A physical activity barriers questionnaire for youth with visual impairments

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ABSTRACT

Background. In the current paper we examined the psychometric properties of the Physical Activity Barriers Questionnaire for children with Visual Impairments (PABQ-VI). We examined evidence for the ability of the PABQ-VI to produce scores considered to be valid and exhibit internal reliability.

Methods. Forty one children living in the USA who were attending a residential sports camp participated in our research. Psychometric properties of the PABQ-VI were investigated using Pearson product-moment coefficients, Cronbach's alpha and split-half reliability tests. Convergent validity was established by exploring correlations between the PABQ-VI, physical activity (PA) levels and participant's self-efficacy for overcoming barriers.

Results. Participants demonstrated low PA levels. Both PA participation and barrier PA self-efficacy scores were correlated with the PABQ-VI. The most physically active participants perceived fewer barriers and had stronger efficacy compared to participants who were less physically active.

Conclusions. Overall, the PABQ-VI demonstrated preliminary evidence of convergent validity. Future researchers may consider reducing participant burden by reducing the scale length through eliminating the most poorly performing items and examining the three-factor structure using factor analysis.

KEYWORDS

exercise; disability; adapted sport; blind

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INTRODUCTION

Children and adolescents with visual impairments (VI) tend to be sedentary and engage in low levels of physical activity (PA) in absolute levels and relatively when compared to comparably aged peers (Augestad & Jiang, 2015; Greguol, Gobbi, & Carraro, 2014; Haegele & Porretta, 2015; Lieberman, Byrne, Mattern, Watt, & Fernandez-Vivo, 2010). The reasons for low PA range from limited opportunities to be active, especially when young (Greguol, Gobbi, & Carraro, 2014; Perkins, Columna, Lieberman, & Bailey, 2013), which can promote developmental delays in motor skill acquisition. Additionally a lack of fitness, poor and inefficient gait patterns, and psychosocial variables (e.g., lack of interest, few friends) contribute to limited PA (Lieberman, Byrne, Mattern, Watt, & Fernandez-Vivo, 2010; Wagner, Haibach, & Lieberman, 2013).

However, researchers have indicated that youth with VI can achieve healthy levels of fitness and adequate motor skills when they engage in PA (Perkins, Columna, Lieberman, & Bailey, 2013). In order for educators and parents to provide quality PA opportunities it is helpful to understand the most common PA barriers that limit youth with VI from participating in PA. Identifying these barriers early in life is critical because childhood PA experiences influence later life PA participation (Telama, Yang, Leskinen, Kankaanpää, Hirvensalo, Tammelin, Viikari, & Raitakari, 2014).

In a recent literature review on PA and school-aged children with VI, Haegele and Porretta (2015) urged researchers to conduct theory-driven PA interventions that address barriers over multiple domains. However, research that can guide PA interventions is constrained by a lack of scales that can be used to identify PA barriers among youth with VI. Current measures such as the Exercise Benefits and Barriers Scale (Sechrist, Walker, & Pender, 1987) and the Perceived Barriers to Exercise Scale (Salmon, Owen, Crawford, Bauman, & Sallis, 2003) do not address barriers unique to people with VI. For example, barriers relating to policy, accessibility, a lack of sight, and fear of stigmatization are missing from the above noted scales (Kissow, 2015; Shields, Synnot, & Barr, 2012). Although two PA barrier scales have recently been developed for people with VI both scales were developed specifically for adults and fail to address barriers specific to children and adolescents (Jaarsma, Dekker, Koopmans, Dijkstra, & Geertzen, 2014; Lee, Zhu, Ackley-Holbrook, Brower, & McMurray, 2014).

Children spend a large proportion of time at school or with peers, and therefore perceive barriers that adults with VI do not encounter. Similarly, we know that parental support heavily influences the PA levels of children with VI (Greguol, Gobbi, & Carraro, 2014; Perkins, Columna, Lieberman, & Bailey, 2013; Stuart, Lieberman, & Hand, 2006). Hence, parent-linked barriers such as over-protection and beliefs that children can't participate in PA contribute to the barriers experienced by youth with VI. For these reasons, questionnaires developed for adults are not ideal for research involving youth with VI.

To facilitate future research on PA barriers of youth with VI, the Physical Activity Barriers Questionnaire for Children with Visual Impairments (PABQ-VI) was developed (Armstrong, Lieberman, Guerrero, & Martin, in review). While the PABQ-VI demonstrated initial adequate validity and reliability, a small sample size was a weakness and additional research examining validity and reliability is needed. The PABQ-VI is based in social cognitive theory (SCT) and initial research (Armstrong, Lieberman, Guerrero, & Martin, in review) indicates it can produce scores that provide

evidence of validity and reliability. In the current study we extended prior work on the PABQ-VI (Armstrong, Lieberman, Guerrero, & Martin, in review) and provided additional evidence of its ability to produced scores deemed valid and reliable.

The PABQ-VI is based on Bandura's SCT which asserts that a person's behavior, their environment and personal factors all exert reciprocal influences on each other (Bandura, 2004; Ramirez, Kulinna, & Cothran, 2012). SCT recognizes that health behaviors are influenced by an individual's outcome expectations, goals and perceived barriers, in addition to their self-efficacy (SE; Bandura, 2004). Researchers have found that SE directly predicts PA and related SCT constructs such as perceived barriers (Ayotte, Margrett, & Hicks-Patrick, 2010). In other words, if a person has low SE, they are likely to perceive many barriers to PA, exhibit low outcome expectations, have difficulty establishing PA related goals and ultimately avoid PA participation (Allison & Keller, 2004; Ayotte, Margrett, & Hicks-Patrick, 2010).

In the current study we continue to examine validity (i.e., convergent) by examining if the PABQ-VI is positively linked to PA and self-efficacy. We also employed a larger sample to achieve these purposes relative to the initial validation sample (Armstrong, Lieberman, Guerrero, & Martin, in review).

METHODS

Participants

Participants were a convenience sample of 41 youth with VI (18 F, 23 M), aged from 8 to 18 years (M = 12.98), who attended a sports camp in America in 2015 (see Table 1). The B1–B4 classification system (United States Association of Blind Athletes, 2016) was used to classify level of vision, because this was the system used to enroll children in the American camp. B1 classification refers to no functional vision and B4 refers to visual acuity from 20/200 up to 20/70 in the better eye with correction, or a visual field of greater than 20 degrees. Gender breakdown via classification was as follows: B1 (6 F, 3 M), B2 (5 F, 5 M), B3 (5 F, 11 M), B4 (2 F, 4 M).

Instrumentation

Physical Activity. The Physical Activity Questionnaire for Children and Adolescents (PAQ-C/-A) (Kowalski, Crocker, & Donen, 2004) was used to assess participant's PA levels. This questionnaire has been used previously among youth with VI and shown evidence it can produce scores considered valid and reliable (Greguol, Gobbi, & Carraro, 2014).

PABQ-VI. The Physical Activity Barrier Questionnaire-Visually Impaired (Armstrong, Lieberman, Guerrero, & Martin, in review) was used with minor changes made to the wording of four items (items 4, 23, 32, 34) to better suit an American audience. For example, the term *play-time* was replaced with *recess* in item 23. An open-ended question was included at the end of the PABQ-VI, allowing children to report additional barriers to PA. The anchors for the 5-point likert scale used in this study were as follows, 1 = strongly disagree and 5 = strongly agree.

PASES. The Physical Activity Self-Efficacy Scale contains eight items and participants responded by circling 'yes' 'unsure' or 'no'. For example, item 1 from the PASES was "I can be physically active most days after school".

Test administration and data analysis

Upon receiving ethical approval, trained camp counselors, who were paired one-on-one with campers throughout the week, dictated the PABQ-VI to their campers using identical scripts. Large print copies were provided to participants who wished to read along and braille versions were also available. Data analysis was completed using IBM SPSS version 21. No estimation or adjustments were required for missing items.

RESULTS

Descriptive statistics can be found in Table 1a and Table 1b. An independent-samples t-test was run to see if there were any differences in PABQ-VI, PAQ or PASES scores for level of vision, gender or age. Homogeneity of variances was confirmed for all comparisons based on Levene's Test for Equality of Variance ($p > 0.05$), except for the comparison of male vs female PASES scores. Effect-sizes (r) were also calculated.

Table 1a Participant Demographics and Measurement Scores

Characteristic	*n* (M ± SD)[a]	Range	VAR[b]
Gender			
Male	23		
Female	18		
Level of vision			
B1	9		
B2	10		
B3	16		
B4	6		
Age	12.98 ± 2.286	10.00	5.22
PAQ Score	2.26 ± 0.583	2.34	0.34
PABQ-VI Score	154.15 ± 25.67	103.00	659.18
PASES Score	1.50 ± 0.435	1.50	0.19

[a] Mean ± Standard Deviation

[b] Variance

Table 1b Ms, SDs for all variables

Vision Level	PABQ-VI	PASES	PAQ
B1	167.8 (19.1)	1.75 (0.25)	2.42 (0.48)
B2	150.2 (28.1)	1.46 (0.35)	1.83 (0.58)
B3	156.9 (24.6)	1.43 (0.50)	2.53 (0.43)
B4	132.8 (22.6)	1.17 (0.46)	2.04 (0.71)

For the PAQ assessing PA levels, significant differences existed between groups B1 and B2 as well as B2 and B3. Children with B1 vision were more active ($M = 2.42$, $SD = 0.477$) than children with B2 vision ($M = 1.83$, $SD = 0.58$); $t(17) = 2.40$, $p = 0.028$; effect-size r = 0.5, and children with B3 vision were also more active ($M = 2.53$, $SD = 0.425$) than those with B2 vision ($M = 1.83$, $SD = 0.58$); $t(24) = -3.56$, $p = 0.002$; effect-size r = 0.57.

For PABQ-VI scores, significant differences were identified for level of vision, between groups B1 and B4, and groups B3 and B4 only. Children in the B1 group ($M = 167.78$, $SD = 19.13$) had significantly higher PABQ-VI scores (fewer barriers) compared to those with B4 vision ($M = 132.83$, $SD = 22.59$); $t(13) = -3.230$, $p = 0.007$; effect-size r = 0.64. Similarly, children with B3 vision scored higher on the PABQ-VI ($M = 156.94$, $SD = 24.61$) than those with B4 vision ($M = 132.83$, $SD = 22.59$); $t(20) = 2.09$, $p = 0.05$; effect-size r = 0.45. Between-group differences were also found for gender, with males reporting significantly fewer barriers (higher PABQ-VI scores) ($M = 163.70$, $SD = 22.46$) than females ($M = 141.90$, $SD = 24.84$); $t(39) = 2.94$, $p = 0.006$; effect-size r = 0.42.

For PASES, significant differences were found for level of vision, between groups B1 and B4 only. Children in the B1 group scored higher on the PASES ($M = 1.75$, $SD = 0.251$) compared to children in the B4 group ($M = 1.17$, $SD = 0.460$); $t(13) = 3.20$, $p = 0.007$; effect-size r = 0.62. Boys also scored significantly higher on the PASES ($M = 1.65$, $SD = 0.344$) compared to girls ($M = 1.31$, $SD = 0.47$); $t(30) = 2.56$, $p = 0.016$; effect-size r = 0.38. Homogeneity of variance could not be assumed for this gender comparison, according to Levene's Test for Equality of Variances ($p = 0.037$), so separate variances were used.

Similar to the initial PABQ-VI validation study, the frequency distribution of likert-scale responses from the PABQ-VI was skewed in the positive direction and the median response across all items was 4, corresponding to the label 'I agree'.

Convergent validity

PABQ-VI scores were correlated with PA levels ($r = 0.44$, $p < 0.01$, effect-size $r^2 = 0.2$) and the PASES ($r = 0.66$, $p < 0.01$; effect-size $r^2 = 0.44$), meaning that participants who were active and had high levels of PA self-efficacy perceived fewer PA barriers. Active participants also demonstrated higher PA self-efficacy ($r = 0.32$, $p < 0.05$; effect-size $r^2 = 0.1$). These correlations provide some evidence of convergent validity.

Item-total correlations for the PABQ-VI subscales

Item-scale correlations for the PABQ-VI sub-scales are provided in Table 2. Personal scale items correlated most strongly with their intended subscale with a few cross-loadings. Similarly, all environmental barrier items correlated most strongly with the environmental subscale, with the exception of item 31. Ten social barrier items correlated most strongly with the social subscale as expected, although the eight remaining social items correlated more strongly the remaining subscales or no subscale at all. In total, eight items (items 3, 11, 12, 14, 19, 25, 28, 31) did not correlate significantly with the PABQ-VI as a whole and five of these were reverse-scored items.

Table 2 Item-total correlations for PABQ-VI subscales

Item		PER*	SOC*	ENV*	Total*
Personal Barriers					
1	I believe physical activity is important.	**0.660****	0.364*	0.372*	**0.503****
2	I feel motivated to do physical activity.	**0.618****	0.364*	0.400**	**0.502****
3	I think I have enough time after homework and chores to do physical activity.	**0.471****	0.110	0.122	0.234
4	I know how to do physical activity if I want to.	**0.459****	0.278	**0.401****	**0.419****
5	I believe I can do physical activity even though I have a visual impairment.	**0.535****	**0.352***	0.337*	**0.447****
6	Sport and physical activities are fun because I'm good at them.	**0.475****	**0.350***	**0.316***	**0.421****
7	I feel confident to try new sports and physical activities.	**0.549****	**0.501****	**0.534****	**0.598****
8	I like how my body looks and feels when I do physical activity.	**0.675****	0.328*	0.418**	**0.510****
9	I'm scared to get hurt when I do physical activity.	**0.512****	0.505**	**0.346***	**0.512****
10	Physical activity and sports are fun.	**0.627****	0.314*	0.405**	**0.485****
11	Physical activity makes me very tired because I have a visual impairment.	**0.417****	0.121	0.254	0.277
12	My vision impairment does not keep me from doing physical activity.	**0.537****	0.111	0.243	0.302
Social Barriers					
13	My parents have time to do physical activity with me.	0.301	**0.659****	0.306	**0.504****
14	My parents show me how to do physical activity.	0.091	**0.502****	0.097	**0.289**
15	My parents encourage me to do physical activity.	**0.343***	**0.532****	0.248	**0.436****
16	My parents can afford for me to do sport and physical activity.	0.249	**0.429****	**0.499****	**0.465****
17	My parents expect me to do physical activity.	**0.568****	0.710**	**0.626****	**0.734****
18	My parents believe that physical activity is just as important as school.	0.259	**0.463****	0.297	**0.401****
19	My parents worry about my safety when I do physical activity.	0.073	0.155	−0.080	0.057
20	Physical activity is important to my parents.	0.358*	**0.648****	0.427**	**0.565****
21	My parents have time to take me to sport even if my brothers or sisters also play sport.	0.234	**0.391***	**0.392***	**0.401****
22	My parents have a way to get me to places to do sport or physical activity.	**0.452****	**0.334***	**0.409****	**0.445****
23	My classmates include me in games and physical activities during play time.	0.379*	**0.690****	**0.551****	**0.640****

24	I know other children who will do physical activity with me.	0.145	**0.513****	**0.346***	**0.410****
25	Other kids have made fun of me during sports or physical activity.	**0.351***	**0.291**	0.141	0.288
26	My teachers expect me to do physical activity just like everyone else.	0.273	**0.566****	**0.574****	**0.564****
27	My PE teacher encourages me to do physical activity.	0.348*	**0.623****	**0.665****	**0.648****
28	My teacher worries about my safety when I do physical activity.	0.154	**0.381***	0.061	0.239
29	My PE teacher makes changes to games and activities so I can participate.	0.273	**0.453****	**0.423****	**0.452****
30	My PE teacher includes me in games and physical activities.	0.304	**0.534****	**0.579****	**0.560****
Environmental Barriers					
31	People in my community don't expect that I can do physical activity.	0.069	0.183	0.165	0.169
32	I know about opportunities to do physical activity outside of school.	**0.698****	0.536**	**0.746****	**0.742****
33	There are sport programs or physical activities available in my community.	**0.541****	0.376*	**0.696****	**0.606****
34	There are sighted guides who can help me do physical activity in my community.	0.237	**0.390***	**0.509****	**0.449****
35	There are sports or activities that I can join which are close to home.	0.527**	0.490**	**0.792****	**0.692****
36	There are places in my community that are safe for me to do physical activity.	0.526**	**0.718****	**0.790****	**0.792****
37	Sports clubs in my community allow me to join even though I have a visual impairment.	0.522**	0.567**	**0.828****	**0.739****
38	I have sports equipment at home that I can use to be physically active.	0.405**	0.546**	**0.789****	**0.680****
39	There are spaces at home that are safe for me to do physical activity.	0.411**	**0.663****	**0.753****	**0.719****
40	I have to participate in PE class because it is a school rule.	0.214	0.368*	**0.432****	**0.401****
41	My school have physical activity equipment for people with visual impairment.	0.276	0.203	**0.511****	**0.377***
42	My school has sport teams and physical activity clubs that I can join if I want to.	0.448**	**0.544****	**0.667****	**0.642****

Note: Items that did not correlate significantly with any subscale are highlighted in grey; Significant correlations are in boldface, except in cases where cross-loading has occurred and the difference between correlations is greater than 0.20; ** Correlation is significant at the 0.01 level (2-Tailed); * Correlation is significant at the 0.05 level (2-Tailed). PER = Personal barriers, SOC = Social barriers, ENV = Environmental barriers, Total = Total PABQ-VI score.

Internal consistency reliability

The PABQ-VI demonstrated good internal consistency with a Cronbach's alpha coefficient of 0.92 and split half reliability of 0.87. When analyzed as separate scales, the environmental subscale was most internally consistent (α = 0.86, split-half reliability = 0.83), followed by the social (α = 0.81, split-half reliability = 0.67) and personal subscales (α = 0.77, split-half reliability = 0.78). Mean inter-item correlations were reasonable (0.54, 0.50 and 0.63) for the personal, social and environmental subscales, respectively.

DISCUSSION

As noted by Hubley and Zumbo (2011) validation is a continuous process that involves lots of different types of evidence to illustrate if scores produced within a given context by a particular sample are supportive of validity and reliability. Further, they emphasize that validity concerns the interpretation and consequences of the test scores and is not a fixed or static property of the measure itself (Hubley & Zumbo, 2011). Hence the current sample and context in which the present findings are based is important for the reader to bear in mind. Future researchers using the PABQ-VI should always remember that the current scale assesses a theoretical construct (PA barriers) and is designed to produces scores relevant to children with VI.

Findings from the current study mostly align with the findings from the initial research study (Armstrong, Lieberman, Guerrero, & Martin, in review) as PABQ-VI responses were positively skewed in the current study, increasing from 'strongly disagree' to 'strongly agree', with the median response being 'I agree'. The tendency for participants in both studies to respond agreeably with PABQ-VI items might reflect that in both studies participants were enrolled in VI-specific sports camps whose goal it was to engage camp participants in PA. Nonetheless, the PABQ-VI was able to yield a consistent distribution of responses across both samples.

In the current study the highest ranked questions were items 1, 4 and 5 (all personal barriers). This finding mirrored the same finding from the initial validation study (Armstrong, Lieberman, Guerrero, & Martin, in review). The finding suggests that both Irish and American children recognize PA as important (item 1); believe they can be active regardless of their VI (item 5) and are aware of ways to do PA (item 4). Item 5 (I believe I can do PA even though I have a VI) was the absolute highest scoring item, with 71.4% of participants in Study 1 and 82.9% of participants in Study 2 responding with 'strongly agree'. This consensus across both studies may reflect that children with VI do not consider their VI as a major barrier to PA, but perceive other factors as most limiting (Greguol, Gobbi, & Carraro, 2014; Perkins, Columna, Lieberman, & Bailey, 2013).

In support of the latter idea, findings from the current study and initial validation study indicate that both social and environmental factors such as a lack of sighted guides (item 34), parents' concerns for safety (item 19), PE teachers' ability/willingness to adapt activities (item 29) and a lack of specialized PA equipment at school (item 41) are important. These findings are supported by current barrier research that has identified parent, peer and teacher-related barriers as well as policy and environmental barriers as pertinent to children with VI (Greguol, Gobbi, & Carraro, 2014; Stuart, Lieberman, & Hand, 2006). Collectively, ourfindings provide preliminary evidence of validity in support of the PABQ-VI.

Convergent validity

Our sample demonstrated low levels of PA. Participants in the current study fell below age and gender norms for the PAQ-C/-A (Voss, Ogunleye, & Sandercock, 2013). Despite a tendency toward physical inactivity, children who engaged in more PA perceived fewer PA barriers, which emulates findings from research on people with disabilities including VI (Jaarsma, Dekker, Koopmans, Dijkstra, & Geertzen, 2014) and provides validity evidence.

The PASES was correlated significantly with PABQ-VI scores with a small to moderate effect-size of = 0.44, providing evidence of convergent validity.

Differences for gender and level of vision

The PABQ-VI was also able to discriminate between participants based on level of vision and gender. In the initial validation study, participants with low vision were more active and reported fewer PA barriers than those who were blind and that finding was consistent with work by Stuart and colleagues (Stuart, Lieberman, & Hand, 2006) who found that PA barriers differed according to level of vision and, Holbrook et al. who observed that blind participants were less active than those with low vision (Holbrook, Caputo, Perry, Fuller, & Morgan, 2009).

A similar relationship between level of vision and PA was found in the current study with the exception of B1 and B2 classifications. A possible explanation for this might be that the difference in level of vision between B1 and B2 classifications might be insufficient to cause the group with lower vision to be any more limited than those with some vision.

We also found differences in PASES scores for level of vision and gender. The finding that B1 participants had higher PASES and fewer PA barriers than B4 participants was unexpected, but serves as a reminder that a person's perception of barriers and SE for overcoming barriers may be influenced by more than just the severity of VI. In fact, children who are blind have been known to achieve healthy levels of PA when provided with the opportunities to do so (Blessing, McCrimmon, Stovall, & Williford, 1993).

In terms of gender, boys had higher SE and fewer PA barriers compared to girls, but no differences were found for PA level. Aslan, Calik and Kitis (2012) found that boys with low vision were significantly more active than girls with low vision, but this was not true for participants who were blind. Most authors have not identified a gender bias for PA engagement among children with VI, which is a phenomenon that exists among sighted peers (Greguol, Gobbi, & Carraro, 2014). It is possible that the absence of a gender bias reflects the global lack of opportunities for children with VI to participate in PA, regardless of gender (Shapiro, Moffett, Lieberman, & Dummer, 2005). The significantly higher SE and fewer barriers reported by boys is consistent with findings by Shapiro and colleagues (2005) who found boys to have higher percieved competence for PA compared to girls.

Item scale correlations and the proposed three-factor structure

In terms of item-scale correlations, the PABQ-VI had 10 items that failed to correlate with their intended subscale in the initial validation study. In the current study only 2 items failed to correlate with any of the subscales, including the overall PABQ-VI. These were item 19, "My parents worry about my safety when I do PA", and item 31,

"People in my community don't expect that I can do PA". Interestingly, both of these reverse-scored items (19 and 31) did not correlate significantly in the initial developmental study (Armstrong, Lieberman, Guerrero, & Martin, in review) either.

Overall, the majority of items throughout the PABQ-VI correlated with their intended subscale, however a few items cross-loaded (Table 2). Cross-loading is not ideal because it shows that these items are unable to discriminate as intended. However, viewed with a social-cognitive lens, PA barriers that are considered personal and environmental should be expected to interact to influence PA behavior, rather than operating exclusively (Ramirez, Kulinna, & Cothran, 2012).

For example, the item "Physical activity and sports are fun" (item 10), was developed to address the barrier 'lack of enjoyment of PA'. Although 'enjoyment' is a feeling generated from within a person, enjoyment can certainly be contingent on social (e.g., friends) or environmental (a nice well-kept soccer pitch) factors.

In order to demonstrate relevance and utility of the PABQ-VI for children with VI, it is essential to include items across multiple domains to reflect the variety of barriers experienced by this population. However, the decision to interpret PABQ-VI results as a single scale or as three subscales depends on the user's goals and the context. For example, analyzing data as three separate subscales might be useful when comparing findings across different groups. In contrast, a single barrier score might be appropriate to track general changes in perceived barriers before and after an intervention. The inclusion of an open question at the end of the PABQ-VI allows researchers to identify additional barriers that could be useful to inform PA program development.

The small sample size prevented a factor analysis to examine the proposed three-factor structure of the PABQ-VI. However, given the adequate internal consistency evidence for the three subscales in the current and initial study it is not recommended that any items are deleted from the PABQ-VI at this time.

Limitations

The most obvious limitation to our study was the low sample size. Future researchers should aim for larger samples that allow for more sophisticated analyses and to reliably reduce scale length by losing the most poorly performing items. A greater diversity of participants would be beneficial in the future to test the generalizability of results. The PAQ-C/PAQ-A is a subjective self-report scale so objective measures of PA (e.g., pedometers) are needed to more fully investigate the relationship between PA participation and barriers. Finally, test-retest reliability was not investigated in the current study and data on test-retest would be helpful. Researchers who wish to apply the questionnaire in its preliminary form should be aware of these limitations, interpret results with caution and seek to address these concerns in future studies.

Conclusions and future directions

Despite the aforementioned weaknesses, we showed that the 42-item PABQ-VI has strong potential to identify PA barriers among children with VI across multiple domains. We conclude that the PABQ-VI demonstrates initial evidence of internal consistency and validity when correlated with PA and SE. Furthermore, the frequency distribution of PABQ-VI responses and the ability of the PABQ-VI to discriminate between population sub-groups support the evidence of validity.

In support of a unified validity theory, Hubley and Zumbo (2011, p. 220) argue that validity is "the degree to which all of the accumulated evidence supports the intended interpretation of test scores for the proposed purpose". Future efforts to validate the PABQ-VI for this purpose will focus on recruiting sufficient participant numbers to investigate the three-factor structure as well as performing item by item analyses and test re-test reliability.

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