

Institute Insider

The Newsletter of the Institute for Ergonomics at The Ohio State University

At the forefront of Human Factors since 1950 Volume 8, No. 3, Autumn, 2005



Marras Discusses Ergonomics in South Africa

For nearly two weeks in September 2005, **William Marras** traveled across South Africa, lecturing on the “working back” and speaking with participants on various ergonomics and biomechanics issues.

This tour was sponsored by the Ergonomics Society of South Africa.

Dr. Marras also had the opportunity to meet with Professor Pat Scott, Head of the Department of Human Kinetics and Ergonomics at Rhodes University in Grahamstown, South Africa.



Dr. Marras (l) touring the AngloGold Ashanti Mine Training Centre



Dr. Marras (l) , Pat Scott (c) and colleagues at the Kwandwe Private Game Reserve in South Africa's Eastern Cape.

CPoD's Summer Institute a Success

The new initiative at Ohio State University, *Converging Perspectives on Data (CPoD)*, is pursuing innovative solutions to data overload problems in information analysis and comprehension tasks.



This summer, CPoD conducted an interdisciplinary Summer Institute, *Data Overload in Information Analysis & Comprehension*. The goal of this event was to:

- Innovate solutions to data overload that go beyond "tweaks" to existing tools;
- Advance methods for collaborative envisioning of what would be useful support for information analysis and comprehension tasks; and
- Develop interdisciplinary talent well versed in Design and Cognitive Systems Engineering methods and concepts to meet the demands of the intelligence community and others.

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The Institute for Ergonomics is proud to once again be an academic co-sponsor of the Applied Ergonomics Conference. This conference provides a forum for ergonomics practitioners to discuss and learn about tools and practical applications for solving ergonomics issues.

The 2006 conference will be held March 6th-9th, in Orlando, FL. More information, including registration forms, is available at www.appliedergo.org/conference.

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HFES Standards

HFES has been re-evaluating its role regarding human factors standards. Standards, in this case, is used as a broad term to include standards, handbooks, best practices, guides, etc.

With insufficient funding for human factors standards activities within the Department of Defense, military human factors standards are rapidly growing out-of-date and are in danger of losing their technical integrity. Given the current status within DoD, the HFES has recognized a need to play a more prominent role in human factors standardization.

The primary approach that is being considered is the creation of a Human Factors Standards Technical Group within HFES. As an initial step, a sufficient number of people need to express their support for such an endeavor. This means is that if a technical group is formed, the individual agrees to pay the annual technical group dues, usually \$3 - \$6 per year. It should be noted that one does not have to be a member of HFES in order to be a member of a technical group.

Interested people can demonstrate their support by sending their contact information to:

Mr. Alan Poston

Federal Aviation Administration
800 Independence Avenue, SW
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Phone: 202-493-4519.

Email: aposton86@comcast.net



Nominations Requested for IETG

The Industrial Ergonomics Technical Group of the Human Factors and Ergonomics Society currently is accepting nominations for the positions of Chair and Webmaster.

Nominations will be open until November 1st, 2005.

If you would like to make a nomination, please contact Dr. Sue Ferguson, HFES IETG Chair. Dr. Ferguson can be reached at ferguson.4@osu.edu or 614-537-4508.

IN THE NEWS



The 7th Annual Symposium on Human Interaction with Complex Systems (HICS) will be held Nov. 17th-18th, 2005 at the Greenbelt Marriott Hotel, Greenbelt, MD. The theme of this symposium is Collaborative Sensemaking in Dynamic Organizations. The organization committee invites participation of researchers from academia, industry, and government labs. The HICS theme reflects current interests on complex systems and asymmetric command and control (C2) decision-making: people, organization, information technology, and automation.

The Symposium will provide an international forum for exchanging ideas and discussions of research related to design and analysis of complex systems of organization, people and technology. The symposium's theme reflects the current concerns of collaborative sensemaking, human trust on technology and information management in complex systems.

Some of the areas of discussions for HICS are collaborative sensemaking, human trust in automation, and information management in complex systems.

Interested in submitting a paper? Abstracts are due October 15th, 2005.

For more information, visit www.eng.ncat.edu/hics.

Sue Ferguson earned the Certified Professional Ergonomist (CPE) credential by the Board of Certification in Professional Ergonomics (June 15th, 2005). BCPE is the certifying body for individuals



whose education and experience indicate broad expertise in the practice of human factors/ergonomics. Congratulations, Sue!

In June, 2005, **David Woods** gave the Plenary Address, "Supporting Cognitive Work: How to Achieve High Levels of Coordination and Resilience in Joint Cognitive Systems," at the Naturalistic Decision Making 7 conference (Amsterdam, Netherlands).

On July 14th, 2005, **Carolyn Sommerich** appeared in a segment broadcast on the Columbus, Ohio NBC television station regarding the risks associated with laptop computers and their use.



William Marras has been elected Chair of the Committee on Human Factors of the National Research Council. The CoHF is a standing committee of the NRC, which is part of the National Academy of Sciences. It was established to advise the federal government on various policy matters involving Human Factors and Ergonomics.



On October 1st, 2005, **James W. Davis** was promoted to Associate Professor in OSU's Department of Computer Science & Engineering. He is developing an advanced video surveillance system that uses computers equipped with video cameras to not only detect the presence of people, but also to identify their activities. The research has broad implications for Homeland Security, search and rescue, border patrol, law enforcement and many other types of military applications.



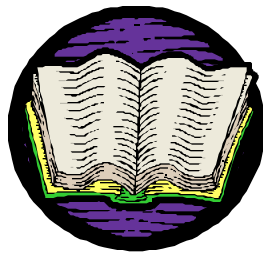
In September, 2005, **William Marras** was elected Secretary-Treasurer of the Human Factors and Ergonomics Society. Congratulations!

Deborah Burr-Doss, formerly on faculty with the Ohio State School of Public Health, and an affiliate of the Institute, is now an Associate Professor in the College of Public Health and Health Professions at the University of Florida in Gainesville. Deb can be reached at ddoss@phhp.ufl.edu.



PUBLISH

or perish



The following articles were published recently by Institute members (noted in boldface type):

Classification of Jobs with Risk of Low Back Disorders by Applying Data Mining Techniques

J. Zurada, W. Karwowski, and **W.S. Marras**, 2004, *Occupational Ergonomics*, 4(4):291-305.



Congestion Management via Interactive Dynamic Flight Lists and Customer Submitted Multiple Routing Options

M. Klopfenstein, G. Wilmouth, **P.J. Smith**, **A. Spencer**, M.J. Mintzer, and V. Sud, 2005, *Proceedings of the 2005 AIAA Aviation, Technology, Integration, and Operations Conference Meeting*, Washington, DC.



Differences Among Outcome Measures in Occupational Low Back Pain

S.A. Ferguson, **W.S. Marras**, and **D.L. Burr**, 2005, *Journal of Occupational Rehabilitation*, 15(3):329-341.



The Future of Research in Understanding and Controlling Work-Related Low Back Disorders

W.S. Marras, 2005, *Ergonomics*, 48(5):464-477.



Migration of FACET Functionality: Simulation Environment to Dispatcher Decision Support System

B. Sridhar, K. Sheth, **P.J. Smith**, and W. Leber, 2005, *Proceedings of the 24th Digital Avionics Systems Conference*, Washington, DC.



NAS User Decision Support Tools for Airport Resource Management

A. Spencer, **P.J. Smith**, and **C. Billings**, 2005, *Proceedings of the 24th Digital Avionics Systems Conference*, Washington, DC.



Ergonomics: Major Writings, is a book, newly published in 2005, that contains a collection of nearly 100 "classic" papers and chapters that were previously published between the late 1890s and 2000 in the field of ergonomics.

Two of the papers selected were written by Institute members:

Cognitive Systems Engineering - **David D. Woods** and Emilie M. Roth

Automation Surprises - Nadine B. Sarter, **David D. Woods**, and **Charles E. Billings**

This book can be purchased through publishers Routledge and Taylor & Francis (edited by Neville Moray).



Research Corner

This issue of the Bulletin summarizes research conducted by Institute members

Differences Among Outcome Measures in Occupational Low Back Pain

S.A. Ferguson, **W.S. Marras**, and **D.L. Burr**, 2005, *Journal of Occupational Rehabilitation*, 15(3):329-341.

Abstract: The rate of recurrence in low back pain patients has been reported as high as 70%; therefore, it is believed that researchers have a poor understanding of low back pain recovery. To enhance our understanding of recovery, a large cross-sectional study was conducted to compare outcome measures of return to work, impairment of activities of daily living, pain symptoms, and functional performance probability. A total of 208 workers were examined. The percentage of workers recovered based on return to work criteria was 99% compared to 25% for impairment of activities of daily living, 17% for symptoms, and 12.5% for functional performance probability. Single functional performance measures of range of motion, velocity, and acceleration had recovery rates of 59, 13, and 10%, respectively. It appears that all these criteria are measuring very different parameters of low back pain recovery. The residual loss in functional performance may indicate a decreased tolerance to physical demand providing potential insight for why recurrent low back pain rates are high.

Institute Member Activity at the 2005 HFES Conference

Members of the Institute for Ergonomics were active in many activities at the 49th annual meeting of the Human Factors & Ergonomics Society, which was held September 26th-30th in Orlando, Florida. Those members who participated at the meeting are listed below, in **boldface** type.

Lectures

Bone Mineral Content and Fatigue Failure of Lumbar Motion Segments in Simulated Flexed Lifting: Does Specimen Age Influence the Relationship?

S. Gallagher (NIOSH), **William Marras**, A. Litsky (Ohio State U), and **Deborah Burr**



Collaborative Broadening in Design: The De:Cycle
Axel Roesler, David Woods, and **Magnus Feil**



Collaborative Cross-Checking to Enhance Resilience
Emily Patterson, David Woods, R. Cook (U of Chicago), M. Render (VA Getting at Patient Safety (GAPS) Center)



Comparison of Spinal Loads in Kneeling and Standing Postures During Manual Materials Handling

Gang Yang, Riley Splittstoesser, Gregory Knapik, David Trippany, Sahika Vatan Korkmaz, Jeffrey Hoyle, P. Lahoti, Steven Lavender, Carolyn Sommerich, and **William Marras**



Cumulative Effects of Load Frequency & Velocity on the Lumbar Spine Response During a Repetitive Lifting Task
N. Campbell-Kyureghyan (U of Louisville) & **William Marras**



The Effects of Fatigue from Repeated Trunk Extensions on Trunk Muscle Activity

D. Kelaher (IBM Corp), G. Mirka (North Carolina State U), and **Carolyn Sommerich**



Electromyographic Evaluation of a New Approach to Descending Stairs While Carrying a Stretcher

Steven Lavender, K. Conrad, P. Reichelt, and J. Gacki-Smith (U Illinois-Chicago), and **Aniruddha Kohok**



Event Template Hierarchies as Means for Human-Automation Collaboration in Security Surveillance

David Woods, S. McNee, **James Davis**, A. Morison, and P. Maughan (Ohio State U), and K. Christoffersen (CS Designs)



Finding Decision Support Requirements for Effective Intelligence Analysis Tools

W. Elm, S. Potter, and J. Tittle (ManTech Corp), **David Woods**, **Justin Grossman**, and **Emily Patterson**



Generic Support Requirements for Cognitive Work: Laws That Govern Cognitive Work in Action

David Woods



Implementation of Ergonomic Interventions in Health Care: Results from 111 Facilities

C. Hamrick (Ohio Bureau of Workers' Compensation), K. Fujishiro and J. Weaver (Ohio State U), **William Marras**, and C. Heaney (Stanford U)



Recurrence of Occupational Low Back Disorders: The Influence of the Definition of Recurrence

Sue Ferguson, William Marras, and **Deborah Burr**



Scenarios as a Tool for Collaborative Envisioning: Using the Case of New Sensor Technologies for Military Urban Operations

Josh Schoenwald, Stoney Trent, James Tittle, & David Woods



There Must Be an Easier Way to Get the Paramedic's Victim from a Bed to the Stretcher!

Steven Lavender, K. Conrad, P. Reichelt, and J. Gacki-Smith (U Illinois-Chicago), and **Aniruddha Kohok**

Panel

Are We Ready to Consider Individual Differences in Human Capabilities in our Workplace Designs?

P. Hancock (U Central Florida), R. Parasuraman (George Mason U), and **William Marras**

Colloquium

Brave New World: Medical Devices, Clinical Information Systems, Networks, and Patient Safety

M. Nunnally (U Chicago), J. Crowley (US Food and Drug Admin), M. Weinger (Vanderbilt U), and **David Woods**

Symposia

Human-Robot Interaction: From Fieldwork to Simulation to Design

David Woods



Large-Scale Coordination in Emergency Response

L. Militello and L. Quill (U of Dayton Research Inst), **Emily Patterson**, R. Wears (U of Florida), and J. Ritter (US Air Force Research Lab)



Overcoming the Keyhole in Human-Robot Coordination: Simulation and Evaluation

Martin Voshell, **David Woods**, & F. Phillips (Skidmore College)

Participation in the Institute was by invitation only, comprised of student and faculty representatives from Cognitive Systems Engineering, Design, Computer Science, Psychology, and International Relations (Political Science). Two senior intelligence analysts and several guest lecturers critiqued the student's work and presented topical research seminars during the Institute.

The Summer Institute faculty included:

David Woods, Director of CPoD, and Professor in Ohio State's Industrial, Welding, & Systems Engineering Department. He also served as Director for the Summer Institute.

Donald A. Sylvan, Associate Professor at the OSU Department of Political Science, International Studies Program, and The Mershon Center.

Flip Philips, Associate Professor in the Department of Psychology at Skidmore College and a visiting faculty member here at OSU.

Dan Kidwell, Instructor in the Ohio State Department of Industrial, Interior and Visual Communication Design.

Wayne Redenbarger, OSU Associate Professor of English and Romance.

Emily Patterson, Associate Director of CPoD and OSU Research Scientist, who is in charge of recruiting, logistics, and team coordination for CPoD Summer Institutes and other educational initiatives.

The Summer Institute began with an intense two-day kickoff on June 27th and 28th, 2005 where faculty members presented their perspective on data overload in information analysis and comprehension.

The Institute ended on August 22th, with multi-media presentations by the three teams on their innovative approach to stakeholders in addressing data overload in information analysis and comprehension.

Preparations for the 2006 Summer Institute, on *Data Overload in Information Analysis & Comprehension*, are underway. Contact Dr. Emily Patterson, Associate Director of CPoD, at patterson.150@osu.edu, for more information.



A new initiative at Ohio State, Converging Perspectives on Data (CPoD), is pursuing solutions to data overload problems in information analysis and comprehension for security, medical, and other tasks. CPoD is an interdisciplinary consortium that pools expertise and results on studies of analysis, methods for innovation, and design of user-centered support.

CPoD projects intertwine three themes in order to progress towards a general model of perspective taking:

- Reduce premature closure: support shifts in perspective by enhancing broadening checks;
- Integrate workflow: visual momentum design techniques to help people move seamlessly between coordinated perspectives on data; and
- Build common ground: emergent monitoring and exchanging of different perspectives.

With this approach, CPoD intends to lead in developing:

- Prototyping design "seeds" that promise to transform our ability to find meaning in massive fields of data;
- Methods for collaborative envisioning of what would be useful support for information analysis and comprehension tasks; and
- Interdisciplinary talent well-versed in Design and Cognitive Systems Engineering methods and concepts to meet the demands of the intelligence community and others.



Patterson



Woods

To learn more about CPoD projects, classes, and activities, contact Emily Patterson, Associate Director (patterson.150@osu.edu) or David Woods, Director (woods.2@osu.edu).



Graduate Student News

Josh Schoenwald successfully defended his Masters thesis in September, under advisor David Woods. His research involved, “Scenarios as a Tool for Design Envisioning: Using the Case of New Sensor Technologies for Military Urban Operations.” This work is summarized below:



Abstract: This research involves the use of a collaborative envisioning tool to combine the goals of disparate communities concerning the role of new sensor technologies being deployed in Military Operations in Urban Terrain (MOUT). To do this, Cognitive Engineering intersects with the sensor development and military operations communities. Through the use of scenario-based design and the Topic Landscape tool, generic patterns provide seeds that help envision realistic futures of MOUT that are expressed in a narrative. These patterns provide insight on two levels. On one level they describe complexities inherent to all cognitive work, while on another level they provide insight about what makes MOUT difficult. The Topic Landscape is a collaborative tool that organizes information from a Cognitive Task Analysis of MOUT in many forms (text, graphics, video, etc.) from many contributors. This approach turns scenarios from a validation tool to an effective envisioning tool.

New Students

Monica Johnson

(johnson.3006@osu.edu)

Advisor: Dr. Steve Lavender

Hometown: Bangalore, India



Monica is working on her PhD under Dr. Lavender. She received her Masters degree in Human Factors Engineering from Wright State University in Dayton, OH.

Janice Pindroh

(Janice.Pindroh@cardinal.com)

Advisor: Dr. Philip J. Smith

Hometown: Cleveland, OH



Janice currently is working full-time at Cardinal Health, where she is developing a user interface for an inventory administration application, mostly developing in Java Swing. She received a BS in Computer Science & Engineering from Ohio State.

Injuries Higher among Obese People, Study Finds

Results from a new study suggest that extremely obese people are more likely than normal-weight people to injure themselves. Researchers collected health and injury data during a one-year period on 2,500+ adults living in Colorado. About 26% of the extremely obese male participants reported personal injuries, and 21.7% of the extremely obese women also reported injuries.

By comparison, about 17% of normal-weight men reported injuries, as did nearly 12% of normal-weight women, said Huiyun Xiang, the study's lead author and an investigator with the Center for Injury Research and Policy at Columbus Children's Research Institute.



Although other studies have looked at the relationship between obesity and injury, those studies were conducted either among adults in highly structured work environments or high school students, Xiang said. The current study is one of the first to look at the risk of injury in the general population and appear in a recent issue of the *American Journal of Preventive Medicine*.

The researchers categorized study participants based on individual body mass index (BMI) measurements, which relate a person's weight to their height. The National Institutes of Health recommends that BMI be used to classify someone as underweight, at a normal weight, overweight or obese, said Xiang, who is also an assistant professor of pediatrics at OSU.

In this study, people with a BMI lower than 18.5 were considered underweight, and those with a BMI of 18.5 to 24.9 were considered within a normal weight range. People with a BMI of 25-29.9 were considered overweight, but not obese. Participants with a BMI of 30-34.9 were considered obese, while those with a BMI of 35 or higher were considered extremely obese.

Overexertion and falls were the most common causes of non-fatal injuries among obese and extremely obese people in the study.

“Obesity may limit what a person can physically do,” Xiang said. “People with such limitations are often at a higher risk for injury than healthy people.”

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Injuries and Obesity

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He and his colleagues gathered data from the Colorado Behavioral Risk Factor Surveillance System, which is sponsored by the Centers for Disease Control and Prevention. Through telephone surveys, the system monitors lifestyles and behaviors related to the primary causes of mortality and morbidity. Of the 2,575 adults who participated in the study, 370 reported injuries within a one-year period.

The extremely obese participants reported the most injuries, while underweight people reported the least.

About 17% of women listed as obese, but not extremely so (those with a BMI of 30 to 34.9) reported injuries. But only 9.3% of obese men reported injuries, a finding that puzzled the researchers.

“We had a fairly small number of participants in this category, which could have resulted in this smaller number for men,” Xiang said. “We expected it to be higher.”

More than half (51.7%) of the injuries sustained by obese and extremely obese people happened inside the home. Transportation areas, such as store parking lots, bus stations and airports, came in a distant second, with 16.3% of all reported injuries happening there.

More than a third of the injuries (35.2%) were caused by acute overexertion. Falls took second place, causing 29.9% of the injuries.

Injury rates reported by people who were overweight, but not obese, were similar to those of normal-weight participants. Results showed that 16.3% of overweight men and 12.3% of overweight women reported injuries, compared to 16.8% of normal-weight men and 11.3% of normal-weight women. Underweight participants reported the least number of injuries.

With the exception of obese men, injury rates increased with BMI in both men and women.

“There is undeniably a link between obesity and injury risk in adults,” Xiang said. “Efforts to promote optimal body weight may reduce not only the risk of chronic diseases, but also the risk of unintentional injuries.”

Xiang conducted the work with Lorann Stallones (Colorado Injury Control Research Center at Colorado State University). Co-authors included Ohio State colleagues Gary Smith (Center for Injury Research and Policy at Columbus Children's Research Institute), J.R. Wilkins (Division of Epidemiology and Biostatistics in

OSU's School of Public Health and an Institute Advisory Board member), and Guanmin Chen and Sarah Hostetler (Columbus Children's Research Institute).

Funding for this study came from the National Center for Injury Control and from the Office of Disability and Health Prevention, both branches of the Centers for Disease Control and Prevention, and by the Ohio Department of Public Safety.

For more information, contact: Huiyun Xiang (614-355-2768; xiangh@pediatrics.ohio-state.edu).

Written by Holly Wagner (614-292-8310; wagner.235@osu.edu).

Calculating Body Mass Index

Body Mass Index (BMI) is a mathematical calculation used to determine if someone is overweight.

You can compute your BMI by dividing your body weight by your height squared. For example:

$$\text{BMI} = \text{Weight (lbs)} / \text{Height}^2 \text{ (in)} \times 704.5$$

(English units)

or

$$\text{BMI} = \text{Weight (kg)} / \text{Height}^2 \text{ (m)}$$

(SI units)

Being obese and being overweight are not the same condition. A BMI of 30+ is considered obese and a BMI of 25-29.9 is considered overweight. The normal range for BMI is 18.5-24.9. Those with a BMI below 18.5 are considered underweight.

It should be noted that BMI can be misleading for very muscular people or for pregnant or lactating women.

More information about the BMI and obesity can be obtained from the American Obesity Association (www.obesity.org).

