

## Relationship of Physical Activity Self-Efficacy and Psychobehavioral Characteristics of Overweight and Obese African American Children

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### Abstract

**Objectives:** The relationship of Physical Activity Self-Efficacy (PASE) to psychobehavioral characteristics of overweight and obese African American children from an inner city area has been understudied, making it difficult to know whether effective interventions should include a broad or more focused approach. Therefore, we hypothesized that children's self-reported self-efficacy toward physical activity would be related to more favorable scores on child-report and parent-report Behavioral Assessment for Children, 2<sup>nd</sup> edition (BASC-2).

**Methods:** A secondary analysis was performed in a sample of 125 children ages 9-11 yr participating in a community-based, type 2 diabetes prevention program. Self-efficacy toward physical activity was assessed using the Children's Self-perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) questionnaire. Behavioral measures were obtained from children and caregivers using the BASC-2.

**Results:** Hierarchical multiple linear regression models showed that for the child-report BASC variables, all 20 associations examined were statistically significant at  $p < 0.05$ . Whereas, for the parent-report BASC variables, results show that none of the 44 associations examined was significant.

**Conclusion:** Based on the strong association between physical activity self-efficacy and child-reported psychobehavioral characteristics, we conclude that positive change in the child's perception of his/her basic behavioral and social characteristics may increase self-efficacy and, thus, effectiveness of physical activity interventions.

**Keywords:** Physical activity; Self efficacy; Psychobehavior; Overweight and obese; African American

### Introduction

The prevalence of childhood overweight and obesity has reached epidemic levels in developed countries [1] and this is of substantial clinical and public health concern. Physical activity is a key component of the expenditure aspect of energy balance, providing a major avenue for caloric consumption. Regular physical activity has favorable effects on weight maintenance and/or loss, improved psychological well-being, and cardiovascular fitness in adolescents [2]. According to social cognitive theory, self-efficacy has a central influence on exercise behavior [3].

Researchers have found that interventions which build perceptions of self-efficacy in youth can increase participation in physical activity [4,5]. In a study of 5<sup>th</sup> grade students living in a rural, predominately African American community, those students categorized as having significantly lower self-efficacy for seeking social support from significant others for being physically active were less physically active than their counterparts [6]. The Children's Self-perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) is a measure of generalized self-efficacy toward physical activity, and has been shown to be a significant predictor of children's participation in both free play and structured activities [7,8]. The CSAPPA captures the critical elements of what Bandura [9] originally described as generalized self-efficacy perceived adequacy to be physically active and predilection for active over sedentary pursuits. There is a lack of understanding regarding self-efficacy toward physical activity in overweight and obese African American boys and girls, including those who reside in inner-city, low-income communities. This is a critical component for the design and development of successful physical activity interventions targeting this high risk population.

Previous physical activity interventions have reported weak effectiveness in increasing physical activity among youth [10,11], due in part to a failure to adequately focus the intervention on theoretically-based mediators of physical activity. The importance of focusing on physical activity mediators, is apparent as interventions that did not focus adequately on PA mediators had little or no impact, whereas programs with this focus demonstrated greater impact [12,13]. Potentially, a more successful approach to physical activity interventions would target those psychosocial determinants that correlate with the amount physical activity engaged in by the child, and which can putatively influence volitional behavior [14-16].

Volitional behaviors are dependent on opportunity as well as on the inner psychological state of the person. Psychobehavioral characteristics are known to cluster within children such that clinical indicators (behavioral symptoms, externalizing problems, internalizing problems, etc.) and adaptive scores (activities of daily living, adaptability, social skills etc.) are negatively correlated [17]. We previously reported that a sample of overweight and obese, inner-city African American children had a higher prevalence of clinical indicators of psychological

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distress and a lower prevalence of adaptive indicators than norm populations of children (General Norm, as defined for BASC-2 [17], includes a large national sample that is representative of U.S. children with regard to race/ethnicity, parent education, geographic region) matched for age and gender [18]. Furthermore, while the scores for these children were not related to indicators of body fatness including BMI, waist circumference, and or percent body fat, insulin resistance was associated with less favorable BASC scores in this cohort [19]. In conceptualizing the current analysis, we reasoned that more insulin resistant children with less favorable BASC scores would not likely feel able to engage in behaviors, such as physical activity, that could have prevented this insulin resistant state. In the absence of research examining this hypothesis we undertook this investigation using a convenience sample of overweight and obese, inner-city overweight and obese African American children.

In this analysis, the relationship of physical activity self-efficacy to child and parent reported psychobehavioral characteristics of overweight and obese African American children from an inner city area was examined. We hypothesized that children's self-reported self-efficacy toward physical activity would be related to more favorable scores on child-report and parent-report Behavioral Assessment for Children, 2<sup>nd</sup> edition (BASC-2).

## Methods

### Subjects

The data included in this study were collected in 2007 from an ancillary study, Taking Action Together that focused on risk reduction for type 2 diabetes (registered with ClinicalTrials.gov #NCT01039116 and described in detail elsewhere [20]). Participants in this ancillary study were included in the parent intervention study. To be eligible for the main study, children had at least one African American biological parent and a Body Mass Index (BMI) greater than the 85<sup>th</sup> percentile (calculated from the Center for Disease Control and Prevention growth charts; <http://www.cdc.gov/nccdphp/dnpa/growthcharts/resources/sas.htm>) as children with both characteristics are at higher risk of the metabolic syndrome and associated type 2 diabetes. The main study provided programming for children who were 9-10 years old at baseline, and lived in inner-city Oakland, CA. No children had a fasting glucose  $\geq 120$  mg/dL (ie., diabetic), known metabolic diseases, or were taking medications known to affect the study outcomes. Written parental informed consent was obtained for all subjects, and all protocols were approved by the institutional review board at the University of California at Berkeley.

### Physical activity self-efficacy

Generalized self-efficacy toward physical activity was assessed using the Children's Self-perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) questionnaire [8]. The CSAPPA has been shown to be a significant predictor of children's participation in both free play and structured activities in previous work [8]. The CSAPPA assesses the degree to which children feel adequate in meeting the minimum standards of performance held by their peers and adults, and to what degree, when given the choice, they would opt for active over sedentary pursuits. The CSAPPA scale is a 20-item, self-report questionnaire and, with guidance as needed from research staff, was completed within 15 min. The scale was designed for children 9–16 years of age and it has demonstrated a high test-retest reliability as well as strong predictive and construct validity [8,21]. The CSAPPA has been reported to be significantly correlated with physical activity

and motor proficiency [8,22]. This scale has three imbedded factors which assess different dimensions of self-efficacy toward physical activity: adequacy (ie., confidence with respect to being physically active, 7 items), predilection (preference for being active, 9 items), and enjoyment of physical education class (3 items). A single item gauges a child's concern over being injured while active. Each item is scored from 1 to 4 with higher scores indicative of greater efficacy. In this study, we report data for the overall CSAPPA scale and for each of these three subscales. To add to the literature on physical activity self-efficacy in children, mean CSAPPA scores and Freedom from Injury scores in our cohort were compared to mean scores reported in the research literature for other cohorts of children using two-sample *t*-tests.

### Behavioral assessment

Behavioral measures were obtained from children and caregivers using the Behavioral Assessment for Children, 2<sup>nd</sup> edition (BASC-2) [17]. The BASC-2 is a widely used instrument, and utilizes multiple raters including children (aged 4-18), parents, and teachers [23]. It allows ratings of both clinically significant and adaptive behaviors on a four-point scale, ranging from never to always, in addition to true/false responses. The BASC-2 was developed for educational and mental health assessment. Assessment forms can be completed within 10-20 minutes. The BASC has been normed on both general and clinical samples and was valid and reliable in the current sample (child and parent internal consistencies assessed using Cronbach's alpha ranged from 0.71 to 0.94 for child report indices and from 0.65 to 0.95 for parent report indices). From parent reports, we examined 14 primary scales, four composites (externalizing problems, internalizing problems, behavior symptoms index, and adaptive skills), and seven content scales (anger control problems, bullying, developmental social disorders, emotional self-control problems, executive functioning problems, negative emotionality and resiliency). From child reports we examined 14 primary scales and five composites (inattention/hyperactivity, internalizing problems, emotional symptoms index, school problems, and personal adjustment).

### Statistical analyses

Of the 150 participants assessed in the 2007 year, data for the dependent variables (physical activity self-efficacy assessed using the CSAPPA scale and its three subscales), were available for a sample of 133, and a complete set of data for the variables included in the regression models was available for 129 participants. Data for dependent and independent variables of interest were examined for skewness (none significant), and it was not necessary to exclude data for any participant due to outlier values [24]. Data for four participants were excluded, however, as one or more values on their child report BASC indices were found not to meet the validity standards set for that instrument [17]. Thus, analyses were performed on a final sample of 125. Differences between boys and girls for continuous variables were evaluated using independent two-sample *t*-test following Levene's test for equality of variances. Differences among mean values for the three subscales and their interaction with gender were evaluated using analysis of variance techniques, and if significant, followed up using Tukey's studentized range test.

To evaluate the primary study objectives, hierarchical multiple linear regression models were employed with physical activity self-efficacy scores as dependent variables, and with BASC scores as independent variables of interest. To determine whether or not it would be necessary to develop regression models separately for boys and girls, interaction terms (gender X BASC independent variables) were initially

evaluated in the in regression models. As these interactions terms were not statistically significant in the physical activity self-efficacy models, it was determined that the relationships were not significantly different for the two genders. Data for boys and girls were analyzed together, with gender included as a covariate. Using methods previously described [20,25], child age, pubertal state, family socioeconomic status and intervention group assignment were also included as covariates in all models.

Statistical analyses were performed using PASW Statistics 18 (IBM Inc.) for Windows. Statistical significance was defined as  $p < 0.05$ , with  $p < 0.10$  being considered marginally significant. Since a total of 176 regressions were performed (44 BASC indices X 4 PA-SE indices), one might expect approximately 9 of these relationships would be found to be statistically significant solely due to chance alone (type 1 error of 5%); with a type 1 error of 1%, two relationships might be expected to be statistically significant solely due to chance. Thus, the reader should consider the p-value when interpreting relationships.

## Results

Of the 150 participants assessed in the 2007 year full set of data were available for 125 participants including 59 males and 66 females. Children included in this analysis averaged 10.7 yr of age and had an average BMI-score of 2.0. In comparison to boys (Table 1), girls in this sample were at a more advanced stage of puberty.

Similarly, descriptive data for the dependent variables (physical activity self-efficacy assessed using the CSAPPA scale and its three subscales), were available for the sample size. The CSAPPA index included 19 items, with reliability of 0.89 described in table 2. The total score was marginally higher in males than females. For item mean scores by subscale, there was no significant interaction between gender and subscale. With genders combined, the item mean score for the subscale, enjoyment of physical education, was significantly higher than the item mean scores for the predilection and adequacy subscales which is a typical result for children of this age. Scores for the CSAPPA index were observed to be significantly lower ( $p < 0.001$ ) for children in our study than for control comparison cohorts evaluated in school and community settings by others [26]; not significantly different ( $p > 0.05$ ) from children with acute lymphoblastic anemia [27]; and significantly higher ( $p < 0.001$ ) than values reported for children with developmental coordination disorder [26]. Additionally, as one of the components of the CSAPPA questionnaire, children were asked the extent to which they frequently get hurt being physically active (hereafter referred to as Freedom from Injury score). In this sample, 21.1%, 36.1%, 23.3 and 19.5% reported scores of 1-4, respectively, with 1 being the least favorable score. When compared to mean scores in the research literature, the Freedom from Injury score in our cohort (Mean=2.41; SD=1.03) was significantly ( $p = 0.001$ ) lower than the mean score of 2.89 reported previously for a control group of school aged children but not significantly different ( $p = 0.39$ ) from the mean value of 2.54 reported for a sample of children with acute lymphoblastic leukemia [27]. Again, the mean value for our cohort is an atypical score for a healthy cohort.

To evaluate the primary study objectives, multiple linear regression models were employed with physical activity self-efficacy scores as dependent variables, and with BASC scores as independent variables of interest. For the child-report BASC variables, results show that all 20 associations examined were statistically significant at  $p < 0.05$  (Table 3). Thus, the child-report BASC variables were significantly associated with all physical activity self-efficacy scores. Additionally, all four physical activity self-efficacy variables were significantly and negatively associated with the four clinical composites (Emotional Symptoms

Index, Inattention/Hyperactivity Composite, Internalizing Problems Composite, and School Problems Composite) and positively associated with the adaptive composite (Personal Adjustment Composite).

For the parent-report BASC variables, results show that none of the 44 associations examined was statistically significant (Table 4). Also, none of the composite scales were significantly related to any of the physical activity self-efficacy variables.

Our overall results show that Child physical activity self-efficacy was significantly related to more favorable scores for the Child Report of his/her psychobehavioral characteristics, but, was not significantly related to the Parent Report of the child's characteristics (Figure 1).

## Discussion

We found that higher self-reported self-efficacy toward physical activity was significantly related to more favorable scores for the Child-Report of his/her psychobehavioral characteristics. Reported by children, strong associations of CSAPPA and its components (predilection, adequacy, enjoyment) with psychobehavioral determinants indicate that a child's self-perception of these characteristics are significantly inter-related. Although the relationships between the child's self-report of physical activity self-efficacy and BASC scores were statistically significant for the child's self-report scores, relationships were not

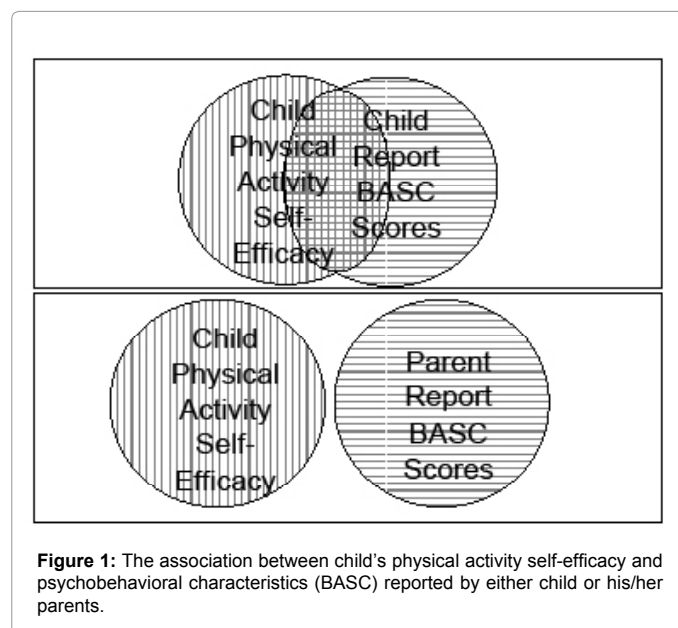
	Mean ± SEM		
	Males (n=59)	Females (n=66)	P value <sup>1</sup>
Age, yr	10.8 ± 0.1	10.6 ± 0.1	0.42
Pubertal Stage <sup>2</sup> (1-5)	2.46 ± 0.2	3.48 ± 0.2	<0.001
BMI, kg/m <sup>2</sup>	27.8 ± 0.9	29.0 ± 0.8	0.26
BMIz	2.00 ± 0.1	2.11 ± 0.1	0.28
Height, cm	149.4 ± 1.2	150.5 ± 1.1	0.51
Weight, kg	62.9 ± 2.5	66.6 ± 2.3	0.28

<sup>1</sup>Differences determined using two-tailed t-test following Levene's test for equality of variances.

Level of significance  $p \leq 0.05$

<sup>2</sup>Pubertal stage by sex was evaluated using a Mann-Whitney U test

**Table 1:** Characteristics of overweight and obese African American children (n=125).



**Figure 1:** The association between child's physical activity self-efficacy and psychobehavioral characteristics (BASC) reported by either child or his/her parents.

Self-Efficacy	Index Characteristics (n=125)			Mean ± SEM		
	# items	Reliability (α)	Possible scores	Males (n=59)	Females (n=66)	Overall (n=125)
CSAPPA Index, sum score	19	0.90	19-76	59.5 ± 1.46	55.6 ± 1.38	57.4 ± 1.04
Subscales:						
Predilection, item mean	9	0.80	1-4	3.09 ± 0.65	2.93 ± 0.68	3.01 <sup>a</sup> ± 0.67
Adequacy, item mean	7	0.80	1-4	3.09 ± 0.70	2.89 ± 0.66	2.98 <sup>a</sup> ± 0.68
Enjoyment, item mean	3	0.81	1-4	3.35 ± 0.84	3.03 <sup>a</sup> ± 0.86	3.18 <sup>b</sup> ± 0.86

<sup>a</sup>Difference by gender at  $p \leq 0.05$   
Means with different superscript letters are significantly different at  $p < 0.05$

**Table 2:** Reliability and differences by gender for physical activity self-efficacy indices.

Independent Variables Child-Report BASC	Dependent Variables Child Physical Activity Self-Efficacy			
	CSAPPA Index	Sub-scales of CSAPPA		
		Predilection	Adequacy	Enjoyment
	Standardized regression coefficients <sup>1</sup>			
Emotional Symptoms Index	-0.275 <sup>***</sup>	-0.181 <sup>*</sup>	-0.287 <sup>**</sup>	-0.265 <sup>**</sup>
Inattention/ Hyperactivity Composite	-0.263 <sup>**</sup>	-0.187 <sup>*</sup>	-0.289 <sup>**</sup>	-0.198 <sup>*</sup>
Internalizing Problems Composite	-0.338 <sup>***</sup>	-0.235 <sup>***</sup>	-0.377 <sup>***</sup>	-0.261 <sup>**</sup>
School Problems Composite	-0.404 <sup>***</sup>	-0.305 <sup>***</sup>	-0.391 <sup>***</sup>	-0.357 <sup>***</sup>
Personal Adjustment Composite	0.374 <sup>***</sup>	0.290 <sup>***</sup>	0.415 <sup>***</sup>	0.220 <sup>*</sup>

<sup>1</sup>Note: <sup>\*</sup> $p \leq .10$ , <sup>\*</sup> $p \leq .05$ , <sup>\*\*</sup> $p \leq .01$ , <sup>\*\*\*</sup> $p \leq .001$   
<sup>2</sup>All models adjusted for child age, pubertal stage and gender, family SEI, and group assignment

**Table 3:** Standardized regression coefficients<sup>2</sup> relating Child-Report BASC variables to child-report of physical activity self-efficacy (n=125).

Independent Variables Parent-Report BASC	Dependent Variables Child Physical Activity Self-Efficacy			
	CSAPPA Index	Sub-scales of CSAPPA		
		Predilection	Adequacy	Enjoyment
	Standardized regression coefficients <sup>1</sup>			
Behavioral Symptoms Index	0.024	-0.005	0.056	0.013
Externalizing Problems Composite	0.012	-0.023	0.063	-0.010
Internalizing Problems Composite	-0.008	-0.055	0.052	-0.013
Adaptive Skills Composite	0.095	0.096	0.073	0.087
Content Scales				
Anger Control Problems	0.087	0.066	0.093	0.078
Bullying	0.008	0.077	0.007	0.014
Developmental Social Disorders	-0.073	-0.087	-0.015	-0.047
Emotional Self Control Problems	0.079	0.069	0.092	0.036
Executive Functioning Problems	0.042	0.015	0.065	0.025
Negative Emotionality	0.048	0.020	0.087	0.019
Resiliency	0.043	0.054	0.005	0.077

<sup>1</sup>Note: <sup>\*</sup> $p \leq .10$ , <sup>\*</sup> $p \leq .05$ , <sup>\*\*</sup> $p \leq .01$ , <sup>\*\*\*</sup> $p \leq .001$   
<sup>2</sup>All models adjusted for child age, pubertal stage and gender, family SEI, and group assignment

**Table 4:** Standardized regression coefficients<sup>2</sup> relating Parent-Report BASC variables to child-report of physical activity self-efficacy (n=125).

significant using Parent-Report of the child's characteristics. Kamel [28] using the Strengths and Difficulties Questionnaire [29] in a small sample of overweight/obese British children reported strong correlations between higher child-report CSAPPA scores and fewer parent reports of peer problems and emotional symptoms. In our cohort, however, only the child and not the parent, judged these characteristics to be related. This discrepancy is not surprising since others have previously reported discrepancies between child and parent report assessments [17,30,31]. Possible causes that have been suggested include a parental lack of awareness of youth's problems, and distortion due to parental depression or anxiety regarding the child's condition [32,33]. Thus, parental assessments have been shown by some to emphasize problem behaviors and underestimate strengths of the child. Differences in cultural values have also been suggested to account for discrepancies among responders [34]. Parents may be more

susceptible to a social expectation bias. Nonetheless, the self-report BASC scores reflect the child's impression of his/her self, regardless of whether or not that impression is in full agreement with the opinions or observations of others. Likewise, self-perception is a key component of self-efficacy and is a characteristic that cannot be easily judged by others. The results of the current study demonstrate that children who perceive themselves as having lower physical activity self-efficacy also report higher scores for characteristics of clinical concern including the emotional symptoms index, inattention/hyperactivity composite, internalizing composite, and school problems composite; and lower scores for the personal adjustment composite. Further study will be needed to determine whether or not it is possible to independently change a child's self-perception of his/her physical activity self-efficacy without also targeting the child's broader, related, psychobehavioral state.



In our study CSAPPA index and subscales predilection, adequacy, and enjoyment of physical education showed satisfactory reliability (>0.70) which supports the existing reports on high reliability and validity of these scales. Mean CSAPPA score were marginally higher for males (59.4) than females (56.1) but, surprisingly, these scores were below the average reported previously for school-age children. Cairny et al. [26], for example, reported mean CSAPPA scores of 63.4 and 60.6 for males and females, respectively, in a large sample of 564 Canadian school children from 4-8 grade including 520 healthy and 44 (8.4%) children with developmental coordination disorder. The mean values in our population lay between these higher mean values and the lower mean values reported for children with developmental coordination disorder [26] and with acute lymphoblastic leukemia [27]. Based on existing research, the low CSAPPA scores in our participants suggest an urgent need to investigate the cause. Also, when these children were asked how frequently they hurt themselves while being physically active their average response were scores more like those of children with significant illness [27]. The authors at this point cannot comment on those factors that account for the scores observed in our study population. Certainly, there is a dearth of ethnicity-specific information regarding physical activity self-efficacy and a need for further investigation.

**Implications for Future Research:** An objective of many efforts is to increase time children devote to being physically active, as this has been shown to reduce risk of obesity and associated metabolic disease. As it improving physical activity self-efficacy has been shown by others to lead to increased time being active, it is thought that efforts must first focus on developing self-efficacy in inactive children. Others have developed programs that specifically target improvements in physical activity self-efficacy. Based on our results, however, we believe it would be interesting to determine whether broad-based interventions that aim to improve a child's perception of his/her psychobehavioral characteristics may more effectively improve physical activity self-efficacy than more narrowly focused interventions. This could be done by providing programming to promote positive self-esteem, improve skills associated with intercommunication, social interactions and daily living, and enhances capacity to express emotions in a socially acceptable way that includes self-regulation of behaviors.

Based on the strong association between physical activity self-efficacy and child-reported psychobehavioral characteristics, we conclude that positive change in basic behavioral and social characteristics of children may increase self-efficacy and thus, effectiveness of physical activity interventions. Also contrary to our hypothesis, the child's self-report of physical activity self-efficacy was not significantly related to parent-report of the child's BASC scores.

Limitations of this study include restriction to low income, inner-city, African American children and exclusion of children with BMI's less than the 85<sup>th</sup> percentile when matched for age and gender. These limitations preclude comparisons among children of different races, ages, and socioeconomic backgrounds, and comparisons with lower BMI children. This is a cross-sectional analysis of data, precluding evaluation of a cause and effect relationship. The data reported here support the need for follow-up with an expanded sample size and with a pre-post evaluation study design, and with a more heterogeneous sample. Also, there may be an influence of culture, which would have been systematic in our sample since all children and parents were African American and of low-income.

Other than study-related limitations, there is considerable debate regarding the importance and reliability of including evaluations from

both parents and child. The value of obtaining information about children's health from self-reported questionnaires is always a point of discussion in clinical pediatrics and child health research. Although, it is no longer always acceptable to obtain only parental reports of children's health, the decision of whether to involve children is not straightforward. In clinical studies on 7-11 yr old children, children's report in conjunction with parental reports are commonly used. Studies suggest that the reliability of reports by children 8-11 years old is quite good on health questionnaires developed especially for this age group [35]. In general, researchers use both parent's and child report to assess physical activity and related psychosocial [36]. If the objective is to gain a full understanding of the child's psychobehavioral characteristics, input from a full range of perspectives (eg. Child, parent, teacher, others) is essential. When the aim is solely to increase physical activity, however, it appears that evaluations need only be performed by the child him/herself as associations were only significant for child-report data.

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