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Agreement Between Student-Reported and Proxy-Reported Physical Activity Questionnaires

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Patty S. Freedson, Wendell C. Taylor, John R. Sirard,
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Parents and 531 students (46% males, 78% white) completed equivalent questionnaires. Agreement between student and parent responses to questions about hypothesized physical activity (PA) correlates was assessed. Relationships between hypothesized correlates and an objective measure of student's moderate-to-vigorous physical activity (MVPA) in a subset of 177 students were also investigated. Agreement between student and parent ranged from $r = .34$ to $.64$ for PA correlates. Spearman correlations between MVPA and PA correlates ranged from $-.04$ to $.21$ for student report and $-.14$ to $.32$ for parent report, and there were no statistical differences for 8 out of 9 correlations between parent and student. Parents can provide useful data on PA correlates for students in Grades 7–12.

Obesity rates in children and adolescents have increased dramatically in recent years (9,14). One factor that might contribute to this increase is a decrease in physical activity (10,16). Students walk to school less often and fewer attend physical education class on a daily basis (4). A large proportion of children's physical activity occurs in the after-school hours and in community facilities (18). Because parents provide access to physical activity by paying fees and transporting their young children to places to be active (21), they are aware of many of the activities in which their children participate.

Adolescents can self-report their physical activity, but some researchers have recommended that self-report should not be used for children younger than 4th grade (20). For children this age and younger, physical activity is often reported by a family member or teacher (15,19). One of the problems with proxy reports, however, is that the parent, guardian, or teacher is rarely with the child during the entire day, and the validity of these proxy reports has been questioned (22).

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Recently, large-scale studies have used accelerometers to objectively measure physical activity in children (7,23,25).

In addition to determining children's physical activity levels, it is also important to identify the factors that influence physical activity behavior in children and adolescents. Questionnaires are typically used to study psychosocial and environmental correlates of physical activity. Some studies ask children to respond to questions about correlates of physical activity, whereas others ask parents or other surrogates to respond. Few studies have investigated the levels of agreement, however, between child self-reports and parent or other proxy reports of correlates of children's physical activity. Therefore, the major purpose of this study was to determine the level of agreement between the self-report of students in Grades 7–12 and parents' proxy reports of hypothesized correlates of physical activity behavior. A second purpose was to ascertain the relationship between an objective measure of students' moderate-to-vigorous physical activity (MVPA) and student self-report and parent proxy report of hypothesized correlates of physical activity.

Methods

Participants

Participants were students enrolled in public schools in Amherst, Massachusetts, and surrounding towns and their parents, who were part of a larger physical activity study (23,26,27). Students were recruited from seven elementary schools, one junior high school, and one senior high school. A total of 3,648 students in Grades 1–12 who were enrolled in physical education were given a packet of study materials. The packet included letters of support, an incentive for the student, an informed consent form, and a parent survey. Of the students, 37.8% returned a consent form and a completed parent survey. Students in Grades 7–12 who returned completed parent surveys completed a student-reported survey during physical education class. This study was approved by the appropriate institutional review boards.

After excluding students with missing data for sex, age group, or physical activity ($n = 25$), data from 531 students in Grades 7–12 were available for analysis (Table 1). Forty-six percent were males, 78% were white, and 60% were in Grades 7–9. The mean age of the younger group (7th–9th grades) was 12.9 years, and the mean age of the older group (10th–12th grades) was 15.7 years. Seventy-eight percent of the proxy questionnaires were completed by the mother, 18% by the father, and the remainder by another adult. Eighty-one percent of the adults reported that at least one adult in the family had a college education or higher.

Accelerometer

A subgroup of students wore an ActiGraph model 7164 accelerometer (previously known as CSA, Manufacturing Technologies, Inc., Fort Walton Beach, FL) for up to 7 consecutive days during waking hours. The ActiGraph detects vertical acceleration and has been shown to be both reliable and valid as a physical activity measure (29). The monitor was attached to an elastic belt and was worn over the right hip. A total of 177 students in Grades 7–12 had complete monitor data (Table 1). These students had been randomly selected from those who had returned

Table 1 Characteristics of Total Youth and Subset With Accelerometer Data

Characteristic	Total Group, <i>N</i> = 531	Subset with accelerometry data, <i>N</i> = 177
Males (%)	45.6	49.2
White (%)	78.3	80.2
MVPA (self-report)	15.7 (12.2) kcal · kg ⁻¹ · day ⁻¹	15.0 (11.1) kcal · kg ⁻¹ · day ⁻¹
Mother respondent (%)	77.8	78.3
Younger (Grades 7–9)		
percent	60.1	52.0
<i>N</i>	319	92
age <i>M</i> (<i>SD</i>)	12.9 (0.9)	12.8 (0.9)
Older (Grades 10–12)		
percent	39.9	48.0
<i>N</i>	212	85
age <i>M</i> (<i>SD</i>)	15.7 (0.9)	15.6 (0.9)

a completed parent survey to obtain about 50 students in each age and sex group (23). Forty-nine percent of the students were males and 52% were in the younger age group. Minute-by-minute activity counts were uploaded to a QBASIC program. Using age-specific count cutoffs derived from an energy-expenditure equation (27), average time spent in MVPA (≥ 3 METs) was calculated by summing the minutes across days and dividing by seven. The ActiGraph data collection was timed to avoid the cold winter months.

Self-Reported Physical Activity

Students completed questionnaires that were used to estimate their physical activity during the previous 7 days. A list of 46 physical activities and sedentary behaviors was provided and three blank spaces were included for other activities. Students were asked to indicate if the activity had been performed and, if so, on how many days and for how many minutes per day. Each activity was assigned a MET-based intensity rating (1 MET = 1 kcal · kg⁻¹ · hr⁻¹) using the Compendium of Physical Activities (1), and activity scores were calculated by multiplying each intensity rating by weekly duration and dividing by seven to give kcal · kg⁻¹ · day⁻¹ of reported activity. For this study, only MVPA was considered, and values were used to compare the total sample and students who wore the ActiGraph. Gross errors for reported minutes of each activity were corrected by the Windsorizing technique by recoding outlier values to approximately the 99th percentile (23).

Correlates of Physical Activity

Hypothesized correlates of physical activity were assessed by the same items in both the student and parent questionnaires. Questions were asked about sports-team participation and activity classes during the past year. Other constructs that were measured included family influences; peer influences; diet quality; athletic coordination; enjoyment of physical activity; enjoyment of physical education; and

access to playgrounds, parks, or gyms. For scales, confirmatory principal components analysis with varimax rotation was used to check for unidimensionality, and scores were summed across the items. The intraclass correlations for test–retest reliability using one-way analysis of variance (ANOVA) of these scales or single items have previously been reported (23,26). Briefly, the number of items and the intraclass correlations for test–retest reliability of the student- (ICC_S) and adult- (ICC_A) reported scales and items were as follows: enjoyment of physical education, 1 item, $ICC_S = .83$, $ICC_A = .81$; enjoyment of physical activity, 1 item, $ICC_S = .80$, $ICC_A = .87$; coordination, 1 item, $ICC_S = .80$, $ICC_A = .81$; diet quality, 7 items, $ICC_S = .50$, $ICC_A = .55$; family influences, 15 items, $ICC_S = .88$, $ICC_A = .81$; peer influences, 3 items, $ICC_S = .86$, $ICC_A = .70$; and access to facilities (playgrounds, parks, or gyms), 1 item, $ICC_S = .86$, $ICC_A = .77$.

Statistical Analysis

Means and standard deviations were reported for hypothesized correlates of physical activity for both adult and student reports. Agreement between the two measures was determined by paired *t* tests, calculation of intraclass correlation coefficients (ICC), and Spearman correlations (3). ICCs were calculated using one-way random effects analysis of variance (ANOVA) (3). ICCs less than .4 are considered to be poor agreement, .4 to .75 as fair to good agreement, and greater than or equal to .75 as excellent agreement (4,8). ICCs and Spearman correlations were also calculated by sex and age groups.

Correlations for the relationship of the hypothesized correlates were reported by both adult and student, with the student's accelerometer data. Correlations between .25 and .5 indicate a fair degree of relationship, from .5 to .75 a moderate to good relationship, and greater than .75 a very good to excellent relationship (5). Fisher's *Z* transformation was used to test if there were differences in the correlations between groups (2-sided) (24). Statistical significance was set at $p \leq .05$.

Results

Overall, student's self-reported MVPA was 15.7 ($SD = 12.2$) kcal · kg⁻¹ · day⁻¹ (Table 1), which was only slightly higher than for those who wore an accelerometer (15.0 kcal · kg⁻¹ · day⁻¹). The average daily MVPA, as measured by accelerometry, was 73.9 ($SD = 33.9$) min. Male students were more active than female students (males: $M = 80.1$, $SD = 35.7$; females: $M = 67.9$, $SD = 31.0$; $p = .02$), and the younger group was more active than the older group (younger: $M = 79.9$, $SD = 34.3$; older: $M = 53.8$, $SD = 27.3$; $p < .001$).

Means and standard deviations for the students' hypothesized correlates of physical activity as reported by student and parent are shown in Table 2. Although students reported significantly ($p < .05$) higher levels of team sports, exercise classes, and access to facilities and lower levels of family influence, coordination, and enjoyment of physical education than their parents, these values were very similar. The strongest agreement between the student and parent reports was for athletic coordination ($ICC = .65$, $r = .64$) and the weakest was for family influences ($ICC = .23$, $r = .34$).

Table 2 Physical Activity Correlates, Intraclass Correlations, and Spearman Correlations Between Adult and Child Reports, *M* (*SD*)

Variable	<i>N</i>	Parent report <i>M</i> (<i>SD</i>)	Child report <i>M</i> (<i>SD</i>)	Paired <i>t</i> <i>p</i> value	ICC	<i>r</i> *
Number of sport teams ^a	525	2.7 (2.7)	3.1 (2.8)	.002	.43	.57
Exercise classes ^b	508	1.6 (1.6)	2.2 (1.9)	< .001	.50	.57
Family influences ^c	531	2.7 (0.8)	2.2 (0.8)	< .001	.23	.34
Peer influences ^d	521	2.8 (1.0)	2.7 (1.0)	.15	.53	.52
Diet quality ^e	526	2.8 (2.0)	2.9 (2.1)	.55	.52	.51
Coordination ^f	519	3.6 (1.0)	3.5 (0.9)	.005	.65	.64
Enjoy physical activity ^g	521	4.3 (1.0)	4.3 (0.9)	.92	.62	.61
Enjoy physical education ^h	518	3.7 (1.2)	3.4 (1.2)	< .001	.59	.60
Access to facilities ⁱ	527	3.4 (1.5)	3.6 (1.3)	.02	.50	.51

Note. *Spearman correlation, all significant $p < .001$. ^aNumber of sport teams in the past year at school or outside of school. ^bNumber of exercise-related classes or lessons that were taken in the past year outside of school. ^cFrequency with which family encouraged, exercised with, provided transportation for, or watched child play sports. ^dFrequency with which friends are active, encouraged child to be active, or are active with child (0 = none, 4 = daily). ^eFrequency of healthy or unhealthy food; healthy: fresh fruit, fruit juice, salad, cooked vegetables. unhealthy: hamburger/hot dog/sausage, french fries/potato chips, cookies/doughnuts/pie/cake (0 = none, 2 = more than once). ^fComparison of child's athletic coordination (1 = much less than peers, 5 = much more than peers). ^gDoes child enjoy physical activity (1 = not enjoyable, 5 = very enjoyable). ^hDoes child enjoy physical education class (0 = not enrolled, 1 = not enjoyable, 5 = very enjoyable). ⁱAccess to playgrounds, parks, or gyms.

Agreement between student and parent for potential correlates by sex are shown in Table 3, and was lowest for family influences (males: ICC = .18, $r = .28$; females: ICC = .27, $r = .39$) and highest for enjoyment of physical activity (males: ICC = .57, $r = .57$; females: ICC = .65, $r = .64$) and access to facilities (ICC = .58, $r = .57$) in male students and for athletic coordination in female students (ICC = .69, $r = .69$). For the hypothesized correlates of physical activity, gender differences were observed for number of sport teams, athletic coordination, and access to facilities. Agreement with parent report was better among females than males for number of sports teams and athletic coordination, whereas agreement for access to facilities was better among males than females.

Table 3 also presents agreement between student and parent for potential correlates by age group. ICCs ranged from .25 (family influences) to .60 (athletic coordination) for the younger students and from .12 (family influences) to .72 (athletic coordination) for the older students. Parent-student agreement differed significantly between younger and older groups for peer influences, athletic coordination, and enjoyment of physical education. Agreement was higher between older students and parents than between younger students and parents.

Spearman correlations between students' objective measure of MVPA and hypothesized physical activity correlates as reported by students and parents are shown in Table 4. Correlations with students' MVPA ranged from $-.04$ (diet quality) to .21 (number of sports teams) for the student-reported correlates and from $-.14$ (diet quality) to .32 (exercise classes) for the parent-reported correlates. Eight of

Table 3 Intraclass (ICC) and Spearman Correlations (*r*)* Between Child and Parent Report By Sex and Age Group and *p* Value to Test Whether Correlations Differ Between Groups

Variable	Males N = 242		Females N = 289		<i>p</i>	Young N = 319		Older N = 212		<i>p</i>
	ICC	<i>r</i>	ICC	<i>r</i>		ICC	<i>r</i>	ICC	<i>r</i>	
Number of sport teams	.34	.47	.48	.62	.01	.36	.52	.57	.63	.07
Exercise classes	.49	.53	.51	.59	.33	.45	.49	.53	.61	.06
Family influences	.18	.28	.27	.39	.16	.25	.31	.12	.32	.90
Peer influences	.51	.51	.53	.52	.88	.45	.45	.62	.62	.01
Diet quality	.54	.52	.48	.49	.65	.49	.48	.57	.57	.16
Athletic coordination	.57	.56	.69	.69	.02	.60	.59	.72	.71	.02
Enjoy physical activity	.57	.57	.65	.64	.21	.56	.59	.71	.65	.28
Enjoy physical education	.52	.55	.60	.61	.31	.55	.55	.62	.66	.05
Access to facilities	.58	.57	.43	.44	.05	.47	.48	.56	.54	.22

**p* < .001.

Table 4 Spearman Correlations Between Child- and Parent-Reported Correlates With Accelerometer Data, MVPA, and *p* Value for Difference Between the Two Correlations

Hypothesized correlates	Child-reported	Parent-reported	<i>p</i> value
Number of sport teams	.21*	.19*	.85
Exercise classes	.10	.32***	.03
Family influences	.15*	.05	.35
Peer influences	.10	.14	.71
Diet quality	-.04	-.14	.35
Athletic coordination	.16*	.29***	.20
Enjoy physical activity	.19*	.12	.51
Enjoy physical education	.03	.17*	.19
Access to facilities	.04	-.03	.51

p* ≤ .05. *p* < .01. ****p* < .001.

the nine correlations between parent and student physical activity correlates were nonsignificant, and the only significant difference was for exercise classes.

Discussion

A key finding of this study was that for eight out of nine hypothesized psychosocial and environmental correlates of physical activity the agreement between student and parent reports using ICCs was fair and moderate to good, using Spearman

correlations. The agreement for family influences was poor (ICC) or fair (Spearman r), with parents reporting significantly higher scores than students did. Agreement on family influence was slightly higher between females and parents than males and parents. In a previous study, three family-support questions were asked of both 7th graders and their parents (2). The correlations between parent- and child-reported family support ranged from .16 to .45, which is similar to the parent–student correlations observed in the present study. In the present study, females exhibited stronger agreement, with parents for the number of sports teams and perceived athletic coordination, whereas males exhibited stronger agreement with parents for access to facilities. Dunton et al. (6) reported low ($r = .14$) agreement between parents and their adolescent daughters' perceptions of community resources. Males might be more aware of places to be active than females because they use the facilities more often than females. This could be because of factors such as females' lack of interest or lack of programs for females at the facilities. In the present study, however, seven out of the nine agreement measures between student- and parent-reported correlates of physical activity were in the fair (ICC) or moderate to good (Spearman r) range, regardless of gender or age group.

A second key finding of the present study was that student-reported correlates and parent-reported correlates of activity behavior exhibited similar relationships with students' objectively measured MVPA. There was only one significant difference out of nine comparisons in the agreement between student-reported MVPA and student- and parent-reported correlates. There was stronger agreement between MVPA and parent report of exercise classes. Perhaps this relationship is due, in part, to high parental awareness of classes because parents pay fees and transport students to lessons and classes. For four reported correlates of physical activity for both parent and student, there were significant associations with MVPA, but only two of these were the same correlates. Several studies (17,28) have reported fewer significant correlates of physical activity when objective measures of physical activity have been used as compared with self-report. Prochaska and colleagues (17) also reported a composite physical activity measure that used both self-report and monitor data. As expected, the relationships with the physical activity correlates were in between the self-reported and monitor values.

The present study is unique for several reasons. The study investigated the level of agreement between student and parent reports of correlates of student's physical activity. Nine theory-based correlates of physical activity, which have been found to be related to physical activity in other studies (21), were examined. In addition, agreement between the student and parent reports for all variables is presented in several ways (both ICCs and Spearman correlations) for the entire sample, by gender, and for two age groups. Furthermore, potential correlates from both parent and student reports for the student were compared with an objective measure of the student's MVPA. There have been similar studies of parent and child agreement on measures of health and well-being (30), and parental smoking prompts (11). These authors speculated that data collected from parent and child might offer different points of view and that information from various sources could be combined.

The present study only included students in Grades 7–12. Other limitations were the cross-sectional design, recruitment from one small geographic region, a low response rate, a predominantly white sample population, and highly educated parents. Therefore, the results might not be generalizable to other populations.

Another limitation is the use of MET activity-intensity codes derived from primarily adult studies. The mean age of the students participating in the present study, however, was 14.0 years ($SD = 1.6$), and, given the absence of a suitable alternative for the pediatric population, the use of the Compendium of Physical Activities is a reasonable compromise. Strengths of the study included the ability to conduct analyses by age groups and sex. In addition, agreement between parent and student report for several physical activity correlates were computed.

Parents are often asked to report the physical activity level of their children (12,13,23) and to identify factors that influence their children's physical activity (12,23). For most of the correlates studied, the association between student-reported physical activity behavior was similar, regardless of whether it was reported by the parent or student. The present study suggests that parents can provide a reasonable estimate of middle school and high school age student's physical activity correlates. Parent reports might be particularly useful when combined with other measures to create a comprehensive profile of the correlates of children's physical activity.

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