ELSEVIER

CrossMark

Disability and Health Journal 7 (2014) 309–317

Disability and Health Journal

www.disabilityandhealthjnl.com

Research Paper

Calibration and validation of the Physical Activity Barrier Scale for persons who are blind or visually impaired

Miyoung Lee, Ph.D.[a,*], Weimo Zhu, Ph.D.[b], Elizabeth Ackley-Holbrook, Ph.D.[c], Diana G. Brower, M.S.[d], and Bryan McMurray, M.S.[b]

[a]*Department of Sport, Health, and Rehabilitation, Kookmin University, South Korea*
[b]*University of Illinois at Urbana-Champaign, USA*
[c]*Roanoke College, USA*
[d]*Wisconsin Center for the Blind and Visually Impaired, USA*

Abstract

Background: It is critical to employ accurate measures when assessing physical activity (PA) barriers in any subpopulation, yet existing measures are not appropriate for persons with blindness or visual impairment (PBVI) due to a lack of validity or reliability evidence.

Objective: To develop and calibrate a PA barrier scale for PBVI.

Methods: An expert panel (n = 3) and 18 PBVI were recruited to establish content validity for a PA barriers subscale; 160 PBVI (96 females) completed the scale along with the Physical Activity Scale for Individuals with Physical Disabilities for calibration. To establish construct-related validity evidence, Confirmative factor analysis (CFA) and Rasch analysis were applied. To investigate internal consistency and reliability, Cronbach's alpha and the reliability coefficient (R) were employed, respectively.

Results: Following CFA and Rasch analyses, five items were eliminated due to misfits; reliability coefficients were unchanged upon deletion of these items. The barriers perceived by PBVI to have the most negative impact on PA included "lack of self-discipline" (logit = 1.40) and "lack of motivation" (logit = 1.27). "Too many stairs in the exercise facility" (logit = −1.49) was perceived to have the least impact.

Conclusions: The newly-developed scale was found to be a valid and reliable tool for evaluating PA barriers in PBVI. To enhance promotion of health-producing levels of PA in PBVI, practitioners should consider applying this new tool as a precursor to programs aimed at improving PA participation in this group.

Keywords: Promotion of physical activity; Disability; Assessment

According to the World Health Organization,[1] 39 million people are blind worldwide and 246 million individuals have low vision. As a result of visual impairment, the mobility of an individual significantly decreases. Longmuir and Bar-Or[2] reported that youth with visual impairments had one of the most sedentary lifestyles of the many disabilities studied. Also, the health-related fitness level of individuals with visual impairments is generally lower than are those of sighted individuals.[2–7]

Current research indicates that physical activity (PA) could serve as the primary preventive behavior for several chronic health problems, including coronary heart disease, cancer, Type II diabetes, and osteoporosis.[8] Moreover, participating in regular PA—at least 150 min of moderate activity per week, or 75 min of vigorous activity per week—is recommended to sustain good health.[8] Because of the importance of PA, great efforts have been made to identify factors that correlate with people's PA behaviors. Perceived barriers to PA have been identified as key correlates,[9] with "lack of time" and "self-discipline" serving as significant barriers to PA in the general population.[10,11] Likewise, perceived barriers to PA are critical to PA participation in persons with disabilities.

According to the Model of Physical Activity for People with a Disability[12] and the World Health Organization's International Classification of Functioning, Disability and Health (ICF),[13] environmental and personal factors (e.g.,

Disclosure of funding received: This study was supported by Seed Grant of Research Consortium at American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) and in part by the new faculty research program 2010 of Kookmin University in Korea.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

* Corresponding author. Tel.: +82 2 910 4786.
E-mail address: mylee@kookmin.ac.kr (M. Lee).

1936-6574/$ - see front matter
http://dx.doi.org/10.1016/j.dhjo.2014.02.004

facilitators, barriers, social influences, health conditions, etc.) are critical to the physical functioning and PA behaviors of persons with disabilities. It has been reported that perceived PA barriers for persons with disabilities may vary depending on the individual's demographic background (e.g., age, disability manifestation, social status, etc.). Among young adults with disabilities, environmental (e.g., lack of PA facilities) and psychological barriers (e.g., lack of motivation, fear of injury, etc.) were identified as the most impactful,[14] whereas a lack of self-efficacy was most frequently identified by older adults with disabilities.[15] Moreover, wheelchair users reported pain, lack of time, and lack of a place to exercise with peers as the most substantial PA barriers.[16] Among African-American females with disabilities, the cost of exercise programs was the most frequently noted PA barrier.[17]

Even though PA barriers have been investigated in different populations, there are limitations in generalizing the findings to PBVI. Most notably, many instruments for assessing PA barriers in the general population have low psychometric quality or have not been validated for subpopulations with disabilities. Moreover, little is known regarding the perceived PA barriers of PBVI, which may involve issues related to orientation and mobility skill or unexpected environmental obstacles.[18] Therefore, the purpose of this study was to develop a PA barrier scale for PBVI from an existing questionnaire[19] utilizing various psychometric theories including classical test theory (CTT) and Rasch. The specific aims of this study were 1) to derive a barrier scale for PBVI and collect content-related validity evidence from expert panels and focus groups of PBVI, 2) to calibrate the scale using the CTT and Rasch model, and 3) to examine evidence of validity (e.g., correlation to PA participation and body mass index) and reliability (e.g., internal consistency and stability) in the new scale.

Methods

To address the specific aims, a three-phase study design was employed, including 1) the development of a PA barrier scale for PBVI, 2) calibration of the developed scale, and 3) validation of the scale using the aforementioned statistical approaches. In order to ensure recruitment of an adequate sample, permission for this study was granted at three universities across the United States (e.g., Illinois, Tennessee, and Wisconsin). Before participating, content experts, focus group participants, and those involved in calibrating the PA barriers scale provided written informed consent.

Data collection and procedures

Phase 1: development of PA barrier items and a subscale for PBVI

From an existing pool of barriers which had been previously calibrated using Rasch model,[16,20] 46 items were selected. Selecting items derived from three principles: (a) the items represented barriers that were applicable to persons with disabilities (e.g., "no time to exercise"), (b) items had good model-data fit statistics, and (c) items represented a range of severity (e.g., less or more impact on PA). In addition, a set of PA barriers for PBVI was compiled from a comprehensive literature review, resulting in the following ten items: walking confidence,[21] walking speed,[21] unexpected obstacles,[18] fear of having an accident,[18] fear of making a wrong decision relative to the intended direction of travel,[18] lack of self-orientation within a location,[18] lack of knowledge of travel distance,[18] too many stairs,[22] dim lights,[23] and low vision.[23]

To examine content-related validity evidence of the 56-item scale, a review was conducted by three visually impaired content experts, including two measurement specialists and a test accommodation specialist. After the experts screened all items, the scale was reviewed by three focus groups of PBVI (for each group, $n = 6$; ages 13–17, 18–54, and 55–85 years, respectively) using various accessible formats (e.g., Braille, large print font). After attainment of written informed consent, focus group members discussed whether items should be included in the final scale with or without modification. According to accepted guidelines,[24] focus group discussions were recorded, transcribed, and analyzed by the content experts to finalize the new PA barrier scale for PBVI.

Phase 2: calibration and preliminary validation of the developed scale

The developed PA barriers scale, called the Physical Activity Barrier Scale for Persons Who are Blind or Visually Impaired, was administered to a sample of 160 PBVI from three states (IL, TN, or WI). Strategies to recruit an adequate sample size included distributing flyers, newsletters, and by sharing by word of mouth through the community of PBVI. Individuals with congenital visual impairment or legal blindness (visual acuity of 20/200 or less) were eligible to participate. All participants received five dollars for their time.

Following attainment of written informed consent, participants completed a demographic questionnaire (including information pertaining to education level, marital status, gender, age, visual acuity, and body mass index), the newly-developed PA barriers subscale, and the Physical Activity Scale for Individuals with Physical Disabilities (PASIPD).[19] The PASIPD[19] was administered to estimate the PA level of the participants to examine preliminary validity evidence for the barrier subscale. It was hypothesized that if the developed subscale accurately measured PA barriers for this subpopulation, a negative relationship with PA would be observed.[16] The validity and reliability of the PASIPD questionnaire for persons with disabilities has been established previously.[19,25–27]

Each questionnaire was made available to participants in a variety of adaptive formats, including Braille, audio