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ScienceDirect

Journal of Sport and Health Science xx (2017) 1–8

www.jshs.org.cn

Original article

Feasibility of using pedometers in a state-based surveillance system: 2014 Arizona Behavioral Risk Factor Surveillance System 2014

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Received 24 July 2017; revised 21 August 2017; accepted 26 September 2017
Available online

Abstract

Background: Despite their utility in accessing ambulatory movement, pedometers have not been used consistently to monitor physical activity in U.S. surveillance systems. This study was designed to determine the feasibility of using pedometers to assess daily steps taken in a sub-sample of adults from Maricopa County who completed the 2014 Arizona Behavioral Risk Factor Surveillance System Survey.
Methods: Respondents were sent an Omron HJ324U pedometer, a logbook to record steps taken, and a walking questionnaire. The pedometer was worn for 7 days. Feasibility was assessed for acceptability (interest in study), demand (procedures followed correctly), implementation (time to complete study), and practicality (cost).
Results: Acceptability was modest with 23.9% (830/3476) agreeing to participate. Among those participating (92.9%; 771/830), 50.1% (386/771) returned the logbook. Demand was modest with 39.3% (303/771) of logbooks returned with valid data. Implementation represented 5 months to recruit participants. The cost to obtain valid step-count data was USD61 per person. An average of 6363 ± 3049 steps/day were taken with most participants classified as sedentary (36.0%) or low active (35.6%).
Conclusion: The feasibility of using pedometers in a state-based surveillance system is modest at best. Feasibility may potentially be improved with easy-to-use pedometers where data can be electronically downloaded.

Keywords: Assessment; Measurement; Physical activity; Public health

1. Introduction

Physical activity (PA) surveillance is performed in public health settings to monitor PA levels over time, assess needs of population groups at risk for low PA levels, evaluate the effects of PA promotion programs, and determine changes in PA behaviors over time.[1] Most PA surveillance in the USA is based on telephone- and self-administered questionnaires.[2]

In the framework of strategic priorities for PA surveillance for U.S. adults, experts[1] have called for innovative strategies to improve public health PA surveillance activities. Walking is the most commonly reported PA by U.S. dults and represents an important behavior that contributes to meeting PA guidelines.[3,4] Pedometers may be a feasible, innovative method to obtain useful information for public health planning purposes. Pedometers have been used in national surveys to characterize PA levels in adult populations in Denmark,[5] Japan,[6] and Western Australia.[7] In the USA, steps taken have been obtained from accelerometers used in 2005–2006 National Health and Nutrition Examination Survey (NHANES).[8] Because the priority of the U.S. surveillance systems is to monitor the 2008 Physical Activity Guidelines for Americans, and the guidelines do not recommend an optimal number of steps taken, pedometers have not been incorporated into U.S. PA surveillance systems. Nevertheless, using pedometers to measure steps taken in a PA surveillance system may have relevance for public health practice as recently highlighted by *Step It Up! The Surgeon*

Peer review under responsibility of Shanghai University of Sport.
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https://doi.org/10.1016/j.jshs.2017.11.003

General's Call to Action to Promote Walking and Walkable Communities, in which gaps in walking surveillance have been identified.[4]

To examine the feasibility of using pedometers in a state-level surveillance system, we conducted a study of pedometer use in a sub-sample of respondents completing the 2014 Arizona Behavioral Risk Factor Surveillance System (AZ-BRFSS).

2. Materials and methods

2.1. BRFSS questionnaire

The BRFSS is an ongoing, national surveillance system and data are collected by each state and U.S. territories to measure behavioral risk factors for the noninstitutionalized adult population (≥18 years) residing in the USA and territories. The BRFSS uses a multistage sampling design to select a representative sample of adults to be interviewed. Both landline- and cellular telephone-based surveys are administered. The BRFSS survey consists of a core set of questions that all states administer, optional questionnaire modules about topics of specific relevance to certain states (e.g., health care access, sugar drinks), and state-added questions.[9] In Arizona, the BRFSS is conducted by the Arizona Department of Health Services (ADHS) and administered by an independent contractor hired by the ADHS. The present study was approved by the Arizona State University Office of Research Integrity and Assurance and the ADHS Institutional Review Board.

2.2. Recruitment

Recruitment occurred between May and September 2014 and was stopped after a pre-established quota of 800 pedometers were mailed to respondents who agreed to participate in the study. Enrollment in the study was limited because only 800 pedometers were available to distribute to the participants. Eligible respondents were adults living in Maricopa County, who completed the 2014 BRFSS, were ambulatory, and were willing to listen to an invitation to participate in the state-added pedometer study at the end of the survey. Interested respondents were told about the pedometer study and what it involved. They were asked if they would like to participate. More details about the study invitation are provided in Appendix 1.

2.3. Study materials

Each participant was mailed a study packet consisting of an instruction page describing tasks to complete for the study, a pedometer with wearing instructions, a questionnaire about walking behaviors, a logbook to record daily steps, a copy of the informed consent statement, and a pre-addressed stamped envelope to return the completed logbook and walking questionnaire. All materials were available in English and Spanish languages. The study packet was prepared by the research team and sent by mail to the BRFSS contractor who mailed the study packet to each participant that agreed to participate. Informed consent was implied by respondents agreeing to participate in the study.

2.3.1. Instruction page

An instruction page informed participants how the pedometer worked, when and where to wear the monitor, how to obtain and record steps in a logbook, how to complete the walking questionnaire, and how to return the questionnaire and step logbook in the pre-stamped envelope. Participants were allowed to keep the pedometer following study participation. A toll-free number was provided for participants to call one of us (BEA) with questions about the study and/or how to use the pedometer.

2.3.2. Pedometer

The Omron HJ324U (Omron Corp., Kyoto, Japan) is a small tri-axial pedometer with 5 activity modes that track total steps, aerobic steps (cadence, ≥100 steps/min), steps per minute, distance walked, and estimated calories expended. The pedometer stores up to 22 days of data and displays steps taken for the current day and the previous 7 days. As the study team was interested in obtaining total steps, aerobic steps, and steps per minute counts only, the pedometers were pre-programed with a standard age (45 years), height (67 inches), weight (150 lbs.), sex (male), and stride length (60 inches) to eliminate data needed to estimate distance walked and energy expenditure. The pedometer was worn on the hip to standardize the pedometer placement.

2.3.3. Walking questionnaire

A questionnaire developed for this study asked participants if they had changed their intentional walking behaviors while wearing the pedometer (walked more, walked less, stayed the same) and to identify participants' perception of the ease of wearing the pedometer for 7 days (very difficult, somewhat difficult, somewhat easy, very easy).

2.3.4. Step logbook

A logbook developed for this study included spaces for participants to write the date, day of the week, total daily steps, aerobic steps, and steps per minute for each day the pedometer was worn.

2.4. Data collection procedures

Participants were instructed to wear the pedometer for 7 consecutive days except during sleep or while in water and to record data from the pedometer into a logbook each night before going to bed. After 7 days, participants were instructed to return the step logbook and the walking questionnaire in the pre-stamped envelope.

The BRFSS contractor conducted up to 9 follow-up/reminder calls to participants that did not return the step logbook within a 3-week period. Participants that did not return the step logbook after 3–4 weeks were classified as non-responders.

Once the research team received the step logbook and questionnaire, data were entered into an Excel spreadsheet using double data entry. Returned logbooks were labeled as valid if they had 3 or more days of reported steps between 1000 and 25,000 steps/day ($n = 303$) as recommended by Bassett et al.[10] and Wyatt et al.[11] Fig. 1 provides the flow of information for the data collection process.

Please cite this article in press as: Alberto Flórez-Pregonero, Janet E. Fulton, Joan M. Dorn, Barbara E. Ainsworth, Feasibility of using pedometers in a state-based surveillance system: 2014 Arizona behavioral risk factor surveillance system, Journal of Sport and Health Science (2017), doi: 10.1016/j.jshs.2017.11.003