International Society of Biomechanics Newsletter

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AFFILIATE SOCIETIES OF ISB:
American Society of Biomechanics; British Association of Sports Science; Canadian Society of Biomechanics; China Sports Biomechanics Association; Czechoslovak Committee on Biomechanics; French Société de Biomécanique; Korean Society of Biomechanics; Polish Society of Biomechanics; Sports Commission of the Soviet Union.

ISB News

Proposed ISB Working Group

CLINICAL AND ATHLETIC FOOTWEAR

Some ISB members hope to establish a Working Group in the area of footwear mechanics. The general purpose of the working group will be to provide a forum for ISB members interested in the biomechanics of clinical and athletic footwear. If enough interest is generated, the Working Group could eventually become a Technical Group, under the provisions of ISB's constitution.

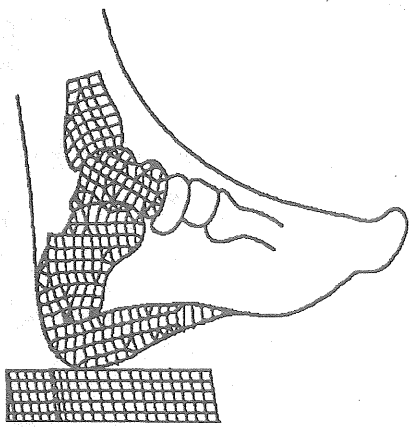
While the group is not yet formalised, the following ISB members have agreed to support the initiative:

Gordon Valiant, Ph.D., NIKE Inc., USA.
Simon Leuthi, Ph.D., adidas AG, Switzerland.
E.C. "Ned" Frederick, Ph.D., Exeter Research,USA
Prof. Benno Nigg, University of Calgary, Canada.
Prof. Peter Cavanagh, Penn. State University, USA
Martyn Shorten, Ph.D. USA.

An inaugural meeting will be held during the forthcominmg ISB Congress in Paris. Everyone interested in the Working Group is cordially invited to attend a brief meeting on Thursday July 6th, following the morning sessions.

DATE:	Thursday 6th July
TIME:	Following the scheduled sessions
VENUE:	ISB Congress 91 Boulevard de l'hopital 6th floor, Room 616

For more information, or simply to express interest, please contact Martyn Shorten by -
FAX: (USA# 503-774-7868), or EMAIL,
(INTERNET:73700.263@COMPUSERVE.COM)



Laboratory feature

Faculty of Human Movement Sciences
Vrije Universiteit, Amsterdam, The Netherlands

Introduction

The Faculty of Human Movement Sciences (Faculteit der Bewegingswetenschappen) of the Vrije Universiteit in Amsterdam, The Netherlands, was founded in 1971 as a Faculty of Physical Education. At no time this faculty was involved in the education of teachers in Phy Ed, for which other institutions exist in The Netherlands. Its task is primarily conducting science in various fields and disciplines relevant for the understanding of human movement. In 1987, when a new law on tertiary education was adopted, the Faculty's name was changed to the present more appropriate one.

Majors are offered in the following departments:

A. Medical-biological departments:- Exercise Physiology, Functional Anatomy, Health Sciences,

B. Social Sciences departments:- Educational Sciences, Psychology, Theory and History of Human Movement Sciences.

A major subject in the biomedical disciplines has to be combined with a minor in the Social Sciences and vice versa. The faculty delivers graduates with multidisciplinary qualification for a wide variety of jobs. A quarter to one third of these appointments is in some kind of medical or technical research, pre- dominantly in human movement. Ergonomics, Rehabilitation, Health and Welfare Insurance, Education of Physiotherapists, Pharmaceutical Industry and Sports are other areas of application. Research projects play a major role in the curriculum for all students: at least 20 and in some departments as much as 38 credit points (or full time weeks of work).

From the start of the Faculty Biomechanics has been taught in the Department of Functional Anatomy by Gerrit Jan van Ingen Schenau. This course has become compulsory for all students majoring in one of the biomedical departments and in recent years also for students of Psychology participating in research of on interceptive or of rhythmic movements using non-linear dynamics as a frame of reference for interpretation.

Research

Research programs in the biomedical departments comprise two major lines: (i) the study of the mechanics and physiology of repetitive or cyclic movements and (ii) the study of the role and function capabilities of individual muscles within human movement.

Cyclic movements

The general approach is to relate mechanical and energetic aspects of movements like speed skating, cycling, swimming, manual materials handling and wheelchair propulsion. For this approach motion is analyzed in the classic way using inverse dynamics and measuring the expenditure of energy in steady state conditions where the production of mechanical power is well known and mechanical efficiency may be assessed. Effects of training on technique of motion or on cardiovascular condi- tion, environmental constraints for efficiency, loads on the body system either mechanical or systemic may be the goal of analysis. Important issues concern the propelling efficiency in swimming (Peter Hollander and Gert de Groot); 3-D analysis of speed skating push off (Gert de Groot and Gerrit Jan van Ingen Schenau); development of a SPACAR-based model of arm and shoulder (DirkJan Veeger in cooperation with Frans van der Helm of Delft Technical University) and modelling of internal load in lifting (Huub Toussaint). Biomechanics and energetics of wheelchair propulsion is studied by Luc van der Woude, DirkJan Veeger and Rients Rozendal.

Individual muscles

In this program experiments are performed on human subjects as well as experimental animals. The former predominantly to obtain information about coordination of muscle activity, the latter to obtain information about individual muscle characteristics. Within the Department of Functional Anatomy the relation between architecture and functional capacity of muscle is analyzed. Muscle mechanics plays an important role in this. Functional muscle models are verified by experiments using dynamometry of experimentally stimulated in situ rat muscles. Models have been refined at the level of muscle fibres, their variation and position in the muscle, the aponeurosis and the interrelation between these muscle components. Effects of growth, immobilization and recovery on architecture and functional capacity of the muscle have been studied. Isometric and dynamic contractions, in supramaximally, and recently in submaximally stimulated preparations were analyzed. The study of human cadavers is used to obtain morphological parameters necessary for modelling of human movement. Peter Huijing who supervises this work was recently appointed as part-time Professor at the University of Twente where muscle models are applied in complex models of human gait within the School of Bioengineering. Within the Department of Exercise Physiology biochemically determined energetics at muscle level is related to performance of muscles or human subjects. Analysis of function in human complex movements like bicycling, vertical jumping, (sprint) running by inverse and direct dynamics completes this programme at the other end of the scale. This line of research leads to hypotheses on intermuscular

coordination and results in studying possible mechanisms in the CNS in bringing about these patterns of motion. Maarten Bobbert and Gerrit Jan van Ingen Schenau initiated and supervise this work. In cooperation with colleagues at Utrecht and Nijmegen Universities a study is started into the organization of multi joint movements including three Ph.D.-students. This study has been granted by the Netherlands Organization for Scientific Research.

Research in the Department of Psychology is focused on interceptive and on rhythmic movements. The analysis uses a non-linear dynamic approach. Ball-catching, tapping, juggling and human pathological gait are studied, the latter in cooperation with the Department of Physiotherapy of the Academic Hospital of the Vrije Universiteit. A close cooperation between Psychologists and Biomechanists resulted in research to fundamental questions of movement control.

The Department of Educational Sciences studies the development of premature infants as these form a population at risk. An aspect is development of motor skills and posture maintenance. Developmental psychology as well as Biomechanics are areas of expertise necessary for an adequate assessment of development. The biomechanical research conducted by a post-doc graduated in the Department of Functional Anatomy (Knoek van Soest).

Facilities and Equipment

Labs for Exercise Physiology comprise various set ups for the ergometric study of gross human movement as well as for mechanical and biochemical studies of in situ rat muscles. Functional Morphology runs five different set ups for the experimental study of mechanics and physiology in situ rat muscles, as well as facilities and equipment for histological and histochemical analysis and morphometry (a total of 225 m2 floor area) and has access to facilities for electron microscopic research and nuclear magnetic resonance in cooperation with other faculties at the Vrije Universiteit.

In addition to various smaller rooms of various dimensions, in use for special purposes by the Department of Psychology, the faculty has at its disposal a huge hall of 15 times 35 square meters and 6.5 m height. Complex movement is analyzed on the basis of data amassed with a Vicon system and two Kistler force plates, and various special purpose dynamometers. A large motor driven treadmill and Oxycon facilitates ergometry. Special purpose devices for wheelchair ergometry, measurement of instantaneous body length, analysis of lifting and of climbing can easily accommodated and used simultaneously in this large facility. For data acquirement and analysis IBM-compatible machines are used connected to a local network as well as to the University Computing Centre.

Curriculum

The Faculty is part of the Dutch tertiary educational system: a four years course leading to the grade of drs (doctorandus ore able to do a PhD study) equivalent to a M.Sc. degree in most Anglo-Saxon systems. Secondary education, starting at 12 years, comprises 6 years and a certain degree of specialization. This results in an entrance requirement for Faculty in Physics and Mathematics. After a first, selective and introductory, year students choose a Major of about 90 credit points, a Minor of 15 and all study general Research Methodology courses of about 20 credit points (a credit point equals a 40 hours week; a year comprises 42 credit points). Most Departments offer opportunities for the students to spend the last half a year of their curriculum abroad, participating in research of colleagues. They offer the same hospitality to students from abroad. An exchange programme between the University of Waterloo, Faculty of Applied Health Sciences Department of Kinesiology and our Department of Functional Anatomy is in the course for formalization.

Recent Publications

Dieen JH van, Oude Vrielink HHE, Toussaint HM; An investigation into the relevance of the pattern of temporal activation with respect to erector spinae muscle endurance. *Eur. J. Appl. Physiol.* 66, 1993, p.70-75.

Helm, FCT van der, Veeger HEJ, Pronk GM, Woude LHV van der, Rozendal RH; Geometry para meters of musculoskeletal modelling of the shoulder mechanism. *J. Biomech.* 25, 2, 1992, p. 129-144.

Huijing PA, Baan GC; Stimulation level dependent length force and architectural characteristics of rat gastrocnemius muscle. *J. EMG Kinesiol.* 2, 1992, p. 112-120.

Ingen Schenau GJ van, Cavanagh P; Power equations in endurance sports (Survey) *J. Biomech.* 23, 1990, p. 865-881.

Ingen Schenau GJ van, Boots PJM, Groot G de, Woensel WWLM van; The constrained control of force and position in multi-joint movements. *Neuroscience* 46, 1992, p. 197-207.

Jacobs R, Ingen Schenau GJ van; Control of an external force in leg extension in humans. *J. Physiol.* 457, 1992, p. 611-626.

Toussaint HM, Beek PJ; Biomechanics of competitive front crawl swimming. *Sports Med.* 13, 1992, p. 8-24.

Toussaint HM, Baar CE van, Langen PP van, Looze MP de, Dieen JH van; Coordination of the leg muscles in backlift and leglift. *J. Biomech.* 25, 1992, p. 1279-1289.

Veeger HEJ, Helm FTC van der, Woude LHV van der, Pronk GM, Rozendal RH; Inertia and muscle contr-action parameters for musculoskeletal modelling of the shoulder mechanism. *J. Biomech.* 24, 1991, p. 615-629.

Veeger HEJ, Woude LHV van der, Rozendal RH; Load on the upper extremity in manual wheelchair propulsion, *J. EMG Kinesiol.* 1, 4, 1991, p. 270-280.

Zuurbier CJ, Huijing PA; Influence of muscle architecture on shortening velocity of pennate muscle. *J. Biomechanics* 25, 1992, p. 1017-1026.

Announcements

12th INTERNATIONAL ERGONOMICS ASSOCIATION TRIENNIAL CONGRESS (IEA'94)

Toronto, Canada, August 15-19, 1994

A. *Research Papers* *Abstracts due August 31, 1993*

Research papers should describe a study or series of studies which contribute new information to some area of ergonomics. In the abstract, describe the reason for the study, the methodology, the overall results and highlight points which will be included in the discussion.

B. *Posters* *Abstracts due November 30, 1993*

Posters are appropriate for reporting studies which will not be completed in time for inclusion in one of the other categories (submission date is later and no paper needs to be submitted) or for more narrowly focussed topics and those more suited to face to face discussion. Abstract requirements are the same as for research papers and case studies, but only the abstracts for posters will appear in the proceedings.

C. *Abstracts*

Submit 4 copies of 500 word, double spaced, abstract(s), and include 4 keyword descriptors. Provide a cover letter indicating the type of submission (review, case study, research paper, etc.) and the general topic area(s) that the submission might be included with. Designate one of the authors as the contact person and provided a complete mailing address, telephone and facsimile numbers. **Submissions should be made to the Congress Secretariat. Indicate on the envelope that abstracts are enclosed and allow sufficient time for your submission to reach the Congress Secretariat by the applicable due date(s).**

Mail to:

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c/o JPdL Multi Management Inc.,
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CANADA

Tel: (416) 784-9396
Fax: (416) 784-0808

BIOMECHANICS POSITIONS AVAILABLE

FULL RESEARCH PROFESSORSHIP
FOUNDATION PROFESSORIAL CHAIR IN HUMAN MOVEMENT SCIENCE (TENURABLE)

University of New England, Australia

The Centre for Human Movement Science and Sport Management is located at the University of New England, Northern Rivers in Lismore on the East Coast of Australia. The Centre, through the Faculty of Health Sciences, offers an undergraduate degree with specialist majors in Exercise Science and Sport Management. Research degrees are offered at Honours, Masters and Ph.D. levels. In addition, a fee paying MBA in Sport Management is offered in conjunction with the Faculty of Business.

The Centre is housed in a modern facility with well equipped laboratories in biomechanics, kinesiology, exercise physiology and exercise biochemistry. Academic staff within the Centre have an active research profile such that the Centre has been recognised as one of five "key" areas of research within the University. Extensive funding for research projects has been attracted from both external and internal sources.

Applications are invited from outstanding scholars in any field of Human Movement/Exercise Science or Sport Management. The appointee will be expected to provide strong academic leadership within the Centre's programs, particularly the development of extensive research and postgraduate programs. Applicants should therefore have an extensive, successful teaching record at both the undergraduate and postgraduate levels. Further, they should have established an international profile within their area of research expertise; have an outstanding publication record and a demonstrated ability to attract funding for research.

The appointee may during his/her tenure, be expected to take on the role of Head of Centre.

Essential Criteria:

1. A higher degree at the Doctoral level.
2. An extensive publication record including papers in high quality international journals, at a level normally expected of Professorial appointments in Australian Universities.
3. International recognition for scholarship in a relevant area of Human Movement/Exercise Science or Sport Management.
4. A proven, extensive and successful record of teaching at the tertiary level.
5. A successful history of postgraduate supervision through to the doctoral level.
6. A demonstrated ability to attract funding for research from granting bodies.

7. Evidence of an ability to provide effective leadership in a research team situation and in particular to be able to facilitate and coordinate cooperative research projects.

Desirable Criteria:

1. An ability to communicate effectively with professional groups in other fields.

Closing date for applications is June 10, 1993.

UNENR is an equal opportunity employer. Smoking is not permitted in University Buildings.

Applications should be addressed to:

Personnel Department
University of New England, Northern Rivers
PO BOX 157
Lismore, 2480 NSW AUSTRALIA

For more information please contact:

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Centre for Human Movement Science and Sport Management
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ASSISTANT/ASSOCIATE PROFESSOR
Louisiana State University

Two academic positions are available in the Bioengineering Section for full-time research and students/residents teaching in Bone and Joint Mechanics and in Spine Mechanics, respectively.

Candidates should have a PhD degree in Bio-Engineering/Mechanics with demonstrated experience of research in Bone and/or Spine Mechanics. High quality facilities and equipment are available for advanced investigation in collaboration with orthopaedic surgeons within the Bioengineering Laboratory and associated clinical facilities. Candidates should submit a Curriculum Vitae and names of three referenees to:

Prof. M. Solomonow
Dept. of Orthopaedic Surgery
Louisiana State University Medical Center
2025 Gravier Street
New Orleans, LA 70112, USA

Tel: (504) 568-2251; Fax: (504) 568-4466

POST-DOCTORAL POSITION
University of California

The Ergonomics Laboratory at the University of California (Berkeley and San Francisco) is seeking applicants for a full-time postdoctoral research position. The successful applicant will primarily be responsible for engineering and design aspects of laboratory studies to investigate the biomechanics of hand and arm function associated with work. Duties also include assisting doctoral students (5) with instrumentation and study design issues and particip-ating in teaching two graduate courses in Ergonomics. The position will begin between July 1, 1993 and December 31, 1993 and support is available for a minimum of two years.

The research focus is on understanding the etiology of carpal tunnel syndrome and tendon disorders of the upper extremity related to work. The research also involves the evaluation of new concepts in the physical design of computer input devices (e.g. keyboards, mice) using physiologic methods. The researcher is encouraged to attend regular meetings of the University's Orthopaedics Research Group and Biomedical Engineering Seminars. The Ergonomics Laboratory is well staffed and equipped with a machine shop, Macintosh computer platforms and National Instruments data collection software and hardware.

The applicant should be an active scientist with a commitment to the field of occupational biomechanics. The applicant must possess a Ph.D. in an engineering field and should be knowledgeable in instrumentation, study design, laboratory techniques, electromyography, statistical methods and computer programming. Experience with Macintosh computers and LabView Software is desired. The applicant must be a U.S. citizen.

For further details contact:

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Thesis abstract

FUNCTIONAL LOAD OF THE LOW BACK

by

Jaap H. van Dieën

Work Study and Ergonomics Department, Institute of Agricultural Engineering, Wageningen, and Health Science Department, Faculty of Human Movement Sciences, Vrije Universiteit, Amsterdam, The Netherlands

Degree: PhD
Supervisors: Prof.dr. R.H. Rozendal; Dr. H.M. Toussaint

Mechanical loads on the low back appear to play a major role in the etiology of low back pain (LBP). In formulating useful preventive measures, insight in the interaction between the mechanical load and the structures of the low back of the individual is imperative. So far, attention has mainly been focused on the effect of peak loads, e.g. the lifting of heavy weights. In this approach the torque to be produced by the trunk extensor muscles during the task is compared to maximum voluntary torque, or the concomitant peak forces working on the motion segment are compared to data on the strength of this structure. Elimination of peak loads in occupational situations has not been very successful in reducing the number of back complaints. Apart from the intensity, the temporal characteristics of the load appear to determine the risk involved. The aim of the present study was to gain insight in the effects and risks of prolonged or repetitive sub-maximal loads and to test the validity of methods for the evaluation of these risks.

As a framework for this study the modified model on work-load and capacity was used. The model can be outlined as follows: If a person has to perform a certain task in a certain environment, this will force him or her to adopt certain postures, perform movements and to exert forces on the environment. As a consequence of this a mechanical load on structures in the low back will occur. For instance to lift an object a subject has to bend over and to exert an upward force on the object, as a consequence of which a rather high compression force on the lumbar motion segments will occur. The mechanical load will lead to a number of short-term consequences. To stick with our example the motion segment will be deformed. The extent to which it is deformed, depends on the characteristics of the subject (capacity), in this case the compressional stiffness of the motion segment, which depends on for instance the subject's age. In the long run these short-term effects may have consequences of a more permanent nature. Both positive (training) and adverse effects (e.g. LBP) may occur. Deformation of the vertebrae may be a stimulus for bone remodelling, strengthening the motion segment. On the other hand due to the deformation damage may occur which can contribute to the etiology of LBP.

Evaluation of the risk involved in performing certain tasks is mostly performed on the level of the mechanical load estimated by means of linked segment models. The short-term effects, have been coined functional load. The use of parameters of functional load as indicators of the risk has a number of advantages. When a correct parameter of functional load is chosen, the relation with the long-term consequences is more direct, and relevant influences such as the duration of the load and the individual capacity are incorporated in the parameter itself. E.g. the deformation of the motion segment is dependent on both intensity and duration of loading and as stated above also on individual characteristics. This thesis deals with the functional load of the motion segments and the low back muscles.

In the first part the functional load of the motion segments in compression is studied. The measurement of spinal shrinkage offers information on the compressional deformation of the motion segments in vivo. Chapter 2 gives a review of the use of this method, discussing its validity and applicability. With regard to the validity the question arises, whether deformation has any link with the risk of the development of LBP. Chapter 3 deals with this question. It is shown that the energy stored in deforming the motion segment is a good predictor of damage to the motion segments irrespective of the loading regime applied. It is therefore, concluded that information on the deformation of the motion segments is relevant. The deformation at a given load is determined by the visco-elastic properties of the motion segments. It has been shown that these properties depend on the degree of degeneration and of the age of the motion segments. Chapter 4 explores the possibility of determining part of these properties on the whole spine in vivo, by means of the spinal shrinkage method. In chapter 5 this method is applied to evaluate the effect of age. It is shown that the effects of age are in line with the results found in in vitro tests of single segments, i.e. the rate at which equilibrium deformation is reached is higher in older subjects. Furthermore, it is tested whether this method yields valuable information in addition to a linked segment model. Two lifting techniques not differing in mean net moments around the lumbo-sacral joint are compared. The position of the motion segments, and the structures balancing the net moment may differ. It is tested whether the shrinkage method can yield any information on the effect of the latter differences. No

differences in shrinkage between the two techniques of lifting were found.

The second part of this thesis deals with the functional load of the low back muscles. Muscle activity invariably leads to muscle fatigue, a short-term effect. The latter is thought to play a role in the development of musculoskeletal complaints. A fairly strong relation exists between the level of muscle activity (i.e. the relative force exerted) and the rate of the fatigue process expressed by the endurance time. This relation is often used to estimate the development of fatigue. Chapter 6 discusses the use of this relation. It is concluded that a large variation in the relation exists between muscles, subjects and situations, mainly due to differences in fibre type and muscle perfusion. Therefore, methods yielding more insight in the physiological condition of the muscle have to be used. Chapters 7 and 8 evaluate the applicability of surface EMG to this end. It appears that spectral analysis of the EMG signals can be used to predict the endurance time in isometric contractions. The trunk extensor endurance of a subject for a given activity, can be seen as his or her capacity for this activity. As stated above endurance times show a large inter-subject variance. The influence of the coordination of the trunk extensor muscles on the endurance is studied in chapters 9 and 10. It appears that alternating activity between the trunk extensor muscles enhances endurance at moderate relative forces.

Chapter 11 gives a general discussion of the thesis, with special focus on inferences drawn from the results for epidemiology and ergonomics. Inter-subject variability depending on the individual capacity and the influence of the temporal characteristics of the load need more attention within these research disciplines.

Calendar of scientific events

June 30 - July 3, 1993
Second International Symposium on 3-D Analysis of Human Movement, Poitiers, France. Contact: Paul Allard, PhD, International Symposium on 3-D Analysis of Human Movement, Centre de recherche Hôpital Sainte-Justine, 3175 Côte Ste-Catherine, Montréal, PQ, H3T 1C5, Canada. Tel: +1(514)345-4740; Fax: +1(514)345-4801; E-mail: aissaoui@ere.umontreal.ca

June 30 - July 2, 1993
IVth International Symposium on Computer Simulation in Biomechanics, Paris France. Contact: B. Landjerit, Laboratoire de Biomécha niique, E.N.S.A.M., 151 Boulevard de l'Hôpital, 75013 Paris, France. Tel & Fax: 33.1.44.24.63.65.

July 4-8, 1993
XIVth Congress of the International Society of Biomechanics (ISB), Faculté de Médicine Pitié-Salpêtrie, Boulevard de l'Hôpital, Paris 13e, France. Congress Office: Convergences - I.S.B. '93, 120, avenue Gambetta, 75020 Paris, France. Fax: (33-1) 40.31.01.65; Telex: 216911 F.

July 9-13, 1993
First World Congress of Science and Racket Sports, Merseyside, England. Contact: Dr Mike Hughes, Centre for Sport and Exercise Sciences, Liverpool Polytechnic, Liverpool L3 3AF, England. Tel: +051 207 3581 ext. 2157.

October 21-23, 1993
17th Annual Meeting of the American Society of Biomechanics, University of Iowa, Iowa City, USA. Contact: Vijay K. Goel, PhD, Professor and Chair, Department of Biomedical Engineering, University of Iowa, 1202 Engineering Building, Iowa City, IA 52242-1527, USA. Tel: 319/335-5638; Fax: 319/335-3533.

December 1-3, 1993
Fifth Brazilian Biomechanics Congress, Santa Maria, Brazil. Congress Office: Secretaria do V Congresso Brasileiro de Biomecânica, Centro de Educação Fisica e Desportos, Universidade Federal de Santa Maria, Faixa de Camobi Km 09, Santa Maria -RS- CEP 119-900, Brazil. Fax: +55(055) 226-2238.

April 7-9, 1994
International Conference on Biomedical Engineering (BME'94), Hong Kong. Contact: BME'94 Conference Secretariat, c/o Rehabilitation Engineering Centre, Hong Kong Polytechnic, Hunghom, Kowloon, Hong Kong. Tel: 852-766-7683; Fax: 852-362-4365; E-Mail: PCRIS@HKPCC.HKP.HK.

June 21-24, 1994
Tenth Congress of International Society for Electrophysiology and Kinesiology (ISEK), Charleston, South Carolina, USA. Contacts: Richard Shiavi, Biomedical Engineering, Vanderbilt University, Nashville, Tennessee 37235, USA; Tel: (615) 322-3598; Fax: (615) 343-7919; E-mail: rgs@use.vanderbilt.edu, or Steve Wolf, Rehab. Med., Emory University School of Medicine, Atlanta, Georgia 30322, USA; Tel: (404) 727-4801; Fax: (404) 727-5895.

July 10-15, 1994
Second World Congress of Biomechanics, Amsterdam, The Netherlands. Congress Office: Biomechanics Section, Institute of Orthopaedics, University of Nijmegen, PO Box 9101, 6500 HB Nijmegen, The Netherlands. Tel: +31-80-613366; Fax: +31-80-540555.

August 9-11, 1994
International Congress on Applied Research in Sports, Helsinki, Finland. Contact: The Finnish Society for Research in Sport and Physical Education, Stadion, torniporras, SF-00250 Helsinki, FINLAND.

ISB membership news

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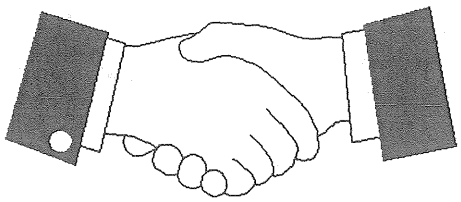

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