not affect the internal validity of the study.

2. Generalizability (external validity). Some studies are based on a single population, occupation, or restricted database (individual insurance companies, specific industrial settings) and, therefore, the sample may not be representative of the general population. Another assumption is that MSD cases in one study are comparable to cases in another study. This assumption needs particular scrutiny in work-related MSD studies because no standardized case definitions may exist for the particular illnesses.

3. Misclassification bias. Misclassification bias may be introduced during selection of cases and determination of their exposure. Erroneous diagnoses may result in work-related MSD cases misclassified as noncases, and similarly, noncases may be misclassified as cases. The
calculated RR or OR would usually underestimate the true association because of a dilutional effect if both exposed and nonexposed cases are equally misclassified. Similarly, misclassification can occur when determining the exposure factor of interest. Again, such misclassification will create a bias towards finding no association if equal misclassification is assumed for cases and noncases.

4. Confounding and effect modification. Other factors may explain the supposed relationship between work and disease. Confounding is a situation in which the relationship (in this case with MSDs) appears stronger or weaker than it truly is as a result of something (the confounder) being associated with both the outcome and the apparent causal factor. In other words, the risk estimate is distorted because symptoms of exposed and nonexposed workers differ because of some other factors that cause disease. For example, diabetes might result in abnormal nerve conduction testing, a sign of CTS. If a higher proportion of exposed workers than nonexposed workers were diabetic, diabetes would act as a positive confounder, causing an apparent exposure-disease association.

An effect modifier is a factor that alters the effect of exposure on disease. For example, it is possible that repetitive motion causes tendinitis only in older workers; in this case, age would be an effect modifier. Although effect modification is not a bias per se, if an investigator has failed to analyze old and young workers separately, the investigator might have missed a true work/disease association.

5. Sample size, precision, and CIs. The CI around an estimated measure of effect (such as a RR) is an estimated range of values in which the true effect is likely to fall. It reflects the precision of the effect observed in the study. Large studies generally have smaller CIs and can estimate effects more precisely. In studies that are "statistically significant" the CI excludes the null value for no effect (for example, a RR of 1.0). Small studies are generally less precise, lead to wider CIs, and less likely to be "statistically significant" even if the exposed have a greater prevalence of disease than the nonexposed.

References available at http://www.cdc.gov/niosh/ergoref.html
Individual Factors Associated with Work-Related Musculoskeletal Disorders

Appendix B of Musculoskeletal Disorders (MSDs) and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back
Edited by: Bruce P. Bernard, M.D., M.P.H. July 1997

Complete document -
http://www.cdc.gov/niosh/ergoc11.html

Although the purpose of this document is to examine the weight of evidence for the contribution of work factors to MSDs, the multifactorial nature of MSDs requires a discussion of individual factors that have been studied to determine their association with the incidence and prevalence of work-related MSDs. These factors include age [Guo et al. 1995; Biering-Sorensen 1983; English et al. 1995; Ohlsson et al. 1994]; gender [Hales et al. 1994; Johansson 1994; Chiang et al. 1993; Armstrong et al. 1987a]; anthropometry [Werner et al. 1994b; Nathan et al. 1983, Hellervoara 1987]; and cigarette smoking [Finkelstein 1995; Owen and Damron 1984; Svensson and Andersson 1983; Kelsey et al. 1990; Hildebrandt 1987], among others. Nonoccupational physical activities, such as nonoccupational VDT use, hobbies, second jobs, and household activities that might increase risk for MSDs are described in the detailed tables for those studies in which they were analyzed as risk factors.

A worker’s ability to respond to external work factors may be modified by his/her own capacity, such as tissue resistance to deformation when exposed to high force demands. The level, duration, and frequency of the loads imposed on tissues, as well as adequacy of recovery time, are critical components in whether increased tolerance (a training or conditioning effect) occurs, or whether reduced capacity occurs which can lead to MSDs. The capacity to perform work varies with gender and age, among workers, and for any worker over time. The relationship of these factors and the resulting risk of injury to the worker is complex and not fully understood.

Certain epidemiologic studies have used statistical methods to take into account the effects of these individual factors (e.g., gender, age, body mass index), that is, to control for their confounding or modifying effects when looking at the strength of work-related factors. Studies that fail to control for the influence of individual factors may either mask or amplify the effects of work-related factors. The comments column of the detailed tables notes whether studies have adjusted for potential confounders.

A number of factors can influence a person’s response to risk factors for MSDs in the workplace and elsewhere. Among these are the following:

AGE

The prevalence of MSDs increases as people enter their working years. By the age of 35, most people have had their first episode of back pain [Guo et al. 1995; Chaffin 1979]. Once in their working years (ages 25 to 65), however, the prevalence is relatively consistent [Guo et al. 1995; Biering-Sorensen 1983]. Musculoskeletal impairments are among the most prevalent and symptomatic health problems of middle and old age [Buckwalter et al. 1993].

Nonetheless, age groups with the highest rates of compensable back pain and strains are the 20–24 age group for men, and 30–34 age group for women.

In addition to decreases in musculoskeletal function due to the development of age-related degenerative disorders, loss of tissue strength with age may increase the probability or severity of soft tissue damage from a given insult.

Another problem is that advancing age and increasing number of years on the job are usually highly correlated. Age is a true confounder with years of employment, so that these factors must be adjusted for when determining relationship to work. Many of the epidemiologic studies that looked at populations with a wide age variance have controlled for age by statistical methods. Several studies found age to be an important factor associated with MSDs [Guo et al. 1995; Biering-Sorensen 1983; English et al. 1995; Ohlsson et al. 1994; Rihimaki et al. 1989a; Toomingas et al. 1991] others have not [Herberts et al. 1981; Punnett et al. 1985]. Although older workers have been found to have less strength than younger workers, Mathiowetz et al. [1985] demonstrated that hand strength did not decline with aging; average hand pinch and grip scores remained relatively stable in their population with a range of 29 to 59 years. Torell et al.
[1988] found no correlation between age and the prevalence of MSDs in a population of shipyard workers. They found a strong relationship between workload (categorized as low, medium, or heavy) and symptoms or diagnosis of MSDs.

Other studies have also reported a lack of increased risk associated with aging. For example, Wilson and Wilson [1967] reported that the age and gender distribution of 88 patients with tenosynovitis from an ironworks closely corresponded to that of the general population of that plant. Similarly, Wissman and Badger [1978] reported that the median age of workers with chronic hand and wrist injuries in their study was 23 years, while the median age of the unaffected workers was 24 years. Riihimaki et al. [1989a] found a significant relationship between sciatica and age in machine operators, carpenters, and sedentary workers. Age was also a strong risk factor for neck and shoulder symptoms in carpenters, machine operators and sedentary workers [Riihimaki et al. 1989a]. Some authors may have incorrectly attributed age as the sole cause of their findings in their analysis, when data presented suggested a relationship with work [Schotland et al. 1991].

An explanation for the lack of an observed relationship between an increased risk for MSDs and aging may be "survivor bias" (this is different from the "healthy worker effect"). If workers who have health problems leave their jobs, or change jobs to one with less exposure, the remaining population includes only those workers whose health has not been adversely affected by their jobs. As an example, in a study of female plastics assembly workers, Ohlsson et al. [1989] reported that the degree of increase in the odds of neck and shoulder pain with the duration of employment depended on the age of the worker. For the younger subjects, the odds increased significantly as the duration of employment increased (p = 0.01), but for the older ones no statistical change was found with length of employment. The older women who had been employed for shorter periods of time had more reported symptoms than the younger ones, while older workers with longer employment times reported fewer symptoms than younger workers. Ohlsson et al. [1989] interviewed 76 former assembly workers and found that 26% reported pain as the cause of leaving work. This finding supports the likely role of a survivor bias in this study, the effect of which is to underestimate the true risk of developing MSDs, in this case in the older workers.

GENDER

Some studies have found a higher prevalence of some MSDs in women [Bernard et al. 1994; Hales et al. 1994; Johansson 1994; Chiang et al. 1993]. A male to female ratio of 1:3 was described for carpal tunnel syndrome (CTS) in a population study in which occupation was not evaluated [Stevens et al. 1988]. However, in the Silverstein [1985] study of CTS among industrial workers, no gender difference could be seen after controlling for work exposure. Franklin et al. [1991] found no gender difference in workers compensation claims for CTS. Burt et al. [1990] found no gender difference in reporting of neck or upper extremity MSD symptoms among newspaper employees using video display terminals (VDTs). Nathan et al. [1988, 1992a] found no gender differences for CTS. In contrast, Hagberg and Wengman [1987] reported that neck and shoulder muscular pain is more common among females than males, both in the general population and among industrial workers. Whether the gender difference seen with some MSDs in some studies is due to physiological differences or differences in exposure is unclear. One laboratory study, Lindman et al. [1991], found that women have more type I muscle fibers in the trapezius muscle than men, and have hypothesized that myofascial pain originates in these Type I muscle fibers. Ulin et al. [1993] noted that significant gender differences in work posture were related to stature and concluded that the lack of workplace accommodation to the range of workers' height and reach may in part, account for the apparent gender differences. The reporting bias may exist because women may be more likely to report pain and seek medical treatment than men [Armsington et al. 1993; Hales et al. 1994]. The fact that more women are employed in hand-intensive jobs and industries may account for the greater number of reported work-related MSDs among women. Bystrum et al. [1995] reported that men were more likely to have de Quervain's disease than women; they attributed this to more frequent use of hand tools. Some studies have reported that workplace risk
factors account for increased prevalence of MSDs among women more than personal factors (e.g., Armstrong et al. [1987a], McCormack et al. [1990]). In a recent evaluation of Ontario workers compensation claims for "RSI," Asbury [1985] reported a RR for female to male claims ranging from 1.3 to 1.8 across industries. Within 5 different broad occupational categories, females were approximately 2–5 times as likely to have a lost-time RSI claim. No information on gender differences in hand intensive jobs was reported. May researchers have noted that men and women tend to be employed in different jobs.

In order to separate the effect of work risk factors from potential effects that might be attributable to biological differences, researchers must study jobs that men and women perform relatively equally.

SMOKING

Several papers have presented evidence that a positive smoking history is associated with low back pain, sciatica, or intervertebral herniated disc [Finkelstein 1995; Owen and Damron 1984; Frymoyer et al. 1983; Svensson and Anderson 1983; Kelsey et al. 1984]; whereas in others, the relationship was negative [Kelsey et al. 1990; Riihimaki et al. 1989b; Frymoyer 1993; Hildebrandt 1987]. Bohuizen et al. [1993] found a relationship between smoking and back pain only in those occupations that required physical exertion. In their study, smoking was more clearly related to pain in the extremities than to pain in the neck or the back. Deyo and Bass [1988] observed that the prevalence of back pain increased with the number of pack-years of cigarette smoking and with the heaviest smoking level. Heliovaara et al. [1991] only observed a relationship in men and women older than 50 years. Two studies did not find a relationship between sciatica and smoking among concrete reinforcement workers and house painters [Heliovaara et al. 1991; Riihimaki et al. 1989b].

In the Vilkari-Juntura et al. [1994] prospective study of machine operators, carpenters, and office workers, current smoking (OR 1.9 1.0–3.5), was among the predictors for change from "no neck trouble" to "severe neck trouble." In a study of Finnish adults ages 30–64, [Makela et al. 1991], neck pain was found to be significantly associated with current smoking (OR 1.3, 95% CI 1–1.81) when the logistic model was adjusted for age and gender. However, when the model included mental and physical stress at work, obesity, and parity, then smoking (OR 1.25, 95% CI 0.99–1.57) was no longer statistically significant [Makela et al. 1991]. With univariate analysis, Holmström [1992] found a PR of 1.2 (95% CI 1.1–1.3) for neck-shoulder trouble in "current" smokers versus "never" smokers. But using multiple logistic regression, when age, individual and employment factors were in the model, only "never smoked" contributed significantly to neck-shoulder trouble. Toomingas et al. [1991] found no associations between multiple health outcomes (including tension neck, rotator cuff tendinitis, CTS or problems in the neck/scapula or shoulder/upper arm) and nicotine habits among platers, assemblers and white collar workers. In a case/referent study, Wieslander et al. [1989] found that smoking or using snuff was not related to CTS among men operated on for CTS.

Several explanations for the relationship have been postulated. One hypothesis is that back pain is caused by coughing from smoking. Coughing increases the abdominal pressure and intradiscal pressure and puts strain on the spine. A few studies have observed this relationship [Deyo and Bass 1988; Frymoyer et al. 1980; Tramp et al. 1987]. The other mechanisms proposed include nicotine-induced diminished blood flow to vulnerable tissues [Frymoyer et al. 1983], and smoking-induced diminished mineral content of bone causing microfractures [Svensson and Anderson 1983]. Similar associations with diminished blood flow to vulnerable tissues have been found between smoking and Raynaud’s disease.

PHYSICAL ACTIVITY

The relationship of physical activity and MSDs is more complicated than just "cause and effect." Physical activity may cause injury. However, the lack of physical activity may increase susceptibility to injury and after injury, the threshold for further injury is reduced. In construction workers, more frequent leisure time was related to healthier lower backs [Holmström et al. 1993] and severe low back pain was related to less leisure time.
activity [Holmstrom et al. 1992]. On the other hand, some standard treatment regimes have found that musculoskeletal symptoms are often relieved by physical activity. Having good physical condition may not protect workers from risk of MSDs. NIOSH [1991] stated that persons with high aerobic capacity may be fit for jobs that require high oxygen uptake, but will not necessarily be fit for jobs that require high static and dynamic strengths and vice versa.

When physical fitness is examined as a risk factor for MSDs, results are mixed. For example, some early case series reported an increased risk of MSDs associated with playing professional sports [Bennet 1946; Nirschl 1983], or with physical fitness and exercise [Kelsey 1975b; Dehlin et al. 1978, 1981] while other studies indicate a protective effect and reduced risk [Cady et al. 1979; Meyer et al. 1985; & #143;strand et al. 1987; Biering-Sorensen 1984]. Boyce et al. [1991] reported that only 7% of absenteeism could be explained by age, sex, and physical fitness among 514 police officers 35 years or older. Cady et al. [1979, 1985], on the other hand, found that physical capacity was related to musculoskeletal fitness. Cady defined fitness for most physical activities as combinations of strength, endurance, flexibility, musculoskeletal timing and coordination. Cady et al. [1979] evaluated male fire fighters and concluded that physical fitness and conditioning had significant preventive effects on back injuries (least fit 7.1% injured, moderately fit 3.2% injured and most fit 0.8% injured).

However, the most fit group had the most severe back injuries. Low cardiovascular fitness level was a risk factor for disabling back pain in a prospective longitudinal study among aerospace manufacturing workers by Battle et al. [1989]. Good endurance of back muscles was found to be associated with low occurrence of low back pain [Biering-Sorensen 1984].

Few occupational epidemiologic studies have looked at non-work-related physical activity in the upper extremities. Most NIOSH studies [Hales and Fine 1988; Kiken et al. 1990; Burt et al. 1990; Baron et al. 1991; Hales et al. 1994; Bernard et al. 1994] have excluded MSDs due to sports injury or other nonwork-related activity or injury and have not included these factors in analyses. However, many of the risk factors that are important in occupational studies occur in sports activities—forceful, repetitive movements with awkward postures.

A combination of high exposure to load lifting and high exposure to sports activities that engage the arm was a risk factor for shoulder tendinitis, as well as osteoarthritis of the acromioclavicular joint [Stenlund et al. 1993]. Kennedy et al. [1978] found that 15% of competitive swimmers with repetitive overhead arm movements had significant shoulder disability primarily due to impingement from executing butterfly and freestyle strokes. Epicondylitis in professional athletes has been well documented, and many of the biomechanical and physiological studies of epicondylitis have been conducted in professional tennis players and baseball pitchers [King et al. 1969; Nirschl 1993]. One prospective study of healthy baseball players has found slowing of the suprascapular nerve function as the season progresses [Ringel et al. 1990]. Scott and Gijbers [1981] found an association between athletic performance and pain tolerance, and suggested that physically fit persons may have a higher threshold for injury.

In summary, although physical fitness and activity is generally accepted as a way of reducing work-related MSDs, the present epidemiologic literature does not give such a clear indication. The sports medicine literature, however, does give a better indication that sports involving activities of a forceful, repetitive nature (such as tennis and baseball pitching) are related to MSDs. It is important to note that professional sports activities usually provide players (i.e., workers) with more substantial breaks for recovery and shorter durations for intense tasks as compared with more traditional work settings in which workers are required to perform repetitive, forceful work for 8 hours per day, 5 days per week.

**STRENGTH**

Some epidemiologic support exists for the relationship between back injury and a mismatch of physical strength and job tasks. Chaffin and Park [1972] found a sharp increase in back injury rates in subjects performing jobs requiring strength that was greater or equal to their

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24
isometric strength-test values. The risk was three times greater in the weaker subjects. In a second longitudinal study, Chaffin et al. [1977] evaluated the risk of back injuries and strength and found the risk to be three times greater in the weaker subjects. Keyserling et al. [1980] strength-tested subjects, biomechanically analyzed jobs, and assigned subjects to either stressed or non-stressed jobs. Following medical records for a year, they found that job matching based on strength criteria appeared to be beneficial. In another prospective study, Troup et al. [1981] found that reduced strength of back flexor muscles was a consistent predictor of recurrent or persistent back pain, but this association was not found for first time occurrence of back pain.

Other studies have not found the same relationship with physical strength. Two prospective studies of low back pain reports (or claims) of large populations of blue collar workers [Battle et al. 1989; Leino 1987] failed to demonstrate that stronger (defined by isometric lifting strength) workers are at lower risk for low back pain claims or episodes. One study followed workers for ten years after strength testing and the other followed workers for a few years. Neither of these studies included precise measurement of exposure level for each worker, so the authors could not estimate the degree of mismatch between workers' strength and tasks demands. Battle et al. [1990] compared workers with back pain with other workers on the same job (by isometric strength testing) and did not find that workers with back pain were weaker. In two studies of nurses [Videman et al. 1989; Mostardi et al. 1992] lifting strength was not a reliable predictor of back pain.

When examined together, these studies reveal the following: The studies that found a significant relationship between strength/job task and back pain used more thorough job assessment or analysis and have focused on manual lifting jobs. However, these studies only followed workers for a period of one year, and whether this same relationship would hold over a much longer working period remains unclear. Studies that did not find a relationship, although they followed workers for a longer period of time, did not include precise measurements of exposure level for each worker, so they could not assess the strength capabilities that were important in the individual jobs. Therefore, they could not estimate the degree of mismatch between workers' strength and task demands.

ANTHROPOMETRY

Weight, height, body mass index (BMI) (a ratio of weight to height squared), and obesity have all been identified in studies as potential risk factors for certain MSDs, especially CTS and lumbar disc herniation.

Few studies examining anthropometric risk factors in relationship to CTS have been occupational epidemiologic studies; most have used hospital-based populations who may differ substantially from working populations. Nathan et al. [1989, 1992, 1994] have published several papers on the basis of a single industrial population and have reported an association between CTS and obesity; however, the methods employed in their studies have been questioned in a number of subsequent publications [Gerr and Letz 1992; Stock 1991; Werner et al. 1994b]. Several investigators have reported that their industrial study subjects with CTS were shorter and heavier than the general population [Cannon et al. 1981; Dieck and Kelsey 1983; Falk and Aarnio 1989; Nathan et al. 1992; Werner et al. 1994b; Wieselander et al. 1989]. In the Werner et al. [1994b] study of a clinical population requiring electrodiagnostic evaluation of the right upper extremity, patients classified as obese (BMI > 29) were 2.5 times more likely than slender patients (BMI < 20) to be diagnosed with CTS. Werner et al. [1994b] developed a multiple linear regression CTS model (with the difference between median and ulnar sensory latencies as the dependent variable) that demonstrated that BMI was the most influential variable, but still only accounted for 5% of the variance in the model. In Nathan's [1994a] logistic model, body mass index accounted for 8.6% of the total risk; however, this analysis used both hands from each study subject as separate observations, although they are not independent of each other. Falk and Aarnio [1983] found no difference in BMI among 17 butchers with (53%) and without (47%) CTS. Vessey et al. [1990] found that the risk for CTS among obese women was double for that of slender women. The relationship of CTS and BMI has been suggested to relate to increased fatty tissue within the carpal canal or to increased hydrostatic
pressure throughout the carpal canal in obese persons compared with slender persons [Werner 1994b].
Carpal tunnel canal size and wrist size has been suggested as a risk factor for CTS, however, some studies have linked both small and large canal areas to CTS [Bleecker et al. 1985; Winn and Habes 1990].

For back MSDs, Hrubec and Nashold [1975] found that height and weight were predictive of herniated disc disease among World War II U.S. army recruits compared with age-matched controls. Some studies have reported that people with back pain, are, on the average, taller than those without it [Rowe 1966; Tauber 1976; Merriam et al. 1980; Birling-Sorensen 1983]. Heliövaara et al. [1987], in a Finnish population study, found that height was a significant predictor of herniated lumbar disc in both sexes, but a moderately increased BMI was predictive only in men. Severe obesity (exceeding 30 kg/m2) involved less risk than moderate obesity. Kelsey [1975a] and Kelsey et al. [1984] failed to reveal any such relationships between height or BMI among patients with herniated lumbar discs and control subjects. Magora and Schwartz [1978] found an association between obesity and radiological disc degeneration, but Kellgren and Lawrence [1958] did not. A study of Finnish white collar and blue collar workers found no association between overweight (relative weight (> 120%)) and lumbosacral disorders either cross-sectionally or in a 10-year follow-up [Aro and Leino 1985].

Scherhout et al. [1985] found that short stature was significantly associated with pain in the neck and shoulder among workers in 11 factories, but not in the back, forearm, hand and wrist. Height was not a factor for neck, shoulder or hand and wrist MSDs among newspaper employees [Bernard et al. 1994]. Kvarnström [1983a] found no relationship between neck/shoulder MSDs and body height in a Swedish engineering company with over 11,000 workers.

Anthropometric data are conflicting, but in general indicate that there is no strong correlation between stature, body weight, body build and low back pain. Obesity seems to play a small but significant role in the occurrence of CTS.

References available at http://www.cdc.gov/niosh/ergoref.html

Testimony of Vernon S. Ellingstad, PhD Director, Office of Research and Engineering National Transportation Safety Board before the Surface Transportation and Merchant Marine Subcommittee Senate Commerce Committee U.S. House of Representatives regarding Fatigue in the Trucking and Rail Industry September 16, 1998

Madam Chairwoman and Members of the Committee,

I am pleased to represent the National Transportation Safety Board on the subject of fatigue and its safety effects on the commercial motor vehicle and railroad industries. Your hearing today will certainly highlight some of the work that has been done in this area, and will go far to evaluate the public's awareness of the problem.

Based on our investigative experience, we are very much aware of the pervasive adverse effects of sleep-related problems on transportation safety. Several high-profile accidents investigated by the Safety Board that involved fatigue included the grounding of the Exxon Valdez in Prince William Sound, Alaska, in 1989; the crash of a DC-8 in Guantanamo Naval Air Station in 1983; the failed commercial space launch of the Pegasus near Cape Canaveral, Florida, in 1983; the crash and explosion of a propane laden truck in White Plains, New York, in 1994; and the collision of two Union Pacific trains that collided near Delia, Kansas, in June 1997.

Fatigue problems permeate our entire society, placing a heavy toll on our safety, productivity, and quality of life. The factors contributing to fatigue are becoming increasingly prominent. As the demand for goods and the availability of transportation continues to grow, the time we want to wait for such services continues to decrease. Our society now demands that goods be shipped anywhere in the country -- or even around the world -- overnight.

Although fatigue has assuredly been with us for a long time, it was not until the industrial age and the advent of complex machinery that fatigue became a major hazard to life and limb. Today, we need only drive from our homes, live near railroad tracks, or board an airplane to face first-hand potential dangers from operator fatigue. Also, our waters can be polluted by accidents like the Exxon Valdez, in which crewmembers suffer from fatigue.
In our investigations, the Safety Board has identified serious and continuing problems concerning the far-reaching effects of fatigue, sleepiness, sleep disorders and circadian rhythm disruption in transportation system safety. We have seen repeated instances of poor scheduling of work and rest periods in all the modes of transportation that have adversely affected the performance of the operating personnel.

These investigations also indicate that many transportation employees and supervisors fail to understand the problems associated with inadequate work and rest schedules. And, with few exceptions, management and labor segments alike fail to consider properly the harmful consequences that irregular and unpredictable work and rest cycles can have on people who operate vehicles.

What is interesting about fatigue is that we are not very good at judging when we are fatigued or the effects of fatigue on us. According to sleep researchers, tired people typically underestimate the extent of their fatigue, and therefore don’t make rational decisions about their fitness for duty.

We have all experienced the dramatic effects of extreme fatigue when we have tried to drive an hour longer than we should, or we tried to stay up to watch a movie or read a book. Often, the effects of fatigue are more subtle and, therefore, more insidious. But we are getting better at identifying fatigue, and, more importantly, we are learning how to counteract it. Much of the success in this area has been accomplished thanks to the work of scientists at NASA and other institutions who have developed an extraordinary body of research on fatigue and measures to counter the effects of fatigue.

In November 1995, the Safety Board co-sponsored a multi-modal symposium with the NASA Ames Research Center’s Fatigue Countermeasures Program on the effects of fatigue in transportation. Nearly 600 people from 16 countries attended. The “Managing Human Fatigue in Transportation: Promoting Safety and Productivity” symposium highlighted the importance of fatigue countermeasures. Although the NASA countermeasures program, as well as the other research findings presented at the symposium, were developed for aviation, they can be adapted for the other modes of transportation as well.

As a result of our investigations and studies specifically targeting fatigue, the Safety Board has issued nearly 80 fatigue-related safety recommendations since 1972 to the Department of Transportation’s (DOT) Federal Aviation Administration (FAA), Federal Railroad Administration (FRA), Federal Highway Administration (FHWA) and Coast Guard, as well as transportation operators, associations and unions. Human fatigue in transportation operations has been an issue on our “Most Wanted” list of safety improvements since the inception of the list in 1990.

In 1989, we issued three major safety recommendations to the DOT calling for a coordinated and aggressive federal program to study and address the fatigue problem in all modes of the transportation industry. Specifically, the Safety Board urged the DOT (1) to expedite a coordinated research program on the effects of fatigue, sleepiness, sleep disorders, and circadian factors on transportation system safety; (2) to develop and disseminate educational material for transportation industry personnel and management regarding shift work, work and rest schedules, and proper regimens of health, diet, and rest; and (3) to review and upgrade regulations governing hours of service for all transportation modes to assure that they are consistent and that they incorporate the results of the latest research on fatigue and sleep issues. In response to these recommendations, the Secretary of Transportation indicated his intent to emphasize human fatigue and sleep issues in the National Transportation Policy, and to include the modal administrations in a concerted effort to reduce the effect of fatigue on transportation safety.

More than nine years have elapsed since the Board issued these three recommendations to the DOT. We have been pleased with the amount of research that has been conducted regarding fatigue, as was evident at the Board symposium, and have, consequently closed recommendation (1) above as “Acceptable Action.” We are also beginning to see an increase in the amount of educational material on fatigue being developed and disseminated to transportation industry personnel. However, we are very disappointed in the efforts to change the hours-of-service regulations.
In our opinion, the Department of Transportation has failed to address one of the most important transportation safety issues facing our society today.

HIGHWAY AND HUMAN FATIGUE

In 1980, the Safety Board released a study of 182 fatal-to-the-driver heavy truck accidents and found that driver impairment due to fatigue was the most frequently cited cause or factor (31 percent) of the accidents investigated.

As a result of this study, the Safety Board recommended that the FHWA require automated/tamper-proof on-board recording devices, such as tachographs or computerized logs, to identify commercial truck drivers who exceed hours-of-service regulations. The intent of the recommendation was to provide a tamper-proof mechanism that could be used to enforce the hours-of-service regulations, rather than relying on drivers' handwritten logs. The current status of that recommendation is "Closed-Unacceptable Action."

On-board recording devices are an important tool not only with regard to monitoring hours of service but also as support in accident investigations. We believe they should be used universally. Closing this recommendation as "unacceptable action" reflects our disappointment in the FHWA and the trucking industry's failure to embrace advanced technology that will improve highway safety.

The Safety Board believes that on-board recording devices in all modes of transportation are important, and we included a category of automated recording devices on our "Most Wanted" list of safety improvements last year.

A second Safety Board study regarding factors that affect fatigue in heavy truck accidents was issued in 1985. In that study, we found that the three most important factors in predicting a fatigue-related accident were (1) the duration of the last sleep period, (2) the total hours of sleep obtained during the 24 hours prior to the accident, and (3) the breaking of sleep into small blocks of time, or split sleep patterns.

As a result of that study, the Safety Board recommended that the FHWA revise the hours-of-service regulations. Specifically, the Board urged them to complete rulemaking within two years to revise the pertinent federal regulations to require sufficient rest provisions to enable drivers to obtain at least eight continuous hours of sleep after driving for 10 hours or being on duty for 15 hours. In November 1986, the FHWA issued an advance notice of proposed rulemaking requesting additional information on fatigue research/issues. The comment period was extended to mid-1987. According to the FHWA, they plan to issue a notice of proposed rulemaking (NPRM) in the fall or winter of 1998, if everything goes according to schedule. To say that we are disappointed that we have not yet reached the NPRM stage would be an understatement. Notwithstanding our support for research, we believe the results of our 1995 study of actual accidents and the wealth of scientific research already done provides concrete and sufficient evidence of the measures that affect fatigue in the accident environment and that the FHWA should proceed immediately to change the hours-of-service regulations. We believe further delays are unacceptable.

Madam Chairwoman, an example of an accident involving truckdriver fatigue may have occurred on September 1, 1998, near Holyoke, Colorado. A large schoolbus was struck in the rear by a tractor semitrailer. When it was stopped along the side of a road, the truck came to rest on the roadway and the schoolbus rotated about 180 degrees and overturned onto its left side. Two students on the bus sustained major injuries and were airlifted to nearby hospitals.

After the accident, the truckdriver told the police that he thought he had fallen asleep. This is the third accident investigated by the Board's Office of Highway Safety in the past 2 years in which a heavy truck has collided with the rear of a stopped schoolbus. I might mention that one of the accidents occurred in Chappell Hill, Texas, in April 1998. We are looking into the issue of truckdriver fatigue in all three of these accidents.

RAILROAD AND HUMAN FATIGUE

For many years, the Safety Board has been concerned about the unpredictable nature of train crew work assignments and its effect on crew fatigue. Although there are some exceptions, most train crews are subject to call with little notice. The Board pointed out in its
1985 report on Burlington Northern Railroad collisions in Wiggins, Colorado, and Newcastle, Wyoming that railroad crews are subjected to the most unpredictable work/rest cycles in the transportation industry. We have investigated far too many accidents in which the lack of sleep and the irregular and unpredictable work schedule of train crews have been causal to the accidents.

Chairwoman Hutchison, it is the Safety Board's view that the Railroad Hours of Service Act is flawed. It was when it was first enacted in 1907, and has remained flawed through its substantial revision in 1969 and its amendments in 1976 and 1988. We believe that the Railroad Hours of Service Act encourages work schedules that combine excessive hours on duty and minimum opportunity for rest, and there is no scientific basis for the work/rest provisions in the current law. In addition, Board railroad accident investigations in which fatigue was a cause or factor show that train crew members were in full compliance with the Hours of Service laws. Let me expand these points.

The current railroad hours-of-service laws permit, and many railroad carriers require, the most burdensome fatigue-inducing work schedule of any federally regulated transportation mode in this country. A comparison of the modes is revealing. The aviation, highway, marine and rail modes all have federally imposed limits on the amount of work and rest in a 24-hour period. The aviation and highway modes also impose weekly limits. Only aviation has monthly and annual limits. To keep the comparison simple, consider the number of hours an employee of each mode is permitted to work in the course of a 30-day month:

1. A commercial airline pilot can fly up to 100 hours per month;

A truck driver can be on duty up to about 280 hours per month;

Shipboard personnel, at sea, cannot operate more than 360 hours per month, and only 270 hours per month when in port; and

Locomotive engineers can operate a train up to 432 hours per month, which equates to more than 14 hours a day on each of those 30 days.

We fail to understand why a locomotive engineer, or other train crew member, is permitted to work more than 4 times longer than an airline pilot, and 1.5 times longer than a truck driver.

Let me emphasize that we are not advocating reducing everybody's hours to 100 hours a month. Our point is that allowing any transportation worker in a safety-sensitive position-operating powerful equipment through our Nation's cities to work more than 400 hours per month is excessive, if not downright unconscionable.

The Safety Board also believes that the hours-of-service laws have no scientific basis. In fairness to those who framed the laws in 1907, there was little more than anecdotal knowledge about fatigue at that time. But in the last two decades, the scientific and research communities have conducted extensive in-depth studies of sleep and fatigue. We now know a great deal about the structure of sleep, the effects of human biological or circadian rhythms, and the debilitating effects that cumulative sleep loss has on alertness and health.

The railroad hours-of-service laws prescribe only maximum hours on duty and a minimum amount of rest in a 24-hour period. They do not take into account (1) how human circadian rhythms interact with the time of day when the work/rest periods take place, (2) the cumulative effects of working an unlimited number of successive days, or (3) the long-term health effects of various work/rest schedules. In short, it is time for a substantial scientifically-based revision to the Hours of Service Act. Unfortunately, little meaningful progress has been made, we believe, because the solution requires a fundamental change in habits and culture - and neither is easy to change. Labor has grown accustomed to the extra money earned and companies save money by employing fewer operators. This was made evident in testimony given at a recent Safety Board hearing on railroad safety. We must all recognize that fatigue is debilitating, and that fewer workers and more overtime are the fundamental ingredients for fatigue.

In all of the railroad accident investigations in which the Board has determined fatigue to be a causal or contributing factor, the train crew members were in full compliance with the hours-of-service laws. However, I
should add that in a number of our investigations, some
crew members did not avail themselves of the opportunity
to get sleep during their off-duty period. The irregular
schedules appear to be the problem in this industry.
Generally, the train crew either had an expectation that they
would be called for duty at a later time, or their
time off was during the day and they found it difficult
to sleep.

While we applaud the work being done at some
individual railroad companies, this problem is not
unique to any one railroad. It is a national problem that
is deserving of national attention. Reducing the hours-
of-service parameters would prevent gross abuses of
work hours and would provide a level playing field
upon which all workers can be provided a healthier
work environment.

I would like to share with you a fax that one of the
Board's railroad investigators recently received from
the widow of the engineer who was killed in the collision
that occurred in July 1997 near Della, Kansas. Her fax
provides us with a poignant perspective on this issue:

"On July 1, 1997, my husband Mike called the
recording to find out when he would supposedly be
going to work. Afterwards, he left to run errands.
Later I called the recording too, but of course it said
the same thing all day. That he was on the line-up
for 5:00 p.m.

That afternoon he came home and called it again.
After listening he said 'well, as usual the lyin-ass line-
up isn't holding up.' Mike and some of his co-workers
called it the 'lyin-ass line-up,' being that it was so
highly inaccurate. Several hours went by before
they finally called him for 8:30 p.m. This was a
common occurrence. He never knew when he would
leave, how long he would be gone, or how long he
would be home, either. He used to say our local
weather forecaster was more reliable than the line-up.
We could never plan anything. About the time he
would decide to give up on the call and make other
plans, they would call him to work. Sometimes he
would be ready for work, 8 to 12 hours before he
would finally receive a call. There is no other industry
that I am familiar with, which is so unprofessional as
to keep their employees uninformed about something
as essential as their work schedule. The last time I called
that recording, it was again inaccurate. It said Mike
was still on duty. That was 8:30 a.m. July 2, 1997,
approximately two hours after Mike was pronounced
dead."

Madam Chairwoman, we as a government need to decide
to what extent the status quo is acceptable. If we can
agree that fatigue-caused accidents are unacceptable,
then we must move to change the status quo.
Electronic Resources

OCCUPATIONAL OVERUSE SYNDROME REVIEW

THE CONTINUING PROBLEM OF OOS IN THE OFFICE.
Sharonne Phillips, MOHS, MESA
(Phillips @ worksafe.gov.au)

The following is a brief overview of a 32 page article available in Ergonomics Australia On-Line
(http://www.uq.edu.au/eaol)

ABSTRACT
Much work over the last twenty years has identified factors associated with the development of occupational overuse syndrome (OOS). Although management strategies have been developed to assist workers and supervisors to control such factors, recent data indicate that the problem still persists. Further, it is acknowledged that OOS is an international problem, with many sufferers hoping for some "magic cure". A variety of companies produce a myriad of products for users to help alleviate the risk of OOS.

This paper reviews the recent literature on OOS with a particular focus on the impact of new technology for addressing this problem in the office environment.

INTRODUCTION
Work duties within many industries involve repetitive movements. Hand and wrist tasks can be considered repetitive if the basic action is repeated within 30 seconds. (1) So, for example, computer mouse usage qualifies as a repetitive task. Many software programs are "mouse driven", particularly those involving data entry and text or graphics editing tasks. The amount of time spent completing repetitive tasks over the working day is significant. (1) The body can recover from stressful work tasks if there is enough variation in the tasks and/or "rest" time, although an individual’s experience and characteristics are an essential component of the healing rate.

THE SCOPE OF THE PROBLEM
Whilst compensation statistics often do not list OOS as a separate condition, over the last eight years there has been a steady increase in the number of people claiming work-related compensation for symptoms occurring in their neck, shoulders, arms, hands, fingers and thumbs. These can be used as an approximation of OOS injuries, and the same trends have been revealed in many countries, including Australia, USA, Canada and some European countries.

BACKGROUND AND RECENT STUDIES
Many elements of office work, equipment used to complete work-related tasks, and the human response to these interventions, are examined in this section of the paper, with specific consideration of:

Computer keyboards
Computer mouse
"Ergonomics-styled" keyboards
Notebook and laptop computers with flat panel displays
Large screen computer technology
Eye strain and monitor height
Training programs
Speech recognition programs and
Miscellaneous OOS issues

DISCUSSION AND CONCLUSION
Many of the published studies involve small sample sizes, no doubt in part due to the problems associated with completing "real world" studies. It may therefore be difficult to find statistically significant results that can be generalised across working populations.

The availability of new technology is increasing and this, combined with labour market changes, may encourage its widespread acceptance. However, there may be an increased risk of occupational health and safety injuries as workers and managers may not fully understand the implications of implementing these changes in the workplace.

Due to the diversity of equipment and the speed with which new technology is introduced into workplaces, it is no longer appropriate for ergonomics guidelines to stipulate a single design for the "ideal office" or "optimal" location of equipment, unless adjustability is emphasised. It is absolutely vital that advice be given
only after a thorough assessment of the users needs and work duties has been conducted.

References:

OTHER RESOURCES
The RSI Network newsletter
The RSI Network newsletter is going strong and is now in its second year as a CTDN publication. Its introduction and archives have also been relocated and can now be found at <http://www.ctdn.org/rsinet>


American Optometric Association
The Relationship of Computer Vision Syndrome to Musculoskeletal Disorders <http://www.aoanet.org/ia-musculo.html>

Preventative Measures Ease Computer Eye Strain and Other Health Problems <http://www.aoanet.org/nr-preventive.html>


Bausch & Lomb Reference Desk -- Computer Vision Syndrome
<http://www.bauscheyecare.com/vision/cvs.htm>

The IBM Ergonomics Update newsletter is now available on the web at: www.pc.ibm.com/us/healthycomputing

"Five Theories of Change Embedded in Appreciative Inquiry" by Gervase Bushe for the World Congress of OD held in Dublin in 1998. It is available at http://www.bus.sfu.ca/homes/gervase/gervase.html

The national Safety Council website has details of an ASC Z365 draft standard on Control of Cumulative Trauma Disorders: http://www.nsc.org/news/z3652.htm

OSHA issued its "Working Draft of a Proposed Ergonomics Program Standard" on February 18, which you can find on the agency's website < http://www.osha-slc.gov/SLTC/ergonomics/ergoreg.html >


The Dutch RSI-Center http://wwwrsi-center.com

The first international cyberspace conference on ergonomics, CybErg 1996, was highly successful with over 1,000 participants from 34 countries. As can be seen from the virtual proceedings of CybErg 1996 (http://www.curtin.edu.au/conference/cyberg/cyberg96.html) and a summary report (http://cyberg.curtin.edu.au/1996summ.html) participants thought the conference was very valuable.

For CybErg 1999, we plan a few improvements to make it even more valuable to participants. These include each participant receiving a CD with all the papers in various formats. This will enable papers to be read from the website, their CD or printed on paper, making paper reading faster and easier. We will also use mirror sites to make discussions faster. In addition to quality papers covering the full spectrum of ergonomics, we will also have several symposia on “hot” topics such as the optimal position of VDUs.

Another way we intend to improve discussion is to have not only awards for the best papers (courtesy of Elsevier Science Publications) but to also have prizes for the best participation (courtesy of Liberty Mutual.)

We will also be providing opportunities for live discussion every Friday during the conference month (courtesy of Gymbreak).

These improvements will come at a cost - CybErg 199 will not be free – however the cost will be extremely cheap compared to a “fleish” international conference. Registration before 31st May will cost only $75 Australian dollars (about 5,500 yen, 45 Euro, 50 US dollar), and later registration will still only be $110.

Whilst for many people this represents little more than a token fee, for some, especially those in industrially developing countries, this could represent a significant financial burden. To offset this, Worksafe Western Australia has provided sponsorship to subsidise the registration costs for these people.

CybErg conferences were established: 1) to provide quality international discussion on the full range of ergonomics issues for little expense, 2) to improve the quality of international discussion and 3) to encourage the broadening of ergonomics discussions to encompass more non Western industrial views.

To contribute to these aims you can 1) submit an Abstract by 9th April (see details at http://cyberg.curtin.edu.au/), 2) share this information with interested colleagues and 3) register to participate (details will be available in April).
Conference Calendar

1999
May 9-12, 3rd National Conference on Injury Prevention and Control, Brisbane, Secretariat: IPC 99/Intermedia, PO Box 1280 Milton Qld 4064 Tel: 07 3369 0477 Fax: 07 3369 1512 Email: icle99@im.com.au Web: www.isu.flinders.edu.au/aipn/3ncipc/

May 12-15, 9th European Congress on Work and Organizational Psychology, Espoo-Helsinki, FINLAND. Contact Sanne-Leena Savola, FIOH, Topeliuksenkatu 41 a A, FIN-00250, sasaa@occuphealth.fi

May 19-21 4th Int. Computer-Aided Ergonomics and Safety Conference, Barcelona SPAIN. Contact Markku Leppanen, PO Box 541, FIN-33101 Tampere FINLAND; mleppane@cc.tut.fi; http://www.caes99.org

June 6-9 14th annual Int. Occupational Ergonomics and Safety conference, Orlando, FL, USA. Contact Prof. Gene Lee, Dept. of Ind. Engineering, Univ. of Central Florida, Orlando, FL 32816; GLEE@mail.ucf.edu

June 15-17, TQM and Human Factors, Linkoping, Sweden. email pigjo@udsliu.se; fax: +46 13 122299

June 16-19 European Conference on Transport Psychology, Angers, FRANCE. Contact Secretariat AEPSAT, BP 808, Place Andre Leroy 49008 Angers Cedex 01 FRANCE; europsat@uco.fr; www.inrets.fr

June 21-23, People in Control - International Conference on human interfaces in control rooms, cockpits and command centres, Bath, UK. Email: PIC99@iie.org.uk; http://www.iie.org.uk/Conf/PIC99

August 8-13, International Society of Biomechanics Congress. Calgary, Canada. Contact: Ph. +1 403 220 6228, Fax +1 403 284 4184, email: mastroh@acs.ucalgary.ca, http://www.kin.ucalgary.ca/ISB99

September 15-17, European Symposium on Safety in the Modern Society Helsinki FINLAND. Contact Ms Kristiina Kulha, FIOH, Topeliuksenkatu 41 a A, FIN-00250, Helsinki FINLAND; Kristiina.Kulha@occuphealth.fi

September 27- October 1, 43rd Annual meeting of Human Factors and Ergonomics Society, Houston. Hfes@compuserve.com http://hfes.org

October 11-13th, 35th Annual ESA Conference, Freemantle, WA. Contact Keynote Conference, PO Box 1126, West Leederville, WA 6901. Ph + 61 8 9382 3799 Fx + 61 8 9380 4006. Email: keynote@ca.com.au.

2000

IEA 2000 29 July-4 August 2000 in San Diego, California, USA. Contact IEA/IEFES 2000, IEF, PO Box 1369, Santa Monica, CA 90406-1369, USA; Email: IEA@compuserve.com http://iea2000.hfes.org

August 22nd-25th, Asia Pacific conference of computer human interaction, S.E. Asian Ergonomics Society conference, Singapore. Email myklim@ntu.edu.sg.

27 August - 1 September 28th ICCH International Conference, Singapore. Contact Secretariat ICCH2000, c/o Dept of Community, Occupational and Family medicine Faculty of Medicine MD3, Lower Kent Ridge Road, Singapore 119260.


2002
August 3-8, 4th World Congress on Biomechanics, University of Calgary, Canada.