Hop, Skip … No! Explaining Adolescent Girls' Disinclination for Physical Activity

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Abstract

Purpose—This study aimed to develop and validate the Girls' Disinclination for Physical Activity Scale (G-DAS) and implement the scale along with an objective measure of physical activity (PA) in a longitudinal sample of adolescent girls.

Methods—Participants were non-Hispanic White girls who were assessed at ages 13 years ($n = 151$) and 15 years ($n = 98$). Girls completed the G-DAS and the Physical Activity Enjoyment Scale and wore an accelerometer for 7 days.

Results—Results supported a five-factor solution for the G-DAS; factors represented reasons for disliking PA including low perceived competence, lack of opportunities, high perceived exertion, concern about physical appearance, and threats to girls' gender identity. Data supported the reliability and validity of the G-DAS. Low perceived competence was the most common reason girls reported disliking PA and predicted a decreased likelihood of maintaining sufficient PA across ages 13 to 15 years.

Conclusion—Developing PA-related skills prior to adolescence may reduce declines in adolescent girls' PA.

Keywords

Exercise attrition; Decline; Attitude; Adolescent females; Enjoyment

Introduction

Participating in physical activity (PA) yields a wealth of physical (e.g., reduced overweight and obesity) and psychological (e.g., increased self-esteem, self-competence, body image, reduced depressive symptoms) health benefits [1–4]. Despite these advantages, participation

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in PA declines among girls and boys during adolescence, with dramatic declines noted for girls across ages 12 to 15 years [5, 6]. Research to date has not effectively explained why adolescent girls have higher PA attrition rates than boys. Much of the work completed to date has focused on girls' reported barriers to PA [3]. The emphasis placed on "barriers" assumes that girls intend or wish to be physically active but experience certain obstacles [7]. Given that adolescent girls are disproportionately categorized as "poorly motivated" or "amotivated" for PA [8], this strategy may present a limited approach to identifying remedies to the problem of declining rates of PA among girls.

Specifically, little attention has been directed toward explaining girls' "disinclination" for PA—or their reluctance for or slight aversion toward PA. Considering the potential role of disinclination for PA and its modifiable antecedents offers a complementary perspective to a focus on barriers. Examining girls' disinclination for PA, however, is inhibited by the lack of a validated measure of this construct. With this perspective in mind, in the current study, we develop a scale to assess girls' disinclination for PA, provide a preliminary assessment of its psychometric properties, and use the resulting scale to examine links between reported reasons for disliking PA and girls' objectively measured PA across ages 13 to 15 years. Scale development is guided by current knowledge of adolescent development, research on barriers to girls' PA, and psychosocial theories including attribution, constraints, and gender schema theories as outlined below.

Adolescent Development and Girls' Physical Activity

Decreases in PA among adolescent girls may be explained by the onset of puberty and its accompanying physical, emotional, and social changes [9, 10]. Fundamental physical changes among girls that are associated with pubertal development and driven by changes in the endocrine system include increases in body fat, breast development, and the onset of menstruation [11, 12]. Recent research also suggests that severe fatigue may be a by-product of hormonal changes during this time [13]. Social changes that accompany the physical maturation process include an increased desire for autonomy, the increased salience of peers, and the onset of romantic relations [14]. These changes in turn are linked with increases in social comparison, increases in conformity, and the intensification of gender roles [14].

As a result of the physical and social changes characteristic of adolescent development, girls report heightened body awareness, increased knowledge of being valued for their physical appearance and physical attributes, and greater dissatisfaction with their bodies [15–17]. Consequently, girls indicate discomfort in PA settings due to a desire to maintain their privacy and to avoid situations in which puberty-related changes may be noticed [18]. Also, due to the incongruity between PA and stereotypic definitions of "femininity," PA may be socially undesirable to girls, increasingly irrelevant to their sense of self, and given a low priority in their lives [18, 19]. In sum, in the context of pubertal development, girls' attitudes towards PA may be affected by an increased emphasis on their physical appearance, the perceived incongruity between participation in PA and femininity, increased sensitivity to social comparisons in a PA setting, and a heightened sense of fatigue or inertia resulting from hormonal changes.

Barriers to Adolescent Girls' Physical Activity

The development of a measure of girls' disinclination for PA can also be informed by research on barriers to PA [3]. Much of this research draws heavily on qualitative methods to gain greater insight into girls' experiences of PA. Barriers to PA that have been reported by adolescent girls and which might also explain girls' disinclination for PA include a lack of perceived competence for PA, anticipated negative reactions of peers (e.g., being considered too masculine), a desire to impress boys, feelings of inertia or lack of energy, a lack of activities and facilities that cater to girls' interests, a lack of autonomy and self-direction in organized activities, and the associated "beauty cost" of PA such as sweating or getting one's hair messed up [20–22].

The considerable overlap between the developmental challenges of adolescence and barriers to girls' PA that could explain their disinclination for PA led us to focus on the following constructs when developing the Girls' Disinclination toward Physical Activity Scale (G-DAS): (a) lack of perceived competence, (b) concern about physical appearance, (c) the perception that PA is not feminine, (d) the perception that PA requires excessive effort, and (e) lack of available opportunities for PA that cater to girls' needs and interests. A review of pertinent psychosocial theories further highlighted the importance of these constructs and guided item development for each domain.

Psychosocial Theories Informing Scale Development

Historically, most of the research aiming to understand influences on girls' PA has used a social–ecological perspective that considers the influence of both individual (e.g., attitude, self-efficacy) and environmental (e.g., access to facilities, safety, etc.) factors. Evidence from successful randomized trials (i.e., TAAG and LEAP [23, 24]) have provided researchers with a good framework on barriers to girls' PA and the types of factors to target for PA promotion. However, there is less theoretical work on disinclination for PA—specifically, the internal reasons for girls' disinterest or lack of motivation for PA. Thus, to compliment the existing research in this area, we draw on constraints [7, 25], attribution [26], and gender schema [24] theories to structure our understanding of possible reasons for girls' disinclination for PA and to guide the development of the G-DAS. These theories were selected because they incorporate elements of social–ecological theories, while highlighting the importance of intrapersonal processes and outlining such processes in detail. The benefits of incorporating psychosocial and ecological theories are highlighted by Elder and colleagues [27].

Constraints theory suggests that there are three primary forms of constraints that inhibit people's participation in activities including intrapersonal (e.g., perceived lack of skills), interpersonal (e.g., family support), and structural (e.g., access to facilities for PA) factors [7]. Recent proponents of constraints theory contend that intrapersonal constraints play the largest role in determining a person's drive to participate in particular activities [25]. Research applying attribution theory has explored how cues received from others or the environment affects behavior [28]. The theory proposes that information, beliefs, or motivations are inferred (i.e., attributed) from messages received from others, society, or the environment and lead to certain behaviors or affects. Finally, according to gender schema

theory, individuals who are highly gender schematic (i.e., subscribe to behaviors deemed appropriate for their gender) are limited in their behavior options and are unlikely to stray from "appropriate" behaviors as defined by the dominant culture. Particularly relevant to the current study is the fact that behavioral norms are especially salient in arenas where gender is emphasized, such as sport [29], and the motivation to conform to such norms is heightened during adolescence [14].

In sum, attribution and constraints theories emphasize intrapersonal factors that serve as predictors of behavior. According to the theories, when intrapersonal factors such as self-esteem or perceived ability in a domain (in this case PA) are low, disinclination for PA increases [7, 26]. When developing the G-DAS, intrapersonal factors discussed in these theories served as the basis from which items in the competence (e.g., "I don't have the skills"), appearance (e.g., "I don't want to get dirty"), and perceived exertion (e.g., "they take too much effort") dimensions of the G-DAS were constructed. Additionally, gender schema theory served as the framework from which items in the identity (e.g., "Girls who do them are too aggressive") and appearance (e.g., "My hair gets messed up") were developed.

Goals of the Study

The current study builds on knowledge of adolescent development, prior research on barriers to girls' PA, and multiple psychosocial theories to (1) develop a scale to operationalize reasons for girls' disinclination for PA, (2) examine its psychometric properties, and (3) use the resulting scale to (a) identify the most salient reasons girls report disliking PA and (b) predict girls' objectively measured PA. Given that the G-DAS is informed by prior research and psychosocial theories of behavior and was pilot-tested with a sample of adolescent girls, we expect that it will exhibit acceptable reliability and validity. In particular, we posit that girls' disinclination for PA will predict lower PA and a decreased likelihood of maintaining sufficient PA across ages 13 to 15 years—when declines in PA are particularly noteworthy [5, 6]. While we expect a negative relationship between each factor on the G-DAS (i.e., each reason for disliking PA) and girls' actual PA, there is little information to inform predictions regarding their relative importance. Hence, this question will be exploratory.

Methods

Participants

Participants for this study include 151 girls who were assessed at age 13 (M age 13.33±0.3), of whom 109 were reassessed at age 15 (M age 15.34±0.3). Participants were part of a larger longitudinal study examining girls' health and development across ages 5 to 15 years. Families residing in Central Pennsylvania, USA, were recruited for the longitudinal study using flyers and newspaper advertisements. Families with age-eligible female children within a five-county radius also received mailings and follow-up phone calls. The University's Institutional Review Board approved all study procedures. Written consent from parents and written assent from girls were obtained prior to girls' participation in the study.

Measures

Girls' Disinclination for Physical Activity Scale—Using knowledge of the social and physical changes girls experience during adolescence, prior research on barriers to adolescent girls' PA, and social–psychological theories including constraints theory [7, 25], attribution theory [26], and gender schema theory [30], we identified five overarching constructs that could explain adolescent girls' disengagement from PA including (a) low perceived competence (competence), (b) the lack of opportunities for PA that cater to girls' needs and interests (availability), (c) high fatigue perceived exertion associated with PA (perceived exertion), (d) concern about physical appearance (appearance), and (e) issues related to gender identity (identity). Thirty-nine items were generated to reflect the five constructs. The initial version of the scale was pilot-tested with a small group of 13-year-old girls ($n = 10$). Based on their feedback and to reduce item overlap and improve item clarity, nine items were deleted, three items were revised, and two items were added, resulting in a 33-item scale (see Appendix 1). The revised version of the G-DAS was implemented in the current study.

At ages 13 and 15, girls completed the revised G-DAS. The instructions on the scale read as follows: "We would like to know about things that might discourage you from being physically active or reasons why you may not like sports and physical activity. Think about sports AND physical activities in general that make your heart rate increase and get you out of breath". A definition of sports and physical activities was provided to ensure that girls considered sports (e.g., soccer, softball) in addition to organized (e.g., dance, gymnastics) and unorganized (e.g., walking, horseback riding, working out) activities. Girls then indicated the degree to which they agreed or disagreed with 33 statements using a four-point scale (1 = disagree, 2 = sort of disagree, 3 = sort of agree, 4 = agree). All statements began with "I don't like sports or physical activities because…" (see Appendix 1). Girls were instructed to circle "disagree" if they enjoyed PA and the specific factor listed did not discourage them from being active.

Enjoyment of Physical Activity—Girls completed the Physical Activity Enjoyment Scale (PACES) at ages 13 and 15 years. The PACES was originally developed by Kendzierski and DeCarlo [31] and was later revised by Motl and colleagues for use with adolescents [32]. The revised scale uses 16 items (e.g., "When I am active, I enjoy it", "When I am active my body feels good"). Girls responded to each statement using a five-point scale from 1 = disagree a lot to 5 = agree a lot. Negatively worded items (e.g., "When I am active I feel bored") were reverse-coded, and scores across all items were averaged to create a total enjoyment score. In a biracial sample of adolescent girls, the internal consistency coefficients of the revised PACES ranged between $\alpha=0.85$ and $\alpha=0.90$, and 2-week test–retest reliability was $r = 0.75$, $p < 0.01$ [32]. Factorial invariance across racial groups was established, and scores illustrated criterion validity with self-reported moderate to vigorous physical activity and sports involvement [32]. In the current sample, the internal consistency coefficient for the PACES was $\alpha=0.91$ at age 13 and $\alpha=0.93$ at age 15.

Objectively Measured Physical Activity—An objective assessment of girls' PA was obtained when girls were 13 and 15 years old using the ActiGraph 7164 accelerometer

(Shalimar, FL, USA). The Actigraph 7164 has been shown to be a valid and reliable tool for assessing PA in children and adolescents [33]. Accelerometer data, which are output as "counts," were compiled over 30-s intervals (or epochs). After receiving detailed instructions regarding the care and use of the accelerometers, girls were instructed to wear the monitor at all times, except when bathing and swimming, for seven consecutive days. Consistent with previous studies, the accelerometer was worn on the right hip. Nonwearing time for each monitoring day was calculated by counting the number of zero counts accumulated in strings of 20 min or longer. Girls were included in the analyses if they had four or more days with ten or more hours of wearing time [34, 35]. Of the 148 girls who completed the accelerometer protocol at age 13, 144 girls had valid data based on the criteria above and were used in the analyses. Of the 104 girls who completed the accelerometer protocol at age 15, 96 girls had valid data. Raw accelerometer counts were converted to minutes per day spent in moderate-to-vigorous PA (MVPA) and vigorous PA (VPA) using age-specific count thresholds developed by Freedson and coworkers [36, 37].

Body Mass Index—Girls' height and weight were measured by a trained nurse at ages 13 and 15 and used to calculate their body mass index (BMI; weight (kg)/height (m)^2). Age- and sex-specific BMI z scores were calculated using the 2000 growth charts from the Centers for Disease Control and Prevention [38]. Girls were classified as normal weight (BMI percentile <85), overweight (BMI percentile 85 and <95) or obese (BMI percentile 95) [39].

Pubertal Development—At age 13, girls' breast development was classified according to Tanner breast staging [11]. Tanner stages range from 1 (no development) to 5 (mature development). Visual inspection of each breast was made unobtrusively by a trained nurse and nurse's assistant while using a stethoscope to check each girls' heart rate. Each breast was rated according to Tanner criteria. In cases where ratings of the two breasts were not equal, the lower stage was used because the girl had not fully attained the higher stage.

Procedures

At ages 13 and 15, girls visited the General Clinical Research Center (GCRC) at The Pennsylvania State University during summer where a trained nurse measured their height and weight and assessed their breast development. During early fall of the same years (i.e., 6 to 8 weeks after visiting the GCRC), trained research personnel visited girls at their homes or at their schools to administer the self-report questionnaires (i.e., G-DAS, PACES). Girls completed the questionnaires independently, and assistance was provided as necessary. To calculate the test–retest reliability of the G-DAS, girls were given a second copy of the scale at age 13 and asked to complete and return the scale in the envelope provided within a week; with follow-up phone calls, all girls completed and returned the scale in the specified time. Girls were also given the activity monitor during the home/school visits, and the accelerometer protocol was explained. All accelerometer data were collected during the school year to provide a more generalizable measure of girls' PA and before the end of October to ensure that cold weather did not prevent girls from being active outdoors. Girls were provided with a courier envelope and instructions on returning the monitors by registered mail. All monitors were returned.

Statistical Analyses

Of the 151 girls who were examined at age 13, 98 were re-examined at age 15. No significant differences in PA, enjoyment of PA, and scores on G-DAS were identified for girls who were reassessed at age 15 and those who were lost to follow-up. Data for all girls were used in the analyses outlined below unless otherwise specified.

Reliability and Validity of the G-DAS—Items representing each of the five anticipated factors or constructs were oversampled to increase the likelihood of identifying the best group of items for each factor. Prior to conducting confirmatory factor analyses (CFA), the item pool was reduced from 33 to 16 items using principal component analysis (PCA); a separate analysis was performed for each anticipated factor. In each analysis, two factors were retained and then rotated using promax rotation. The factor loadings were compared for each subfactor at ages 13 and 15, and the three or four items with the highest factor loadings on the first factor across both age groups were retained. In cases where two very similar items were among the four items chosen (e.g., "sports and PA take too much effort" and "Sports and PA are tiring"), the item with the highest factor loading was retained. This process ensured that a small number of high-performing items were included in the follow-up CFA models.

The factorial structure of the G-DAS was then examined using CFA (with AMOS software). At each age, the items that were retained were modeled as indicators of the five predetermined latent factors as outlined in Fig. 1. Given that the data were not normally distributed, it was necessary to estimate the model fit and the parameter estimates using bootstrapping techniques [40]. As stated by Byrne [40], "the bootstrap procedure provides a mechanism for addressing situations where the ponderous statistical assumptions of large sample size and multivariate normality may not hold (p. 270)." Model fit (based on a chi-square statistic) was estimated using the Bollen–Strine bootstrap procedure [41]. Indices of practical fit included the root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI).

Following the identification of the final factor model, mean scores for the factors were calculated and used in the remaining analyses. To test the reliability of the G-DAS, test–retest (at age 13) and internal consistency (ages 13 and 15) coefficients were calculated for each factor. To test the convergent validity of the G-DAS, correlations with girls' enjoyment of PA, MVPA, and VPA were calculated at each age using Spearman rank correlation analysis.

Implementation of the G-DAS—The sample means for the G-DAS subscales were examined to identify the most pertinent reason, or reasons, that girls reported disliking PA and aged-related differences in the reasons provided. At each age, mean scores for the subscales of the G-DAS were compared using a Friedman's test, the nonparametric equivalent of a repeated-measures analysis of variance (ANOVA). These analyses were limited to girls who endorsed at least one reason for disliking PA, which was 70% of the sample at each age. In instances where the Friedman's test was significant, a Dunn's post hoc test was performed to test differences for all pairs of means. The Friedman test and post

hoc analyses were performed using GraphPad Prism version 4.0 [42]. Differences in the extent to which girls endorsed a specific reason for disliking PA between ages 13 and 15 were assessed using Kruskal–Wallis ANOVA in SAS version 9.0, the nonparametric version of the *t* test. A separate analysis was performed for each subscale.

Longitudinal associations between girls' reported reasons for disliking PA and their actual PA were then examined. For this analysis, two PA groups were created based on girls' MVPA measured at ages 13 and 15 including (1) girls who "maintained PA" and (2) girls who "did not maintain PA"; only girls with accelerometer data at ages 13 and 15 were considered ($N = 98$). Creating a dichotomous outcome variable made it possible to examine the longitudinal association between reasons for disliking PA at age 13 and girls' PA across ages 13 and 15 years using a familiar and easily interpretable nonparametric test (i.e., logistic regression). In addition, maintaining sufficient PA during adolescence is a public health priority given dramatic declines in adolescent girls' PA [6]. Girls were considered to have "maintained PA" if they recorded 30 min of MVPA per day at ages 13 and 15 ($n = 24$). If girls did not meet this criterion, they were classified as "did not maintain PA" ($n = 72$). It was not possible to use a cut point of 60 min MVPA [43] because fewer than 5% of girls met this criterion. Furthermore, it was not possible to identify girls maintaining sufficient (i.e., 20 min) VPA across ages 13 to 15 years because no girls met this criterion. This particularly low rate of meeting PA recommendations is consistent with rates reported among similar-aged girls in a large national study [6]. The effect of each reason for disliking PA at age 13 (as reported on the G-DAS) on the likelihood of maintaining PA across ages 13 and 15 years was assessed using logistic regression. Analyses were performed separately for each subscale of the G-DAS. Associations between scores on each subscale of the G-DAS and girls' BMI *z* score and their breast development were examined prior to performing the logistic regression models to determine the appropriateness of including them as covariates in the models. No significant relationships were identified. Consequently, they were not included as covariates in the models.

Results

Participant Characteristics

All girls were non-Hispanic White. At age 13, 13% of girls had a total family income of less than $35,000, 19% had a family income between $36,000 and $50,000, 26% had a family income between $51,000 and $75,000, and 42% had a family income of $76,000 or more. Parents were in general well-educated with mothers and fathers completing a mean of 15±2 (range = 12–20) and 15±3 (range = 12– 20)years of education, respectively. At age 13, 14% of girls were overweight and 11% of girls were obese. At age 15, 11% were overweight and 10% were obese. On average, girls participated in 35± 14.8 min of MVPA per day at age 13, which declined to 26±15.2 min at age15. Similarly, girls participated in 4.37±4.44 min of VPA per day at age 13 which declined to 2.30±2.99 min at age15. While average minutes per day of VPA was low, daily minutes of VPA ranged from 0 to 30.4 min at age 13 and from 0 to 17.4 min at age 15. Girls reported moderate enjoyment of PA at age 13 with a mean score of 2.77±0.75 (out of 4), which declined slightly to 2.65±0.79 at age 15.

Responses on the G-DAS indicated that the majority of girls in this study experienced some degree of disinclination for PA. Sixty-eight percent of girls endorsed at least one item listed on the G-DAS as a reason for disliking PA (i.e., they recorded a response of *sort of agree* or *agree* to at least one item on the scale). Furthermore, 48% of girls endorsed three or more and 15% endorsed seven or more of the listed reasons for disliking PA.

Reliability and Validity of the G-DAS

Preliminary analyses revealed that model fit improved when the items "other girls will think I am a tomboy" and "boys will think I am a tomboy" were combined (using a mean score) to create a single item; hence, the CFA models used 15 rather than 16 indicators. Results from the CFA models indicated that the proposed model exhibited an acceptable level of fit with the data at each age, as shown by the nonsignificant chi-square statistics, RMSEA values below 0.10 and CFI and TLI values above 0.90 [44] (see Fig. 2). A nonsignificant chi-square indicated that the null hypothesis (i.e., that the model provides a good fit to the data) could not be rejected. In addition, the factor loadings were in general greater than 0.60, and all factor loadings were statistically significant.

Table 1 presents information regarding the reliability and validity of each subscale of the G-DAS by age. Measures of reliability include internal consistency and test–retest reliability coefficients. All internal consistency coefficients were above $\alpha = 0.70$ and all test–retest correlations were $r = 0.63$ or higher. Measures of validity include correlations between scores on the G-DAS and girls' enjoyment of PA and objectively measured MVPA and VPA. Reflecting the convergent validity of the G-DAS, scores on all subscales at ages 13 and 15 years were negatively correlated with girls' reported enjoyment of PA. Reflecting the scale's criterion validity, higher scores on competence, perceived exertion, and availability were concurrently associated with lower MVPA at age 13 and higher scores on appearance were concurrently associated with lower MVPA at age15. Higher scores on all subscales of the G-DAS at ages 13 and 15 were associated with lower VPA.

Implementation of the G-DAS

Mean scores for the G-DAS subscales were compared at each age using a Friedman test. At age 13, results indicated that the means for the five subscales were significantly different ($\chi^2=87.61$, $df = 4$, $p<0.001$). Follow-up post hoc analyses indicated that girls' lack of perceived competence for PA and the perceived effort or exertion associated with being active were the most frequently endorsed reasons for disliking PA and did not differ significantly from each other. The impact of PA on girls' physical appearance, the threat of PA to girls' self-identity, and the lack of available options for PA that catered to girls' interests were endorsed less frequently as reasons for disliking PA and did not differ from each other. Thus, girls' reported reasons for disliking PA at age13 fell into two clusters. Competence and perceived exertion were reported most frequently followed by appearance, identity, and availability, which were reported to a similar degree.

Differences in girls' reported reasons for disliking PA were less distinct at age 15 (Fig. 3). Results from the Friedman test indicated that the mean scores on the five subscales were significantly different ($\chi^2=48.37$, $df = 4$, $p< 0.001$). Follow-up post hoc analyses indicated

that girls' reported reasons for disliking PA fell into three clusters. A lack of perceived competence was again the most frequently reported reason for disliking PA and differed significantly from appearance and availability, which were the least frequently reported reasons. Identity and perceived exertion fell midway between these two clusters and did not differ significantly from either cluster.

Each reason for disliking PA at age 13 was examined as a predictor of the likelihood of maintaining sufficient PA across ages 13 and 15 years. Results from the logistic regression models are reported in Table 2. Girls who reported disliking PA at age 13 due to a lack of perceived competence were significantly less likely to maintain sufficient PA across ages 13 and 15 years than girls who did not report this as a reason. For each unit increase in perceived lack of competence (i.e., from disagree to sort of disagree; sort of disagree to sort of agree), girls were 30% as likely to maintain PA. Marginally ($p < 0.10$) significant effects were also identified for the availability and identity subscales. Girls who reported disliking PA due to a lack of available options for PA of interest to girls and the perceived threat of PA to girls' self-identity were marginally less likely to maintain PA across ages 13 and 15 years.

Discussion

While declines in girls' PA begin in middle childhood, the rate of decline is particularly dramatic during adolescence [6]. Detailed information on girls' reported reasons for disliking PA, or their disinclination for PA, and validated measures of this construct are needed to develop appropriate intervention strategies. In this study, we developed the G-DAS to measure reasons for girls' disinclination for PA, assessed the scale's psychometric properties, and used the G-DAS to identify dominating reasons girls report disliking PA and the extent to which they predict their objectively measured PA. Overall, our findings demonstrate support for the anticipated five-factor structure of the G-DAS and provide evidence of the scale's internal consistency, test–retest reliability, and convergent and criterion validity. Perceived competence was the most frequently reported reason for disliking PA and was the only factor on the G-DAS linked with a reduced likelihood of maintaining sufficient PA across ages 13 to 15 years. Several study findings warrant further discussion.

Construction of the G-DAS was informed by the developmental context in which declines in girls' PA occurs (i.e., adolescence), prior research on barriers to girls' PA, and psychosocial theories focusing on intra-personal predictors of health behaviors. The conceptualization of the G-DAS as a measure of girls' disinclination for PA produced a five-factor model with acceptable model fit. Evidence of model fit was observed at both ages based on concordance between the actual and the predicted covariance matrix and practical measures of fit such as model parsimony [40]. Further supporting the scale's measurement properties, the internal consistency, test–retest reliability, and convergent validity of the G-DAS were adequate. Internal consistency coefficients were greater than $\alpha=0.72$ and 1-week test–retest reliabilities were greater than $r = 0.63$ for all subscales. Supporting the scale's convergent validity, scores on all subscales of the G-DAS were significantly and negatively correlated with girls' enjoyment of PA at ages 13 and 15 years, with correlations ranging from $r = -0.18$ to $r = -0.53$. Furthermore, girls with higher scores on the G-DAS, indicating more

negative attitudes toward PA, had lower objectively measured PA—supporting the scale's criterion validity. It is interesting to note that scores on the G-DAS were significantly and negatively correlated with VPA in all instances, with correlations ranging between $r = -0.19$ and $r = -0.38$, but only four of the ten correlations were significant and in the anticipated direction for MVPA. This pattern suggests that the factors examined in this study (i.e., competence, perceived exertion, availability, identity, and appearance) may deter girls from vigorous intensity activities to a greater extent than moderate intensity activities. This finding is intuitively appealing given that girls have greater volitional control over their VPA compared with their MVPA, which can be accumulated in the course of everyday activities, thereby making VPA a likely mechanism through which disinclination for PA is expressed.

At ages 13 and 15 years, a perceived lack of skill or competence was the most frequently reported reason for disliking PA. Further examination of the data reveals that 24% of girls at age 13 and 19% of girls at age 15 endorsed all competence-related items on the G-DAS. That is, they responded, on average, with *sort of agree* or *agree* to all competence-related items. Furthermore, girls who reported disliking PA due to a perceived lack of competence were significantly less likely to maintain sufficient PA across ages 13 to 15 years. These findings are consistent with prior research, indicating that a perceived lack of competence is linked with lower enjoyment of PA [3, 45] and actual PA [3, 46–48]. Although the link between perceived athletic competence and youth PA is not new to research, results from this study indicate that perceived competence potentially plays a leading role in explaining girls' PA attrition. According to Steele [49], individuals (and particularly adolescents) who are concerned about how others may perceive them will disidentify from an activity rather than pursue it with the goal of improving skills. In this case, girls may be quick to disidentify from PA during adolescence, a period of heightened social comparison [14] and a time when intramural sports are largely replaced by competitive extracurricular sports [50]. Findings from this study support the need to promote early PA-based skill acquisition among girls as a method to foster perceived competence and enjoyment of PA. Skill attainment and perceived competence can be promoted through early positive experiences with a range of physical activities. Given that girls report being bored with traditional sports [20, 21] and enjoy the social aspects of PA [22], nontraditional activities such as rock climbing, surfing, and cycling and group-based activities such as aerobics and dance teams should be considered.

Perceived exertion or fatigue was the second most common reason girls reported disliking PA and did not differ significantly from girls' reports of disliking PA due to low perceived competence. Approximately 18% of girls at age 13 and 16% at age 15 clearly indicated that they disliked PA due to perceived exertion or fatigue (e.g., I don't have the energy). Fatigue or exertion as a precipitator for girls' disinclination for PA has rarely been considered to date. A growing body of research, however, indicates that that adolescent girls disproportionately experience severe fatigue [13, 51, 52]; approximately 20% of adolescent girls experience severe fatigue compared with only 6% of adolescent boys, possibly reflecting gender differences in changes in neuroendocrine functioning during puberty [13]. In contrast to perceived competence, perceived exertion did not predict girls' likelihood of maintaining PA across ages 13 to 15 years. Thus, while severe fatigue may be relatively

common among adolescent girls, it is unclear how it impacts girls' PA behaviors, indicating that additional research on this topic is needed.

The potential effect of being active on girls' physical appearance (e.g., my hair gets messed up) and gender identity (e.g., boys will think I'm a tomboy) were the least frequently endorsed reasons for disliking PA. Child development texts outline the central role that girls' perceived physical appearance plays in their sense of self [53]. Consistent with this view, a recent qualitative study with African American adolescent girls found that appearance-related issues (e.g., one's hair getting messed up) served as a barrier to girls' PA [22]. In the current study, which focused on a non-Hispanic White population, only 5–6% of girls endorsed its role. Furthermore, appearance-related concerns did not predict girls' maintenance of sufficient PA across ages 13 to 15 years. It is possible that girls from different racial/ethnic groups differentially perceive PA as a threat to their personal appearance, which highlights the need to examine disinclination for PA in a more diverse sample of girls. Similarly, girls in this study rarely reported disliking PA because it threatened their sense of femininity. Prior research on girls' and boys' opinions about active girls and the degree to which they are perceived as feminine has produced mixed findings [18, 54]. The majority of this research, however, is qualitative, suggesting that a more detailed quantitative investigation is needed.

To our knowledge, this is the first study to thoroughly examine the reasons for adolescent girls' disinclination of PA and develop a measure of this construct. The resulting scale can be utilized and expanded upon in future research. Additional strengths of the study include its longitudinal design and objective assessment of girls' PA. While this study makes a number of important contributions to the literature, there are some limitations. First, findings from this study only pertain to non-Hispanic White girls from middle-income backgrounds. Additional research is needed to examine the applicability of the G-DAS with more diverse samples, including youth from different racial/ethnic and socioeconomic groups and youth ranging in age from early to late adolescence. Second, focusing on five specific reasons for girls' PA attrition could be a weakness of the study. It is possible that low perceived athletic competence was identified as the most pertinent reason for disliking PA in this study because other more fundamental reasons were not measured by the G-DAS. The current scale does not assess two commonly reported barriers to PA, namely, a perceived lack of time and parental support. Although a perceived lack of time is frequently reported as a barrier to PA [55], it is not anticipated that it would lead one to dislike physical activity. Similarly, while parental support facilitates PA in youth populations [21, 56], its absence is unlikely to lead one to dislike PA. We anticipate that fundamental barriers to PA such as a lack of time or parental support will act as antecedents to the factors measured by the G-DAS (e.g., a girl has little time to be active leading to few opportunities to develop PA skills and in turn low perceived athletic competence, which itself explains their disinclination for PA). Third, we exclusively utilized psychosocial theories to develop the G-DAS. Future work could expand the theoretical basis of the G-DAS, and in particular draw on more traditional theories of health behavior (e.g., theory of planned behavior, self-efficacy theory), to determine if the dimensions of the G-DAS should be expanded. Finally, findings from this study are limited by its small sample size. It is possible that an absence of an effect or

marginal effects for a number of the G-DAS subscales is due to the lack of statistical power rather than the absence of an effect per se.

Summary and Future Research

Findings from this study provide evidence supporting the reliability and validity of the G-DAS as a multidimensional measure of reasons that adolescent girls dislike PA. Using the G-DAS, key explanations for girls' disinclination for PA in this study included low perceived athletic competence and excessive perceived fatigue or exhaustion associated with PA. Girls who reported disliking PA due to a lack of perceived athletic competence were significantly less likely to accumulate at least 30 min of MVPA across ages 13 and 15 years. We recognize that scale development is an ongoing process; thus, continued application and refining of the G-DAS with multiple populations will increase its potential utility. Future research could expand on results from this study by (a) examining links between fundamental barriers to PA, such as time and parental support, and girls' disinclination for PA as measured by the G-DAS and the temporal sequencing of these constructs; (b) exploring other potential reasons for disliking PA that are not currently tapped by the G-DAS; and (c) examining ways in which the G-DAS can be modified for use with other populations such as boys (B-DAS), pregnant and/or postpartum women (P-DAS), and individuals who are overweight or obese (O-DAS) including the identification of overlapping and unique reasons for disliking PA across populations.

Acknowledgments

Appendix 1: Development of the Girls' Attitudes Toward Physical Activity Scale (G-DAS)

I don't like sports and physical activities because……..	Item added, deleted, or revised following pilot testing	Item deleted following PCA	Item included in CFA analyses
Competence			
I am not athletic			X
I am not built for it			X
I don't have the skills			X
I am not good at them		X	
I don't feel good playing them	Deleted		
I don't know how		X	
I am not strong enough		X	
I am too slow		X	
I am clumsy		X	
Appearance			
My hair gets messed up			X
I would have to shower and do my hair over			X
I don't want to get dirty			X

I don't like sports and physical activities because……..	Item added, deleted, or revised following pilot testing	Item deleted following PCA	Item included in CFA analyses
I get red in the face		X	
I look silly doing them		X	
I am already thin		X	
I feel/look funny doing them	Deleted		
I don't like to sweat		X	
I am too heavy to do them	Deleted		
They are for thin people	Deleted		
I don't want to cut my nails		X	
Identity			
Other girls will think I'm a tomboy			X
Boys will think I'm a tomboy			X
I am not aggressive	Revised: Girls who do them are too aggressive		X
I am not competitive	Revised: Girls who do them are too competitive		X
Popular girls don't do them	Deleted		
My friends don't do them	Deleted		
I don't fit in	Deleted		
I don't want to get hurt		X	
Perceived exertion			
I don't like to run out of breath			X
They are too tiring			X
I don't have the energy	Added after pilot work		X
They are too hard		X	
They take too much effort	Added after pilot work	X	
I don't have the endurance	Revised: I am not in good enough shape	X	
Availability			
Most of them are for boys			X
Girls don't play the ones I like			X
The ones I want to play aren't offered			X
My friends don't play the ones I like	Deleted		
There aren't many for girls to choose from		X	
There aren't enough girls to play with	Deleted		
There's no coach		X	
I don't like to play on co-ed teams		X	

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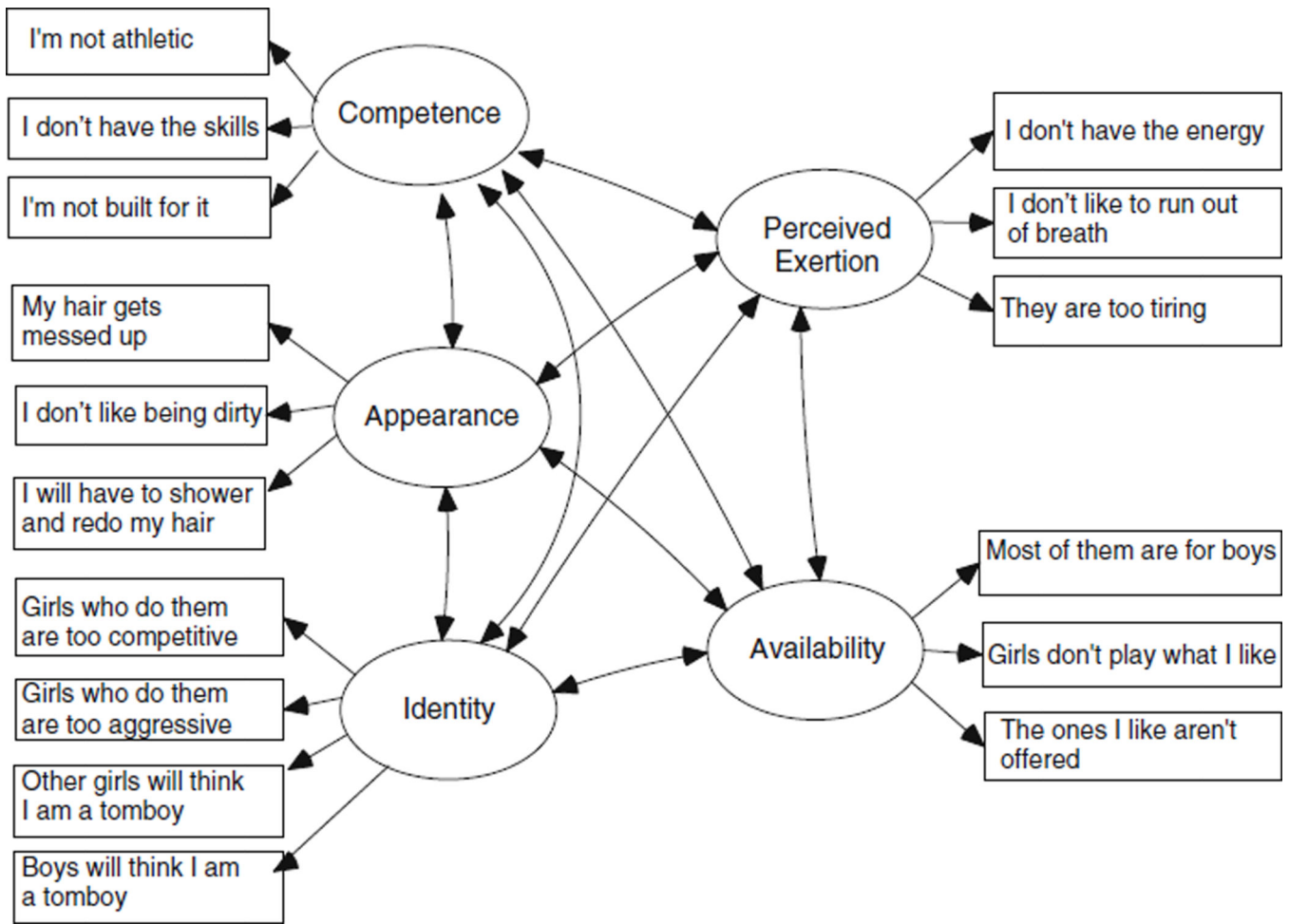**Fig. 1.**
Proposed factor structure of the girls' disinclination for physical activity scale (G-DAS)

Model Fit (age 13): χ^2 (df=80) = 149.26, p = .53; RMSEA=.07; CFI=.94; TLI=.92
Model Fit (age 15): χ^2 (df=80) = 146.62, p = .20; RMSEA=.09; CFI=.92; TLI=.89
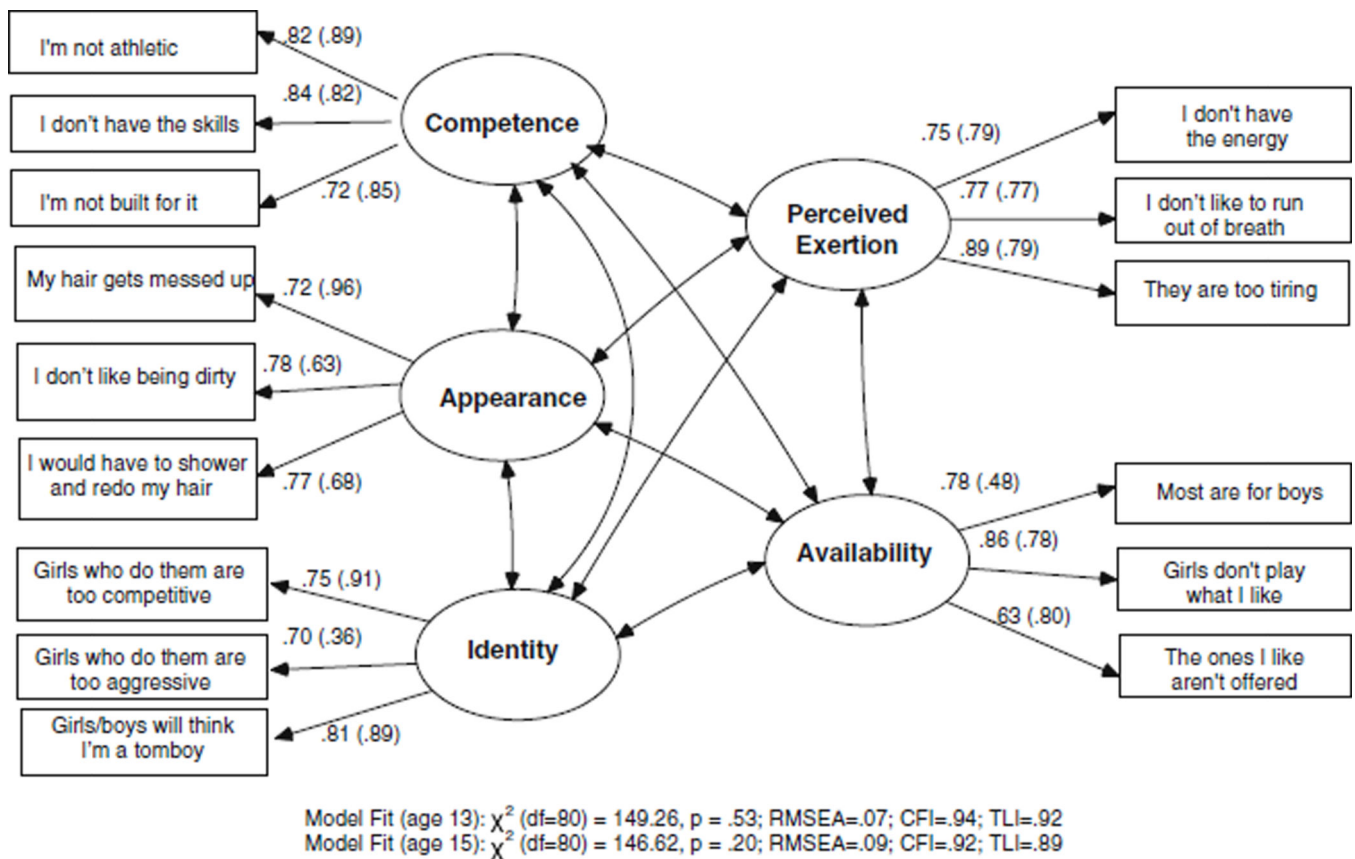
Fig. 2.
Results from Confirmatory Factor Analyses of the G-DAS at age13 (shown in *regular text*) and at age15 (shown in *parentheses*). Note: All factor loadings were statistically significant at *p*<0.001. *G-DAS* Girls' Disinclination for Physical Activity Scale
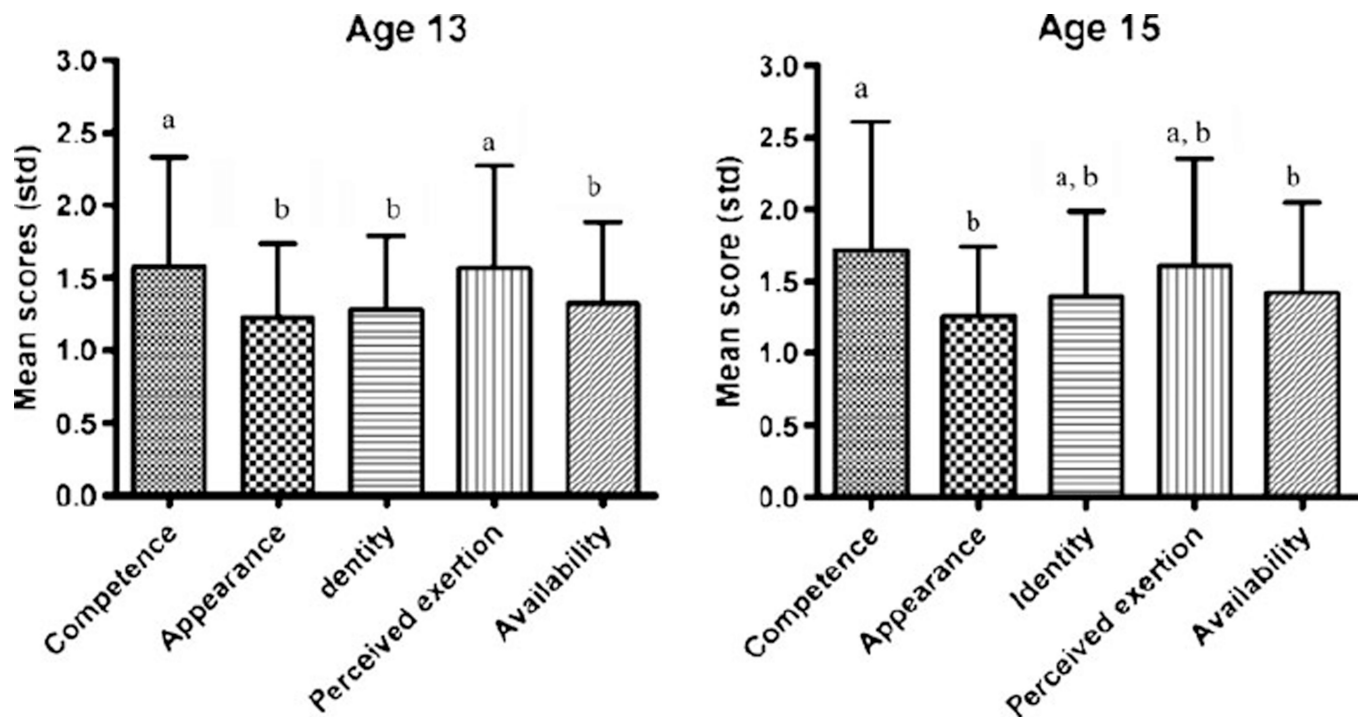
Fig. 3.

Differences in mean scores (std) for each subscale of the G-DAS by age. Note: Group differences in mean scores for each dimension were examined using a Friedman test with a Dunn's follow-up post hoc analysis. *Different letters* indicate that the means are significantly (*p*<0.05) different. Analyses were performed separately for data at ages 13 and 15 years. *G-DAS* Girls' Disinclination for Physical Activity Scale

Table 1

Reliability and validity of the girls' disinclination for physical activity scale (G-DAS)

Subscales of the G-DAS	Measures of reliability		Measures of convergent and criterion validity (correlations, r)		
	Alpha	1-week test–retest (r)	Enjoyment of PA	MVPA	VPA
Age 13 (N=143)					
Competence	0.83	0.76 ***	−0.46 ***	−0.35 ***	−0.36 ***
Appearance	0.80	0.74 ***	−0.29 ***	−0.15	−0.20 **
Identity	0.75	0.63 ***	−0.35 ***	−0.11	−0.19 *
Perceived exertion	0.83	0.85 ***	−0.53 ***	−0.39 ***	−0.38 ***
Availability	0.77	0.76 ***	−0.28 ***	−0.24 **	−0.29 ***
Age 15 (N=94)					
Competence	0.89		−0.49 ***	−0.07	−0.27 **
Appearance	0.75		−0.18 *	−0.24 *	−0.22 *
Identity	0.73		−0.43 ***	−0.02	−0.22 *
Perceived exertion	0.82		−0.51 ***	−0.06	−0.30 **
Availability	0.72		−0.45 ***	−0.13	−0.21 *

*
p<0.05;

**
p<0.01;

***
p<0.001

MVPA moderate to vigorous physical activity; *VPA* vigorous physical activity

Table 2

Reasons for disliking PA at age13 predict the likelihood of maintaining PA across ages 13 and 15 years

Subscales of the G-DAS	Odds ratio (98% CI) maintain PA across ages 13 and 15	*p* value
Competence	0.29 (0.11–0.76)	0.01
Appearance	0.87 (0.28–2.66)	0.81
Identity	0.29 (0.07–1.22)	0.09
Availability	0.32 (0.09–1.07)	0.06
Perceived exertion	0.73 (0.35–1.56)	0.42

Maintaining PA 30 min MVPA at ages 13 and 15 years (*N*=24)

G-DAS Girls' Disinclination for Physical Activity Scale