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Reliability and Validity of the Commitment to Physical Activity Scale for Adolescents

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Abstract

Purpose—To examine psychometric properties of a Commitment to Physical Activity Scale for Adolescents (CPASA).

Design—Two test-retest studies and a prospective study, approved by a university institutional review board, were conducted in Midwestern U.S. urban areas.

Setting—The first test-retest study occurred in four community centers, the second test-retest study took place in a community school, and the prospective study occurred in eight middle schools.

Subjects—To measure commitment at baseline and one week later, 51 girls in the first test-retest study completed an original 26-item scale, and 91 in the second test-retest study completed a revised 11-item scale. In the prospective study, 503 girls completed the 11-item scale.

Measures—Commitment was measured via the CPASA. After completing the CPASA, girls in the prospective study wore ActiGraph GT3X-plus accelerometers that measured light, moderate, and vigorous PA (LMVPA) and moderate to vigorous PA (MVPA).

Analysis—Internal consistency and test-retest reliability were estimated. Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to cross-validate the factor structure.

Results—For the 11-item CPASA, Cronbach's alpha ranged from .81 – .82, and test-retest reliability was .88. Both EFA and CFA indicated a single-factor. The scale was significantly correlated with LMVPA ($r = .10$) and MVPA ($r = .11$).

Conclusion—The 11-item CPASA demonstrated acceptable reliability and validity with girls.

Keywords

Female; exercise; adolescent; motivation; factor analysis; measures

Indexing Key Words

Manuscript format: research; Research purpose: instrument development; Study design: non-experimental; Outcome measure: cognitive and behavioral; Setting: local community and schools; Health focus: fitness/physical activity; Strategy: skill development/behavior change; Target population age: youth; Target population circumstances: education/income level, geographic location, race-ethnicity

PURPOSE

The U.S. Department of Health and Human Services¹ calls for children and adolescents to attain at least 60 minutes of moderate to vigorous physical activity (MVPA) daily. National survey data indicate that only about one-fourth of 12- to 15-year-old adolescents meet this physical activity (PA) guideline.² Accelerometer data show only 34.7% of 6- to 11-year-old girls and 3.4% of 12- to 15-year-old girls attain the recommended PA.³ Also, a recent systematic review of studies measuring PA mainly via surveys supports a mean decline in girls' self-reported PA of 5.3–7.1% per year from ages 10 to 19.⁴

Results from two systematic reviews support an inverse relationship between PA and overweight (including obesity) status among adolescents.^{5, 6} In the U.S., approximately 33.8% of 12- to 19-year-old girls are overweight or obese with 20.7% being obese.⁷ These findings coupled with adolescent girls' low level of PA indicate that efforts are needed to reverse the high prevalence of overweight and obesity in this group. Although interventions have been conducted to address the problem, their impact on maintaining behavior change has been minimal,⁸ with relatively little effect on weight-related outcomes.^{9, 10} Continuing research is needed to examine factors that may be contributing to the dismal results. This effort requires reliable and valid measures of the determinants of PA. Because some level of personal commitment is essential for maintaining a health-promoting behavior,¹¹ commitment is one potential determinant that merits consideration when designing studies to test PA interventions for adolescent girls.

In general, commitment reflects a mindful internal resolve that involves self-directed goal setting.^{11, 12} Congruent with this definition, researchers who developed a Sport Commitment Model (SCM) specifically defined commitment to sports as a desire and resolve to continue

participation.¹³ Adapted from theoretical models that emphasize perceived benefits; costs (e.g., barriers); and satisfaction within relationship contexts (e.g., social support), the SCM was customized to specify conditions in which individuals express desire to continue in a program or with an activity, with enjoyment being identified as an important predictor of commitment.¹³ Others tested the model by including additional determinants, such as perceived physical ability or competence (e.g., self-efficacy), which was found to be moderately correlated with sport commitment.¹⁴ Bandura^{15, 16} refers to an individual's beliefs about or confidence in his or her ability to change behavior as self-efficacy. Additional understanding and testing of the relationships among these constructs is needed before definitive strategies can be designed to enhance commitment by modifying its determinants.

Aligning with Scanlan and colleagues' work,¹³ commitment is described as either including, impacting, or being synonymous with motivation.¹⁷ Weiss and Weiss¹⁸ reported that examining commitment is "one way of looking at motivation to persist in one's involvement in organized athletic or other physical activities" (p. 310). Debate and colleagues¹⁹ identified motivation to engage in PA over time as only a component of commitment to PA and measured the former variable with only three items: Physical activity is hard work; I have to force myself to be physically active; and I wish there were better ways to get healthy than being physically active. Reflecting a different perspective, Canrinus and colleagues²⁰ found that the effect of self-efficacy on commitment was mediated by motivation. The lack of conceptual clarity limits the ability to distinguish between commitment and motivation.

Other researchers report that commitment reflects a cognitive or conscious decision to do things related to a behavior or thoughtfulness regarding it.²¹ For example, commitment involves the identification of definitive strategies for eliciting and reinforcing a health-promoting behavior.²² The identification of strategies that can be used extends beyond intention, readiness, or motivation to increase the likelihood that the individual will be propelled into action with the behavior being performed on a regular basis. This contention is congruent with results from a study examining the relationship between adults' ($N = 84$) potency of commitment strategies and subsequent substance abuse behavior change. Findings suggest that action-oriented commitment reflected by expressions of specific actions may be a more reliable or potent predictor of behavior change than either expressions reflecting intention or readiness to change or other behavioral determinants.²³

Two cross-sectional studies with adults examined relationships involving exercise²⁴ or PA²⁵ and two forms of commitment: (1) "want to" or enthusiastic commitment (i.e., I am determined to keep exercising); and (2) "have to" or obligatory commitment (i.e., I feel obligated to continue exercising).²⁶ One study involved university students and staffers ($N = 428$) enrolled in group exercise classes,²⁴ and the other included 18- to 79-year-old individuals ($N = 267$) recruited from university classes or organizations, health clubs, and a running club.²⁵ Although both studies employed the Exercise Commitment Scale,²⁴ subscales measuring enthusiastic and obligatory commitment included six and three items, respectively, in the former study,²⁴ and three items for both subscales in the latter study.²⁵ Despite these differences, both studies showed that "want to" commitment, but not "have to" commitment, was related to self-reported PA or exercise. Specifically, in the former study,

“want to” commitment emerged as a strong predictor of persistent exercise participation,²⁴ while in the latter study, “want to” commitment was related to time spent engaging in PA.²⁵

Only one study with children or adolescents was found that examined the relationship between commitment and PA. This cross-sectional study, involving 3rd–5th grade girls ($N=932$), indicated that commitment was positively associated with PA frequency assessed via a single item asking girls to report the number of days of vigorous PA over the past seven days.¹⁹ Although the relationship was significant, a single-item PA measure may be less reliable than a more comprehensive one.²⁷ Moreover, self-report of PA has been found to be largely unreliable among adolescents, so researchers recommend use of objective measures, such as accelerometers, to assess PA.²⁸

Although commitment is identified theoretically as a determinant of PA, few studies have empirically examined the influence of commitment on PA. Weiss and Amorose²⁹ emphasize the importance of directing future research efforts toward improving the measurement of commitment. To understand the contribution of commitment to PA in children and adolescents, reliable and valid measures are needed. The purpose of this study was to examine the psychometric properties of a Commitment to PA Scale for Adolescents (CPASA) among underserved urban girls.

Theoretical Framework

The study was based on the Health Promotion Model,²² which underscores that commitment to a plan of action is directly related to a health-promoting behavior, such as PA. Similar to the Sport Commitment Model,¹³ the Health Promotion Model indicates that behavior-specific cognitions and affect are determinants of commitment.²² According to the Health Promotion Model, these cognitive and affective variables include perceived benefits, barriers, self-efficacy, enjoyment, and social support. Commitment is hypothesized to be a positive determinant of PA.

METHODS

Design

Two test-retest studies and a prospective study were conducted in urban areas in the Midwestern U.S. For the first test-retest study, girls were recruited during summer 2013 from four locations, including a community center, Boys and Girls Club, a Field Zone (youth center), and one summer camp. Girls in the first test-retest study completed an original 26-item scale measuring commitment at baseline and one week later. The second test-retest study involved another convenience sample of girls recruited from a community school during early fall 2013 that included only 5th and 6th grade students. At baseline and one week later, this group of girls completed a modified 11-item scale named the CPASA. For the prospective study, girls from eight urban middle schools were recruited in the fall of 2013. Each girl in this prospective study completed the 11-item CPASA and a series of other surveys assessing cognitive and affective variables, and then wore an accelerometer for seven days. Girls in the two test-retest studies and those in the prospective study also completed a demographic survey.

All the three studies were approved by the university Institutional Review Board for the Protection of Human Subjects. Permission for data collection from administrators in each data collection setting was received. Before any data collection, parental consent and adolescent assent were obtained. Each girl was informed that participation was voluntary and her information would remain confidential.

Sample

Inclusion criteria for girls in the two test-retest studies included: (a) enrolled in 5th–8th grade and (b) capable of reading, understanding, and speaking English. Of 116 girls invited to participate in the first test-retest study, 58 (50.0%) returned completed consent and assent forms and were interested in participating. Seven girls were not available at the time of data collection. Therefore, 51 girls completed the scale at baseline, 35 of whom completed the retest one week later. Of the 149 girls invited to participate in the second test-retest study, 96 (64.4%) returned completed consent and assent forms and were interested in participating. Five girls were not available at the time of data collection. Therefore, 91 girls completed the scale at baseline, 88 of whom completed the retest one week later.

Of 1388 girls invited to participate in the prospective study, 584 (42.1%) returned packets including signed consent and assent forms. Of the 566 (40.8%) girls meeting the inclusion criteria, 508 (89.8%) began participating in the study, but four withdrew prior to baseline data collection due to family relocation ($n = 3$) or opting out of the study ($n = 1$), and one was excluded due to pregnancy. Therefore, a total of 503 girls were included in the prospective study. Details concerning the prospective study and its inclusion and exclusion criteria are presented elsewhere.³⁰

Measures

Demographics—Single items included on the consent form were used to assess girls' demographic characteristics. Variables of interest were: (a) age, (b) grade, (c) ethnicity, (d) race, and (e) enrollment in the free or reduced-price lunch program at school. Girls' parents or guardians were asked to complete the items in collaboration with their daughters as needed.

Physical activity—PA was assessed via the ActiGraph GT3X-plus accelerometer (www.theActiGraph.com), which has been reported to be reliable and valid when used to assess PA of adolescents.³¹ In the prospective study, girls were asked to wear the monitor on their right hip all day for seven consecutive days (except when bathing, swimming, or sleeping). Data indicating that the monitor was worn for at least 8 hours on three weekdays and one weekend day were included in the analysis.^{32, 33} In this study, count thresholds included: sedentary activity 25 counts/15 seconds; light PA 26–573 counts/15 seconds; moderate PA 574–1002 counts/15 seconds, and vigorous PA 1003 counts/15 seconds.^{34, 35} Acceleration counts were used to calculate the average minutes per hour that the girls participated in both light, moderate, and vigorous PA (LMVPA) and MVPA.

Commitment—To measure commitment, a 26-item scale was initially developed from three scales: Debate and colleagues'¹⁹ 12-item Commitment to Physical Activity Scale

(Cronbach's alpha = .82–.84), Pender's³⁶ 11-item Planning for Exercise Scale based on the Health Promotion Model (Cronbach's alpha = .83–.86; two-week test-retest stability = .90),^{37, 38} and a scale measuring six cognitive and behavioral self-management strategies in the Trial of Activity for Adolescent Girls (TAAG; Cronbach's alpha = .66–.74; two-week test-retest stability = .84).³⁹ All items in the first two scales and three from the TAAG self-management scale were included without any modifications for testing. Other TAAG self-management scale items, including "*I say positive things to myself about physical activity, I set goals to do physical activity, and I make back-up plans to be sure I get my physical activity,*" were not included because they were somewhat similar to those from the other two scales.

We chose to include four response choices for all three scales during testing to prevent central tendency error or reluctance to choose extreme responses even when clearly favoring one side or another, because selection of a neutral or middle response category is common among youth.^{40, 41} The four original response choices for the Debate et al.¹⁹ Commitment to PA Scale (e.g., strongly disagree, disagree, agree, and strongly agree) were used. Pender's³⁶ Planning for Exercise Scale included only three response choices (e.g., never, sometimes, and often), so we added "rarely" as a fourth response choice for all 11 items. Because the TAAG self-management scale included five response choices (e.g., never, rarely, sometimes, often, and very often), we deleted "very often" for the three selected scale items. All response choices were coded from 0 to 3. Testing the three scales made theoretical sense because each scale by itself captured different conceptual dimensions of commitment, and we were interested in evaluating each scale to identify the best scale for measuring the construct with girls.

To examine the internal consistency reliability using Cronbach's alpha and test-retest reliability with intraclass correlation coefficient (ICC) of the 26-item scale, the first test-retest study was conducted. In this study, Cronbach's alphas for the 26-item scale were .85 and .90, respectively. The test-retest reliability, assessed by ICC, was .94 [.89, .97]. For Debate and colleagues'¹⁹ 12-item Commitment to Physical Activity Scale, Cronbach's alphas were .75 and .89 at the test and retest periods, respectively. The ICC was .91 [.83, .96]. Pender's³⁶ 11-item Planning for Exercise Scale also had acceptable Cronbach's alphas of .77 initially followed by .78 at the retest. The ICC was .88 [.77, .94]. For the TAAG self-management scale, the ICC was .71 [.43, .86]. Cronbach's alphas were .59 for the first testing and .62 for the retest; however, results were based on only three items from the original TAAG self-management scale. We did not examine validity in this test-retest study because the sample size was small and girls did not wear accelerometers.

Although the reliability indices were acceptable, the data collector noted during the initial test that a sizeable percentage of the 51 girls had difficulty responding to some of the 26 items. To clarify the issue, at the end of the first retest at one of the four sites, the data collector asked all 7 girls participating at the site to specifically identify any items that were difficult to understand or unclear. The girls mutually agreed that 10 items on the 26-item scale were problematic. Specifically, girls reported that the following nine items described something that they would not think about doing (e.g., "unrealistic" and "not typically done"): one from Debate and colleagues'¹⁹ scale (e.g., I have to force myself to be

physically active), one item from the TAAG self-management scale³⁹ (e.g., I think about the benefits I will get from being physically active), and seven items from Pender's³⁶ scale (e.g., I keep written records of my physical activity; I reward myself for being physically active; I post notes where I can see them to remind me to be physically active; I let people know about my need to be physically active; I tell my friends to be physically active; I exercise in a specific location or facility; I plan times for exercise or active sports in my weekly schedule). The 7 girls also reported that another item from Debate and colleagues' scale was difficult to understand (e.g., I wish there were better ways to get healthy than being physically active). To avoid these issues in future work, we deleted the 10 items.

To ensure clarity regarding the response choices, the 7 girls were also asked to identify the ones that made the most sense to them when responding to the items. Four different sets of four response choices were discussed: *Never to often*; *not at all true to very true*; *disagree a lot to agree a lot*, and *strongly disagree to strongly agree*. Girls unanimously selected *never to often* followed by *not at all true to very true*. As a result, we chose to include *never* (0), *rarely* (1), *sometimes* (2), and *often* (3) as response choices in future work.

Based on the 7 girls' additional suggestions to increase clarity and relevance, we continued to modify the scale. Specifically, we converted one negatively-worded item including "do not" in Debate and colleagues'¹⁹ scale to a positively-worded item (e.g., "I do not like thinking about doing physical activity" was changed to "I like thinking about doing physical activity"). According to Fried and Ferris,⁴² participants with low levels of education may have difficulty responding due to an inability to understand the reverse nature of items that are negatively worded. de Leeuw, Borgers, and Smits⁴³ state that negatively formulated items can make the intended meaning ambiguous even for adults and recommend avoiding them in surveys for children and adolescents, particularly those younger than age 12.

We chose to delete items measuring constructs other than commitment. This approach was necessary to eliminate redundancy and reduce the response burden. We deleted three items in the Debate and colleagues'¹⁹ scale because these items measured enjoyment of PA (e.g., I do not enjoy physical activity; I don't like being physically active every day; physical activity feels good). We deleted two other items (e.g., physical activity is hard work; physical activity is important to me) that assessed perceived barriers to and importance of PA, respectively. Overall, the changes resulted in the deletion of a total of 15 items and the final retention of 11 items: four from Pender's scale, four from Debate and colleagues' scale, and three from the TAAG self-management scale (see Table 1).

Cognitive and affective variables—A 10-item Perceived Benefits Scale and 16-item Perceived Barriers Scales were used to measure girls' reasons for participating in PA and obstacles interfering with engagement in the behavior, respectively;⁴⁴ and a 6-item PA Enjoyment Scale adapted from one used by Motl and colleagues⁴⁵ was employed to assess perceived enjoyment. Response choices for the three scales ranged from *not at all true* (0) to *very true* (3). A 6-item scale modified from the one used by Dishman et al.³⁹ to measure self-efficacy was used to determine how much girls agree or disagree that they can be active in their free time. Psychometric properties for the scales used in this study are reported

elsewhere.³⁰ Social support was measured with an 8-item Social Support Scale that was found to be reliable and valid when used with adolescent girls.⁴⁶

Analysis

The internal consistency of the CPASA was assessed by the Cronbach's alpha. The item-total correlation coefficients were evaluated by the cutoff value of .30.⁴⁷ The test-retest reliability was estimated by the ICC, calculated by a two-way mixed model with type consistency.^{48, 49} Content validity was evaluated by the content validity index of alpha coefficient among five expert ratings.⁵⁰

To cross validate the factor structure of the scale, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used. Baseline data from participants in the prospective study were randomly divided into two groups (group 1 and 2). EFA with correlation matrix was performed using SPSS 21.0 to examine the factor structure using group 1 data. The Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (> .50) were used to decide if a factor analysis can yield distinct and reliable factors.⁵¹ The criteria used to decide number of factors retained were: (1) eigenvalue > 1.0; (2) scree plot (elbow); and (3) variance explained by each factor.⁵² To confirm the factor structure obtained in the EFA, CFA with covariance matrix was applied using EQS 6.2 for group 2 data. The goodness-of-fit indices, including Non-Normed Fit Index (NNFI) and Comparative Fit Index (CFI), were used to evaluate model fit. The misfit indices of Standardized Root Mean-square Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA) were calculated. A model with goodness-of-fit indices exceeding .90 and misfit indices of SRMR less than .08 and RMSEA less than .10 has acceptable fit.⁵³

Criterion-related (concurrent) validity was examined by the Pearson product-moment bivariate correlation with LMVPA and MVPA. According to the Health Promotion Model,²² commitment to PA would be positively correlated with PA. To assess the scale's construct validity, relationships between commitment and behavior-specific cognitive and affective variables identified in the model were examined using the Pearson product-moment bivariate correlation. Based on the model, commitment would be positively correlated with PA self-efficacy, social support, PA enjoyment, and perceived benefits of PA; and negatively correlated with perceived barriers to PA.

RESULTS

Participant Demographics

Table 2 demonstrates the sample demographics of the three studies. Compared to the prospective study, the two test-retest studies involved higher proportions of young Hispanic girls, and lower proportion of girls enrolled in free or reduced-price lunch program. The 2nd test-retest study included a lower proportion of Black girls than the first test-retest study and the prospective study.

First test-retest study—Fifty-one 5th ($n = 9$, 17.6%), 6th ($n = 15$, 29.4%), 7th ($n = 14$, 27.5%), and 8th ($n = 13$, 25.5%) grade girls participated in the first test-retest study. About

one third were Hispanic ($n = 15$, 30%, 1 missing), 54.9% were Black ($n = 28$), and 69.6% ($n = 32$, 5 missing) were enrolled in the free or reduced-price lunch program at school.

Second test-retest study—Ninety-one girls provided initial data for the second test-retest study involving the 11-item scale. Average age was 10.78 years ($SD = .65$, min-max: 9.13–12.26). The majority were in 5th ($n = 57$, 62.6%) and 6th ($n = 33$, 36.3%) grades. Only one (1.1%) was in the 7th grade. Twenty (22.2%, 1 missing) were Hispanic. Nearly half were White ($n = 45$, 49.5%), and less than a quarter were Black ($n = 19$, 20.9%). The remainder ($n = 27$, 29.7%) were mixed-racial. More than half ($n = 45$, 56.3%, 11 missing) received free or reduced-price lunches at school.

Prospective study—A total of 503 girls having an average age of 12.64 years ($SD = .95$, min-max: 11–15) participated. The majority of girls were non-Hispanic ($n = 427$, 89.3%, 25 missing) and enrolled in the free or reduced-price lunch program at school ($n = 402$, 86.3%, 37 missing). Close to half of the girls were Black ($n = 227$, 45.1%), 28.2% ($n = 142$) were White, and 26.6% ($n = 134$) were of mixed races. About 93% of girls ($n = 468$) provided valid PA data, with an average accelerometer wear time of 13.75 hours ($SD = 1.45$, min-max: 9.72–20.18). On average, girls participated in 19.68 minutes of LMVPA ($SD = 4.23$, min-max: 5.63–31.60) and 2.63 minutes of MVPA ($SD = 1.22$, min-max: 0.31–9.45) per hour.

Reliability

Internal consistency reliability—Based on the data from the prospective study, a Cronbach's alpha of .81 resulted for the 11-item CPASA. Indicating no item redundancy, item-total correlation coefficients ranged from .35 to .64 with none being beyond .70.⁵⁴

Test-retest stability—The test-retest reliability, assessed by ICC, was .88 for the 11-item CPASA with 95% confidence interval of [.82, .92]. Cronbach's alpha was .81 and .82 for the test and retest data, respectively.

Validity

Content validity—Two faculty members holding doctoral degrees, a senior statistician, and two masters-prepared exercise physiologists, each with over 10 years of experience in health promotion, behavior change, and youth PA reviewed the 11-item commitment scale and completed a Likert scale designed by the first and second authors to assess content validity. All five rated the 11 items as being representative of commitment to PA, clear, relevant, and developmentally appropriate for the intended age group. Quantifying the extent of agreement among the experts,⁵⁰ the content validity index was .77.

Factor structure—For EFA with group 1 data ($n = 248$), Bartlett's test for the 11 items was significant ($\chi^2_{55} = 702.32$, $p < .001$), and the KMO measure of sampling adequacy was .88, indicating the factor analysis can yield unique and reliable factors.⁵¹ A principal axis factoring analysis suggested a one-factor structure with eigenvalue of 4.18, accounting for 32.28% of variance (See Table 3). The one-factor model obtained from the EFA was examined with a CFA using group 2 data. One item was chosen as the marker and its

unstandardized loading coefficient was set to 1. The CFA using maximum likelihood method among 254 girls confirmed the one-factor structure with acceptable goodness-of-fit and misfit values, $\chi^2(df=44, N=254) = 64.41$, NNFI = .95, CFI = .96, SRMR = .04, RMSEA = .04 with 90% CI of [.02, .06]. The factor loading coefficients including errors and variances for the one-factor model are presented in Figure 1.

Concurrent and construct validity—For the prospective study data, the mean score of the 11-item CPASA was significantly correlated with LMVPA ($r = .10, p = .038$) and MVPA ($r = .11, p = .032$). When measured by the 11-item CPASA, commitment was positively and moderately correlated with PA self-efficacy ($r = .45, p < .001$), social support ($r = .43, p < .001$), PA enjoyment ($r = .52, p < .001$), and perceived benefits of PA ($r = .36, p < .001$). A negative correlation occurred between commitment and perceived barriers to PA ($r = -.25, p < .001$). These relationships, all of which are proposed in the Health Promotion Model, lend support for the construct validity of the CPASA.

DISCUSSION

As noted by Cronbach's alphas ranging from .81 to .82, the internal consistency reliability of the 11-item CPASA was excellent.^{47, 55} The strong internal consistency reliability of the 11-item scale is comparable to other scales measuring commitment.^{17, 19, 56} Item-total correlations for the 11-item scale ranged from .35 to .64 with no item discriminating poorly, as noted by an item-total correlation coefficient of less than .30.⁴⁷ Test-retest reliability was evidenced by the high ICC of .88. An ICC .75 is excellent.⁵⁷ Because Debate and colleagues¹⁹ did not report test-retest reliability for their Commitment to Physical Activity Scale when tested with a somewhat similar population, direct comparison to the CPASA's result could not be made.

The factor analysis supports a one-factor structure for the 11-item CPASA among adolescent girls. The single factor is not surprising because all scale items reflect functional resolve or "want to" commitment, and none indicate obligatory resolve or "have to" commitment, the latter of which was not associated with adult self-reported PA or exercise in prior studies.^{24, 25} Although Pender³⁶ may have hypothesized a one-factor structure for the 11-item Planning for Exercise Scale, no study to our knowledge was conducted to specifically examine its factor structure. In contrast, Debate and colleagues¹⁹ reported a three-factor structure including values, attitudes, and motivation for their 12-item Commitment to PA Scale among 932 3rd–5th grade girls. Dishman and colleagues³⁹ 6-item self-management scale had a two-factor structure including cognitive and behavioral strategies among 4,885 6th and 8th grade girls. With these inconsistencies, continued efforts are needed to support the factor structure of the commitment scale.

Although relationships between the CPASA and both accelerometer-measured LMVPA and MVPA were weaker than expected, the correlations were significant, lending some support for the scale's concurrent validity. Dishman⁵⁸ explained that high correlations are expected when similar methods are used (e.g., self-report only) due to inflation by a common method artifact. However, Debate and colleagues¹⁹ found that commitment to PA was significantly, but not highly ($r = .28$), correlated with self-reported PA among 3rd–5th grade girls. They

explained that the low correlation may be due to the continued lack of clarity concerning the many factors that may influence girls' PA. Moreover, Dishman and colleagues⁵⁹ noted no relationship between self-management strategies that can indicate commitment^{22, 23} and accelerometer-measured PA among girls in 6th and 8th grades. Interestingly, when Dishman and colleagues⁵⁹ examined relationships between accelerometer-measured PA and social support, perceived barriers, and self-efficacy, correlations ranged as low as $-.06$ to $.12$ with $.12$ being described as significant ($p < .01$). Although no definitive reason underlying the low correlations between accelerometer-measured PA and cognitive variables could be determined, another plausible explanation may be that some young adolescents cannot be relied upon to accurately self-report their perceptions, due to incomplete development of cognitive and communicative skills⁴³ or an intent or need to respond to scale items in socially desirable ways to be viewed positively by others.⁶⁰ Because it is certainly important for a scale measuring commitment to PA to be related to the behavior itself, particularly when the latter is objectively measured, additional research with this age group to examine ways to overcome these issues may be needed.

As proposed in the Health Promotion Model,²² significant correlations in the expected direction emerged between commitment to PA and the following cognitive and affective variables: PA self-efficacy, social support, enjoyment, perceived benefits of PA, and perceived barriers to PA. Somewhat similar findings were reported by other researchers who noted that greater enjoyment and involvement opportunities (e.g., benefits of participating in a sport) predicted a higher level of sport commitment among 10- to 19-year-old athletes.⁶¹ Raedeke⁶² found that adolescent swimmers who were involved in the sport for positive reasons or out of attraction to it perceived higher enjoyment and benefits and lower costs (e.g., barriers) with resultant higher commitment than those who remained in the sport due to feelings that they "had to" continue their involvement for various reasons. Other studies support a link between social support and sport commitment.^{18, 61, 63} Interestingly, to measure self-regulation strategies among female adolescents, Taymoori, Rhodes, & Berry³⁸ used Pender's³⁶ 11-item Planning for Exercise Scale designed for assessing adolescents' commitment to a plan, a construct identified in Pender's Health Promotion Model. Taymoori and colleagues noted a mediating role of self-regulation strategies in the association of self-efficacy with PA. The expected correlations between commitment to PA and the cognitive and affective variables in this study lend support for the Health Promotion Model and validity of the CPASA.

The study had strengths and limitations. Three strengths were: (a) the inclusion of a large sample of girls associated with the prospective study; (b) measurement of PA via accelerometers; and (c) cross validation of the factor structure of the CPASA using two independent samples. Four limitations included: (a) the use of a small test-retest sample that may not be adequately representative of the population; (b) inclusion of only 5th–8th grade girls that may limit generalizability of the results, particularly to boys or other age groups; (c) low response rate ($< 70\%$); and (d) reliance on self-report that may be unreliable in this age group due to social desirability bias. The low response rates in the three studies further limit the generalizability of the study findings. Evidence indicates that studies with female and Black adolescents are more likely to have low response rates,⁶⁴ possibly explaining the low response rates in the three studies that included girls only. Despite some limitations, the

findings support use of the scale by health promotion practitioners and researchers who are interested in examining commitment to PA in a young population.

CONCLUSION

Although the correlation between the CPASA and accelerometer-measured PA was somewhat low when tested with 5th–8th grade girls, the relationship was significant. Acceptable content and construct validity of the scale was established, and adequate internal consistency and test-retest reliability were demonstrated. To confirm this study's findings and the one-factor structure, additional testing of the scale is recommended with large and racially diverse samples of adolescents, including boys and high school students. Because many items have been adapted from scales used in the past with both adolescent boys and girls, we expect the scale to perform similarly with boys. Longitudinal studies examining commitment to PA across the entire adolescent period should be conducted to provide insight regarding any change with advancing age or development.

To prevent the notable decline in PA across adolescence, a need exists for approaches to increase and sustain girls' level of commitment to PA followed by research to identify those that are most effective. A concerted effort in research and practice to improve identified determinants may strengthen commitment and, in turn, result in the attainment of positive behavioral outcomes.²⁹ Empirical testing is also warranted to identify any factors that may mediate the relationship between commitment and PA. This study provides an initial, but critical, step toward achieving these important objectives.

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Abbreviations

PA	physical activity
MVPA	moderate to vigorous physical activity
LMVPA	light, moderate, and vigorous physical activity
N/n	sample size or frequency
ICC	intraclass correlation coefficient
EFA	exploratory factor analysis
CFA	confirmatory factor analysis
NNFI	non-normed fit index
CFI	comparative fit index

SRMR	standardized root mean-square residual
RMSEA	root mean square error of approximation
χ^2	chi-square test
r	correlation coefficient
p	p-value

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SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Although commitment is identified as a determinant of behavior, few studies have examined the influence of commitment on PA, especially among adolescents. Studies to date are limited by self-report measures of PA. The literature emphasizes the importance of directing research toward improving measurement of commitment.

What does this article add?

The CPASA had acceptable internal consistency and test-retest reliability. Content, concurrent, and construct validity were established.

What are the implications for health promotion practice or research?

Assessing commitment to PA may be useful for health promotion practitioners and researchers in designing interventions to maximize PA. Continued testing is needed to identify determinants of commitment and factors that may mediate the relationship between commitment and PA. Understanding commitment can assist with not only conducting research that contributes to positive behavior change, but also asking questions of practical significance for health promotion.

Figure 1.
Confirmatory Factor Analysis for the Commitment to Physical Activity Scale for
Adolescents (N = 459)

Table 1

Revised Commitment to Physical Activity Scale for Adolescents

Items	
1	I try to get better at doing physical activity. ^a
2	I make time for physical activity. ^a
3	If I stop doing physical activity, I can start up again. ^b
4	I try to make physical activity fun. ^b
5	I get my clothes, shoes, or other items ready as needed for physical activity. ^a
6	I change my physical activity to avoid getting bored. ^a
7	I think about the fun I have when I do physical activity. ^b
8	I like thinking about doing physical activity. ^c
9	Physical activity is one of the best parts of my day. ^c
10	I would change my schedule so I can do physical activity. ^c
11	My day is better when I am physically active. ^c

Note: Items were obtained from the existing scales as follows:

^aPlanning for Exercise Scale (4 items modified).

^bTAAG study scale (3 items modified).

^cCommitment to Physical Activity Scale (4 items modified).

Table 2

Demographic Characteristics of Girls Participating in the Three Studies

Variable	1 st Test-retest Study (N = 51)		2 nd Test-retest Study (N = 91)		Prospective Study (N = 503)	
	n	%	n	%	n	%
Grade ^a						
5th	9	17.6	57	62.6	0	0
6th	15	29.4	33	36.3	130	25.8
7th	14	27.5	1	1.1	256	50.9
8th	13	25.5	0	0	117	23.3
Hispanic ^b	15	30.0	20	22.2	51	10.7
Race ^a						
Black	28	54.9	19	20.9	227	45.1
White	5	9.8	45	49.5	142	28.2
Mixed/other	18	35.3	27	29.7	134	26.6
Enrolled in free or reduced-price lunch program ^b	32	69.6	45	56.3	402	86.3

Note.

^aSignificant differences ($p < .01$) between (1) 1st test-retest study and 2nd test-retest study, (2) 1st test-retest study and prospective study, (3) 2nd test-retest study and prospective study.^bSignificant differences ($p < .01$) between (1) 1st test-retest study and prospective study, and (2) 2nd test-retest study and prospective study.

Table 3
Item and Exploratory Factor Analysis for the Commitment to Physical Activity Scale for Adolescents

Item	Item Analysis (<i>N</i> = 502 [*])			Exploratory Factor Analysis (<i>n</i> = 248)		
	<i>M</i>	<i>SD</i>	Item-Total Correlation	Alpha if Item Deleted	Loading Coefficient	Communality (<i>h</i> ²)
I try to get better when I am physically active. (V1)	2.27	.66	.52	.79	.64	.41
If I stop doing physical activity, I can start up again. (V2)	2.13	.82	.35	.81	.37	.14
I try to make physical activity fun. (V3)	2.57	.67	.40	.80	.50	.25
I vary my physical activity to avoid getting bored. (V4)	1.93	.88	.41	.80	.46	.21
I think about the fun I have when I do physical activity. (V5)	2.16	.87	.53	.79	.63	.39
I like thinking about doing physical activity. (V6)	1.98	.87	.47	.79	.52	.27
Physical activity is one of the best parts of my day. (V7)	1.76	.86	.64	.78	.76	.57
I would change my schedule to participate in physical activity. (V8)	2.07	.87	.37	.80	.41	.17
My day is better when I am physically active. (V9)	2.14	.82	.62	.78	.72	.51
I make time for physical activity. (V10)	2.01	.76	.53	.79	.61	.37
I prepare as needed with clothes, shoes, or other items for physical activity. (V11)	2.27	.86	.38	.80	.52	.27

Note.

* One girl did not provide complete data; *M*: mean; *SD*: standard deviation; LC: loading coefficient