

3. Abstract

Physical inactivity and obesity among youth are critical public health issues. The Cellular Assessment of Leisure Lifestyles Study (CALLS) is an innovative project that uses cell phone technology to gather *in-situ* reports of sedentary behavior and examine links between these reports and factors theorized to influence sedentary activity. Sixty 13-15 year old girls will receive calls on their cell phone every two hours for three weekdays (after school only) and one weekend day. Responding to a call will initiate an automated interview of 12 questions about what they were doing at the time of the call, as well as the physical and social context of that activity. Each interview will last 2-3 minutes and all responses will be entered using the phone's touch tone keypad. Girls' mothers will complete a paper-and-pencil survey about family demographics and parental practices (e.g., rules, reinforcements, behaviors) [relating to](#) their daughter's sedentary behavior.

(148 words)

4. Project Description

Rationale and Significance of the Project

Physical inactivity and obesity among youth are now critical public health issues. Sedentary behavior has been linked with negative health outcomes among children including obesity, poor dietary habits, smoking, poor educational achievement, and early onset of sexual activity (1,2,4,5). While research has attempted to understand the factors that influence physical activity habits of children and adolescents, few studies have focused on understanding sedentary behaviors that compete with, or prevent, physical activity. Even fewer studies have focused on sedentary behavior among adolescent girls, despite their greater risk of leading a physically inactive lifestyle (3). Our understanding of the causal link between sedentary behaviors and health, as well as our ability to change these behaviors, is further limited because our data come mainly from surveys that rely on young people's memory of how they spend their free time. Very little is known about the physical and social context of physical inactivity, or how parenting practices limit or facilitate sedentary behavior among girls. Measures are needed that assess sedentary behavior in real time and in the context in which it occurs. This will help guide the development of effective intervention programs to reduce sedentary behavior among youth. An innovative method involving ubiquitous and cost-effective technology for assessing behavior is the cell phone. Recent research suggests that 82% of high school students own a cell phone (8) with ownership highest among adolescent girls. While other studies have used technology to collect behavioral data, these have been limited to hand held computers, particularly Personal Digital Assistants (PDA) (7). However, PDAs' require comprehensive training of participants, weekly in-person contact to download data and change batteries, complex data management, and extensive programming costs.

Key points:

- Sedentary lifestyles among youth are an increasing burden to public health. Despite these concerns, research that attempts to understand the sedentary habits of young people, and of adolescent girls in particular, is virtually non-existent.
- The cell phone is a portable and ubiquitous interactive technology that enables data about sedentary behavior to be collected in the field and in real time. To date, no studies have attempted to use cell phones to measure childhood risk factors for obesity.

Project Objectives

The proposed study, Cellular Assessment of Leisure Lifestyles Study (CALLS), will: (a) gather ecologically valid reports of sedentary behavior in 13-15 year-old girls using cell phone technology, and (b) examine links between these reports and individual, familial, and environmental factors theorized to influence youth sedentary activity.

Methodology

Participants. Sixty adolescent girls and their mothers will be invited to participate. Participants will be recruited using advertisements and verbal announcements at local clubs, societies, and community center programs targeting adolescent girls and women. The girls' mothers will be recruited to enable data to be collected about family demographics and parental practices (e.g., rules, reinforcements, behaviors) relating to their daughter's sedentary behavior.

Measures. The proposed study will use an automated telephone interview system to collect *in-situ* data about the types and context of activity girls are participating in. The automated telephone interview will be developed by Angel.com, a leading provider of Interactive Voice Response (automated survey interview) solutions. The system will auto-direct-dial a call to the cell phone number of each girl. Answering the call will trigger a 12-question automated interview. Each question will include a multiple-choice response set ranging from two to nine choices, which correspond to the numbers on the telephone keypad. If the required response option is not included in the list, participants will be able to speak into the phone and state what they are doing. The girl's

mother will complete a confidential paper-and-pencil survey about familial factors (e.g., family size) and parental practices (e.g., rules, reinforcements, behaviors) relating to their daughter's sedentary behavior.

Procedures. Participants will be required to carry their own cellular phones at all times and complete the automated telephone interview placed by the system. Participants will receive calls approximately every two hours on three weekdays (between 3:30 and 10pm) and one weekend day (between 9am and 10pm). Answering the call will initiate the automated interview which will take approximately 2-3 minutes to complete. If participants are unable to respond to a call immediately, a voice message will be left asking them to call into the system at their earliest opportunity. All calls to the system will be date and time stamped and, together with the interview responses, will be recorded and collected in a computer-generated database file.

Analyses. All analyses will be performed using specialized statistical software. The frequency of each type of sedentary behavior will be computed. The likelihood of each behavior occurring in specified contexts (e.g., in their bedroom, at a friend's house, with family members) will be assessed using logistic regression analysis. Associations between sedentary behavior and parental practices will be assessed using multiple regression analysis.

Key point:

- Adolescent girls will receive a series of calls to their cell phone each day. Each call will require them to participate in an automated interview lasting 2-3 minutes. Mothers will complete a paper-and-pencil survey at the beginning of the study.

Proposed timeline

Project task	Jan 2007	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec 2007
Literature review												
IVR system development												
Measure piloting												
Participant recruitment/training												
Data collection												
Data extraction												
Data cleaning									--	-	-	---
Data analysis												
Report writing												

Work completed to date

The proposed study builds on previous research by the Principal Investigator (PI) involving the prevalence (7) and measurement (6) of sedentary behavior among youth, but also involves new interdisciplinary collaboration with experts in Biobehavioral Health (Dr. Lori Francis, Penn State), and Family Studies (Dr. Kirsten Davison, SUNY, Albany). A previous collaboration with Dr. Davison and colleagues (4) revealed that girls who watched more than 2 hours of TV per day at ages 7, 9 and 11 were 4.7 times more likely to become overweight than girls who watched fewer than 2 hours per day. In a subsequent study it was found that girls watched significantly more TV when their parents were high volume TV viewers, relied heavily on TV as a recreational activity, watched TV with them, and failed to limit their access to TV. Although these studies highlight the negative health outcomes associated with excessive TV viewing among children and the important role that parents play in shaping such behaviors, they are limited because only TV viewing was measured (by retrospective self-report), and no data were collected about the physical and social context in which viewing occurred. In May 2006, I initiated a pre-pilot study (unfunded) with my collaborators to explore the feasibility of **using cell phone technology to collect** behavioral and contextual data. From a number of single-subject case studies and qualitative interviews I have determined that the methodology is promising but that additional funding is needed to develop a sophisticated system for conducting automated interviews.

Educational impact on students

One graduate student and one undergraduate student research assistant will be employed during the study and will be given learning experiences in study design, data collection, analysis, interpretation, and dissemination. In particular, the students will be given the opportunity to present some of the research data at scientific conferences. The study will also be used in my teaching as exemplars of innovative methodology (ENS 602) and determinants of physical activity (ENS 687).

Anticipated dissemination of research

The results of this study will be disseminated through publication in international peer-reviewed journals, presentation at scientific conferences, and as an application for external funding. Specifically, I plan to write an R21 grant application (R21 is a special funding mechanism through the National Institutes of Health) to examine the applicability of the telephonic system to assess active and sedentary behaviors, and the social and physical contexts in which they occur, in a diverse sample of adolescent girls and boys. This research is well suited to the R21 category, which is intended for innovative and exploratory research. Examples of current NIH R21 program announcements that are relevant to the proposed study include: Improving Diet and Physical Activity Assessment (R21) (PAR-06-103); Parenting Capacities and Health Outcomes in Youths and Adolescents (R21) (PA-06-530); and Understanding Mechanisms of Health Risk Behavior Change in Children and Adolescents (R21) (PA-06-298). In addition to being appropriate for an R21 grant application, research on behaviors that place children at risk of obesity is also of key interest to other funding institutions such as the Robert Wood Johnson Foundation.

Key point:

- The high funding priority given to obesity-risk behaviors among children, and the interdisciplinary collaboration with experts in related fields considerably adds to the potential of this study to lead to external funding.

Potential for development of intellectual property

If shown to be valid and reliable, the telephonic application could be made available for purchase by researchers or clinicians. This application could become a critical diagnostic and intervention tool for clinicians working with special populations (e.g., obese youth) or for researchers attempting to further understand the 'causes' and intervention 'leverage' points of sedentary habits in this important age group.

References

- 1 Ashby, S. L., C. M. Arcari, and M. B. Edmonson. Television viewing and risk of sexual initiation by young adolescents. *Arch Pediatr Adolesc Med.* 160:375-380, 2006.
2. Boynton-Jarrett, R, T. N. Thomas, K. E. Peterson, J. Wiecha, A. M. Sobol, and S. L. Gortmaker. Impact of television viewing patterns on fruit and vegetable consumption among adolescents. *Pediatrics.* 112:1321-1326, 2003.
3. Centers for Disease Control and Prevention. Youth risk behavior surveillance--United States, 1999. *Morbidity & Mortality Weekly Report.* 49(SS-5):1-94, 2000.
4. Davison, K., S. Marshall, and L. Birch. Cross sectional and longitudinal associations between TV viewing and girls' Body Mass Index, overweight status, and percentage body fat. *Journal of Pediatrics.* 149:32-37, 2006.
5. Gutschoven, K. and J. Van den Bulck. Television viewing and smoking volume in adolescent smokers: a cross-sectional study. *Prev Med.* 39:1093-1098, 2004.
6. Marshall, S. and R. Readdy. The development of an electronic diary to collect in-situ data about sedentary behavior and eating. In *Fourth Annual conference for the International Society of Behavioral Nutrition and Physical Activity.* Amsterdam, The Netherlands, 2005.
7. Marshall, S. J., T. Gorely, and S. J. H. Biddle. A descriptive epidemiology of youth sedentary behavior: A review and critique. *Journal of Adolescence.* 29:333-349, 2006.
8. Zogby, J., J. Bruce, and R. Wittman. *Survey of teens and adults about the use of personal electronic devices and head phones:* Zogby International, 2006.

5. Experience and Qualifications

I have 11 years of experience coordinating the measurement and evaluation of physical activity research. My current research focuses on childhood obesity and the causes of sedentary behavior among youth. My emerging interests are in the use of innovative technology for measuring and changing patterns of youth inactivity.

Education

- 2001-2002. Post-doctoral Research Associate, British Heart Foundation, U.K.
- 1998-2001. Ph.D. Sport and Exercise Psychology, Loughborough University, U.K.
- 1993-1995. M.A. Physical Education, San Diego State University, San Diego, California.
- 1988-1991. B.Sc. (Hons) Sports Science, Liverpool Polytechnic, U.K.

Academic positions

2002-present. Assistant Professor, Department of Exercise & Nutritional Sciences, SDSU.

Relevant Publications

- Marshall, S.J., Gorely, T., Biddle, S.J.H., (2006). A descriptive epidemiology of youth sedentary behavior: A review and *critique*. *Journal of Adolescence*, 29, 333-349.
- Marshall, S.J., Gorely, T., Biddle, S.J.H., Cameron, N., & Murdey, I. (2004). Couch kids: Correlates of television viewing among youth. *International Journal of Behavioral Medicine*, 11(3), 152-163.
- Marshall, S.J. Biddle, S.J.H., Gorely, T., Cameron, N., & Murdey, LM. (2004). Relationships between media use, body fatness and physical activity. among children and youth: a meta-analysis. *International Journal of Obesity*, 28, 1238-1246.
- Marshall, S.J., Biddle, S.J.H., Sallis, J.F., McKenzie, T.L., & Conway, T.L. (2002). Clustering of sedentary behaviors and physical activity among youth: a cross-national study. *Pediatric Exercise Science*, 14(4), 401-417.
- Marshall, S.J., Biddle, S.J.H., Murdey, LM., Gorely, P.J., & Cameron, N. (2003). But what are you doing now? Ecological momentary assessment of sedentary behavior among youth. *Medicine and Science in Sports and Exercise*, 35(S); (Supplement S1 S0).

Honors/awards.

1. Invited speaker, International Congress on Physical Activity and Public Health, Centers for Disease Control and Prevention. April 17 - 20, 2006, Atlanta, Georgia.
2. 2004 Peach Mountain Award (Presented annually by the editor of Pediatric Exercise Science to innovative papers presented or published in 2004). "Sedentary behaviors, body fatness and physical activity in youth: A meta-analysis. *Medicine and Science in Sports and Exercise*, 35(S), (Supplement 178).
3. Unlock Research.com - Research Report of the Month (Dec 2004) : McKenzie, T.L., Sallis, J.F., Prochaska, J.J., Conway, T.L., Marshall, S.J., and Rosengard, P. (2004). Evaluation of a two-year school physical education intervention: M-SPAN. *Medicine and Science in Sports and Exercise*, 36. 1382-1388
4. Joint 2nd place - 2002 International Olympic Committee (IOC) Prince Alexandre De Merode Award (Published paper).
5. 5th place, Young Investigators Award, European College of Sports Science, Jyvaskala, Finland, July 18-22, 2000.
6. Exemplary Paper Awards, 1999, 2001 - American Educational Research Association (AERA) (SIG-- Research on Learning and Instruction in Physical Education).

University grants in the past three years/External funding relevant to the project

None (FDP/GIA, 2002)/None.