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Measuring Enjoyment of Physical Activity in Children: Validation of the Physical Activity Enjoyment Scale

Abstract

This study sought to determine the reliability and validity of the Physical Activity Enjoyment Scale (PACES) in elementary school children. The sample consisted of 564 3rd grade students (M age = 8.72 ± .54; 268 male, 296 female) surveyed at the beginning of the fall semester. Results indicated that the PACES displayed good internal consistency and item-total correlations. Confirmatory factor analyses supported a unidimensional factor structure. Scores on the PACES were significantly correlated with task goal orientation ($r = .65$, $p < .01$), athletic competence ($r = .23$, $p < .01$), physical appearance ($r = .20$, $p < .01$), and self-reported physical activity ($r = .16$, $p < .01$). However, results of invariance analysis suggested the factor structure is variant across sex. The present findings suggest support for the validity of the PACES as a valid measure of enjoyment of physical activity in children; nevertheless, further research examining the invariance of the factor structure across sex is warranted.

Low levels of PA are clearly linked to obesity (i.e. excessive body fatness) and cardiovascular disease (CVD) risk factors in adults and in youths (Gutin & Owens, 1996; U.S. Department of Health and Human Services, 2001). Important to the development and evaluation of interventions for the promotion of PA in youths is the assessment of psychological correlates and determinants of PA (Sallis, Prochaska, Taylor, Hill, & Geraci, 1999). For practitioners, the ability to evaluate engagement in one's program provides a means to measure and potentially predict perseverance or dropout in a non-sport specific manner.

Enjoyment of PA was identified as an important correlate of PA in two reviews (Health Education Authority, 1997; Sallis, Prochaska, & Taylor, 2000), exhibiting a strong positive relationship across a number of studies. DiLorenzo, Stucky-Ropp, Vander Wal, and Gotham (1998) examined a number of psychological and environmental variables in relationship to PA in fifth and sixth grade children and discovered that enjoyment of PA was the only consistent predictor of PA levels for boys and girls. In a sample of 1504 children in grades 4–12, Sallis and colleagues (1999) found that enjoyment of physical education consistently predicted participation in PA among boys in grades 4–12 and girls in grades 7–12. Enjoyment has also been found to be associated with a variety of PA correlates, such as self-efficacy, goal setting (Rovniak, Anderson, Winett, & Stephens, 2002), self determination (Ntoumanis, 2002), task orientation (Boyd & Yin, 1996; Newton & Duda, 1993), and perceived competence (Boyd & Yin, 1996). Recently, enjoyment of PA was shown to mediate the effect of a comprehensive school-based intervention designed to promote physical activity on self-reported physical activity in adolescent girls (Dishman, Motl, Saunders et al., 2005).

Despite these promising results, most studies seeking to measure enjoyment of PA in children have used single item measures or measures that have not been adequately validated in this age group (Kendzierski & DeCarlo, 1991; Motl et al., 2001). Kendzierski and DeCarlo (1991) designed the Physical Activity Enjoyment Scale (PACES) as a single factor, multiple-item scale to assess enjoyment of PA in adults across exercise modalities. In their work, the PACES demonstrated acceptable internal consistency and test-retest reliability in college students. Furthermore, evidence supporting the construct validity was garnered as scores on the PACES differentiated between self-selected and compulsory exercise modalities (Kendzierski & DeCarlo, 1991). However, in a sample of young adolescent boys and girls (*M* age = 14.4 yrs), Crocker, Bouffard, and Gessaroli (1995) found that the hypothesized single

factor measurement model of the PACES did not fit the data. It has been hypothesized that this is due to method effects created by the positively and negatively worded items used to measure a unidimensional construct (Marsh, 1996). These method effects have been suggested to be substantially immaterial, representing nothing more than noise in certain cases such as the Rosenberg Self-Esteem Scale (Marsh, 1996). However, others have suggested that method effects are a result of a response bias (Motl & DiStefano, 2002) which is a manifestation of a latent trait (Bentler, Jackson, & Messick, 1971). As a follow-up to the work of Crocker and associates, a recent study by Motl and colleagues tested this hypothesis and supported the presumed unidimensional structure of the PACES using confirmatory factor analysis (CFA) in a sample of young adolescent European American and African American girls (Motl et al., 2001). This evidence supporting the factorial validity of the PACES emerged after adjusting for a method effect related to positively and negatively worded items. Furthermore, the PACES was shown to be invariant across race between the African American and European American girls. In addition, Motl and associates (2001) examined factors hypothesized to influence physical activity and showed a significant relationship between the PACES and self-reported physical activity and sport team participation. In one of the only studies to use the PACES to examine the relationship between enjoyment of physical activity and results of an intervention designed to increase physical activity, Dishman and colleagues (Dishman, Motl, Saunders et al., 2005) demonstrated a positive association between enjoyment and increased physical activity in high school girls.

Despite the emerging support for the use of the PACES in adolescents, there remains no validity evidence for the use of the PACES in children younger than 12 years of age. As young children do not possess the same level of comprehension or cognitive capability as those who are older, psychological instruments designed for adults and adolescents often are not suitable for this population (De Civita et al., 2005). Specifically, the six year period from age 6 through 12 is an important developmental time in which children develop complex cognitive skills such as the ability to use personal experiences to make decisions (Stone & Lemanek, 1990) and to rely on mental cues to understand emotions (De Civita et al., 2005). These cognitive skills are essential, along with reading comprehension, to the successful application of the PACES in children, which would support the need to test the factor structure in the PACES in children. Furthermore, when considering the increased prevalence of developmental reading disability in boys compared to girls (Rutter et al., 2004), it is also imperative to test for invariance of the factor structure across sex since the factor structure of the PACES has only been established for adolescent females (Motl et al., 2001). Additionally, the convergent validity of the PACES has not been established for the PACES in children. Therefore, the current study sought to determine the convergent validity of the PACES with validated measures of competence, goal orientation, and self reported physical activity. Enjoyment of physical activity and sport has been found to be related to perceptions of competence in youth wrestlers (Scanlan & Lewthwaite, 1986) and figure skaters (Scanlan, Stein, & Ravizza, 1989). Enjoyment is also reported to be positively correlated with task orientation in adolescents (Duda & Nicholls, 1992; Viira & Raudsepp, 2000), and self-reported physical activity in children (DiLorenzo et al., 1998). While other studies have used measures such as fitness (Motl et al., 2001), depression and global self-worth (Davison, Werder, Trost, Baker, & Birch, 2007), the psychological or physiological mechanisms to support such relationships have not been well established in children. Conversely, support has been shown for the present measure in sport settings with similar populations (Boyd & Yin, 1996; Scanlan, Russell, Beals, & Scanlan, 2003; Schmidt & Sein, 1991).

It was hypothesized that enjoyment of physical activity measured with the PACES (as modified by Motl for young adolescent girls) would be positively correlated with task goal orientation, perceptions of physical competence, and self-reported physical activity in young children. The purposes of the present study were to 1) examine the internal reliability of the modified PACES

for young children, 2) examine the factorial validity of the PACES via confirmatory factor analyses, 3) examine the factor invariance across sex, and 4) test the convergent validity of the PACES in a sample of presumably healthy 3rd grade children.

Method

Participants and Procedures

Participants (N = 617) for this study were part of a clinical trial of a PA intervention in 18 elementary schools in the Southeast of the USA (the Medical College of Georgia [MCG] FitKid Project) (Yin et al., 2005). Racial composition was 61% African American, 30% European American, 1.3% Hispanic American, 0.5% Asian American, 0.3% Native Americans, 4.6% multi-racial, and 2.3% not reporting. Sixty-eight percent were eligible for free or reduced school lunch. For the purpose of statistical analysis, only participants who completed the psychosocial questionnaires (described below) were included. Therefore, the present study only used data from 564 third grade students (M age = 8.72 ± .54, 175 European American, 343 African American, 7 Hispanic American, 3 Asian American, 2 Native American, 26 multi-racial, 8 not reporting race, 268 male, 296 female).

The measures utilized in the present study were part of a larger battery of tests consisting of numerous physical and physiological measures which are outside the scope of the present paper. Prior to data collection, all questionnaires were reviewed by reading teachers from the participating school district to ensure comprehension and a pilot study was conducted with a separate sample of third grade students. All procedures were approved by the Human Assurance Committee at the Medical College of Georgia. The informed consent of the parent or legal guardian of all participants was obtained along with the assent of the participants prior to data collection. On the testing day, research assistants administered the questionnaires to students who were assembled in a classroom or the lunchroom. All students were given uniform instructions, and all questions were read aloud by a research assistant. A minimum of a 1:10 research assistant to participant ratio was maintained throughout testing which lasted approximately 35 minutes per session. Upon completion of the questionnaires, students were taken to the MCG Mobile Testing Laboratory in groups of four for anthropometric measures and fitness testing. All analyses were conducted on initial baseline data collected in fall 2003.

Measures

Enjoyment—The enjoyment of PA was assessed by the revised PACES, which was originally designed to measure positive affect associated with involvement in physical activities in college students (Kendzierski & DeCarlo, 1991). It has since demonstrated internal consistency in 12–16 year-old children, with coefficient α = .90, and item-total correlations = .38 – .76 (Crocker et al., 1995). The original PACES consisted of 18 bipolar statements on a 7 point continuum (I enjoy it - I hate it) which were summed to produce a total enjoyment score. The revised PACES consists of 16 statements which begin with the stem “When I am physically active…”. The items of the PACES questionnaire can be seen in Table 1. Motl et al. (2001) modified the PACES for use with young adolescent females. In doing so, two items were removed and others rewritten to improve comprehension and reduce redundancy, and a 5-point Likert-type scale (1 = “Disagree a lot” to 5 = “Agree a lot”) which was considered more comprehensible to younger children replaced the 7-item bipolar continuum (Motl et al., 2001). A score is computed by calculating the average of the 16 items.

Task goal orientation—The Task subscale from the Task and Ego Orientation in Sport Questionnaire (TEOSQ) was utilized to measure individual dispositional differences in goal orientation in sport and PA (Duda & Nicholls, 1992). The seven task items of the 13-item TEOSQ ask participants to respond to the stem “I feel most successful in sport when,” and

indicate their agreement with task-oriented (e.g., "when I do my very best") criteria underlying subjective success. For the present study, the stem was slightly expanded to "…sport and physical activity…" Participants rated their agreement using a 5-point Likert-type scale (1 = "Disagree a lot" to 5 = "Agree a lot"). The TEOSQ has been found to be internally consistent in children aged 9–12 (coefficient α ranging from .52 – .86 for the task subscale) (Duda, 2000). The TEOSQ task subscale was also found to be internally reliable in the present sample (α = .90).

Athletic competence—The Athletic Competence subscale of the Self-Perception Profile for Children was utilized to assess the participant's subjective evaluation of his/her athletic ability. The Self-Perception Profile for Children is a 36 item, 5-scale instrument designed to measure children's domain specific judgments of their competence, and assess their global perceptions of their self-worth (Harter, 1982). With respect to the six-item Athletic Competence subscale, acceptable internal consistency has been reported for children in 3rd–5th grade with coefficient α = .80 (Harter, 1985). For the present study, the observed coefficient α was considerably lower (α = .61) than those reported previously.

Physical activity—Physical activity was assessed utilizing the Physical Activity Questionnaire for Older Children (PAQ-C; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997). The PAQ-C is a nine-item, physical activity questionnaire designed for use with elementary and middle school aged children. The PAQ-C asks children general questions about their participation in activities over the last 7 days but does not require the child to recall specific activities. An activity score is computed, but is not intended to estimate metabolic equivalent expenditure. The PAQ-C has been shown to be internally consistent in children 9–15 years of age with coefficient α of .79 – .89 reported (Crocker et al., 1997). In the present study, the internal consistency (α = .61) was considerably lower than that reported in the validation sample. Upon further examination, it was discovered that items referring to activity during PE, recess, and lunch were detracting from the internal consistency of the scale, with corrected item-total correlations of .07, .14, .08 respectively. In an attempt to determine why these questions were performing so poorly, the research team spoke with school officials concerning these time periods. It was discovered that these particular periods were extremely inconsistent between schools in that P.E. is not uniformly offered across schools during the same semesters for all children, recess is often taken indoors as "game time" due to outdoor heat concerns, and activity is not permitted during lunch. The one item nature of the questions (versus a day by day recall of these periods) was deemed problematic due to the current sample characteristics (Moore et al., 2007), thus those three items were removed. For the present study, a mean PA score was calculated utilizing the 6 item version of the PAQ-C, omitting the items referring to PE, recess, and lunch. After removal of these items, the observed coefficient α was .70 with all corrected item-total correlations exceeding .35.

Data Analysis

An analysis of covariance (ANCOVA) was conducted to determine any differences by race or sex on the PACES score while controlling for the effect of age using SPSS 13.0 (SPSS, Inc., Chicago, IL, 2004). For purposes of this analysis, race was recoded into three categories; European American (n = 175, 91 female), African American (n = 343, 180 female), and "Other races" (n = 46, 25 female). Racial composition was consistent across sex and did not influence the results of the statistical tests. Bonferroni procedure was used to adjust for multiple comparisons during follow-up tests. To examine the convergent validity of the PACES, Pearson product-moment correlations were calculated for all measured variables. The internal consistency of the PACES was assessed through calculation of the coefficient α. Coefficient α of .70 is considered to be an indication of desirable reliability (Nunnally, 1978). Corrected item-total correlations were also calculated to assess the association of individual items to the

composite score. A minimum corrected item-total correlation of .30 with the total score is considered desirable (Field, 2005).

Confirmatory Factor Analysis (CFA) was conducted to test the hypothesized unidimensional measurement model of the PACES that has been supported previously in young adolescent girls (Motl et al., 2001). Model estimation was performed using full-information maximal likelihood (FIML) estimation utilizing the covariance matrix in LISREL 8.72 (Scientific Software International, Inc., Lincolnwood, IL, 2005). FIML was utilized due to missing responses to items on the PACES questionnaire (ranging from .04 – 2%). Data screening procedures performed in LISREL indicated that the data were missing completely at random. FIML has previously proven to provide accurate parameter estimates and fit indices in the presence of missing data (Enders, 2001).

Four nested CFA models were tested. Model 1 tested the single factor model which posits that all items load on a single factor with uncorrelated error variance. Model 2 tested the two factor model in which the positively worded items loaded on factor one and negatively worded items loaded on factor two. Motl et al. (2001) argued that the observance of a two factor model of the PACES was a method effect caused by the positively and negatively worded items, despite reasonable indices of fit. This procedure is supported by the work of Marsh (1996) who suggests that, in certain cases, allowing for correlated uniqueness between similarly valenced items produces more accurate indices of fit for the model by statistically accounting for specific uniqueness not accounted for in the underlying factor structure. Motl et al. (2001) demonstrated that a single factor model of the PACES represented the best fit for the data. As a result, Model 3 tested a single factor model allowing for correlated uniqueness among negatively worded items. Model 4 tested a single factor model with correlated uniqueness among positively worded items.

The appropriateness of each model was assessed by using several indices of fit, since each provided a different perspective of model estimation. These included the X^2 statistic, the comparative fit index (CFI), the non-normed fit index (NNFI), and the root mean square error of approximation (RMSEA; (Hu & Bentler, 1999). Criteria for good fit were a small X^2 statistic relative to degrees of freedom resulting in a non-significant *p* statistic (Kline, 1998). However, it is well known that the X^2 statistic is sensitive to a number of sample factors (including sample size and complexity). Conversely, the CFI and NNFI have been demonstrated to have strong resistance to the influence of sample size (Bentler, 1990). A CFI and NNFI greater than .95 are considered indicative of model fit (Hu & Bentler, 1999). The RMSEA represents the closeness of fit and adjusts for degrees of freedom (MacCallum & Austin, 2000). A RMSEA value below .06 is considered acceptable model fit (Hu & Bentler, 1999). The adequacy of parameter estimates was assessed by t-value (*t* = unstandardized estimate/standard error). A t-value greater than 1.96 is considered indicative of a significant parameter.

Following the fitting of the four models on the entire sample, a series of invariance analyses were run to assess the stability and generalizability of the factor structure across sex (Byrne, 1998; Cheung & Rensvold, 1999, 2002). Briefly, this procedure developed by Joreskog and Sorbom (1993) calls for the initial fitting of the measurement model to the two datasets for each sex separately to ensure that the factor structure fits independently. Second, the procedure calls for multisample confirmatory factor analyses to be performed to test the invariance across sex of 1) the factor structure, 2) factor loadings, 3) invariance of the error variance, and 4) invariance of the error covariance (Joreskog & Sorbom, 1993). Test 1 tests the pattern of significant factor loadings between the observed and the latent variable for invariance across groups, but does not contrain the loadings to be equal. Test 2 tests a fully constrained model where all factor loadings are the same across groups. Tests 3 and 4 are increasingly restrictive, constraining the error variance and error covariance, respectively (Cheung & Rensvold,

1999). Chi-square (X^2) differences between the subsequent nested models (subtracting X^2 of the less restrictive from the more restrictive model), relative to the difference in degrees of freedom between the two models, are to be evaluated to determine if the factor models differed between groups (Bollen, 1989).

Results

Initial Scale Modification

For the present investigation, it was a concern that the wording of some items in the PACES might be too advanced for the 3rd grade students to comprehend. To improve the readability of the PACES, the questionnaire was pilot tested in an independent sample of 3rd grade students with the assistance of a 3rd grade, remedial reading master teacher. Based on information gathered through pilot testing, students' feedback concerning their understanding of the items, and input from the instructor, one modification was deemed necessary. For the final version of the PACES used in this study, the word "depressed" was replaced with "sad." No other changes were deemed necessary.

Descriptive Statistics

Correlations between the items of the PACES questionnaire along with means and standard deviations can be found in Table 2. A main effect emerged for race, $F(2, 557) = 4.77$, $p < .01$, with European American children ($M_{adj} = 3.99$, $SE = .06$) displaying higher enjoyment of PA than African American children ($M_{adj} = 3.78$, $SE = .04$), after controlling for the effect of age, $F(1, 557) = 5.36$, $p < .05$. No significant differences were found between European American or African American children and those in the "other races" category. There was also a significant effect for sex on levels of enjoyment after controlling for the effect of age, $F(1, 557) = 5.40$, $p < .05$, with males ($M_{adj} = 3.77$, $SE = .06$) displaying lower enjoyment of PA than females ($M_{adj} = 3.97$, $SE = .06$). The PACES displayed acceptable internal consistency for the entire sample ($\alpha = .87$, n = 511), and within European American males ($\alpha = .87$, n = 77), females ($\alpha = .88$, n = 80), African American males ($\alpha = .86$, n = 144), and females ($\alpha = .87$, n = 165). The corrected item-total correlations ranged from .26 to .71 across groups.

Convergent Validity

Enjoyment of PA was significantly correlated with task goal orientation ($r = .66$, $p < .01$; $r = .66$, $p < .01$), as well as perceptions of athletic competence ($r = .24$, $p<.01$; $r = .25$, $p<.01$), physical appearance ($r = .21$, $p<.01$; $r = .23$, $p<.01$), and self-reported physical activity ($r = .17$, $p < .01$; $r = .16$, $p<.01$) both before and after controlling for sex and race, respectively.

Confirmatory Factor Analysis

Results of the CFA indicated that Model 1, which represents a single-factor model, provided a poor fit to the data ($X^2(104) = 1495.44$, RMSEA =.149 [90% CI =.140 – .160], CFI = .89, NNFI = .87). Model 2, which represents a two factor model, exhibited acceptable indices of fit ($X^2(103) = 228.25$, RMSEA = .045 [90% CI = .037 – .053], CFI = .98, NNFI = .98), and was a significant improvement over Model 1 (see Table 3). The model was then modified to determine if the two factor solution was indeed due to method effects related to the positively and negatively worded items. Models 3 and 4 allowed for correlated uniqueness among the negatively (Model 3) and positively (Model 4) worded items, respectively. Both Model 3 ($X^2(83) = 149.85$, RMSEA = .038 [90% CI = .028 – .048], CFI = .99, NNFI = .99) and Model 4 ($X^2(68) = 150.45$, RMSEA = .047 [90% CI = .037 – .057], CFI = .99, NNFI = .98) produced better fit than Models 1 and 2. All fit indices were indicative of close fit, suggesting that the data did fit the hypothesized structure after adjusting for the response set bias. Furthermore, comparison between the models showed that Models 2, 3, and 4 all resulted in better fits to the

data than Model 1 (Table 3). However, Models 3 and 4, which allowed for correlated uniqueness between similarly valenced items, resulted in a superior fit to Model 2 (the two factor model). Individual parameter estimates (standardized coefficients) for all items ranged from .21 to .86 for all items in Model 3 and 4. The t-values for all items in the scale were greater than 1.97 indicating each item was significantly associated with the latent factor of "enjoyment".

In concordance with Motl et al. (2001), Model 4 was utilized for the invariance analysis. Results of the CFA testing the equality of the factor structure across sex also indicated strong evidence for factorial consistency with ($X^2(204) = 367.76$, RMSEA = .052 [90% CI = .043 –.060], CFI = .98, NNFI = .97). Goodness of fit indices were equally as strong for Model 2 ($X^2(152) = 279.47$, RMSEA = .053 [90% CI = .043 – .063], CFI = .98, NNFI = .97). However, results of the X^2 difference tests ($\Delta X^2(52) = 163.76$, $p < .001$) suggest that the null hypothesis that the factor loadings are invariant across sex should be rejected. After determination that variance exist between sexes on the factor loadings, post-hoc examination of the modification indices following the recommendation of Marsh and Hocevar (1985) was conducted. Inspection of the modification indices indicated that only the constraint on item five ("it's no fun at all") across sex was recommended for removal with an expected $\Delta X^2 = 9.6$.

Discussion

As previously reported in adolescent girls (Motl et al., 2001), the results of the CFA support the assertion that the two factor structure produced was caused by method effects related to the positively and negatively worded items of the scale. This is consistent with the previous work of Marsh (1996), which demonstrated that negatively worded items used to measure self-esteem produce a similar measurement effect. Post hoc analyses of the factor structure showed that Model 3, allowing for correlated uniqueness among negatively worded items, was a superior fit for the data in boys than Model 4. Future studies are warranted to determine if the present findings are sample specific or indicative of a differential response pattern for boys and girls. However, if the current findings are robust, a solution might be to utilize the negatively worded items exclusively as in a recent study by Dishman and colleagues (Dishman, Motl, Sallis et al., 2005). The results of the present study suggest that the PACES demonstrated promising structural validity and internal consistency as a measure to assess enjoyment related to PA in young European American and African American children. However, despite the desirable fit of the factor structure and the acceptable indices of internal consistency, the magnitudes of the relationships for concurrent validity were relatively weak when compared to a similar study in 11 and 13 year old girls. In the study by Davison and associates (2007), enjoyment measured with the PACES was more highly correlated with athletic competence (r = .37 at age 11; r = .56 at age 13) and self reported PA (r = .49 at age 13) than in the present study. Though not directly comparable, the correlation between body image and enjoyment increased with age with r = .28 at age 11 and r = .32 at age 13, suggesting that age might moderate this relationship. Additionally, when looking at objectively measured PA (via accelerometer) in Davison's study the relationship with enjoyment at age 13 (r = .28) was closer to the relationship observed in the present study (r = .16).

The present findings support the work of Motl et al. (2001), which found the validity of the PACES in adolescent European American and African American girls, while extending this line of research by investigating the structure in males and females. Of potentially serious concern are the results of the invariance analyses which suggest that while the factor structure is invariant across sex, the factor loadings are different in boys and girls. The implication of these findings is that use of the PACES to compare levels of enjoyment between boys and girls is inappropriate (Meade & Lautenschlager, 2004). Though impossible to test in the present study, these results might suggest that boys and girls are differentially responding to the

questionnaire based upon activity preference. For example, research has shown that boys and girls prefer different physical activities during free play (Vu, Murrie, Gonzalez, & Jobe, 2006). This difference might have ramification for both factor loadings and concurrent validity across sex, but future work is needed to explore this possibility.

Though the PACES demonstrated acceptable psychometric properties in the present sample of multiracial boys and girls, there are a number of limitations to the present study which need to be noted. First, the sample size of European American children prohibited an invariance analysis across race. Second, the present data was collected at only one time point. An additional administration would have allowed the examination of test-retest reliability and temporal stability of the factor structure of the PACES which is missing from the present study. Finally, only moderate correlations were observed between PACES scores and criterion variables. This finding may be the result of developmental deficiencies which would inflate error in both the PACES and the criterion measures.

The present study filled a gap to allow researchers to study the relationships between enjoyment and PA in this age group (Motl et al., 2001). Numerous studies utilizing self-report have demonstrated relationships between enjoyment and PA in children, adolescents, and adults (Sallis et al., 1999; Salmon, Owen, Crawford, Bauman, & Sallis, 2003; Trost et al., 1997). Unfortunately, few studies have used psychometrically sound instruments to examine psychological determinants of PA, such as enjoyment, in intervention studies (Lewis, Marcus, Pate, & Dunn, 2002). The PACES, for which data supporting its validity are presented here, will allow researchers to prospectively examine these relationships in longitudinal studies to determine the extent to which enjoyment influences future activity or adherence to a physical activity promotion program, or conversely, the degree to which interventions such as the MCG FitKid Project influence enjoyment of PA. Because enjoyment is an intrinsic motivator for physical activity, the better understanding of how enjoyment of physical activity can be fostered in childhood may lead to programs that exhibit greater participation and retention (Kendzierski & DeCarlo, 1991). Work by Dishman and colleagues (2005) demonstrated that enjoyment of PA (measured utilizing the PACES) mediated the effect of a PA promotion intervention on PA behavior in adolescent youth. This recent work of Dishman and colleagues is some of the first to answer the call of numerous authors (Baranowski, Klesges, Cullen, & Himes, 2004; Bauman, Sallis, Dzewaltowski, & Owen, 2002; Lewis et al., 2002) that future studies should investigate mediators and moderators in PA behavioral research. . If future research supports the validity of the PACES, this measure might be useful to the practitioner as a quick method to assess those who are at risk of withdrawing from physical activity during transitional periods (such as middle school) when children become more autonomous regarding leisure activities. The present study provides support for the validity of the PACES as a tool for the measurement one such potential correlate

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Table 1

Items from the PACES questionnaire

Stem: When I am physically active…	
1	I enjoy it
2	1 feel bored
3	I dislike it
4	I find it pleasurable
5	It's no fun at all
6	It gives me energy
7	It makes me sad
8	It's very pleasant
9	My body feels good
10	I get something out of it
11	It's very exciting
12	It frustrates me
13	It's not at all interesting
14	It gives me a strong feeling of success
15	It feels good
16	I feel as though I would rather be doing something else

Table 2

Correlations among variables with means and standard deviations for PACES items

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PACES-1	-	.26**	.17**	.39**	.22**	.41**	.12**	.45**	.40**	.31**	.45**	.20**	.11*	.38**	.44**	.17**
PACES-2			.37**	.16**	.42**	.20**	.44**	.14**	.15**	.15**	.21**	.39**	.34**	.20**	.18**	.37**
PACES-3				.12**	.35**	.11*	.30**	.10*	.08	.12**	.11**	.32**	.27**	.11**	.12**	.36**
PACES-4					.24**	.46**	.09*	.49**	.05**	.37**	.43**	.16**	.13**	.42**	.48**	.14**
PACES-5						.24**	.39**	.15**	.23**	.18**	.17**	.28**	.32**	.17**	.21**	.32**
PACES-6							.22**	.41**	.57**	.40**	.49**	.18**	.13**	.47**	.52**	.11**
PACES-7								.14**	.16**	.15**	.17**	.42**	.43**	.21**	.20**	.37**
PACES-8									.50**	.36**	.52**	.25**	.16**	.49**	.53**	.10*
PACES-9										.37**	.53**	.24**	.18**	.53**	.62**	.18**
PACES-10											.38**	.19**	.13**	.40**	.46**	.13**
PACES-11												.25**	.21**	.55**	.55**	.19**
PACES-12													.42**	.20**	.22**	.45**
PACES-13														.20**	.25**	.42**
PACES-14															.52**	.15**
PACES-15																.18**
PACES-16																
M	3.89	3.94	3.67	3.87	3.99	3.94	3.92	3.81	3.98	3.5	3.91	3.88	3.84	3.89	3.98	3.66
SD	1.26	1.23	1.33	1.29	1.24	1.30	1.18	1.25	1.24	1.30	1.29	1.30	1.26	1.28	1.24	1.37

*P < .05,

**p < .01

Table 3

CFA testing one and two factor models allowing for correlated uniqueness among items

Model	*df*	X^2	RMSEA (90% CI)	CFI	NNFI
Model 1	104	1495.44	.149 (.140 – .160)	.89	.87
Model 2	103	228.25	.045 (.037 – .053)	.98	.98
Model 3	83	149.85	.038 (.028– .048)	.99	.99
Model 4	68	150.45	.047 (.037 – .057)	.99	.98
Comparisons	***df***		X^2_{diff}		***p***
Model 1 vs 2	1		1267.19		< *.0001*
Model 1 vs 3	21		1345.59		< *.0001*
Model 1 vs 4	36		1344.99		< *.0001*
Model 2 vs 3	20		78.40		< *.0001*
Model 2 vs 4	35		77.80		< *.0001*
Model 3 vs 4	15		−.60		*ns*

Note: Model 1 is a single factor model with uncorrelated error variance. Model 2 is a two factor model Model 3 is a single factor model allowing for correlated uniqueness among negatively worded items. Model 4 is a single factor model with correlated uniqueness among positively worded items.