

Sedentary Behavior and Health Conference

September 25 – 27, 2014

University of Illinois at Urbana-Champaign, USA

SPECIFIC AIMS

Physical inactivity has been demonstrated to be a major risk factor for cancer and many other chronic diseases. Very recently, sedentary behavior, or specifically prolonged sitting, has been demonstrated to be an independent risk factor for poor health and premature death. Reducing sitting time thus has emerged as a potential new, very important public health strategy for physical activity promotion and cancer/chronic disease prevention initiatives in the 21st century. Sitting time reflects the accumulated hours spent each day in numerous sedentary behaviors while commuting, at school, in the workplace, in the domestic environment, and during leisure time. Even for those who meet the public health recommendation (30 minutes of moderate-to-vigorous physical activity on most days a week for adults; 60 minutes daily for children and youth), there are deleterious metabolic consequences they can be exposed to in *7 to 10 hours of sitting* each day. Yet, many critical measurement and research questions and issues in sedentary behavior and health remain unanswered or unaddressed. A conference focused on sedentary behavior and health is urgently needed to examine the issues, problems, progresses, and possible solutions.

The purpose of this conference is to provide a forum to update and address critical measurement and research issues, as well as practical concerns, in sedentary behavior and health research and practice. There are seven specific aims for this conference:

1. To understand how *sedentary behavior* (or too much sitting) may be defined as a behavioral attribute that is distinct from *physical inactivity* (or too little exercise).
2. To provide evolutionary and historical perspectives and concepts on sedentary behavior and its relationship with health and chronic diseases, especially cancer.
3. To describe some key characteristics of the rapidly evolving body of research evidence on sedentary behavior, health, and chronic diseases, especially cancer.
4. To address critical measurement and research challenges in sedentary behavior and health research, and explore the potential held by the latest technological methods.
5. To describe the characteristics of sedentary behavior by subpopulations, e.g., cancer survivors, children, older adults, minorities, and persons with disabilities.
6. To provide a review and update on a variety of intervention theories, strategies, and programs.
7. To outline research priorities for future sedentary behavior and health research.

Using a three-day conference format, which includes 3 preconference workshops, 6 sections, 28 presentations by more than 30 nationally and internationally known scholars in sedentary behavior research, 2 poster presentations, and several community health promotion activities, this conference will be the first to report and illustrate the latest research studies, methods, and technologies that could address the issues, solve the problems, and guide future research directions related to sedentary behavior and health. The conference format, in fact, proved to be effective in the two previous successful conferences we organized here at the University of Illinois at Urbana-Champaign. In addition, we will run the conference at the National Center for Supercomputing Applications (NCSA) this time to take full advantage of its world-class information gathering and dissemination capacity (e.g., streaming, recording, and distributing of the presentations online). Moreover, based on the information generated, a book entitled "*Sedentary Behavior and Health: Concepts, Assessment & Intervention*" will be published by Human Kinetics, the largest publisher of sport and physical activity information. Finally, efforts will be made for worldwide distribution of the information generated from the conference through social media to raise the general public's awareness of the negative impact of sedentary behavior as one of the major health risk factors in the 21st century.

BACKGROUND AND SIGNIFICANCE

Sedentary Behavior Is an Independent Health Risk!

Sedentary behavior has its recent historical roots in the physical activity and health field. Research on physical activity and health gained much of its early impetus from epidemiological studies with members of active and inactive occupations in the UK (Morris et al., 1953) and the USA (Paffenbarger et al., 1997). Early studies were conducted with British civil servants – bus drivers and desk-bound workers – who primarily sat at work, compared to their occupational counterparts – bus conductors and mail delivery workers – who were on the feet for most of their working day. Morris and colleagues demonstrated significantly reduced cardiovascular disease risk in those who were more active with the findings being interpreted as showing the beneficial effects of physical activity. However, alternative perspective is that these early physical activity epidemiology studies showed deleterious health consequences of prolonged occupational sitting. Brown et al. (2009) argue that with burgeoning research attention on sedentary behavior, the physical activity and health field is now revisiting some of its fundamental epidemiological bases within the new sedentary behavior perspective.

“Sedentary behavior” thus may be defined as *too much sitting, as distinct from too little exercise*. This perspective requires some clarification, given that “sedentary” is a term that previously has been used to describe those who do little or no physical activity, or who do not meet current physical activity and health guidelines (Owen & Bauman, 1992). With recent advances in the base of evidence on sedentary behavior and health outcomes, the recommended terminology is to use the term “sedentary” to characterize behaviors involving prolonged sitting; and, to use the term “inactive” in the context of little physical activity or not meeting activity guidelines (Owen, 2012; Owen et al., 2010a; Pate et al., 2008). Reducing sitting time has emerged as a potential new strategy for physical activity promotion and chronic disease prevention initiatives. Sitting time reflects the accumulated hours spent each day in the numerous sedentary behaviors during commuting, at school, in the workplace, the domestic environment and during leisure time. Even for those who meet the public health recommendation (for adults, 30 minutes of moderate-to-vigorous physical activity on most days each week; for children and youth, it is 60 minutes daily), there are deleterious metabolic consequences of the 7 to 10 hours of sitting that they can be exposed to each day (Healy et al., 2011b; Salmon et al., 2011).

Sedentary Behavior, Cancer and Other Chronic Diseases

Sedentary behavior has been independently associated with chronic disease-related risk factors such as adiposity (Hu et al. 2003; Blanck et al. 2007; Wijndaele et al. 2010), insulin resistance (Balkau et al. 2008; Schmidt et al. 2008; Healy et al. 2011) and inflammation (Healy et al. 2011) in healthy adults. These factors are also hypothesized to be operative in the development and progression of some cancers. Hence, it is biologically plausible that sedentary behavior may be a contributing factor to some types of cancer and other chronic diseases. In fact, according to Dr. Brigid M. Lynch, one of the faculty of our “Sedentary Behavior and Health” conference, 10 (77%) of the 13 identified studies (by 2012) assessing self-reported sedentary behavior and cancer found a statistically significant risk increase when comparing the highest versus lowest category of sedentary behavior (Arem et al. 2011; Friberg et al. 2006; Friedenreich et al. 2010; George et al. 2010; Howard et al. 2008; Moore et al. 2010; Patel et al. 2006; Steindorf et al. 2000; Teras et al. in press Zhang et al. 2004), e.g.:

- Ten of the 13 studies examined the trend of the association between sedentary behavior and cancer risk in fully-adjusted models (Arem et al. 2011; Friedenreich et al. 2010; George et al. 2010; George et al. 2011; Howard et al. 2008; Moore et al. 2010; Patel et al. 2006; Patel et al. 2008; Teras et al. in press; Zhang et al. 2004), and six found evidence for a dose-response relation (Arem et al. 2011; Howard et al. 2008; Moore et al. 2010; Patel et al. 2006; Teras et al. in press; Zhang et al. 2004).
- The greatest average risk increase was found for ovarian cancer (average increase of 124%) followed by colorectal (54%), endometrial cancer (36%), and non-Hodgkin lymphoid neoplasms in women (26%).
- In addition, the National Institutes of Health American Association of Retired Persons (NIH-AARP) Diet and Health Study demonstrated a statistically significant increase risk amongst both men and women (Matthews et al. 2012), whereas a significant association was seen only in the women of the American Cancer Society Cancer Prevention Study-II (CPS-II) Nutrition Cohort (Patel et al. 2010).

Principal Investigator/Program Director (Last, First, Middle):

- Finally, two of the 15 studies on occupational activity and cancer risk (13%) found a statistically significant risk increase associated with employment in jobs categorized as “sitting” versus “standing” (Levi et al. 1999; Orsini et al. 2009); four studies (27%) found an inverse association between sedentary behavior or a sedentary occupation and cancer risk (Bak et al. 2005; Lacey et al. 2001; Mahabir et al. 2004; Steindorf et al. 2006).

As expected, recent research also suggests that the effects of excessive sedentary behavior, independent of physical activity levels, may play an important and unique role in the development of cardiovascular diseases (CVD) and other non-communicable diseases (Hamilton et al., 2007). As an example, Cooper et al. (2006) found a significant dose-response relationship “*in which REE (resting energy expenditure) decreased as average weekly hours of TV viewing increased.*” This significant reduction of energy expenditure is one of the primary mechanisms by which sedentary behavior increases the risk of atherosclerosis and manifest CVD.

Understanding/Modeling of Sedentary Behaviors

Modern men and women sit too much! For example, recent research suggest that Europeans spend approximately 40% of their free time (i.e., ~4 hours per day) watching TV while in Australia and the U.S. it is more than 50%. Americans on average spend 4.5-5 hours per day sitting in front of their TV (ABS, 2008) despite the fact that there is evidence that >2hours promotes obesity and multiple reviews have demonstrated that TV viewing (as a surrogate for sedentary behavior) is a strong independent predictor of CVD risk and mortality. An ecological model of sedentary behaviour (Owen et al., 2011) proposes that environmental contexts are significant determinants of sedentary behaviors. Environmental contexts can shape or constrain individual-level initiative – for example, prolonged sitting may be unavoidable in most office/work, classroom, and transportation settings. Evidence is emerging from cross-sectional studies in multiple countries on the environmental correlates of sedentary behavior, using self-report (Kozo et al., 2012; Van Dyck et al., 2011) and device-based measurement (Van Dyck et al., 2010). Much of the available evidence to date is from cross-sectional studies, however; so our understanding presently tells us about the “correlates” more so than about the “determinants” of sedentary behavior (Bauman et al., 2002). Intriguingly, relationships of neighborhood “walkability” attributes with device-measured sedentary time have emerged that are the inverse of what has been observed for self-reported sedentary behaviors.

Critical Measurement and Research Issues

Sedentary behaviors typically involve sitting or reclining, in the energy-expenditure range of some 1.0 to 1.5 METs (multiples of the basal metabolic rate). By contrast, physical activity (moderate-to-vigorous physical activity; ‘exercising’) such as brisk walking or running typically requires an energy expenditure of some 3 to 8 METs. Measurement-development is a key element of the sedentary behavior and health research agenda (Clark et al., 2009; Clark et al., 2011b, Gardiner et al., 2011a, Winkler et al., 2011). For example, an initial study using self-report measures suggested that TV time may be a marker of overall sedentary time (Sugiyama et al., 2008); however, accelerometer-assessed sedentary time was shown to be positively but only weakly related to television viewing time (Clark et al., 2011a). While device-based measurement is leading to significant progress, self-report methods nevertheless remain essential elements of population-prevalence studies (Healy et al., 2011a, Troiano et al., 2012). Using the IPAQ instrument, wide international variations in the prevalence of prolonged sitting have been identified (Bauman et al., 2011). The employment of appropriate self-report methods in context-specific studies is crucial for documenting the prevalence and variations in sedentary behavior and for developing and evaluating the outcomes of specific initiatives for behavioral change (Chau et al., 2011; Chau et al., 2012; Clark et al., 2011a; Marshall et al., 2010; Oliver et al., 2010).

Summary of Background and Needs of This Conference

- Prolonged sitting is now understood to be a significant and distinct health risk;
- Many critical measurement and research questions and issues in sedentary behavior and health remain unanswered or unaddressed;
- Latest progress in research studies, methods, and technologies should help address the issues, solve the problems, and light future research directions;
- A conference focused on sedentary behavior and health is urgently needed to examine the issues, problems, progresses, and possible solutions.

Previous Successful “Aging and Measurement” and “Walking for Health” Conferences

The “Sedentary Behavior and Health” conference being planned is an extension/continuation of two previous successful “Aging and Measurement” and “Walking for Health” conferences we organized here at the University of Illinois at Urbana-Champaign (UIUC) in 2003 and 2005, respectively. Supported by CDC, American Association for Active Lifestyle and Fitness (AAALF), American College of Sports Medicine (ACSM), Measurement and Evaluation Council, UIUC, and Human Kinetics (HK) publisher, both conferences were extraordinary successful. More than 200 researchers and practitioners from around the world participated in each of these conferences and the feedback was extremely positive. There were several unique features to both conferences: (a) A distinguished panel of world-class scholars in the fields presented the latest issues, challenges, and techniques for their respective fields; (b) A pre-conference workshop on advanced statistical and research methods was included in the program; (c) Very broad topics of research were covered, including kinesiology, biology, physiology, psychology, technology, culture, urban planning, statistics, etc. Many state-of-the-art research fields (e.g., human gene mapping, remote clinical assessment and online computerized assessment, agent based modeling) were discussed, and future trends and research directions were addressed; (d) Multicultural factors associated with physical activity promotion and physical activity interventions were discussed by several speakers; (e) Issues related to measurement training for researchers and training for future measurement specialists were discussed at the conferences; and (f) the information generated was well disseminated, including a book “*Measurement Issues in Aging and Physical Activity*” (edited by Zhu & Chodzko-Zajko, 2006) and a *Medicine & Science in Sports & Exercise* supplement (Vol. 40(7), 2008) on “*Walking for Health: Measurement and Research Issues and Challenges*.”

CONFERENCE PLANNING

To meet specific aims of this conference, an extensive effort has been made in conference planning. These planning efforts are briefly summarized into the following sections: (1) Organization/scientific committees, (2) Faculty, (3) General formats and uniqueness of the conference, (4) Programs Specifics, (5) Involvement in women, minority and persons with disabilities (6) Marketing/fund-raising plan, and (7) Dissemination plan.

Organization/Scientific Committees

The organization committee is consists of a group of top scholars in sedentary behavior, physical activity and health research, including Drs. Adrian Bauman, Steven Blair, David Dunstan, Neville Owen, James Rimmer, James Sallis, Joan Vernikos, Melicia Whitt-Glover and Weimo Zhu. The UIUC representatives included Drs. Wojtek Chodzko-Zajko (Head of Department of Kinesiology and Community Health) and Dr. Brad Hedrick (Director of Disability Resource & Education Service). All the members have extensive administrative, leadership and conference organization experiences. The scientific committee is consists of a group of international known scholars in physical activity and health research and all members also serve as the faculty of the conference. Dr. Zhu serves as the chairs for both committees.

Faculty

The initial support and response to the planned conference have been extremely positive. In fact, a group of world leading researchers have agreed to speak at the conference. As a colleague said after she looked at the speaker list: “This is a Who's Who list in the field sedentary behavior, physical activity, and health research”

Principal Investigator/Program Director (Last, First, Middle):

(see enclosed biosketches for more details; note that, due to space constraint, only the faculty who served on the Scientific Committee are enclosed; other faculty's information can be found in the program in Section C.4).

General Format and Uniqueness of the Conference

We will maintain the basic conference format we found to be successful in the two last conferences:

- Thursday morning and afternoon for preconference; Evening for opening and reception
- Friday and Saturday for programs
- Friday evening for a reception and a measurement device show (new)
- Friday and Saturday noon/lunch for research poster sessions
- Saturday afternoon for a local health promotion (walking) event (new)

We will also maintain unique features of the last two conferences:

- A distinguished panel of world-class scholars in the fields of sedentary behavior, physical activity and public health will present the latest issues, challenges, and techniques in their respective fields.
- Pre-conference workshops will be again included in the program.
- Very broad topics of sedentary behavior and health research will be covered and new measurement device and technology that may improve measurement practice will be introduced.

We will, for the first time, run the conference at the National Center for Supercomputing Applications (NCSA; <http://www.ncsa.illinois.edu/about>) at UIUC so that we can take the full advantages of its computing and internet promotion and dissemination power.

Program Specifics

More specifics of the conferences, as well as the related speakers and their selection, are described below.

Thursday (Sept. 25, 2014)

Pre-conference I (Morning): The morning training will be on "Machine learning and sedentary behavior data." Prof. Feng Liang of the Department of Statistics at UIUC will be the speaker.

Pre-conference II (Afternoon): The afternoon training will have two focuses:

- (a) Using new Polar Loop for assessing and promoting physical activity (Speakers: Dr. Raija Laukkanen, Sharon Warren);
- (b) Designing /supporting effective sedentary intervention programs. Speakers to be confirmed.

Opening (Evening): Dr. Neville Owen, a leading sedentary behavior and health scholar from the University of Queensland will be the speaker for the Safrit Lecture at the opening. He will talk about "Evolution of research on sedentary behavior and health;" Dr. Joan Vernikos, the former director of NASA's Life Sciences Division, will be the keynote speaker of the conference and she will speak on "Gravity, sitting, and health."

Friday (Sept. 26, 2014)

Abstract Posters Displayed (8:00 am – 5:00 pm)

Section 1: Concepts and Science of Sedentary Behavior (8:00-9:40 am): This section will provide a thorough review of the physiology of sedentary behavior and the relationship between modern technologies and sedentary behavior, and an evolutionary and an industrial engineering and design perspective of sitting.

- Physiology of sedentary behavior, David W Dunstan, Baker IDI Heart and Diabetes Institute
- Screen time and sitting, Thomas N. Robinson, Stanford University
- Mismatch of human genes and sedentary living, S. Boyd Eaton, Emory University
- Rethinking the chair and sitting, Galen Cranz, University of California, Berkeley

Principal Investigator/Program Director (Last, First, Middle):

- Regulated sedentary behavior, Kenneth Glover, CSX

Section 2: Prolonged Sitting and Health Consequence (10:00 am-12:30 pm): *This section will provide the most up-to-date review on the relationship between sedentary behavior and several major chronic diseases, specifically obesity, cardiovascular disease, cancer, diabetes, and low-back pain.*

- Sedentary behavior and cancer, Brigid M. Lynch, Alberta Health Services, Canada
- Sedentary behavior and obesity, Michael L. Power, National Zoological Park
- Sedentary behavior and cardiovascular disease, Steven N Blair, University of South Carolina
- Sedentary behavior and diabetes, Carl J. Caspersen, CDC
- Sedentary behavior and low-back pain, Marco Boscolo, California State University, Sacramento
- Sedentary behavior and brain function, Stuart Biddle, Loughborough University

Poster Section 1 and Lunch (12:30 am – 2:00 pm): Lunch will be in the same room as the poster session to promote interaction between poster presenters, faculty, and conference participants.

Section 3: Measuring and Analyzing Sedentary Behavior (2-4 pm): *This section will provide an overview on conventional approaches, as well as latest development, in measuring sedentary behavior; related challenges, and potential solutions will also be introduced.*

- Assessing sedentary behavior using motion sensors, Kong Chen, NIH
- Assessing sedentary behavior using physiological sensors, David Bassett, University of Tennessee
- Assessing sedentary behavior using questionnaires, Barbara E. Ainsworth, Arizona State University
- Assessing sedentary behavior using new technology, Stephen Intille, Northeastern University
- Heart rate measure in practice: From sport performance to sedentary behavior, Raija Laukkanen, Polar
- Critical psychometric issues in analyzing sedentary behavior data, Weimo Zhu, University of Illinois at Urbana-Champaign

Section 4: Sedentary Behavior and Subpopulations (4:20-6:20 pm): *This section covers subpopulation related sedentary behavior, from job-related sedentary issues to sedentary behavior of children, older adults, minorities, and persons with disabilities*

- Job related sedentary behavior, Wendy Brown, University of Queensland
- Sedentary behavior of children, Gregory Welk, Iowa State University
- Sedentary behavior of older adults, Abby King, Stanford University
- Sedentary behavior of minorities, Melicia Whitt-Glover, Gramercy Research Group
- Sedentary behavior of person with disabilities, James Rimmer, University of Alabama at Birmingham

Section 5: Assessment Devices/Poster Session/Reception (6:30-8:00 pm). *Sedentary behavior and physical activity assessment device manufacturers will be invited to demonstrate their devices. Participants will have a chance to have hands-on experience with the devices. Poster session and reception will be held in the same room.*

Abstract Posters Displayed (8:00 am – 3:00 pm)

Section 6: Changing Sedentary Behavior (8-10:40 am): *This section will introduce both conventional intervention methods based on behavioral theories and psychological models and the ones based on new socio-ecological models and new technologies.*

- Psychological and behavior based intervention, John P. Elder, San Diego State University
- Environment and policy intervention, James Sallis, San Diego State University
- Worksite intervention, Nicolass P. Pronk, HealthPartners
- Community based intervention, Adrian Bauman, University of New South Wales
- Redesigning sitting: An ergonomic view, John B. Shea, Indiana University
- Social media/network based intervention, Chengxiang Zhai, University of Illinois at Urbana-Champaign

Closing remarks (11-11:30, by Charles E. Matthews, NIH)

Poster Section 2 and Lunch (11:30 am – 3:00 pm)

A major local community walking event (1:00-3:00 p.m.; led by “to be determined”)

Involvement in Women, Minorities, and Persons with Disabilities

As in the previous conferences, a systematic effort will be made to include them in planning, organizing, programming, and implementing the conference. The followings are a few examples:

- Representatives of women, minorities and persons with disabilities are included in the organization committee, scientific committee, and faculty of the conference;
- Both cultural and special population issues have been addressed in the program of the conference;
- A marketing plan targeting subgroups traditionally underrepresented in science has been developed.

Marketing/fund-raising plan

All major organizations (to be finalized) involved in this conference planning will have rich experience in marketing conferences. Using a special conference mechanism, the organizations will systematically market this conference using its usual and e-mail mass mailings to their members and related organizations. HK will also assist marketing the conference using its existing state and conference mechanisms. A marketing effort will be made to related existing listservs. All of the faculties have agreed to help the marketing using their contacts, especially to subgroups traditionally underrepresented. A similar approach will be made for the fund-raising to support the conference. A fund-raising package has been developed. Finally, a website with modern social-media features has been developed for the conference: <http://www.sedentaryconference.com/>, which will be used to help the conference marketing and promotion, as well as the after-conference information dissemination.

Dissemination Plan

A plan has been developed for the dissemination of the new information generated from this conference. Based on the contents generated, HK has agreed to publish a book entitled “Sedentary Behavior and Health: Concepts, Assessment & Intervention” and Drs. Zhu and Owen will serve as the editors. All faculty and chapter contributors, with many accomplished researchers who had accumulated over 1,000 peer-reviewed scholarly journal publications and books, will be encouraged to assist in the dissemination. The faculty is also actively engaged in professional activities and routinely makes presentations to the national and state conferences of American College of Sport Medicine, American Planning Association, Active Living Research, Active Living by Design, and Society of Health and Physical Educators (formerly American Alliance of Health, Physical Education, Recreation and Dance). They will be able to help dissemination through their affiliations with major national and international organizations. Finally, all presentations in the conference will be recorded using NCSA’s state-of-arts facility and will be promoted and disseminated through internal and social media.