Measuring Activity in Children and Adolescents Using Self-Report: PAQ-C and PAQ-A

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Departments of [1]Health and Sports Studies, [2]Epidemiology, and [3]Preventive and Community Dentistry, University of Iowa, Iowa City, IA; and [4]Department of Occupational Therapy at St. Ambrose University, University of Iowa, Iowa City, IA

ABSTRACT

JANZ, K. F., E. M. LUTUCHY, P. WENTHE, and S. M. LEVY. Measuring Activity in Children and Adolescents Using Self-Report: PAQ-C and PAQ-A. *Med. Sci. Sports Exerc.*, Vol. 40, No. 4, pp. 767–772, 2008. **Purpose:** This study examined the psychometric properties of two versions of a commonly used physical activity 7-d self-report, the Physical Activity Questionnaire for Older Children (PAQ-C) and Physical Activity Questionnaire for Adolescents (PAQ-A). **Methods:** We longitudinally examined the internal consistency, stability, and situational effects of the PAQ-C and PAQ-A in a cohort of children ($N = 210$) at ages 11 and 13 yr. Statistical analysis included factor loading and standardized Cronbach coefficient alphas. We cross-sectionally examined concurrent validity of the PAQ-A in a subsample of our cohort ($N = 49$) at age 13 by comparing it with concurrently measured physical activity using an activity monitor (Actigraph). Spearman correlation coefficients were used for this analysis. **Results:** Standardized Cronbach alphas ranged from 0.72 to 0.88. A subsample analysis suggested that completing the questionnaires during the summer months slightly reduced the standardized alpha for the PAQ-C, but not the PAQ-A. Associations between the PAQ-A (revised) summary score and activity monitor variables were rho = 0.56 for total PA and rho = 0.63 for moderate through vigorous activity ($P < 0.05$). Associations between individual PAQ-A questions and activity monitor variables for the same time frame ranged from rho = 0.41 to 0.62 ($P < 0.05$). **Conclusion:** The PAQ-C and PAQ-A show good internal consistency. The PAQ-A has acceptable validity. **Key Words:** EPIDEMIOLOGY, EXERCISE, RELIABILITY, PSYCHOMETRIC PROPERTIES, RECALL, VALIDITY

Self-report physical activity questionnaires are important tools in population-based studies of older children and adolescents. Advantages of self-report questionnaires include low cost and ease of administration, relatively low participant burden, and the ability to capture the context in which activity occurs (11,16). However, the use of these instruments is problematic because of the difficulty that children and adolescents have in correctly interpreting questions and accurately recalling activity. In addition, when compared with adult self-report instruments, limited validity and reliability information exists for even the most commonly used self-report instruments for children and adolescents (11,14,16).

As the field of physical activity measurement has advanced, researchers have improved the ability of self-report instruments to capture meaningful physical activity data on children and adolescents. For example, questions framed within a shorter period of time improve the accuracy of recall (11). Key contextual prompts and items that query for location and purpose also improve the quality of data and provide important dimensions of physical activity not easily captured using accelerometers, heart rate monitors, or other objective measures (11).

The Physical Activity Questionnaire for Older Children (PAQ-C), developed by Kowalski and colleagues (9), was initially used in the Saskatchewan Pediatric Bone Mineral Accrual Study. The instrument has been used in a number of studies, including the Healthy Bones Studies (10) and Action Schools BC! (1). The PAQ-C is designed for use in older children ages 8–14 yr (or grades 4–8) and consists of nine questions structured to discern moderate through vigorous physical activity (MVPA) during the last 7 d.

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The first question of the PAQ-C provides contextual cues via a checklist of 22 common leisure and sport physical activities and two "other" fill-in choices. This question is scored as the mean of all activities, using a 1–5 scale. The remaining eight PAQ-C questions are organized using a segmented time-of-day or day-of-the-week strategy. These eight items are also scored using a 1–5 scale. The summary score for the PAQ-C is the average of the sum of the nine questions. The Physical Activity Questionnaire for Adolescents (PAQ-A), developed by the same Saskatchewan investigators, has the same scoring scheme and is nearly identical to the PAQ-C, except that the PAQ-A does not include a question concerning MVPA during morning recess (8). This form is suitable for use for ages 14–18 yr (or high school students). Both the PAQ-C and PAQ-A were designed to be used during the school year, rather than summer vacation or holiday periods.

The PAQ-C and PAQ-A have been tested for multiple psychometric properties, using Canadian (predominately white) children and adolescents. In separate studies, item and scale properties, test–retest reliability, internal consistency, sensitivity to gender- and age differences, convergent validity, and construct validity have been examined and reported as acceptable to good (3,8,9). With respect to convergent validity, investigators have reported that both versions of the instrument correlated with physical activity as measured by a Caltrac activity monitor ($r = 0.39$ for PAQ-C and $r = 0.33$ for PAQ-A). The authors also report that the scale distribution for both versions was approximately normal, and the variance around the group mean indicates that the instrument assessed a range of physical activity levels (3,8,9). The authors note that adolescents provided more consistent self-reports than did children, suggesting that this method of assessment may be more accurate for the adolescent age group (3,8,9). Recently, Moore and colleagues (12) examined the psychometric properties of the PAQ-C using a U.S. cohort of 1789 10-yr-old children. The children were heterogeneous with respect to race and ethnicity, with sample sizes large enough to examine differences among African American, Hispanic, and white children. The authors reported significant associations between the PAQ-C and a step test ($r = 0.30$) and BMI ($r = -0.16$) for white children; these markers of physical fitness were not significantly associated with the PAQ-C in African American and Hispanic children. Exploratory-factor analysis, which indicated a three-factor model within the PAQ-C, suggested that the internal consistency of the questionnaire could be improved and that a two-factor model could be constructed with the removal of the PAQ-C question addressing physical activity during the lunch period (12).

In this paper, we further explore the psychometric properties of the PAQ-C and PAQ-A by longitudinally examining internal consistency, stability, and situational effects in a large cohort of children and cross-sectionally examining concurrent validity in a subsample of our cohort. We also examine the impact of a revised scoring strategy. We test the validity of the PAQ-A to specifically measure MVPA by comparing it with the MVPA determined using an activity monitor and an age-specific movement count-intensity threshold. Finally, we uniquely test the validity of the time-of-day and day-of-the-week organization of the PAQ-A by comparing individual questions with time-stamped movement counts from the activity monitor.

METHODS

Sample. The study participants were a subset of Midwestern children recruited during 1998–2001 from 890 families then participating in a longitudinal health outcomes study (The Iowa Fluoride Study). The children's mothers were predominantly white (98%) and of relatively high SES. For example, 48% of the mothers had 4-yr college degrees at the time of their child's birth. Almost all (95%) of the children were white. The study was approved by the University of Iowa's institutional review board (human subjects). Written informed consent was provided by the parents of the children, and assent was obtained from the children.

Procedures. Prior to data collection, the PAQ-C and PAQ-A were rewritten to be administered throughout the year, including summer vacation. Taking care to maintain as much of the original language as possible, we added common Midwestern seasonal physical activities (e.g., snowboarding), which increased the list of activities represented in question 1 from 24 to 28. We also rewrote the segmented time-of-day questions to allow for the possibility that respondents were not in school during the week that they were reporting their activity. For example, Q2 of the original PAQ-C asks, "In the last 7 d, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)?" We appended this question to include, "Shade the first answer if you did not have PE in the last week."

To facilitate longitudinal analyses of the PAQ, our edited versions were matched to include the same number of questions (nine items), response selection, and scoring. The syntax and language were very similar. However, there were several subtle differences in the versions. The differences reflected the types of activities likely to occur during adolescence when compared with late childhood. For example, in the PAQ-A, calisthenics and pilates replaced PAQ-C choices of creative play (army, house). In addition, the PAQ-A did not include a reference to recess.

To test scale reliability, factor loading of items, stability, age sensitivity, and situational effects, 210 (106 girls and 104 boys) completed the PAQ-C at age 11 yr and the PAQ-A at age 13 yr. The questionnaires were administered by trained study staff during a clinical visit. Responses were checked for completeness by staff. Each participant was also weighed, and his or her height was measured using a standardized protocol.

Criterion method. To assess concurrent validity and to explore different scoring strategies, a subset of the age 13 sample (N = 49 children, 28 boys and 21 girls) completed the PAQ-A immediately after wearing an Actigraph activity monitor (model 7164, Fort Walton Beach, FL). The monitor was worn for up to five consecutive days (Wednesday through Sunday) during the month of April (2006). Each participant's parents reported the child's weight at this time. All participants wore the monitor at least 8 $h \cdot d^{-1}$ for at least 3 d. Participants wore the monitor for at least 1 h during the segmented time periods that we examined (morning, afternoon, evening). To be included in the subanalysis of weekend days, participants wore the monitor on at least one weekend day.

The Actigraph is an accelerometry-based instrument designed to measure normal human movement using an internal piezoelectric cantilever beam that creates a charge proportional to the magnitude of movement. Accelerometry is considered an acceptable criterion measure for the validation of physical activity surveys (7,15,18). Studies examining the Actigraph and the construction of summary variables for intensity of movement indicate that it provides a valid, reliable measure of children's physical activity (5,6). From the Actigraph raw data, we constructed two summary variables: 1) total physical activity (total PA), and 2) minutes spent in MVPA activity. Total PA was calculated as the total movement counts divided by total time of measurement (min). This variable included sedentary, light, moderate, and more intense physical activity levels. Minutes spent in MVPA were calculated using the Freedson and Trost age-specific threshold for MVPA (1399 movement counts per minute for 13-yr-olds) (17). Prior to data analysis, all MVPA variables were adjusted for time worn and were described as the percentage of the time spent in MVPA. All movement counts were collected in 1-min epochs.

TABLE 1. Description of age 13 yr participants used for the validity analysis of the PAQ-A.

	Mean	SD
Age (yr)	13.54	0.31
Weight (kg)	60.18	17.95
PAQ-A Summary (original 9 Q)	2.80	0.65
PAQ-A Summary (rescaled Q1, 7 Q)	3.04	0.77
Leisure and Sport Q1	1.27	0.18
Leisure and Sport Rescaled Q1*	2.56	1.05
Physical education Q2	3.67	1.31
Morning activity Q3	2.31	1.10
Lunch activity Q4	1.76	1.13
Afternoon activity Q5	3.80	0.96
Evening activity Q6	2.71	1.40
Weekend activity Q7	3.08	1.08
Free-time weekly activity Q8	3.24	1.13
Overall weekly activity Q 9	3.54	0.77
Total PA ($ct \cdot min^{-1}$)	597.48	239.18
Percent day MVPA	12.36	4.60
Morning total PA ($ct \cdot min^{-1}$)	451.98	178.79
Percent morning MVPA	8.95	4.72
Afternoon total PA ($ct \cdot min^{-1}$)	683.09	299.22
Percent afternoon MVPA	17.54	7.62
Evening total PA ($ct \cdot min^{-1}$)	663.75	484.00
Percent evening MVPA	8.42	5.71
Weekend total PA ($ct \cdot min^{-1}$)	674.59	507.68
Percent weekend MVPA	13.48	8.64

N = 49, 28 boys and 21 girls except weekend where N = 46, 27 boys and 19 girls. * Q1 rescaled = 4(q1 − 1)/(1.7(max raw score) − 1) + 1.

TABLE 2. Spearman coefficient correlations of original and revised PAQ-A with activity monitor measures of total activity and MVPA.

	Total PA	Percent Day MVPA
PAQ-A summary (original 9 Q)	0.47	0.49
PAQ-A summary (rescaled Q1, 7 Q)	0.56	0.63
Leisure and sport Q1	0.48	0.61
Leisure and sport rescaled Q1*	0.48	0.61
Physical education Q2	0.15*	0.18*
Morning activity Q3	0.16*	0.26
Lunch activity Q4	−0.14*	−0.21*
Afternoon activity Q5	0.43	0.37
Evening activity Q6	0.42	0.46
Weekend activity Q7	0.51	0.56
Free-time weekly activity Q8	0.46	0.50
Overall weekly activity Q9	0.48	0.43

Total PA (counts per minute) and MVPA (percentage of time > 1399 counts per minute). See Table 1 for Q1 rescaled formula. * Not significant at $P < 0.05$. All other P values significant at $P < 0.05$.

Statistical methods. Data were examined for assumptions of normalcy, and descriptive statistics were calculated. PAQ-C and PAQ-A summary scores were examined as originally constructed (the average of the sum of nine questions) and revised to reflect (only) individual questions that were significantly associated with activity monitor outcomes as determined in our validity study. The revised scoring strategy also included a rescaling of question 1 to reflect a range consistent with the other questions. Spearman correlation coefficients (rho) were used for validity analysis. Cronbach's coefficient alpha was used for reliability analysis, and standardized results were presented. In addition, common factor analysis of items in PAQ-C and PAQ-A scale was performed to verify that a one-dimensional solution was appropriate for the data. Significance levels were set at $P < 0.05$. Data were analyzed using SAS 9.3.

RESULTS

Validity. PAQ-A scores and activity monitor variables for the validity subset are presented in Table 1. Forty-nine participants (N = 28 boys and 21 girls) completed the questionnaire and wore the activity monitor. Four participants wore the monitor for 3 d, 11 for 4 d, and 36 for the (requested) 5 d. Of these, 46 participants (N = 27 boys and 19 girls) wore the monitor at least one weekend day. PAQ-A questionnaire responses ranged from 1 to 5 for all items except Q1, which ranged from 1 to 1.7. Activity

TABLE 3. Spearman correlation coefficients of PAQ-A questions addressing time-of-day and weekend activity, with corresponding segmented activity monitor measures of total activity and MVPA.

	Total PA during Specific Time Segment	Percent Time MVPA during Specific Time Segment
Morning activity Q3	0.45	0.41
Afternoon activity Q5	0.45	0.46
Evening activity Q6	0.47	0.52
Weekend activity Q7	0.62	0.62

Percent time MVPA = percentage of the time > 1399 counts per minute during morning (5:00 a.m. to 11:59 a.m.), afternoon (noon to 5:59 p.m.), or evening (6:00 p.m. to midnight). All correlations are significant at $P < 0.005$.

TABLE 4. Description of participants (N = 210; 106 girls and 104 boys) used for reliability analysis of the PAQ-C (age 11 yr) and PAQ-A (age 13 yr).

	PAQ-C		PAQ-A	
	Mean	SD	Mean	SD
Age (yr)	11.32	0.33	13.10	0.28
Height (cm)	149.58	7.53	160.96	8.23
Weight (kg)	45.55	13.55	56.64	16.21
PAQ summary (original, 9 Q)	2.61	0.60	2.51	0.61
PAQ summary (rescaled Q1, 7 Q)	2.76	0.70	2.72	0.75
Leisure and sport Q1	1.30	0.17	1.23	0.17
Leisure and sport rescaled Q1*	2.10	0.61	1.91	0.67

* Q1 ranged from 1 to 2.1 at age 11. Q1 ranged from 1 to 2.0 at age 13. Age 11 Q1 rescaled = 4(q1 − 1)/(2.1(max raw score) − 1) + 1. Age 13 Q1 rescaled = 4(q1 − 1)/(2.0(max raw score) − 1) + 1.

monitor values were similar to those previously reported for this age (17). In our sample, there were higher levels of total and MVPA activity during the afternoon when compared with the morning and evening.

The PAQ-A is scored with an arbitrary numeric score, whereas the activity monitor raw output is a movement count. Because the units differ, the results, which are presented in Table 2, represent relative validity (compared with the study cohort) rather than absolute validity. The associations between the PAQ-A summary score and the activity monitor were rho = 0.47 for total PA and rho = 0.49 for MVPA. Two PAQ-A items were not significantly associated with the activity monitor variables ($P > 0.05$); these questions addressed physical activity during physical education classes (Q2) and physical activity during lunch (Q4). When these questions were eliminated and question 1 was rescaled so that it contributed to the summary score similarly to the other PAQ-A questions, associations between the PAQ-A (revised) summary score and the activity monitor variables were rho = 0.56 for total PA and rho = 0.63 for MVPA. Associations between individual PAQ-A questions and average daily activity monitor variables tended to be lower than associations between the PAQ-A summary score and average daily activity monitor variables (Table 2). Associations increased when individual PAQ-A questions were matched with activity monitor variables for the same time frame and ranged from rho = 0.41 to 0.62 (Table 3). For example, the association between the PAQ-A morning activity question and average daily MVPA was rho = 0.26; however, when the PAQ-A morning activity question was compared with average morning MVPA (as determined by the activity monitor), the association increased to rho = 0.41.

Reliability. Longitudinal data from 210 children who completed both the PAQ-C at age 11 yr and the PAQ-A at age 13 yr were used to examine the reliability of the PAQ across versions (Table 4). The Spearman correlation coefficients between the two versions were rho = 0.30 using the original summary score (nine questions) and rho = 0.39 using the revised summary score. These associations suggest that physical activity, as measured using the PAQ-C and PAQ-A, was moderately stable across a 2-yr period. Given the time between test administrations, both analytical error (i.e., measurement error, including incongruity between the two versions) and behavioral change would be expected to contribute to these associations.

We also examined how situational differences and age-related changes influenced the internal consistency of the questionnaire. To do so, we sorted the sample at ages 11 and 13 yr by school year (September through May) and summer vacation (June 15 through August 15). We did not include participants who completed questionnaires during the first 2 wk of June or during the last 2 wk of August, because we were not sure of the exact dates that school districts started and ended their terms. The standardized Cronbach alphas ranged from 0.72 to 0.85 for the PAQ-C and PAQ-A, using the original summary scoring (Table 5). The alpha values increased for the questionnaires using the revised summary scoring (0.75–0.88). Our subsample analysis suggested that completing the questionnaires during the summer months slightly reduced the standardized alpha for the PAQ-C but did not reduce the standardized alpha for the PAQ-A.

Eigenvalues provided a measure of how well the construct was represented in the PAQ-C and PAQ-A. Eigenvalues greater than 1.0 are usually interpreted as strong, as they show that associated factors account for a high percentage of common variance. Our factor analysis results indicate only

TABLE 5. Standardized Cronbach coefficient alpha and factor loadings of items for PAQ-C and PAQ-A stratified by school year and summer vacation.

	PAQ-C			PAQ-A		
	All at Age 11 yr	September–May	June 15–August 15	All at Age 13 yr	September–May	June 15–August 15
	N = 210	N = 142	N = 45	N = 210	N = 113	N = 70
Standardized Cronbach's coefficient alpha						
Original PAQ-C and PAQ-A summary (9 Q)	0.73	0.76	0.72	0.77	0.77	0.84
Revised PAQ-C and PAQ-A summary (rescaled Q1, 7 Q)	0.78	0.78	0.75	0.84	0.81	0.88
Factor loading						
Leisure and sport rescaled Q1	0.57	0.59	0.43	0.60	0.57	0.67
Physical education Q2	0.12	0.36	—	0.04	0.25	—
Morning activity Q3	0.25	0.26	−0.02	0.36	0.16	0.61
Lunch activity Q4	0.17	0.22	0.10	0.19	0.12	0.18
Afternoon activity Q5	0.65	0.60	0.80	0.65	0.60	0.72
Evening activity Q6	0.54	0.53	0.60	0.69	0.70	0.70
Weekend activity Q7	0.61	0.61	0.66	0.73	0.74	0.71
Free-time weekly activity Q8	0.69	0.67	0.72	0.74	0.79	0.69
Overall weekly activity Q9	0.75	0.77	0.72	0.78	0.79	0.84

There was only one eigenvalue > 1 in factor analysis for each sample.

one eigenvalue > 1 for the entire sample at ages 11 and 13 yr and for our school year and summer vacation subsamples. This finding suggests that a one-factor solution was appropriate, and both versions of the questionnaire measure only one construct, presumably MVPA. Table 5 presents the results of the factor analysis for specific PAQ-C and PAQ-A questions as standardized regression coefficients (factor loadings) for predicting the construct using a specific item. These factor loadings can be interpreted similar to Pearson correlation coefficients, and loadings are usually considered high if they are above 0.3 or 0.4 in absolute values. The loadings for physical activity during PE (Q2) was 0.36 for age 11 yr during the school year and 0.25 for age 13 during school year. The loadings for physical activity during lunch (Q4) were less than 0.25 for both ages 11 and 13 yr during the school year and the summer months. This finding indicates that these questions do not add substantially to the total scale. In addition, the morning activity (Q3) question did not load high (−0.02) during the summer vacation when the participants were 11 yr old, nor did it load high (0.16) during the school year when the participants were 13 yr old.

DISCUSSION

In this study, we examined the psychometric properties of the PAQ-C and PAQ-A. These are two age-based versions of a commonly used self-report instrument designed to assess MVPA in the previous 7 d during the school year. We report moderately high concurrent validity for the PAQ-A when compared with an activity monitor, and good internal consistency for the PAQ-C and PAQ-A. The questionnaire could also be improved by rescaling the first question (an inventory of leisure and sport activities during the last week) to reflect a range consistent with the other questions. In addition, our results suggest that the questionnaire could be improved by modifying items that ask about physical activity during physical education classes and during lunch time.

Validity. The validity correlation coefficients between the revised PAQ-A with the activity monitor were moderate (rho = 0.56 and 0.63). However, these correlation coefficients are considerably higher than the previously reported associations between the PAQ-C and PAQ-A with the Caltrac activity monitor (r = 0.33 and 0.39) (8,9). In fact, the correlation coefficients that we report are among the highest reported associations between any 7-d physical activity recall for youth and an objective measure of concurrent physical activity (7,13,14,16,18). For example, when compared with objective monitoring, the validity correlation coefficients are r = 0.24 for the Youth Media Campaign Longitudinal (Physical Activity) Survey and r = 0.53 for the Seven-Day Recall (13,19). The latter association reflected only 1 d of concurrent measurement. The improved validity that we found for the PAQ-A is partially attributable to our refinement of the PAQ-A, specifically eliminating two items (Q2 activity during PE and Q4 activity during lunch) that were not significantly associated with the activity monitor. We also improved the validity of the PAQ-A by rescaling an item (Q1) that was strongly associated with the activity monitor (rho = 0.63). This strategy increased the item's contribution to the overall summary score. However, it is likely that the minute-by-minute recording capabilities and sensitivity of our concurrent measure (Actigraph activity monitor) also contributed to improved validity. (The Actigraph activity monitor was not available for commercial use when the original validation PAQ-C and PAQ-A studies were conducted.) In addition, associations between the PAQ-A and MVPA measured using the activity monitor were consistently higher than associations between the PAQ-A and total activity (also measured with the activity monitor). This finding increases confidence that the PAQ-A is measuring what it purports to measure (MVPA), rather than another characteristic of physical activity. This is important from a public health perspective, because MVPA is currently believed to be the type of activity most highly associated with health outcomes (7). Therefore, not surprisingly, it is the type of activity often recommended by federal and international agencies and organizations (7).

Reliability. We used Cronbach's coefficient alpha to measure the internal consistency of the PAQ-C and PAQ-A. Cronbach's coefficient alpha is based on the average correlation among the items in the questionnaire. In general, intrainstrument reliability increases with longer questionnaires and heterogeneous samples. An estimate of > 0.70 is usually considered indicative of a reliable questionnaire. Our finding of standardized Cronbach alphas ranging from 0.72 to 0.88 for the PAQ-C and PAQ-A suggests good internal consistency for both versions. Our results also suggest that both versions could be used during the school year and the summer vacation. This makes the questionnaire a viable option for investigators working with yearlong data-collection protocols. The consistency of responses between the versions also suggests that investigators working with longitudinal study designs could move from the PAQ-C to the PAQ-A as their cohort ages. However, we did find the PAQ-A questions to be consistently more reliable than PAQ-C questions. This is likely attributable to the older age and stronger reasoning skills of the participants when they completed the PAQ-A. For example, we suspect that the subset of 11-yr-old children who completed the PAQ-C during the summer vacation may have been confused by the complexity of the morning activity question (Q3) that was worded, "What did you do most of the time during the morning or if you were in school, and had a morning recess, what did you do during a morning recess?" Our analysis of individual items indicated that participants (regardless of age) were more reliable reporters of some questions when compared with others. For example, reliability associations were high for questions (Q8 and Q9) for all subsamples at ages 11 and 13 yr. These two questions queried about weekly activity and did not

segment the day. It may be that this approach was cognitively easier for participants, or perhaps a general report of weekly activity improves stability because day-to-day variability is attenuated.

Finally, our factor analysis suggested that the PAQ-C and PAQ-A measured only one construct with two questions, activity during physical education (Q2) and activity during lunch (Q4), not contributing much to the total scale. Recently, Moore and colleagues (12) have reported a three-factor model for the PAQ-C. However, they reran their model, eliminating the activity during lunch question (Q4) after determining that some schools that contributed participants have policies that restrict activity during lunch. Rerunning the data resulted in a two-factor solution in which six items loaded on one factor and two items loaded on the second factor. The latter two items were the physical activity during physical education (Q2) and morning physical activity (Q3) questions. These findings would suggest some agreement with our results and (again) the need to modify these items.

Limitations of our work include our inability to examine the validity of the PAQ-C questionnaire. In addition, in the validity component of our study, we did not entirely match the time span of the PAQ-A with the activity monitor. The PAQ-A covers 7 d, but participants wore the activity monitor for only 3–5 d. Finally, there was a lack of substantial representation by minority children and adolescents within our cohort. Future studies addressing psychometric properties of the PAQ-C and PAQ-A should include samples with greater ethnic diversity.

The ease-of-use and efficient formats of the PAQ-C and PAQ-A make them desirable for measuring MVPA in large epidemiologic studies or in smaller studies where physical activity is a confounding variable. Our findings suggest good internal consistency for both versions of this questionnaire and moderately high concurrent validity for the adolescent version (PAQ-A). Previous work has shown that the PAQ-C and PAQ-A predict adiposity and bone mineral content (2,4). These health outcomes would be expected to be influenced by activity and, thus, provide additional evidence of (predictive) validity for these questionnaires.

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