ISB

International Society of Biomechanics Newsletter

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AFFILIATE SOCIETIES OF ISB:
American Society of Biomechanics; British Association of Sport and Exercise Sciences; Bulgarian Society of Biomechanics; Canadian Society of Biomechanics/Société canadienne de biomécanique; Chinese Society of Sports Biomechanics; Comisia de Biomecanica Inginerie si Informatica (Romania); Czech Society of Biomechanics; Formosan Soceity of Biomechanics, Japanese Society of Biomechanics; Korean Society of Sport Biomechanics; Polish Society of Biomechanics; Russian Society of Biomechanics; Société de biomécanique (France).

From the President-Guenter Rau

Any answer may result in new questions – this sounds so trivial that I hardly dare to recall this experience. But since we have established a group of persons in ISB to look for standards and definitions we become faced with this experience again. The goal is to make experiments and results comparable independent of the part of the world, the laboratories and the group of people involved. Ge Wu approaches ISB members who may contribute by their input – please give her your support. If anybody has additional ideas or suggestions it would be appreciated – ultimately it is for your benefit! That there are many open questions can be learned from the effort which is within a European consortium to establish standardized surface EMG methods. The problem is not the measurement as such but the interpretation which is so difficult because of the biomechanical and neuromuscular properties.

The 10th International Conference on Mechanics in Medicine and Biology was held in Hawaii early this year. It was a very stimulating conference due to its broad scope, excellent scientific quality and the ample time for discussion. Prof. Wen-Jei Yang from the University of Michigan has been the chairman of the organizing committee since the start of this series, and he succeeded also this time to invite key note speakers of highest ranking.

The next upcoming big event will be the World Congress on Biomechanics in Sapporo, Japan. I do hope that many of the ISB members will participate. ISB members are involved in several symposia and invited as key note speakers. Unfortunately, although I serve as Vice Chairman ,will not be able to attend. However, I was happy to announce Benno Nigg to the Chairman Professor Fung as the official representative of ISB. Also in the future, ISB will be ready to actively take part in the organization of parts of the program within this conference series.

A very special highlight of this year was the IOC prize 1998. The winner of the IOC-Olympic Prize 1998 is Dr. Savio Lau-Yuen Woo. This prize is extremely prestigious and is awarded according to highest scientific criteria. Personally and on behalf of the ISB I wish to express to Savio Woo our highest appreciation and congratulations. This IOC-Olympic Prize will become recognized by an even increasing number of people all over the world because it is given as the first medal of each of the Olympic Games. Movement, exercise and sport are core areas of interest within the ISB. Therefore, this IOC-Olympic Prize will have a high significance for ISB, and we are proud of Dr. Woo to be the winner of the 1998 Prize.

Finally, I wish to mention the interest in the Student Initiative induced by Peter Cavanagh. I refer to it because I wish to disseminate the information about this program specifically to the students and their supervisors.

The ISB Council will have its 1998 meeting in Montreal on June 27, 1998 in connection with the ISEK Conference. The ISEK Conference is organized by Dr. Bertand Arsenault, and it will be an exceptional one since it is the 25th anniversary of ISEK. The founder of ISEK, Professor John Basmajian, will attend and will give a lecture on Saturday afternoon which nobody who can take part should miss. Also on my initiative, there will be a joint ISEK/ISB session where the ISEK President, Professor Jan Clarys, and myself will serve as co-chairpersons. After the Council Meeting, we hopefully can inform you about some decisions – among others: you will be interested in the site of the first conference in the new millennium.

From the President-Elect- Kit Vaughan

Professor James G Hay, better known to his colleagues around the world as Jim, will be retiring at the end of June 1998. Jim and his wife Hilary will be returning to their native New Zealand after almost 30 years at the University of Iowa. During this time Jim Hay has been a recognized world leader in the field of biomechanics. Among his many achievements being the period he served at President of the International Society of Biomechanics (1987-89). Part of Jim's outstanding legacy that he leaves for us all include his innovative research in sports biomechanics, his outstanding undergraduate textbooks, and the graduate students whom he trained. I am privileged to have been one of those students and I know that I speak for the biomechanics community when I say that we have all benefited from Jim's ideas, his enthusiasm and his wise counsel. We wish him and Hilary a long and fruitful retirement and we look forward to the possibility that these two Kiwis may join us at ISB congresses in the future.

From the Editor- Mark D. Grabiner

In addition to the transition commented upon by Kit Vaughan, there has been another that deserves our reflection. Earlier this spring, Dr. Gerrit Jan van Ingen Schenau of the Vrije Univesiteit in the Netherlands died of cancer. I did not personally work with Dr. van Ingen Schenau but one need not have known the man to have been influenced by his scientific and technological contributions to biomechanics. Dr. van Ingen Schenau interests impacted the areas of speed skating, most noticeably apparent in every world speed skating record having been recently broken by athletes using skates of his design. Further, Dr. van Ingen Schenau contributed to the literature in the areas of movement energetics, and coordination of multiarticular muscles as evidenced by the *Journal of Applied Biomechanics* requesting him to write a target article on the topic and which was published in 1997. Dr. van Ingen Schenau will be missed by the international biomechanics community.

THE IOC-OLYMPIC PRIZE 1998

Scientific research relating to movement, exercise, and sport has become increasingly important. To give recognition to this development and to honor outstanding scientific contributions related to movement, exercise, and sport, the International Olympic Committee (IOC), together with the sponsor, Parke-Davis, have created the IOC-OLYMPIC PRIZE, consisting of a medal and a financial award of US$250,000.00. The IOC-OLYMPIC PRIZE is awarded for identifiable *findings* resulting from outstanding basic or applied research which represent a significant discovery, contribute to the betterment of humankind, have a significant impact upon science and society, and are related to movement, exercise, and/or sport. Note that the IOC-OLYMPIC PRIZE is not given for lifetime achievements.

The winner of the 1998 IOC-OLYMPIC PRIZE

Dr. Savio Lau-Yuen Woo

was announced on January 13, 1998 in New York and was given the first medal of the Nagano Winter Olympic Games. The medal was handed to Dr. Woo during the Olympic meeting of the IOC-Session on February 2, 1998.

Dr. Woo is the A.B. Ferguson Professor and Vice Chairman for Research at the Department of Orthopaedic Surgery and Director of the Musculo-Skeletal Research Center at the University of Pittsburgh (Pennsylvania, USA).

Dr. Woo was selected for the IOC-OLYMPIC PRIZE in acknowledgement of his outstanding contributions to the understanding and development of:

- Innovative methods to quantify stress-strain relationships for connective tissue,
- Visco-elastic laws governing connective tissue,
- Effects of exercise and immobilization on soft tissue properties, and
- Possibilities for repair and healing of injured soft tissues

The selection committee came to the conclusion that the scientific quality of Dr. Woo's work is of the highest order. Dr. Woo's work provides a rare combination of in-depth research into fundamental problems of soft tissue integrity with broad ranging investigation of medical problems of direct clinical relevance. He researched these questions using and developing state of the art methodologies and a multidisciplinary approach including biomechanical, histological, and biochemical methods. The outstanding scientific quality of his work is underlined by the many prestigious awards he has received and his election to the National (USA) Academy of Sciences in two different categories, the Institute of Medicine (1991) and the Academy of Engineering (1994).

The impact of Dr. Woo's findings on the field of exercise science is substantial as the principles developed by him are known and used by biomechanists and orthopaedic surgeons and implemented by physical therapists and rehabilitation specialists. Dr. Woo's findings have drastically influenced medical procedures and rehabilitation practices associated with the repair of ligaments. Considering the frequency of ligamenteous injuries due to physical activity, his impact on exercise and sport is significant and impressive.

Dr. Woo's work has influenced the work of every scientist working on connective tissue. His impact is obvious in basic science departments. His methods have been applied worldwide and his conceptual path has been followed by a vast number of scientists.

The greatest contribution of Dr. Woo to society relates to the health and well being of patients who have joint operations and rehabilitation procedures. Dr. Woo's work has demonstrated that in some cases natural healing is superior to surgical repair. Consequently, his findings on repair and rehabilitation of injuries have reduced the number of unnecessary surgical interventions and related pain, reduced expense, and shortened the recovery process.

Dr. Woo's research findings, his teaching, mentoring, and lecturing, and his research productivity have demonstrated convincingly that a multi-disciplinary approach to analyzing ligaments based on biomechanical testing, histological assessment, and ultrastructural analysis deserves inclusion within a sport medical curriculum and is the preferred approach to tissue related research questions. He has directly and indirectly attracted many outstanding individuals to this approach of science and has changed substantially since in medicine.

The Selection Process

The selection of the winner of the 1998 IOC-OLYMPIC PRIZE was based on many excellent nominations submitted to the Selection Committee. The Selection Committee was comprised of:

Chair:

Nigg, B.	Dr.sc.nat	University of Calgary, Canada

Members:

Assmann, G.	MD	University of Munster, Germany
De Duve, Ch.	MD/PhD	Catholic University of Louvain
Dishman, R.	PhD	University of Georgia, Athens, USA
Ekblom, B.	MD/PhD	Karolinska Institute, Stockholm, Sweden
Gotto, A.	MD/PhD	Cornell University, New York, USA
Hay, J.	PhD	University of Iowa, USA
Landers, D.	PhD	Arizona State University, USA
Noakes, T.	MD	University of Cape Town, South Africa
Pellock, J.	MD	Virginia Commonwealth University, USA
Renstrom, P.	MD/PhD	Karolinska Hospital, Stockholm, Sweden
Rau, G.	Dr.rer.nat.	RWTH Aachen, Germany
Wieringa, W.	PhD	VP Research, Parke-Davis

The selection of a prizewinner from a group o such distinguished candidates is certainly not an easy task. The challenge is even more difficult due to the fact that the Selection Committee must choose from excellent candidates from different fields of science.

The Next Steps

The next IOC-OLYMPIC PRIZE will be awarded on the occasion of the Olympic Games in Sydney, Australia. Nomination procedures and the deadlines will be published in time. The likely deadline for the IOC-OLYMPIC PRIZE 2000 will be mid-summer 1999. Additional Information about the IOC-OLYMPIC PRIZE can be received from:

Benno M. Nigg, Dr.sc.nat., Professor
Chair, IOC-OLYMPIC PRIZE Selection Committee
Director, Human Performance Laboratory
The University of Calgary
Calgary, Alberta, Canada, T2N 1N4
Tel: 403-220-3436; Fax: 403-282-7637
Email: uheinz@acs.ucalgary.ca

Job Market

•Faculty Positions

- The Wright State University School of Medicine seeks a Ph.D. or M.D. faculty member at the Associate Professor or Professor level to become the Director of the Institute for Rehabilitation Research and Medicine. The new Director would be responsible for the academic and clinically-oriented research and teaching programs, the operational and budgetary aspects of the Institute, and maintaining the publication and presentation activities of the Institute researchers. Requirements include a Ph.D. in either Physiology, Biomechanics, Human Movement/Rehabilitation Research, or MD with Board Certification in Neurology, Orthopedic Surgery, or Physical Medicine and Rehabilitation. Five or more years of research and a demonstrated track record of extramural funding are necessary. Send a CV and names of three references to: G.C. Hamilton, M.D., Chair IRRM Search Committee, Department of Emergency Medicine, Wright State University School of Medicine, P.O. Box 927, Dayton, Ohio 45401-0927 or contact: T.W.J. Janssen, PhD, Wright State University School of Medicine, Institute for Rehabilitation Research and Medicine, 3171 Research Boulevard, Dayton, OH 45420, Tel: 937.259.1326 or 259.1306, Fax: 937.259.1310, Email: tjanssen@discover.wright.edu
- The Pennsylvania College of Podiatric Medicine has recently merged with Temple University in Philadelphia Pennsylvania to form the Temple University School of Podiatric Medicine. The Biomechanics and Biomaterials Laboratories at the Temple University School of Podiatric Medicine invite applications for a senior faculty position in the area of Biomedical Engineering. Individuals with significant experience in biomechanics, biomaterials, or tissue engineering are encouraged to apply. Applicants must possess a Ph.D. in engineering and/or related basic sciences. Send a letter of interest briefly describing previous and future career plans, a CV, and names, addresses, and telephone numbers of at least three references should be sent to H.J. Hillstrom, PhD, Pennsylvania College of Podiatric Medicine, Eighth and Race St., Philadelphia, PA 19107, Tel:215.625.5366, Fax: 215.629.1622, Email: hhillstrom@pcpm.edu
- Becker College, with campuses in Worcester and Leicester, MA, invites applications for the Program Coordinator/Faculty position of the

developing BS in Kinesiology program. The program will augment Becker's well-established Health Science programs which presently include associate degrees in Nursing, Occupational Therapy, and Physical Therapy. Contact: Director of Human Resources, Becker College, 61 Sever Street, Worcester, MA 01615-0071

- A lectureship in Sport and Exercise Science is available in the Department of Sport and Exercise Science, Tamaki Campus, The University of Auckland. Applicants should have a doctoral qualification with teaching strengths in gross and functional human anatomy. Research skills in functional human anatomy and/or an allied area are preferred. Contact: R. Marshall, PhD, Tel: 64-9-373 7599, Ext 6630, Fax: 64-9-373 7043, Email: r.marshall@auckland.ac.nz.

Postdoctoral Positions

- A one-year post-doctoral position is available starting Setember 1, 1998 in Biology of Physical Activity, University of Jyväskylä, Jyväskylä, Finland. The position emphasizes Biomechanics and neuromuscular performance. Qualified candidates will have knowledge in various aspects of neuromuscular function, such as reflex control, muscle mechanics, muscle stiffness, neuromuscular fatigue, and adaptation mechanisms in strength & power training. The appointed researcher will work in the projects of Prof. Paavo V. Komi. The work involves also advicing doctoral students in their projects. Contact: P.V. Komi, PhD, Email: komi@maila.jyu.fi
- A Research Associate / Post Doctoral position is available at the University of Maryland in the Department of Physical Therapy. The topic of the research is overuse injury among manual wheelchair users. Candidates must hold a PhD in biomechanics, physical therapy, kinesiology, biomedical engineering, or exercise physiology. Contact B. Gardner, PhD, Tel: 410.706.4432,Email: bgardner@physio.ab.umd.edu or M. Rodgers, PhD, 410.706.5658, Email:mrodgers@physio.ab.umd.edu both of whom are at University of Maryland, Department of Physical Therapy, 100 Penn St., Baltimore, MD 21201-1082
- A postdoctoral research fellow / senior research fellow position is available for a 2-year period (one-year minimum) on a project entitled "Sensorimotor Control of Dexterous Behavior in Man". The candidate will be free to work independently on a focused research project of her/his choice. Apart from an active interests in sensorimotor control it is of advantage if the applicant have experience with neurophysiological experimental work in humans. Interests in computational modeling of sensorimotor control mechanisms or soft tissue mechanics are likewise of advantage. The start date is planned for 1st September 1998, is flexible. Contact: R.S.Johansson Department of Physiology, Umea University, SE-90187 Umea, Sweden Tel: +46-90-786 5490, Fax: +46-90-786 6683, Email: Roland.S.Johansson@physiol.umu.se

Graduate Assistantships

- The Center for Locomotion Studies at Penn State University invites applications for graduate assistantships to support predoctoral study in the field of Kinesiology beginning in the Fall of 1998. Applications are encouraged from individuals with M.S. degrees in any related Science or Engineering discipline. Contact: L. Mulfinger, PhD, 29 Recreation Building, Penn State University, University Park, PA 16802; Tel: 814.865.1972, Email: lxm14@psu.edu.
- At least three, 3-year PhD scholarships are available for European citizens to pursue research in Biomechanics and Biomaterials within the School of Sport and Exercise Sciences at The University of Birmingham. Send a CV with the name and address of two academic referees to: T. Gardner, PhD, School of Sport and Exercise Sciences, The University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK, Tel: 0121 414 7239, Fax : 0121 414 4121, Email : N.M.Evans@Bham.ac.uk
- Three graduate student positions (MS and PhD) positions are available in Biomedical Engineering at the University of Calgary in the general area of spinal bioengineering, related to low back pain and scoliosis. Send a C.V. with the names and phone numbers of three references, and a one-page statement of research interests and goals to: N.A. Duncan, Ph.D., Dept. Civil Engineering, University of Calgary, 2500 University Drive NW, Calgary, Alberta, Canada T2N 1N4, Tel: 403.220.8553, Fax: 403.282.7026, Email: duncan@acs.ucalgary.ca

- Graduate assistantships are available in the Biomechanics Laboratory at East Carolina University for the 1998 academic year. Students will pursue a Master's degree in exercise science for two years. Laboratory work focuses on the biomechanical and motor control mechanisms of neuromuscular adaptations to exercise in rehabilitation settings and in aging. Contact: T. Hortobágyi, Ph.D., Biomechanics Lab, 251 Sports Medicine Building, East Carolina University, Greenville, NC 27858. Tel: 252.328.4564, Email: hortobagyit@mail.ecu.edu.
- The Ergonomics Research Centre at the University of Limerick, Ireland, has an opening for a full-time graduate researcher to work on a research project on decision support systems for production planners funded by the European Union. The work entails developing software for the evaluation of Ergonomics problems of workplace designs. Either of two areas will be addressed: (1) accomodating wide varieties of workers with regard to their anthropometrical and functional abilities; (2) Analysis of aspects of the design of work to minimise musculo-skeletal injuries. The work is intended to lead to the award of a Masters or PhD. Send a CV, and the names and addresses of two referees to T. Gallwey, PhD, Ergonomics Research Centre, Department of Manufacturing and Operations Engineering, University of Limerick, Ireland.
- Email to Timothy.Gallwey@ul.ie

Industry, Health Care, et al.

- The Department of Neurosurgery at University of California, San Francisco is seeking a Ph.D. or equivalent with experience in spine biomechanics to work with the Director of Neurospinal Surgery in setting up a laboratory. Salary support is available for up to 3 years and is commensurate with experience. Contact: W.S. Rosenberg, M.D., Mayfield Clinic and Spine Institute, Cincinnati, OH 45237, Tel:513.558.3536, Fax: 513.558.0886, Email: wsr@post.harvard.edu
- Applications are invited for a full time, one-year, possibly renewable research engineer position at the School of Human Kinetics, University of Ottawa on research directed at skates and skating. Applicants should possess a degree in computer sciences , electric engineering , mechanical engineering or a related fields. Candidates should be conversant with computer programming, electronics design, computer hardware and networking, as well as analog and digital circuitry. Send a CVand three professional references to: M. Lamontagne, PhD, School of Human Kinetics, University of Ottawa, 125 University Street (MNT 339), Ottawa, Ontario, Canada K1N 6N5, Tel:613.562.5800 ext. 4258, Fax: 613.562.5149, email: mlamon@uottawa.ca
- Applications are invited for a full time biomedical engineer to work with researchers in the Center on Aging, University of Kansas Medical Center. Preferred candidates will hold MS in biomedical engineering, mechanical engineering, electrical engineering, or equivalent degree. A minimum of two years additional research experience in the methods of experimental biomechanics such as motion analysis, force plates, and EMG. Experience in computer maintenance, computer file backup and software installation is desirable. Send a letter of interest, a CV, and names and addresses of three references to: C.W. Luchies, PhD, Center on Aging, University of Kansas Medical Center, 3901 Rainbow Boulevard, Kansas City, Kansas 66160-7117, Tel: 913.588.1442, Fax: 913.588.1417, Email: cluchies@kumc.edu

Upcoming Meetings, Workshops, Etc.

July

Fifth International Symposium on the 3-D analysis of Human Motion, 2-5 Jul 1998, Chattanooga, Tennessee, Contact: M. Whittle, PhD, The University of Tennessee at Chattanooga, Michael-Whittle@utc.edu, http://www.utc.edu/Human-Movement

11th Conference of the European Society of Biomechanics, 8-11 July 1998, Toulouse, France, Contact: ESB'98, BP 3103, 31026 Toulouse, Cedex, France, Tel: 33 5 61 77 82 84/ 33 5 62 74 83 59, Fax: 33 5 61 31 97 52, Email: ESB98.@purpan.inserm.fr, http://esb.purpan.inserm.fr

Second International Conference on Exercise Science, 9-12 July, 1998, Griffith University, Gold Coast, Queensland, Australia. Contact: Tel: International: +61 7 55 948531, National: 07 55 948531, Fax: International: +61 7 55 948674, National: 07 55 948674, Email: B.Pettitt@nhs.gu.edu.au, http://www.nhs.gu.edu.au/Conf.htm

The Third Annual Congress of the European College of Sport Science, 15-18 Jul 1998, Manchester, U.K.. Contact: Conference Secretariat, HIT Conferences, Cavern Court, 8 Mathew Street, Liverpool L2 6RE UK., Tel: +44 (0)151 227 4423, Fax: +44 (0)151 236 4829, Email: ecss@hit1.demon.co.uk

Symposium of the International Society of Biomechanics in Sports. 21-25 July, 1998. University of Konstanz (Germany). Contact ISBS'98 Secretariat, Department of Sports Science, Lehrstuhl Riehle, P.O.Box 5560 D30, 78434 Konstanz / Germany, Tel:+49-7531-883565, Fax: +49-7531-884221, Email: isbs98@uni-konstanz.de,

2nd International Conference on The Engineering of Sport, 13-17 July 1998, The University of Sheffield, Contact: Miss A. Staley, Conference Secretariat, 2nd International Conference on the Engineering of Sport, Department of Mechanical Engineering, The University of Sheffield, Mappin Street, Sheffield S1 3JD, UK. Tel. (+ 44 114) 222 7801, Fax. (+44 114) 275 3671, email: a.staley@sheffield.ac.uk, http://www.shef.ac.uk/uni/academic/I-M/mpe/sportseng/

International Symposium on Biomechanics of Sports, 21-25 Jul 21-25, 1998, University of Konstanz, Germany, Contact: R. Fritsch (chairman of conference office/ISBS secretariat), University of Konstanz, P.O. Box D30, D-78457 Konstanz, Germany, Tel: +49 7531 883565, Fax:+49 7531 884221, http://www.ISBS98.uni-konstanz.de

International Research Society of Spinal Deformities, 28 Jun - 1 Jul, 1998, Burlington, Vermont. Contact: I.A. Stokes, PhD, Department of Orthopaedics and Rehabilitation, University of Vermont, Burlington, Vermont, 05405-0084, Email:irssd@med.uvm.edu, http://salus.med.uvm.edu/~irssd/1998.htm

August

The Third World Congress of Biomechanics: 2-8 Aug 1998, Hokkaido University, Sapporo, Japan; Contact K. Hayashi, PhD, Biomechanics Laboratory, Department of Mechanical Engineering, Faculty of Engineering Science, Osaka University, Toyonaka, Osaka 560, Japan; Tel: +81-8-850-6170, Fax:+81-8-850-6171

VI Emed Scientific Meeting, 8-12 Aug, 1998, Brisbane, Australia, Contact: C. Jordan, Medical Engineering & Physics, King's College Hospital, East Dulwich Grove, London, SE22 8PT, UK, Tel & Fax: + 44 (0) 181 693 2345

The Third North American Congress on Biomechanics: 14-18 Aug 1998, University of Waterloo, Waterloo, Ontario, Canada. Contact: S. McGill, Ph.D., host chair, http://www.ahs.uwaterloo.ca/nacob98

First Pan-Pacific Conference on Rehabilitation, 29-31 Aug 1998, Guangzhou (formerly known as Canton), Guangdong, China. Contact: Conference secretariat Email::rsmtlyam@polyu.edu.hk, http://www.polyu.edu.hk/panpac

September

Third Triennial International Hand and Wrist Biomechanics Symposium, 9 Sep 1998, Minneapolis, Minnesota. Contact: F.W. Werner, PhD, Department of Orthopedic Surgery, SUNY Health Science Center, 750 E. Adams Street, Syracuse, New York 13210, U.S.A. Email: wernerf@vax.cs.hscsyr.edu

Global Ergonomics Conference, 9-11 Sep 1998, Cape Town, South Africa, Contact: D. McTeer, Postgraduate Conference Centre, University of Cape Town Medical School, Observatory 7925, Cape Town, South Africa, deborah@medicine.uct.ac.za

The International IMEKO Conference on Measurement in Clinical Medicine: "Biomedical Measurement and Instrumentation" & 12th International Symposium on Biomedical Engineering, 16-19 Sep, 1998, Dubrovnik - Croatia, Contact: KoREMA, P.O. Box 473, HR-10001 Zagreb, CROATIA, Tel.: +385 1 61 29 869/938, Fax.: +385 1 61 29 870, Email: imeko.bmi98@zesoi.fer.hr, http://www.imeko-bmi98.hr

XIth International Biomechanics Seminar, 18-19 September 1998, Wroclaw, Poland, Contact: IBS'98 Secretariat, Academy of Physical Education, Unit for Biophysics of Motion, Paderewskiego St. 35, 51-612 Wroclaw, Poland, Fax: (48 71) 482281, Email: as@awf.wroc.pl, http://www.awf.wroc.pl/~as/ibs98/

23rd Annual Congress of the "Société française de biomécanique, 17-18 Sep 1998, Lyon, France. Contact: L. Maiffredy, Congress Secretary, Tel: 33 0 4.72.43.83.08, Fax: 33 0 4.72.43.85.25,

Email:mgmfredi@insa-lyon.fr, www.insa-lyon.fr/actualités.html

An **Instructional Gait Course** by The European Society for Movement Analysis in Adults and Children, 21-23 September 1998, Wellington Park Hotel, Belfast. Contact: C. Murphy, ESMAC Conference Secretariat, McKinney House, Musgrave Park Hospital, Stockman's Lane, Belfast BT9 7JB, Tel +44 1232 669501 ext 2027, Fax +44 1232 382008

3rd Combined Meeting of Orthopaedic Research Societies of USA, Canada, Europe and Japan, 28-30 Sep 1998, Contact: Hayato Hirotani, MD, Shigetomi Health Care Group, 1-1521, Shikenya, Moriyamaku, Nagoya, Japan 463. Tel: +81-52 -776-2501, Fax: +81-52-776-2508.

October

III International Congress on Motor Rehabilitation, 5-8 Oct 1998, Sao Paulo, Brazil, Contact: Vertical Eventos e Turismo, R. Maria Monteiro, 1.104, Campinas.SP.Brazil-13025-151, Fax:019-254 7602, Email: gla@obelix.unicamp.br, vectur@bestway.com.br, www.unicamp.br/ib/congresso/motor-reabilit98

20th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 29 Oct - 1 Nov 1998, Hong Kong, Contact: R. F. Kirsch, PhD, Cleveland VA FES Center, MetroHealth Medical Center, Hamann 640, Cleveland, OH 44109, Tel: 216.778.4139, FAX: 216.778.4259, Email: rfk3@po.cwru.edu

November

Control Mechanisms for Postural Behaviors, A satellite meeting to the Society for Neuroscience, 6-7 November 1998, http://sulu.smpp.nwu.edu:80/~keshner

75th Annual Conference of the American Congress of Rehabilitation Medicine, 8-10 November1998, Seattle, Washington, Contact: American Congress of rehabilitation Medicine, 4700 W. Lake Avenue, Glenview, IL 60025-1485, Tel:847.375.4725, Fax: 847.375.4777, EMail: info@acrm.org, http://www.acrm.org/

International Conference on Weightlifting and Strength Training (in conjunction with the World Weightlifting Championships), November 10-12, 1998, Lahti, Finland, Contact: Ms Pirjo-Leena Pitkanen, Conference Coordinator, ConFinnia Ltd, P.O. Box 35, FIN-40351 Jyvaskyla, Finland, Tel: +358-14-603662, Fax +358-14-603727, Email: pitkanen@jyu.fi, http://www.jyu.fi/wlconference/

3rd Interdisciplinary World Congress on Low Back- and Pelvic Pain, 19-21 Nov, 1998, Vienna, Austria, Contact: in Europe: European Conference Organizers, P.O.Box 4334, 3006 AH Rotterdam, The Netherlands. Phone +31 - 10- 4133287. Telefax + 31 - 10 - 4148059. Email: SJCECO@WorldAccess.NL; in the U.S.: University of California, San Diego, Office of Continuing Medical Education, 9500 Gilman Drive, 0617, La Jolla, California 92093-0617, U.S.A. Tel(619)534 3940. Fax:(619)534 7672

December

2nd International Workshop on 'Biomedical Aspects of Manual Wheelchair Propulsion: the state of the art II. 7-9 Dec 1998, Vrije Universiteit Amsterdam, Contact: Faculty of Human Movement Sciences, Department of Kinesiology, Van der Boechorststraat 9, 1081 BT Amsterdam, The Netherlands, Tel: ++31 20 4448470/4448530, Fax: ++31 20 4448529, Email:M_L_den_Besten@fbw.vu.nl, www.fbw.vu.nl/events/wheelchair98

1999

World Congress of Science of Football, 22-26 February 1999 University of Technology Sydney, Australia. Contact: World Congress of Science of Football, PO Box 236, ROSEVILLE NSW AUSTRALIA 2069, Tel: 61 2 9411 4666, Fax: 61 2 9411 4243, Email: Nick@hotelnetwork.com.au

18th Southern Biomedical Engineering Conference and 2nd International Conference for Ethical Issues in Biomedical Engineering, 2-4 April 1999, Clemson university, Clemson, South Carolina. Contact; S. Saha, PhD, Director, Bioengineering Alliance of South carolina, 313 Rhodes Research center, Clemson University, Clemson, SC 29634-0906, Tel: 864.656.7603, Fax: 864.656.4466, Email: amarand@clemson.edu

1st International Conference on Science and Technology in Climbing and Mountaineering; 7-9 April 1999, University of Leeds, UK. Contact: N. Messenger PhD, STCM conference, Centre for PE and Sports Science, University of Leeds, Leeds LS2 9JT, UK. Tel:+44 (0)113 233 5080, Fax: +44 (0)113 233 5083. Email: Climbing.conf@leeds.ac.uk,

http://www.leeds.ac.uk/sports_science/conference/climbingsci99.html

First World Congress of Science and Medicine in Cricket, 14-17 Jun 1999, Newport, Shropshire, Contact: N. Stockill, PhD, Tel: 01952 670185, Fax: 01952 820924, Email: nigelstockill@lsihpc.demon.co.uk

17th International Symposium of Bioemchanics in Sports. 30 Jun - 6 July, Perth Western Australia. Contact: R. Sanders, PhD, School of Biomedical and Sportss Sciences, Edith Cowan University, Joondalup, Western Australia, 6027. Tel: 61 8 9400 5860, Fax: 61 8 9400 5717, Email: r.sanders@cowan.edu.au, Http://weaver.fste.ac.cowan.edu.au/~blaw/sports/isbs_invitation.html.

ISB99 The University of Calgary, 8-13 Aug, 1999, Contact: M. Stroh, Conference Mgmt. Services, 1833 Crowchild Trail N.W., Calgary, AB, CANADA T2M 4S7, Tel: (403) 220-6229, Fax: (403) 284-4184, Email: mastroh@acs.ucalgary.ca

Progress in Motor Control - II: Structure-Function Relations in Voluntary Movements, 19-22 Aug 1999, Penn State University. Contact: M.L. Latash, PhD, Rec. Hall 267-L, Department of Kinesiology, Penn State University, University Park, PA 16802, Tel:814.863.5374, Fax: 814.865.2440, Email: mll11@psu.edu

2000

2nd International Congress on Skiing and Science in St. Christoph/Arlberg, Austria, 9-15 Jan 2000. Contact: Hermann Schwameder, Secretary General, Email: hermann.schwameder@sbg.ac.at

New Perspectives on Laboratory Management: Ancient Philosophy

Native American wisdom says that when you discover you are riding a dead horse, the best strategy is to dismount. However, in management we often find other strategies are suggested, including the following:

Buying a stronger whip.
Changing riders.
Saying things like, "This is the way we have always ridden this horse."
Appointing a committee to study the horse.
Arranging to visit other sites to see how they ride dead horses.
Increasing the standards to ride dead horses.
Appointing a tiger team to revive the dead horse.
Creating a training session to increase our riding ability.
Comparing the state of dead horses in today's environment.
Changing the requirements declaring that "This horse is not dead."
Hiring contractors to ride the dead horse.
Harnessing several dead horses together for increased speed.
Declaring that "No horse is too dead to beat."
Providing additional funding to increase the horse's performance.
Doing a Cost Analysis study to see if contractors can ride it cheaper.
Purchasing a product to make dead horses run faster.
Declaring the horse is "better, faster and cheaper" dead.
18. Forming a quality circle to find uses for dead horses.
Revisiting the performance requirements for horses.
Saying this horse was procured with cost as an independent variable.
Confirming that running is a dead horse's core competence

Thanks to Adelaide Jaffe, The Cleveland Clinic Foundation for this submission.

For People Having Excess Time...

An ANAGRAM, as we all know, is a word or phrase made by transposing or rearranging the letters of another word or phrase. The following examples are quite astounding!

Dormitory = Dirty Room
Evangelist = Evil's Agent
Desperation = A Rope Ends It
The Morse Code = Here Come Dots
Slot Machines = Cash Lost in 'em
Animosity = Is No Amity
Mother-in-law = Woman Hitler
Snooze Alarms = Alas! No More Z's
Alec Guinness = Genuine Class
Semolina = Is No Meal
The Public Art Galleries = Large Picture Halls, I Bet
A Decimal Point = I'm a Dot in Place
The Earthquakes = That Queer Shake
Eleven plus two = Twelve plus one
Contradiction = Accord not in it

This one's amazing: [From Hamlet by Shakespeare] To be or not to be: That is the question, whether tis nobler in the mind to suffer the slings and arrows of outrageous fortune. = In one of the Bard's best-thought-of tragedies, our insistent hero, Hamlet, queries on two fronts about how life turns rotten.

Politicians:

George Herbert Walker Bush = Huge Berserk Rebel Warthog
George Bush = He bugs Gore
Ross Perot = SS Trooper
Ronald Wilson Reagan = A long-insane Warlord (or Insane Anglo
Ronald Reagan = A darn long era
Leroy Newton Gingrich = Yon Right-winger Clone
Margaret Thatcher = That great charmer
The Conservative Party = Teacher in vast poverty

And the grand finale:

"That's one small step for a man, one giant leap for mankind" = A thin man ran, makes a large stride, left planet, pins flag on moon! On to Mars!

Collected from Jill Mari Embry who is from somewhere via Alan Litsky, Ohio State University

Evidence That Other Organization's Contests Seem To Work Pretty Well...

From what we can determine, for a pretty long time, New York magazine has run a contest in which contestants are to take a well-known foreign language expression, change a single letter, and provide a definition for the new expression. here is a list of pretty good ones.

Harlez-vous Francais?
Can you drive a French motorcycle?
Cogito Eggo Sum
I think; therefore I am a waffle.
Rigor Morris
The cat is dead.
Respondez s'il vous plaid
Honk if you're Scottish.
Que sera serf
Life is feudal.
Posh mortem
Death styles of the rich and famous.
Pro Bozo publico
Support your local clown.
Apres Moe le deluge
Larry and Curly got wet.
Felix navidad
Our cat has a boat.
Haste cuisine
Fast French food.
Quip pro quo
A fast retort.
Veni, vidi, vice
I came, I saw, I partied.
Mazel ton!
Tons of luck.
Aloha oy
Love; greetings; farewell; from such a pain you should never know.
Veni, vipi, vici
I came, I'm a very important person, I conquered.
Visa la France
Don't leave your chateau without it.
L'etat, c'est moo
I'm bossy around here.
Cogito, ergo spud
I think, therefore I Yam.
(OK, more than one letter.)
Veni, vidi, Velcro
I came, I saw, I stuck around

This may have come from Ian Johns or the Philadelphia Inquirer, or New York Magazine, we just don't know.

Engineers can be fascinating individuals...

What is "pi"?

Mathematician: Pi is the number expressing the relationship between the circumference of a circle and its diameter.

Physicist: Pi is 3.1415927 plus or minus 0.000000005.

Engineer: Pi is about 3.

A mathematician, an engineer, and a physicist are being interviewed for a job. In each case, the interview goes along famously until the last question is asked: "How much is one plus one?" Each of them suspects a trap, and is hesitant to answer. The mathematician thinks for a moment, and says "I'm not sure, but I think it converges". The physicist says "I'm not sure, but I think it's on the order of one". The engineer gets up, closes the door to the office, and says "How much do you want it to be?"

Q: What is the difference between Aero Engineers and Civil Engineers?
A: Aero Engineers build weapons, Civil Engineers build targets.

An Engineer, a Physicist, and a Mathematician all go to the same conference. University budgets being what they are, they all stay in the same cheap hotel. Each room has the same floor plan, has the same cheap TV, the same cheap bed, and a small bathroom. Instead of a sprinkler system, the hotel has opted for Fire Buckets. The Engineer, Physicist, and Mathematician are all asleep in bed. At about 2AM, the Physicist wakes up because he smells smoke. He looks in the corner of the room and sees that the TV set is on fire! He dashes into the bathroom, fills the Fire Bucket to overflowing with water, and drenches the TV set. The fire goes out, and the Physicist goes back to sleep. A little while later, the Engineer wakes because he smells smoke. He looks in the corner of his room and sees that the TV set is on fire. He grabs a handy envelope, estimates the BTU output of the fire, scribbles a quick calculation, then dashes into the bathroom and fills the Fire Bucket with just enough water to douse the flames. He puts the fire out and goes back to sleep. In a little while, the Mathematician wakes up to the smell of smoke. He looks in the corner of his room and sees the TV on fire. He looks into the bathroom and sees the Fire Bucket. Having determined that a solution exists, he goes back to sleep.

Engineering is the art of moulding materials we do not fully understand into shapes we cannot fully analyse and preventing the public from realising the full extent of our ignorance.

A pastor, a doctor and an engineer were waiting one morning for a particularly slow group of golfers.
Engineer: What's with these guys? We must have been waiting for 15 minutes! Doctor: I don't know, but I've never seen such ineptitude!
Pastor: Hey, here comes the greenskeeper. Let's have a word with him. [dramatic pause] Hi George! Say, what's with that group ahead of us? They're rather slow, aren't they? George: Oh, yes, that's a group of blind firefighters. They lost their sight saving our clubhouse from a fire last year, so we always let them play for free anytime.
The group was silent for a moment.
Pastor: That's so sad. I think I will say a special prayer for them tonight.
Doctor: Good idea. And I'm going to contact my ophthalmologist buddy and see if there's anything he can do for them.
Engineer: Why can't these guys play at night?

In the high school gym, all the girls in the class were lined up against one wall, and all the boys against the opposite wall. Then, every ten seconds, they walked toward each other until they were half the previous distance apart. A mathematician, a physicist, and an engineer were asked, "When will the girls and boys meet?" The mathematician said: "Never." The physicist said: "In an infinite amount of time." The engineer said: "Well... in about two minutes, they'll be close enough for all practical purposes."

Thanks to Brian Davis, The Cleveland Clinic Foundation, for collecting these gems

What really Counts...

One sunny day a rabbit came out of her hole in the ground to enjoy the fine weather. The day was so nice that she became careless and a fox snuck up behind her and caught her.

"I am going to eat you for lunch," said the fox.

"Wait," replied the rabbit, "You should at least wait a few days."

"Oh yeah? Why should I wait?"

"Well, I am just finishing my thesis on 'The Superiority of Rabbits over Foxes and Wolves.'"

"Are you crazy? I should eat you right now! Everybody knows that a fox will always win over a rabbit."

"Not really, not according to my research. If you like, you can come into my hole and read it for yourself. If you are not convinced, you can go ahead and have me for lunch."

"You really are crazy!" But since the fox was curious and had nothing to lose, it went with the rabbit. The fox never came out.

A few days later the rabbit was again taking a break from writing and sure enough, a wolf came out of the bushes and was ready to set upon her.

"Wait!" yelled the rabbit, "you can't eat me right now."

"And why might that be, my furry appetizer?"

"I am almost finished writing my thesis on 'The Superiority of Rabbits over Foxes and Wolves.'"

The wolf laughed so hard that it almost lost its grip on the rabbit.

"Maybe I shouldn't eat you; you really are sick ... in the head. You might have something contagious."

"Come and read it for yourself; you can eat me afterward if you disagree with my conclusions."

So the wolf went down into the rabbit's hole ... and never came out.

The rabbit finished her thesis and was out celebrating in the local lettuce patch. Another rabbit came along and asked, "What's up? You seem very happy."

"Yup, I just finished my thesis."

"Congratulations. What's it about?"

"'The Superiority of Rabbits over Foxes and Wolves.'"

"Are you sure? That doesn't sound right."

"Oh yes. Come and read it for yourself."

So together they went down into the rabbit's hole. As they entered, the friend saw the typical graduate abode, albeit a rather messy one after writing a thesis. The computer with the controversial work was in one corner. And to the right there was a pile of fox bones, on the left a pile of wolf bones. And in the middle was a large, well-fed lion.

The moral of the story:

The title of your thesis doesn't matter.

The subject doesn't matter.

The research doesn't matter.

All that matters is who your advisor is.

Passed on from an anonymous source from another anonymous source...thanks anyway.

Places to "Go"

- NACOB 98
  http://www.ahs.uwaterloo.ca/nacob98
- ISB '99
  www.kin.ucalgary.ca/isb99/
- Institute for Ergonomics (Ohio State University)
  http://osuergo.eng.ohio-state.edu/institute/institute_home.html
- Biomechanics Interest Group of the American College of Sports Medicine (ACSM)
  http://www.pepperdine.edu/seaver/natsci/spme/acsmbiomech/

The Thesis Exchange

Editor's note: This newsletter component provides a vehicle through which graduate students can disseminate, reasonably rapidly, the results of their Masters and Doctoral studies to the biomechanics community. These abstracts are intended also to provide impetus for interactive discussions on these topics among members and, thus, may provide valuable feedback to the author. Comments may be directed to the newsletter Editor for inclusion in future issues. The Newsletter Editor assumes no responsibility for being unilingual. Since no one seems to follow the previously published instructions anyway, submissions are received at the Editorial Office in many different forms, some of these forms are acceptable and other are not. Forms of the latter category will generally be noticed by their not being included in the Newsletter. The Editorial Office is particularly pleased to receive Thesis Abstracts that include data. Further, authors are encouraged to have abstracts that are shorter than the full-length version of the work.

TIBIAL FLEXURAL WAVE PROPAGATION VELOCITY IN VIVO: METHODOLOGICAL CONSIDERATIONS IN THE ANALYSIS OF BONE QUALITY

Timothy William Flynn
Penn State University
Advisor: Peter R. Cavanagh, PhD

Bone is a unique self-repairing structural material that is capable of adapting to a variety of environmental stimuli. Generally, healthy bone can respond to a wide-range of mechanical skeletal loading by either increasing bone mass or modifying bone architecture. However, frequently a loading stimulus exhausts the remodeling capacity of bone and the result is a stress fracture or bone stress injury (BSI). In particular, in both civilian and military training environments, young women have an alarming incidence of bone stress injury. Ideally, in order to minimize the rate of bone stress injuries, a measurement tool that could objectively quantify a subject's fracture resistance prior to onset of increased physical activity is desirable. Procedures that measure either bone mass or bone geometry have been proposed as methods to estimate bone strength. However, these methods do not provide a mechanical measure of bone competence. Therefore, a search for reliable and informative alternative methods continues. One such alternative investigated in this study was the measurement of tibial flexural wave propagation in vivo. An advantage of this method is that it can provide information on the structural and mechanical properties of bone. However, a number of methodological issues remain to be answered before this technology can be successfully implemented in a screening environment.

The purpose of the present study was to determine the most reliable method for measuring flexural wave propagation, and subsequently, to demonstrate the effect of soft-tissue, shank mass, and subject characteristics on the measured velocity. Following completion of informed consent, the right tibiae of twenty-five young women were sampled on four separate days, two setups per day, and ten trials per setup. The sampling rate was 400 Khz with an accelerometer separation distance of 10cm and the hammer impact on the tibial tubercle. Two velocity determination methods, peak (time domain) and phase (frequency domain), as well as the attenuation coefficient were analyzed. The mean peak velocity was 219 m.s-1 (range 142 to 355 m.s. -1 and the mean phase velocity was 210 m.s-1 (range 144 to 409 m.s-1). The peak method was more reliable (ICCs ranged from 0.811 to 0.963) than the phase velocity method (ICCs ranged from 0.589 to 0.888). A step-wise regression analysis was used to find the best factors to predict peak velocity. Two models were developed: 1) subject age and history of late menarche ($p<0.001$, $R2 = 46.2\%$) and 2) subject age and width of the proximal tibia ($p<0.003$, $R2 = 41.6\%$). Additionally, a simple regression model demonstrated that the level of subject risk factors for BSI explained a moderate ($R2 = 23\%$) amount of the variance in peak velocity ($p<0.015$). Peak velocity was not associated with shank mass or soft-tissue characteristics, suggesting that peak velocity measured underlying tibial bone characteristics. The attenuation coefficient was highly inversely correlated (-O.944) with peak velocity and therefore, should not be used as an independent measure of bone quality. In conclusion, the peak method can be used to discriminate between subjects with varying levels of flexural wave velocity, however, individual change would need to be fairly substantial in order to not be masked by the measurement variability.

THE IMPACT OF LOWER EXTREMITY STRENGTH ON OBSTACLE CLEARANCE IN THE ELDERLY

Juan C. Garbalosa
Penn State University
Advisor: Peter R. Cavanagh, PhD

Falls in the elderly have grave consequences on their quality and length of life. Lower extremity strength deficits have been identified as a risk factor for falls in the elderly. A common extrinsic factor leading to a fall in the elderly is tripping over an obstacle. Yet, little is known regarding how deficits of peak torque and power produced by lower extremity muscles impair an elderly individual's ability to prevent a fall or how elderly individuals with these deficits respond to an obstacle in the gait path. The aim of this study was to determine what differences exist in the gait kinematics and muscular responses, when a sudden obstacle is presented in the gait path, between elderly individuals with and without a lower extremity strength deficit. To investigate this issue, two distinct groups of elderly subjects were recruited: elderly with and without a lower extremity strength deficit. The groups without lower extremity strength deficits (dominant knee strength index at 60 deg/sec equal to or greater than 220 and 129 Nm, for men and women respectively) and the group with lower extremity strength deficits (dominant knee strength index at 60 deg/sec less than 190 and 117 Nm, for men and women respectively) consisted of fifteen elderly subjects each. Both groups were free of musculoskeletal, neurological or cognitive impairments that would affect their gait and were matched according to age, gender and medication usage. Participation in the study was limited to those individuals who had a body mass index between 20.8 to 31.2. The differences between the subject groups during obstacle clearing gait were quantified by recording the angular displacements of the hip, knee and ankle joints; electromyographic (EMG) activity of the tibialis anterior (TA), lateral head of the gastrocnemius (GAS), lateral head of the biceps femoris (BIC), and the rectus femoris (REC); and foot clearance under two walking conditions. The subject groups walked down a 14m gait path. On random trials, a pop up device at a fixed location was activated upon right heel strike, forcing the subject to clear the obstacle during the swing phase of the right lower extremity. Each subject performed five trials of obstacle clearing and non obstacle clearing gait. Elderly subjects with and without strength deficits exhibited similar obstacle toe clearance (9.7 ± 4.5, 12.2 ± 4.4, 13.7 ± 5.7, and 11.4 ± 4.7 cm for strong and weak, males and females, respectively) and non obstacle toe clearance (9.2 ± 2.2,13.8 ± 4.7, 8.5 ± 3.3, and 8.7 ± 3.7 cm for strong and weak males and females, respectively). To obtain the necessary obstacle toe clearance, elderly subjects primarily increased the knee joint flexion angle; augmenting it with increased hip joint flexion. The mean knee flexion angles (83.7 ± 6.5, 79 ± 9, 89.3 ± 11.1, 81.4 ± 9.9 degrees for strong and weak, males and females, respectively) and hip flexion angles (17.2 ± 3.2, 19.4 ± 9.6, 22.9 ± 11.5, 28.9 ± 7.7 degrees for strong and weak, males and females, respectively) and ankle joint angles (-1.8 ± 6.4, 1.7 ± 11.1, 10.3 ± 20.9, 3.5 ± 10.2 degrees for strong and weak, males and females, respectively) at obstacle toe clearance of the subject groups were not significantly ($p > .05$) different from each other. Elderly subjects utilized a consistent pattern of increased pre toe clearance EMG activity of the BIC and GAS muscles to accomplish the above kinematic strategy. This pattern of muscle activity was complemented by a variable pattern of increased pre obstacle TA and post obstacle REC EMG activity. No difference in the pattern or timing of the increased EMG activity of the above muscles could be detected visually between the subject groups. There was no significant ($p > .05$) difference between the subject groups in the integrated individual ensemble averaged subtracted standardized time normalized linear envelopes of the four muscles. Additionally, the angular velocities of the hip, knee and ankle joints at obstacle toe clearance and the intra subject coefficient of variation of the kinematic and EMG data were not significantly different ($p > .05$) between the subject groups.

THE EFFECT OF DIABETIC NEUROPATHY ON LOWER LEG MUSCLE SPINDLE FUNCTION AND POSTURAL CONTROL STRATEGIES

Robert William Martin van Deursen
Penn State University, 1997
Advisor: Peter R. Cavanagh, PhD

Diabetes mellitus is a major chronic disease and is epidemic in many regions of the world. It is associated with long-term complications that affect almost every major part of the body. Neuropathy is one of the main complications of diabetes resulting in loss of peripheral sensory, motor and autonomic nerve function. Often, the sensory neuropathy in the lower legs is often the most apparent. This peripheral nerve damage can lead to a variety of problems, one of which is loss of balance and coordination. Subjects with diabetic neuropathy have been found to be less stable and this has, in the past, been associated exclusively with loss of plantar cutaneous sensation. The postural control system, however, relies on multiple sources of sensory feedback. This raises the question whether loss of plantar cutaneous sensation can sufficiently explain the instability observed in patients with diabetic neuropathy or whether more components of postural feedback are affected when balance becomes a problem.

The aim of this study was two-fold. The first aim was to demonstrate that diabetic neuropathy not only seriously affects plantar cutaneous sensation but that muscle spindle function of the lower legs is also affected. The second aim was to demonstrate that adaptations in postural strategies occur when loss of peripheral sensation is severe enough. The combined loss of plantar cutaneous sensation and muscle spindle function in the lower leg was predicted to limit the flow of useful kinesthetic information from the lower leg to the CNS. The importance of kinesthetic feedback from the upper leg and hip was therefore expected to be inversely related to the severity of neuropathy in the lower leg. This was predicted to result in a change of control of the lower limb from an ankle strategy to a hip strategy.

An experimental design was chosen to control for important confounding factors while accommodating for the fact that the availability of appropriate subjects with diabetic neuropathy imposed limitations on the number that could be recruited. Four groups of subjects were selected: a non-diabetic control group, a diabetic, -neuropathic control group, a diabetic, mildly neuropathic group and a diabetic, severely neuropathic group. Before subjects were entered into the study, they had to meet a large number of exclusion criteria. The four groups were successfully matched on marginal distributions for gender, age, height and weight. Other possible confounding factors were measured but not used to match the groups. Fortunately, there were no significant differences between the groups on any of these factors. The results of this study can, therefore, be attributed mainly to the differences between the groups in terms of the presence or absence of diabetic neuropathy and the severity of peripheral neuropathy.

Three tests were used to demonstrate a loss of muscle spindle function in diabetic neuropathy. In all tests, muscle vibration was used to stimulate muscle spindles of the lower leg muscles to bias feedback from those receptors. The assumption was that the main effect of muscle vibration could only occur when the muscle spindles and their nerve supplies were intact. If muscle spindle function was degraded in diabetic neuropathy, the effect of muscle vibration was expected to be reduced. All three tests appear to confirm that there is a loss of muscle spindle function due to diabetic neuropathy. Furthermore, the changes in muscle spindle function described for neuropathic subjects were most pronounced in the group of subjects with severe diabetic neuropathy. Subjects with significant loss of sensation in the lower legs were expected to adapt their strategies of postural control by controlling lower limb movement at the hip joint (hip strategy). In this situation, the upper leg muscles were predicted to be a more dominant source of afferent feedback resulting in an increased response to upper leg muscle vibration in neuropathic subjects. Also, the relative contribution of ankle joint movement was predicted to be reduced in favor of the relative contribution of hip joint movement. Both of these consequences of a hip strategy were tested in the quiet standing and the voluntary sway tests.

Although there were no significant changes in postural control strategies for the neuropathic subjects compared to the control subjects, there were significant differences for the group of subjects with severe diabetic neuropathy. The severe neuropathic subjects tended to move less at the ankle joint during the

voluntary sway test. More importantly, there was a significant difference with respect to the relative contribution of hip movement in the voluntary sway test for the severe neuropathic group. Severe loss of muscle spindle function in combination with loss of cutaneous sensation resulted in adaptations in the postural control strategy in the group of subjects with severe diabetic neuropathy. Therefore, the reduced stability in diabetic neuropathy appears to be the result of a more general loss of peripheral sensory receptor function in the lower legs then has previously been realized.

THE CONTRIBUTION OF PLANTAR CUTANEOUS MECHANORECEPTORS TO MUSCLE STRETCH RESPONSES

Bin Xia
The Pennsylvania State University, 1997
Advisor: Peter R. Cavanagh, PhD

It is believed that a better understanding of how the neuromuscular system responds to external disturbances will help to identify people at risk for falls and to develop treatment approaches or interventions that may be effective in reducing the number of falls. The principal objective of this study was to investigate the contribution of sensory information from plantar cutaneous mechanoreceptors to muscle stretch responses. To accomplish this task, lower extremity muscle EMG signals were recorded in 12 young female subjects with the use of an integrated perturbation device. A toe-up ankle perturbation was generated while varying the quality and quantity of loading force and plantar stimulating pressure.

The results of this study clearly established the importance of the cutaneous mechanoreceptor system in muscle stretch responses, and stressed the importance of future research into sub-somatosensory system integration and compensation. The data showed that, in the time domain, the EMG response occurrence frequency, EMG response latency times, and EMG response amplitudes were all affected by the cutaneous afferent information. In the frequency domain, central frequencies were modulated by somatosensory inputs. This study raised some important questions regarding the classic upright standing research protocol for studying sub-somatosensory systems, such as cutaneous mechanoreceptors. The results from this study may also help in validating the local multi-channel, parallel processing model of the preprogrammed reaction theory.

STRUCTURAL AND FUNCTIONAL FACTORS THAT DETERMINE REGIONAL PEAK PRESSURES UNDER THE FOOT DURING WALKING

Erez Morag
Penn State University, 1997
Advisor: Peter R. Cavanagh, PhD

The relationship between structure and function of the human foot has attracted many investigators over the years, and has led to the development of many theories. In most cases, these theories have not been quantitatively verified due, in part, to the complex structure and the variable function of the human foot. In the present study the concept of load distribution under the sole of the foot has been used to present conceptually, and validate experimentally, the relationship between structure and function of the human foot. Although plantar pressure distribution measurements during gait are used extensively and successfully as a screening tool, the origins of variation in plantar pressure distribution are not fully understood. To date, there is no model that can fully explain why load is distributed in a certain pattern in one person, and in a different pattern in another. Furthermore, the exact reasons for the development of areas of high pressure in various clinical entities are not clear. The purpose of this study was to develop a comprehensive model which describes the relationship between structure and function of the human foot. In particular, this model was designed to explore how a combination of structural and functional mechanisms influence load distribution underneath the human foot during walking.

Attempts to predict plantar pressure parameters have been described since the mid 1970s. These provided regression equations to predict plantar pressure based on age, weight, walking speed, and angle of 'toe-out', but could not explain much of the variance in plantar pressure based on the given predictors. Later attempts to predict peak pressures based on a single factor also met with only limited success. It was

hypothesized that both structural and dynamic variables affect regional peak pressure, and that a comprehensive study is needed to identify the significant factors. In the present study, a number of structural and functional outcome measures (potential independent variables) were identified from a total of five structure and three function data sets as follows: (1) physical characteristics (age, height and weight), (2) anthropometric data, (3) passive range of motion at selected foot joints, (4) standardized measurements from weight bearing plain radiographs of the foot and ankle, and (5) mechanical properties of the soft tissue under the heel and the first and second metatarsal heads (MTHL and MTH2). The function data were obtained from five walking trials in each subject at an average speed of 0.78 statures per second. Each walking trial was recorded by three MacReflex cameras, and gait analysis was performed leading to (6) stride foot parameters, (7) 3D joint kinematics, and (8) EMG. Plantar pressures in the right foot only were recorded simultaneously and subsequent analysis provided peak pressure values under the rearfoot, midfoot, MTHl and MTH2. Selected potential predictors from each data set were identified, based on their anatomical relevance and their relationship with peak pressure. Regression analysis was performed to explore what portion of the variance in plantar pressure under each region during walking could be explained by both structural and functional characteristics of the foot and lower extremity, using only the selected variables (from the list of all the independent variables) that were identified as potential predictors. The final regression models for the five foot regions consisted of five to seven variables. Each one of the models introduced a unique combination of structural and functional variables. For example, heel peak pressure was a function of the inclination of the calcaneus (+), the amount of unloaded soft tissue thickness under the heel (-), contact time during stance (-), the horizontal velocity of the foot at heel strike (+), the vertical velocity of the foot at one frame after heel strike (+), and age (-). The model accounted for 49.2% of the variance in peak heel pressure. In comparison, peak pressure under MTH1 was a function of the inclination of the calcaneus (+), the Chopart's angle (+), the angle between the horizon and the proximal first phalanx shaft (-), the distance between floor and lower surface of the MTHl sesamoids (-), Morton's Index (-), the average activity of the gastrocnemius over the third quarter of stance (+), and the talocrural dynamic range of motion (+). The model accounted for 48.6% of the variance in peak MTH1 pressure. A (+) sign represents direct association between pressure and a given variable, while a (-) sign represents inverse association between the two.

It was concluded based on these models that foot structure and function predict approximately 50% of the variance in peak pressure. Despite the similarity in predictive ability for the different regions, the contribution of structure and function for each anatomical region varied dramatically. Structure proved to be very dominant in predicting pressure under the midfoot and MTH1, while function accounted for the majority of the variance in peak pressure for the heel region. The present study was not designed to provide immediate clinical application. However, it is well known clinically that mechanical factors and gait abnormalities contribute to the development of foot disorders. The results presented here provide quantitative data in the form of a multifactorial predictive model that provides insight into the potential etiological factors that are associated with elevated plantar pressure.

DIRECTORY of ISB EXECUTIVE COUNCIL MEMBERS

(Officers are listed on the cover)

Leendert Blankevoort
Biomechanics Section
800 Institute of Orthopaedics
University of Nijmegen
NL-6500 HB Nijmegen
THE NETHERLANDS
Tel: + 31 24 361 6959
Fax: + 31 24 354 0555
e-mail: L.Blankevoort@orthp.azn.nl

Gert-Peter Brüggemann
Deutsche Sporthochschule Köln
Inst. für Leichtathletik & Turnen
Carl-Diem-Weg 6
D-50933 Köln
GERMANY
Tel: + 49 221 498 2418
Fax: + 49 221 497 3454
e-mail: brueggemann@hrz.dshs-koeln.de

Brian L. Davis
Department of Biomedical Engineering
The Lerner Research Institute
The Cleveland Clinic Foundation
9500 Euclid Avenue
Tel: +1 216 444 - 1055
Fax: +1 216 444 - 9198
E-mail: davis@bme.ri.ccf.org

Bruce C. Elliott
Department of Human Movement
The University of Western Australia
Nedlands, Perth, AUSTRALIA 6009
Ph Office: +61 9 380 2374
Fax: +61 9 380 1039
E-Mail: belliott@uniwa.uwa.edu.au

Mark D. Grabiner
Department of Biomedical Engineering,
The Lerner Research Institute
The Cleveland Clinic
Cleveland, Ohio, 44106
Tel: + 1 216 444 7276
Fax: +1 216 444 9198
E-Mail: grabiner@bme.ri.ccf.org

Keijo Häkkinen
Department of Biology of Physical Activity
University of Jyväskylä
PO Box 35
Jyväskylä
FINLAND
Tel: +358 14 602076
Fax: +358 14 602071
e-mail: Hakkinen@maila.jyv.fi

Toshio Moritani
Lab. for Applied Physiology
Graduate School of Human & Environmental Studies
Kyoto University
Sakyo-ku, Kyoto 606, JAPAN
Ph. Office: +81 75 753 6888

Mary Rodgers
Department of Physical Therapy
University of Maryland
100 Penn Street
Baltimore, MD 21201 USA
Tel: + 1 410 706 0840
Fax: + 1 410 706 6387
Email: mrodgers@physio.ab.umd.edu

Gisela Sjøgaard
Department of Sports Science
University of Odense
Campusvej 55
DK-5230 Odense M
DENMARK
Tel: +45 65 57 3423
Fax: +45 66 15 8612
e-mail: gis@sportmed.ou.dk

Anton J. (Ton) van den Bogert
Department of Biomedical Engineering
The Lerner Research Institute
The Cleveland Clinic Foundation
9500 Euclid Avenue
Tel: +1 216 444 - 5566
Fax: +1 216 444 - 9198
E-mail: bogert@bme.ri.ccf.org

EDITOR'S NOTE

The ISB Newsletter is published quarterly: February-March (Spring); May-June (Summer); August-September (Autumn), and November-December (Winter). There may be alternative printing schedules that coincide with unbelievable errors. Deadlines for material and articles are the first day of each first named month,except in the alternative schedule in which there are no deadlines or simply nothing will be accepted. The Newsletter is mailed to members whenever we can get to it except, of couse on the alternative schedule which is always on time. Members are encouraged to submit just about anything they would like to relate to the biomechanics community. The content of the Newsletter does not necessarily reflect the philosophy and opinions of the ISB but may reflect the mood of the Editor. Naturally, serious items such as *Letters, Special Articles, Affiliate Society News, Laboratory Features, Reports,* or *Announcements* of *Meetings, Conferences,* and *Jobs Available* , *Reviews* of relevant conferences and other serious biomechanics-related information is desirable *Thesis Abstracts* can be published. Thesis abstracts should provide an Introduction that includes the rationale and hypotheses of the study, description of the methods, the key results, and important conclusions. The title of the work student's name, department and institution, the degree earned and the conferring institution and supervisor's name should also be provided. Clearly though, no one actually does this but its important to have guidelines nevertheless. Material may be submitted electronically or on a computer disk as a text-only file, and must be in some form of English.

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