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Acceptability and Feasibility of Physical Activity Assessment Methods for an Appalachian Population

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Abstract

Nowhere is improving understanding and accurate assessment of physical activity more important for disease prevention and health promotion than among health disparities populations such as those residing in rural and Appalachian regions. To enhance accurate assessment of physical activity and potentially improve intervention capacity, we conducted a mixed-methods study examining the acceptability and feasibility of self-report physical activity questionnaires, pedometers, and accelerometers among rural Appalachian children, adolescents, and adults. Most participants reported positive experiences with all three physical activity assessment tools. Several acceptability ratings differed by age group and by sex within each age group. With very few exceptions, no significant differences in acceptability were found by race, education, employment status, health status, BMI categories, income levels, or insurance status within age groups or overall. Several factors may impact the choice of the physical activity assessment method, including target population age, equipment cost, researcher burden, and potential influence on physical activity levels. Children and adolescents appear to have more constraints on when they can wear pedometers and accelerometers. While pedometers are inexpensive and convenient, they may influence physical activity levels, rather than simply measure them. Accelerometers, while

less influential on behavior, consume extensive resources, including high purchase costs and researcher burden.

Keywords

physical activity; pedometer; accelerometer; self-report; Appalachia

Accurate assessment of physical activity comprises the foundation for research aimed at promoting physical activity and eliminating health disparities. Assessment of physical activity enables (a) understanding of the relationship among physical activity, its correlates, and physical and mental health outcomes; (b) monitoring and surveillance of physical activity levels within populations; (c) making cross-cultural comparisons; (d) measuring the impact and effectiveness of programs and interventions designed to increase physical activity; and (e) building an evidence base for broader initiatives in disease prevention and health promotion policy and practice.¹⁻³

Accurate assessment of physical activity is especially warranted among those populations that suffer health disparities, such as residents of rural Appalachia. Compared with non-rural populations, rural Appalachian residents experience more pervasive negative sequelae of inadequate physical activity (e.g., higher rates of cancer, diabetes, obesity, and heart disease).⁴⁻⁶ Based on 2008 estimates from the Behavioral Risk Factor Surveillance System (BRFSS), Appalachian Kentucky residents fall in the top quartile nationally for sedentary leisure time.⁷

Factors contributing to low physical activity levels in Appalachian and rural populations include contextual (e.g., availability of resources to promote physical activity like trails and gyms, parks, and safely walkable destinations) and collective (e.g., social support) circumstances, as well as interactions with compositional and socio-demographic factors (e.g., individual age, sex, education and income levels).^{8,9} Rural areas and mountainous Appalachian terrain are less likely than suburban and urban areas to contain accessible and navigable walking trails and sidewalks.^{10,11} Low population density and lack of access to public transportation increase reliance on motorized transport to perform physical activity in community locations like gyms.^{12,13} Furthermore, inadequate broadband service stymies rural and Appalachian residents' capacity to take advantage of Internet-based physical activity interventions.¹⁴ Low to modest levels of social support for physical activity in rural areas also contribute to inadequate physical activity levels.¹⁵ Based on a survey of rural elders, those who do not meet recommended levels of physical activity are significantly less likely to report that they had a partner with whom to be active, compared to those reporting higher physical activity levels.¹⁶

These contextual and collective influences tend to differ significantly depending on compositional factors. Data from the National Walking Survey suggest differential effects of access to neighborhood streets and indoor gyms on physical activity among rural and urban residents based on income levels. Specifically, rural residents with lower income levels are more likely to exercise if they have access to neighborhood streets, while rural residents with higher income levels are more likely to engage in physical activity if they have access

to an indoor gym.^{17, 18} In a cross-sectional study conducted in rural Georgia, several significant interaction effects were observed for collective and compositional influences on physical activity. For example, females who reported having high levels of social support at church also reported higher levels of vigorous physical activity compared to women with low levels of social support at church.¹⁵

To understand the direct and interaction effects of contextual, collective, and compositional influences on rural-urban disparities in physical activity, accurate assessment of physical activity is needed. Existing data on physical activity in Appalachia—particularly rural Appalachia—are scant and are limited by data collection methods. To our knowledge, no studies have evaluated the acceptability and feasibility of both subjective (e.g., self-report) and objective (e.g., pedometry and accelerometry) methods to assess physical activity in this highly sedentary population and its diverse age segments. Acceptability and feasibility of measurement approaches are important to understand because if the target population is unwilling to use a given method or if it is not feasible to use a method, administering even the most valid and reliable tool is futile. Therefore, the purpose of this study is to examine the acceptability and feasibility of three commonly used methods of assessing physical activity (i.e., self-report, pedometry, and accelerometry) within a mixed-age sample of rural Appalachian residents. Acceptability and feasibility are typically related to (a) the specific instrument(s) and equipment used to collect the raw information, (b) the characteristics of the study participants (e.g., age and sex – the most common modifiers identified by prior researchers), and (c) study setting.² Hence, for the present study, we report the overall study design, acceptability (i.e., being both culturally and practically acceptable to study participants), and feasibility (i.e., not being overly burdensome to researchers in terms of resources required) of each instrument with regard to age and sex of the Appalachian participants. Measurement properties of the instruments (e.g., validity and reliability) will be reported in future publications.

Methods

Study Design and Participants

The project examined reliability, validity, acceptability and feasibility of three physical activity assessment methods in a rural Appalachian context, with attention to age and sociocultural considerations. Eligibility criteria included being at least 8 years old and a resident of one of the 54 counties of Appalachian Kentucky. The minimum age was selected based on existing literature suggesting that at age 8, children begin to initiate more independence with lifestyle behaviors.¹⁹⁻²¹ Research assistants (RAs) recruited participants from local churches, schools, recreation and community centers, and other community locations.

Based on sample size calculations to achieve adequate power for reliability and validity analyses, quota sampling was used to enroll 84 participants from each age group (i.e., children ages 8-12, adolescents ages 13-17, and adults ages 18 and over), with approximately equal numbers of males and females. All interested participants were given a brief study description specifying that their involvement would require (a) seven consecutive days of wearing a belt with the New Lifestyles NL-1000 pedometer and the Actigraph

GT3X accelerometer attached; (b) completing a self-report physical activity assessment instrument (as well as a parent-report instrument for children and adolescents); and (c) participating in a brief structured interview to provide their opinions about the measurement activities. Participants were compensated \$100 for their time and effort. All study procedures were approved by the University of Kentucky Institutional Review Board. Adult participants provided written informed consent. Children and adolescents provided assent, and a parent/legal guardian provided written informed consent.

Procedures

Four physical therapy doctoral students, hired as RAs, were trained to administer all three physical activity instruments. The RAs trained each participant (and parent/legal guardian, in the case of the children and adolescents) to use the pedometers and accelerometers correctly. Participants were also provided with written instructions on how to use the equipment, as well as contact information for study staff in case questions arose.

Participants were instructed to wear the belt with the accelerometer and pedometer attached for eight consecutive days, to ensure at least four complete days of physical activity data for accurate analysis.²² Over the course of the eight days, an RA contacted each participant by telephone to encourage correct and continuous use of the equipment. After two months of data collection, participant feedback prompted the project team to revise the protocol to seven days of data collection to be more convenient for participants. The RAs dropped off and picked up equipment at the same location and day and time of the week.

At baseline, participants completed a sociodemographic questionnaire. During each day of accelerometer and pedometer data collection, participants completed a daily physical activity log (PAL). The PAL was used to record steps taken each day, any times when the accelerometer and pedometer were not worn, and any bouts of exercise. At the end of each participant's data collection period, they returned to the training site to meet with the RAs, return the equipment, complete the age-appropriate physical activity self-report instruments (described below), and participate in a semi-structured interview regarding their experiences.

Measures

Sociodemographic characteristics—Adults and adolescents completed a sociodemographic questionnaire, and a parent/legal guardian completed a sociodemographic questionnaire for child participants. Sociodemographic variables included age, sex, race, ethnicity (Hispanic or non-Hispanic), height and weight (for calculations of Body Mass Index [BMI]), health status (poor, fair, good, very good, or excellent), and health insurance status, as well as adult's or parental educational level achieved, annual household income, perceived financial status, and employment status (see Table 1).

Acceptability—Acceptability of the physical activity assessment methods was examined quantitatively and qualitatively. For the quantitative examination, participants completed a questionnaire during their audio-taped interviews. The questionnaire was comprised of 16 items with Likert-type response options (from 1=Strongly disagree to 4 = Strongly agree).

The questions addressed perceived time expenditure, hassle, and cost associated with use of self-report questionnaires, pedometers, and accelerometers to track physical activity. Costs included opportunity costs (e.g., the cost of forgoing activities because of the need to wear a pedometer or accelerometer or to be otherwise engaged in this project), as well as perceived incompatibility with roles and other responsibilities (e.g., being a student, engaging in certain professions, or being a caregiver). The interviews also included open-ended questions, allowing participants to express their experiences in their own words. For the qualitative examination, participants completed a brief semi-structured interview with open-ended questions allowing participants to express their experiences in their own words.

Feasibility—Feasibility was determined for each physical activity assessment tool (self-report, pedometer, and accelerometer) by considering amount of missing data and costs of administration of each tool, including researcher burden – the time spent on training participants to use each movement sensing tools, data handling, cleaning, management, and analysis for each physical activity assessment instrument. All self-report questionnaires were scanned into TeleForm for data entry.^{23,24} Data from the accelerometers were uploaded directly from the instruments, and pedometer data were hand-entered by the RAs. Data collected by the accelerometer involved a series of activity counts representing the intensity and duration of motion in the sampling interval (i.e., counts/second).²⁵ In order to make these data comparable to the pedometer and self-report data, they were summarized in terms of counts or steps/day, which is standard in pedometer performance.²⁶

Data Analysis

Quantitative analyses—Univariate analyses were employed to describe sample characteristics and acceptability. Differences between the three age groups with respect to each of the acceptability items were assessed using the Kruskal-Wallis rank test. When the test was statistically significant, post-hoc pairwise comparisons were performed using the kwallis2 Stata procedure with $\alpha/(k(k-1))$ adjustment, where k represents the number of levels of a categorical variable (i.e., for age and other three-level variables, the adjusted $P = .008$; for sex and other two-level variables, the adjusted $P = .025$). Differences in acceptability ratings by sex were tested in the overall sample as well as within each age group, using the two-sample Wilcoxon rank sum (Mann-Whitney) test based on the ranks of observations rather than on their actual values. Mean ranks (or the mean rank scores for each group) for each acceptability item were also examined given other sample characteristics, including race, education, employment status, health status, BMI categories, income levels, and insurance status correcting for the multiple comparisons. All quantitative analyses were conducted with Stata/MP 11.2 for Windows.

Qualitative analyses—Interviews were audio-recorded and transcribed with the permission of the participant. Qualitative data were imported into NVivo and analyzed using content analysis and line-by-line coding by one of the authors (BH) to create a codebook.^{27, 28} Each sentence in the transcript was thematically coded using a grounded theory-type approach, where no single theoretical orientation guided the thematic coding. Codes were grouped together; a codebook with exemplary quotes was created, and broader themes from the data and codebook were identified.

Results

Sample Characteristics

The analytic sample consisted of 291 observations: 86 children, 89 adolescents, and 116 adults. Consistent with the demographics of Appalachian Kentucky ²⁹, nearly all participants were white and non-Hispanic (see Table 1).

Children (8-12 years)—The mean age of the 86 child participants was 10 years (SD = 1). Approximately half (51%) were male. Twenty-five percent had parents with less than a high school education and 18% had parents who had completed high school. Most children's parents (59%) were employed. The health status of nearly all children (98%) was described positively by their parents, ranging from good to excellent. Fewer than half of the children were of normal weight; 25% of children were overweight (i.e., 85th BMI percentile < 95) and 34% were obese (i.e., BMI 95th percentile).

Adolescents (13-17 years)—The mean age of the 89 adolescent participants was 15 years (SD = 1). Approximately half (49%) were male. Almost one-third of adolescents had parents with less than a high school education and 15% had parents with a high school education. Most adolescents' parents (74%) were employed. All parents described their adolescents' health status as either good (13%) or very good/excellent (87%). However, nearly half of adolescents were either overweight (17%) or obese (32%).

Adults (ages 18-81 years)—The mean age of the 116 adult participants was 40 years (SD = 16). Most (61%) were female. Fewer than half of adults reported education beyond high school: 17% had less than a high school education and 32% had only a high school education. Just over half (55%) were unemployed. The majority of adult participants (71%) described their health status positively, ranging from good to excellent, but most were either overweight (24%) or obese (58%).

Acceptability: Quantitative Results

Most participants indicated positive experiences with all three assessment tools. Overall, 80% of the participants reported that self-report, pedometer and accelerometer were not overly time consuming, and 88% did not think using the pedometer and accelerometer posed a hassle. Ninety-two percent of the participants indicated their activities were not impeded by using pedometers and accelerometers, and 91% believed others in their community would be willing to use self-report instruments, pedometers, and accelerometers. In addition, 89% of all participants would recommend using all three of the instruments to measure physical activity in future studies (Figure 1).

Several statistically significant differences in acceptability ratings among the three age groups were detected, using a threshold for significance adjusted for multiple comparisons ($P = .008$). Adults responded more favorably than adolescents and children on several acceptability ratings. Specifically, with regard to the use of the self-report questionnaire, adults (mean rank = 159) were more inclined compared to adolescents (mean rank = 131) to recommend use of self-report to measure physical activity ($P = .007$). Likewise, adults were

more positive in recommending the use of pedometers to measure physical activity in future studies (mean rank = 164) compared to adolescents (mean rank = 130) ($P = .002$). Adults also more frequently disagreed that using a pedometer was time consuming (mean rank = 128) compared to adolescents (mean rank = 159) ($P = .004$). Likewise, adults (mean rank = 125) more often disagreed that pedometer use had limited their activities, compared to children (mean rank = 156) and adolescents (mean rank = 159) ($P = .004$ and $.002$, respectively). Similarly, adults (mean rank = 130) more frequently disagreed that using a pedometer had posed a hassle, compared to children (mean rank = 163) ($P = .003$). With regard to the use of accelerometers, adults (mean rank = 131) more often than children (mean rank = 157) or adolescents (mean rank = 155) disagreed that its use was time-consuming ($P = .007$). For all other acceptability measures, participants' responses did not differ significantly by age group (Table 2).

Acceptability ratings did not differ significantly by sex within the overall sample (Table 2), but several sex differences were noted within the children's age group using a threshold for significance adjusted for multiple comparisons ($P = .025$) (results not shown). Among children, girls were less inclined than boys (mean ranks = 49; $P = .023$) to agree that others in their community would be willing to use self-report (mean rank = 38) to track their physical activity levels. Among adolescents, females tended to disagree that self-report (mean rank = 39) was time consuming to complete compared to males (mean ranks = 50; $P = .024$). Similarly, women were more inclined to disagree that using an accelerometer was time consuming (mean rank = 63) compared to men (mean rank = 51) ($P = .025$).

With very few exceptions, no statistically significant differences were found between mean ranks of sample sub-groups based on sociodemographic characteristics, including race, education, employment status, health status, BMI categories, income levels, or insurance status.

Acceptability: Qualitative Results

A summary of feasibility and acceptability considerations based on qualitative analyses is reported in Table 3.

Self-Report Instruments—Children reported no problems or difficulties filling out the self-report instruments. Among adolescents and adults, most feedback about the self-report instruments pertained to the specific activities listed on the revised Community Health Activities (CHAMPS) questionnaire.^{30, 31} Both adolescents and adults indicated that the form was “straightforward” and easy to complete, mostly because participants did not engage in many activities listed. One adolescent male stated, “It was easy, because I mean, I don't do anything so I'd just go through checking no.” One man said, “It was really easy to fill out because most of it was ‘no, I don't play golf,’ I didn't do, you know, an exercise machine. Most of it was just ‘no’ except the leisure activities.”

Some participants were unsure of their own ability to accurately recall physical activities. Children were asked to recall activities from the previous day, but adolescents and adults were asked to recall activities for the previous week, resulting in some challenges, as described by one woman: “Some of the questions, I guess, I found challenging because I

guess I really didn't measure how many times I did certain activities during the week.” One adolescent boy stated that he “...did not keep track so I kind of had to estimate the number of times I did something, 'cause I didn't know I was going to be answering those kind of questions.”

Pedometer and Accelerometer—Although most participants of all age groups reported enjoying using the pedometer and accelerometer, there were a few participants who provided negative feedback. Complaints largely had to do with the elastic belt to which the pedometer and accelerometer were attached so that they could be worn at the waist. One man indicated, “I wouldn't say I enjoyed it – it was, it was terrible. I mean it [the accelerometer], along with the other one on that elastic thing [the pedometer], was sort of - I guess because I was not used to it.”

Some adults were concerned about breaking the expensive equipment during the course of their day. One woman explained, “... you kept being afraid that maybe you're going to hit it against something and bust it. Or you're going to, you know, if you're wallowing on the couch, you might tear it up or something and again, it makes you a little nervous that way. It was real simple to use, but I hate the belt; they need to shorten that belt, cut them off or do something.”

Because there were some activities that required removal of the belt during the day, such as showering, swimming, gym class, and organized sports, a few participants stated it was difficult to remember to wear the belt all day long. Some adolescents and children forgot to put the equipment belt back on after removing it for such activities. More importantly, consistent with school requirements that students not wear any non-essential equipment (e.g., pedometers and accelerometers), participants had to remove the equipment belts for some sports. As a result, the accelerometers and pedometers did not capture key physical activities during the times when the belt had been removed. One adolescent female stated, “I just didn't wear it for dance try-outs or practice.” Another participant said she “took it off before volleyball practice every day.” One boy tried wearing it in basketball practice, but indicated that the belt “fell off sometimes,” a report seconded by another boy when he tried wearing it while doing jumping jacks in gym class.

In general, most participants had no trouble wearing the equipment and “forgot [they] had it on” throughout the course of the day. One man stated, “Well, I worked with the thing on, but it wasn't uncomfortable on my belt. I didn't have a bit of trouble. And my work activities, like where we repair gas lines and stuff like that, a lot of bending, using the shovels, and one thing and then another, but it wasn't in the way, it was no problem at all.”

Because pedometers were more familiar to participants of all age groups (most children and adolescents had used one in the past, typically for school projects), many participants indicated liking this equipment “the best” over the self-report and accelerometer. Participants were so used to pedometers that when asked if the pedometer accurately captured his physical activity, one child responded, “Well, I mean, I thought it was just running like a regular old pedometer.”

Because the pedometer has a step count display, allowing participants to monitor their activity levels, participants in each age group indicated they entered into “competitions” with friends, relatives, or even themselves to get the most steps in a day. One adolescent boy stated, “Well, I always liked checking it frequently during the day and me and my brothers would kind of compete to see who would get the most steps.” One man stated, “I was very conscious about the number of steps that I was taking compared to my wife and I wanted to out-walk her every day,” and an adult woman said, “I was curious to see how many steps I got in a day. You always try to do better the next day.”

Participants offered slightly more negative assessments of the accelerometer, including problems of visibility and inability to monitor their activity. Some participants were annoyed with “the blinking red light” that showed through their clothing. One woman indicated, “It was probably less noticeable than the pedometer was because it didn't have the problem of coming off the belt from the clip or I didn't have to worry about clipping it onto the flexible [elastic] belt, stuff like that. I mean it was smaller, the only time I didn't like it was the flashing because it, if you were like coming to church or something, you could see that it flashed through [your clothing].” One man realized this could be a problem for others, but not for him: “I would say it was easier than, for me, I mean probably just because I'm a guy and I can untuck my shirt. I don't tuck a lot of shirts in so I can let something hang over it.” Additionally, a few participants in each age group indicated not liking the accelerometer as much as the pedometer because there was no feedback display and they “couldn't see their steps” on the accelerometer.

Feasibility

Feasibility, which relates to the population, study setting, and specific instrument², was assessed by considering amount of missing data, costs and researcher time burdens. Self-report instruments had the least missing and/or unusable data (less than 5%), compared to pedometers and accelerometers with 10-15% of missing and/or unusable data on children, adolescents, and adults. The expenses associated with the self-report instruments consisted mainly of printing costs and researcher time undertaking data entry and processing. After participants completed the forms on paper, the surveys were scanned into PDFs and entered into TeleForm for Windows (Cardiff Software, Hewlett-Packard), a form-processing software for data entry. At the time of data collection, TeleForm was among the most efficient approaches to transfer the data into an electronic format for analysis with statistical software, bypassing the need for data entry by hand. Approximately 30 hours of researcher time were required to verify the forms before they were inputted into the electronic database and to conduct accuracy checks of the data after entry. Newer data capture procedures, including REDCap, may preclude this time expenditure.

The pedometers were reasonably priced at \$30 apiece and required very little researcher burden. Upon collection of the equipment from the research participants, research staff could scroll through the data on the display to record the participants' daily step counts. Participants needed to keep track of the equipment because they were much more likely to fall off than were the accelerometers, creating problems in the data collection protocol.

At \$300 apiece, the accelerometers were the most expensive measurement tool. The accelerometers also required the most hands-on work by the research team. For example, the accelerometers needed to be charged overnight between each data collection phase, sometimes necessitating delays in data collection. The accelerometers had to be attached to special belts, requiring the RAs to train participants how to wear them appropriately. The RAs then had to connect the accelerometers to a laptop in the field to download data for storage so they could be charged overnight for re-deployment. Once downloaded, the accelerometer data required specialized software and costly researcher expertise to clean, transform, and prepare for analysis, as opposed to the pedometer and self-report data that could simply be entered into standard statistical software.

Discussion

These results provide the first known quantitative and qualitative assessments of physical activity assessment tools' acceptability and feasibility within a mixed-age sample of rural Appalachian residents. As indicated by descriptive statistics and consistent with the overall description of this health disparities population, study participants were characterized by low socioeconomic status coupled with high burden of overweight and obesity. Findings from the quantitative and qualitative analyses may inform future research involving physical activity assessment with children, adolescents, and adults in this region. Specifically, adults reported more favorable views of physical activity assessment tools compared to adolescents and children. These age differences could be indicative of adults' recognition of the significance of physical activity and health promotion.

Results demonstrated that while most participants were satisfied with the physical activity assessment instruments, some participants reported challenges in wearing the accelerometer and pedometer (e.g., forgetting to wear the equipment, fear of damaging it, the visibility of the equipment with some outfits, and the need to remove the equipment for various reasons). These challenges should be considered when planning future studies. Given that only certain groups of participants indicated these challenges (e.g., student athletes, women, etc.), considering the characteristics and lifestyles of participants in future studies could allow identification of those most likely to encounter these issues. For example, children and adolescents more frequently reported having to remove the equipment for intramural sports and physical education classes. Participant completion of an accompanying physical activity log provided contextual insights into activity patterns (e.g., explanations for time periods with no accelerometer data recorded). Thus, supplementation of objective measures of physical activity with subjective measures might be a viable solution for researchers working with youth in rural Appalachia. Overall, participants did not indicate a strong preference for (or rejection of) any of the three physical activity assessment methods, indicating that all of the methods were acceptable.

Participants stated that the self-report instruments listed irrelevant physical activities and were missing some important activities. For example, the revised CHAMPS instrument listed golf and tennis, although these activities are not readily available in the region. Additionally, the form was missing common regional activities such as cutting wood, hunting, engaging in sports such as softball and gymnastics/cheerleading, and horseback

riding (though spaces for “other” activities were included at the end of the instrument, including spaces for activity description, frequency, and duration). Tailoring self-report instruments to the local population may increase acceptability, with the limitation that modifications of standard validated instruments can pose challenges to measurement validity and generalizability of study findings.¹

In addition to considering acceptability, researchers must also consider the feasibility—including costs and researcher's burden—of various physical activity assessment methods. Although self-report measures have the lowest up-front costs, the data entry and processing costs may be extensive. Pedometers cost more than self-report instruments, but are significantly less expensive than accelerometers. Accelerometers are the most expensive in terms of purchasing the equipment and providing the time and labor to deploy and collect the equipment, as well as to upload and process their data. In addition, pedometers and accelerometers may present hidden costs in terms of lost equipment.

Importantly, however, accelerometers may produce a more modest effect on participants' behavior than pedometers. As evidenced by multiple participants' comments, pedometers pose a challenge to physical activity assessment due to their Hawthorne effect. Consistent with observations from other studies^{27,28}, many participants seemed to have become accustomed to checking their pedometers and working to increase or manipulate their physical activity accordingly.^{32,33} Such potential for altering people's behavior complicates the use of pedometers as objective measure of physical activity.

In sum, researchers must consider several acceptability and feasibility factors in selecting physical activity assessment instruments for use in rural Appalachia. Established self-report instruments may engender recall bias, as well as exhibit lack of cultural appropriateness (e.g., inclusion of activities atypical for a specific population or region). Pedometers, while inexpensive and convenient, may influence physical activity levels, rather than simply measure them objectively. Accelerometers, while less influencing on behavior, are quite expensive in terms of purchase costs and researcher burden. Finally, participant characteristics and context (e.g., student athletes being required to remove accelerometers and pedometers before engaging in sports activities) must be anticipated and addressed to ensure acceptable and feasible measurement. When these prerequisites for physical activity assessment are met, the most reliable and valid measures that are also acceptable and feasible can be selected for optimal physical activity assessment in this high-risk population.

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Figure 1.
Frequency of Responses on Cultural Acceptability of Self-Report Instruments, Pedometers,
and Accelerometers (N = 291)

Table 1

Descriptive Statistics (N = 291)

Sample Characteristics	Children (N = 86)	Adolescents (N = 89)	Adults (N = 116)	All (N=291)
Mean age in yrs, (SD) [range]	10 (1) [8-12]	15 (1) [13-17]	41 (16) [18-81]	24 (17) [8-81]
Sex				
Male	44 (51%)	44 (49%)	45 (39%)	133 (46%)
Female	42 (49%)	45 (51%)	71 (61%)	158 (54%)
Race ^a				
Non-White	2 (2%)	6 (7%)	18 (16%)	26 (9%)
White	84 (98%)	83 (93%)	98 (84%)	265 (91%)
Ethnicity				
Non-Hispanic	84 (99%)	82 (100%)	114 (99%)	280 (96%)
Hispanic	1 (1%)	0 (-)	1 (1%)	2 (1%)
Body Mass Index categories ^b				
Normal weight	31 (41%)	40 (51%)	19 (18%)	93 (35%)
Overweight	19 (25%)	13 (17%)	26 (24%)	63 (24%)
Obese	26 (34%)	25 (32%)	63 (58%)	109 (41%)
Health status				
Poor/Fair	2 (2%)	0 (-)	32 (28%)	34 (12%)
Good	10 (12%)	11 (13%)	37 (32%)	58 (20%)
Educational level ^c				
Very good/Excellent	72 (86%)	76 (87%)	45 (39%)	193 (68%)
< High School	21 (25%)	26 (30%)	19 (17%)	66 (23%)
= High School	15 (18%)	13 (15%)	37 (32%)	65 (23%)
> High School	48 (57%)	47 (55%)	59 (51%)	154 (54%)
Income ^c				
\$20,000	17 (34%)	15 (38%)	36 (32%)	68 (34%)
\$20,001 - \$40,000	18 (36%)	8 (20%)	26 (23%)	52 (26%)
> \$40,000	2 (4%)	4 (10%)	33 (29%)	39 (19%)
Perceived financial status ^c				
Refused	13 (26%)	13 (33%)	17 (15%)	43 (21%)
Sometimes struggle to make ends meet	18 (22%)	14 (17%)	46 (40%)	78 (28%)
Just about enough to get by	40 (48%)	37 (45%)	44 (38%)	121 (43%)
More than enough to live well	25 (30%)	31 (38%)	25 (22%)	81 (29%)
Currently Employed ^c				
No	33 (41%)	22 (26%)	62 (55%)	117 (42%)
Yes	48 (59%)	63 (74%)	51 (45%)	162 (58%)

Sample Characteristics	Children (N = 86)	Adolescents (N = 89)	Adults (N = 116)	All (N=291)
Health Insurance Status ^d	No			
	3 (4%)	4 (5%)	25 (22%)	32 (11%)
	82 (96%)	80 (95%)	89 (78%)	251 (89%)

Note. Sociodemographic variables are reported by parents for child and adolescent participants. SD – standard deviation.

^aNon-White includes African-American, Asian and bi/multi-racial or of unknown/unreported race.

^bFor children and adolescents, age and sex-specific BMI percentiles were calculated based on the US growth curves standards excluding extreme values, i.e. Z-score > 4.

^cFor children and adolescents, their parents' education and income levels, as well as perceived financial status and work status are reported.

^dIncludes those with public, private, or other types of insurance, including veterans' benefits.

Table 2

Acceptability of Physical Activity Measurement Instruments and Equipment: Mean Ranks of Participants' Responses by Age Group and Sex (Response Options: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree) (N = 291)

Instrument Items	Age groups			Sex	
	Children (N = 86)	Adolescents (N = 89)	Adults (N = 116)	Male (N = 133)	Female (N = 158)
<i>Self-report</i>					
Knowing I would complete the self-report changed my typical behavior.	153.61	143.19	141.24	143.11	147.50
The self-report was time consuming to complete.	144.27	147.22	145.11	148.35	143.12
Others in my community would be willing to report their activity levels through the self-report questionnaire.	141.13	140.70	153.68	148.07	144.26
I would recommend use of the self-report to measure physical activity in future studies.	142.24 ^{ab}	130.51 ^a	159.39 ^b	141.31	149.00
<i>Pedometer</i>					
Using the pedometer changed my typical behavior.	154.31	138.06	144.75	147.02	144.23
The pedometer was time consuming to use.	156.18 ^{ab}	158.65 ^a	127.59 ^b	149.86	141.85
There were activities I was unable to do because I was using the pedometer.	156.42 ^a	159.90 ^a	125.03 ^b	150.19	140.64
Others in my community would be willing to use a pedometer.	140.20	139.44	154.03	144.96	145.95
Using the pedometer was a hassle.	163.35 ^a	146.80 ^{ab}	130.34 ^b	147.91	142.55
I would recommend use of the pedometer to measure physical activity in future studies.	135.07 ^{ab}	130.20 ^a	163.55 ^b	141.77	147.68
<i>Accelerometer</i>					
Using the accelerometer changed my typical behavior.	152.93	142.06	143.88	148.07	144.26
The accelerometer was time consuming to use.	156.69	155.00	131.17	145.53	146.39
There were activities I was unable to do because I was using the accelerometer.	150.97	156.28	132.07	149.24	141.38
Others in my community would be willing to use an accelerometer.	151.19	135.40	149.06	146.63	144.54
Using the accelerometer was a hassle.	155.72	149.15	136.38	147.96	144.35
I would recommend use of the accelerometer to measure physical activity in future studies.	139.93	139.43	154.24	147.53	143.81

Note. Superscripts indicate significant differences between the mean ranks given $p = .008$ - level of significance corrected for multiple comparisons for age categories. If the values have common letter(s), there is no statistically significant difference between them; if the values do not have a common letter, there is a statistically significant difference between them.

Table 3
Summary of Feasibility and Acceptability Considerations Based on Qualitative Analyses

Acceptability		Rankings ^a		
Definition	Measures	Accelerometer	Pedometer	Self-Report
A property of being both culturally and practically acceptable to study participants	Participant time investment.	Low	Low	Low
	Participant enjoyment from using the tool.	High	High	Neutral
Feasibility				
Definition	Measures			
A property of being not overly burdensome to researchers in terms of resources required	Risk of tool loss or data loss.	High	High	Low
	Cost of the tool.	High	Moderate	Low
	Researcher time investment.	High	Moderate	Low

Note.

^a Out of the three physical activity assessment tools (or compared to other tools used in the study).