Motivations for Adolescent Physical Activity

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Background: Motivating adolescents to maintain levels of physical activity (PA) is important because regular PA in adolescence contributes to physical, psychological, and social well-being and PA during adolescence has been associated with activity levels in adulthood. Purpose: The overall aim of this study is to validate a measure of external reward, health values, and personal interest motivations for adolescent PA developed by Wold and Kannas and to examine the relationship between these motivations and level of PA. Methods: A nationally representative sample of 9011 adolescents completed the Health Behavior in School-aged Children survey instrument. Ten items were used to measure PA motivations. Multiple group confirmatory factor analysis and structural equation modeling were applied to test the 3-factor structure of the motivation scale and to examine the relationship between the 3 motivations and PA. Results: The Wold and Kannas’s motivation measure assessed external, social, and health motivations which predicted PA in adolescents. Conclusions: The Wold and Kannas’s motivation measure is suitable for assessing motivations for PA in US adolescents and may contribute to both theoretical and intervention studies that address this public health need.

Keywords: measurement, exercise, children

Regular physical activity in adolescence contributes to physical, psychological, and social well-being. Conversely, low levels of physical activity have been linked with obesity, heart disease, and diabetes. The school-age years represent a critical period in health behavior development because physical activity during adolescence has been associated with activity levels in adulthood. Unfortunately, physical activity decreases during adolescence, especially in females. Based on the important links between physical activity and health outcomes, an emerging literature has focused on examining physical activity and its correlates in adolescent populations.

Motivations, often defined as perceived incentives or reasons for engaging in a behavior, relate to physical activity initiation and maintenance. Motivation is central to Self-Determination Theory which assumes that all individuals are naturally motivated by needs for competency, relatedness, and autonomy. In general, most measures of motivation focus on intrinsic versus extrinsic motivation. Intrinsic motivation has been defined as the desire to do something based on the inherent enjoyment or satisfaction derived from the behavior itself whereas extrinsic motivation is commonly defined as the desire to perform a certain behavior based on the potential external rewards that may be received as a result.

Research in this area has predominantly shown that intrinsic motivations are more likely than extrinsic motivations to increase or maintain physical activity. Ryan and Deci propose that different extrinsic motivations can be placed along a self-determinism continuum and as such may have different effects on a behavior. For example, motivation based on external reward (parental approval, social comparison) would be more external than motivations reflecting rational values (improved health, improved fitness); whereas, motivations based on enjoyment and personal interest (having fun, seeing friends) are assumed to reflect intrinsic motivation. Currently, there are several measures, including the Extrinsic Motivations Inventory and the Intrinsic Motivation Inventory that assess physical activity motivation. However, it should be noted that neither of these have been validated in child and adolescent populations and measures that have been evaluated in pediatric populations tend to present motivation as dichotomous, internal or external.

An initial attempt to measure broad motivations for sports-related physical activity in a nationally representative sample of children and adolescents was conducted by Wold and Kannas. They examined the structure of motivational questions included in the Health Behavior in School-aged Children (HBSC) survey of a large sample of Scandinavian adolescents. The 13 items included in the scale were best represented as 3 distinct factors on the external-internal continuum: external reward (External), health values (Health), and personal interest (Social). These factor structures were constant across age and gender. Although the study provided some useful information about the measure used in the HBSC dataset, a major limitation of the study is that it did not
directly assess whether these motivations were predictive of exercise behavior or physical activity more broadly.

Reward and compliance with authority is one of the most basic motivations. Though effective, such external control of behavior can be counterproductive. Self-Determination Theory suggests that external control of behavior is associated with short-term compliance and will not be maintained when the external influence is no longer present. Social motivation is perhaps one of the most widely cited categories of motivations for adolescent involvement in physical activity. Adolescents report that physical activity is “fun” if it provides an opportunity to be with existing friends or meet new friends.

The third motivational factor suggested by Wold and Kannas is health motivation. Health motivation is rated by younger adults and adolescents as one of the most important reasons for physical activity. Much of the work in this area has focused on health motivation reflecting external benefits (ie, to control one’s weight and manage appearance). However, health motivations are not just driven by aesthetic goals; wanting to improve or maintain their health is an important motivator for physical activity. Research that has examined the relationships between health motivations and physical activity has found that adolescents who advocate the health-benefits of regular physical activity are more likely to engage in physical activity.

Thus, the factors derived by Wold and Kannas’s fit within the continuum of external and internal motivations identified by Ryan and Deci and show promise as motivators of adolescent PA. However, to our knowledge, no other studies have used this particular motivation scale. Therefore, a primary objective of the current study is to determine if the 3-factor solution can be replicated roughly 2 decades later in a nationally-representative sample of U.S. youth. It is also important to examine the structural consistency of the 3-factor solution across different age and gender samples.

As previously noted, Wold and Kannas did not directly examine the links between these motivations and physical activity. The current analyses will examine the validity of this scale for predicting physical activity levels in adolescents. A second objective of the current study is to test the relationship between physical activity and the 3 motivations measured in the scale. It is predicted that External motivations will be associated with lower levels of PA and that internal motivations (Social) will be associated with higher levels of PA. Health motivation, an external motivation that is somewhat internal, is expected to be intermediate in its relation to adolescent PA.

In summary, the overall aim of this study is to validate a measure of motivation for physical activity for use in a nationally representative child and adolescent population. The validation process will occur in 2 steps. The first is to test the 3-factor structure found in the earlier version of this scale and to explore the stability of these factors across gender and grade. The second step is to test the validity of this scale by examining the correlation between the 3 motivation factors and level of physical activity.

Methods

Sample and Procedure

The survey instrument is part of the HBSC international study which was carried out in collaboration with the World Health Organization. The U.S. survey was conducted during the 2005–2006 school year to provide a nationally-representative sample of students in classrooms grade 6 to 10. A two-stage stratified randomized design was employed; before randomization, U.S. school districts were stratified by Census Division and eligible classrooms were stratified by grade. An oversample of African-American and Hispanic students was surveyed to provide more accurate population estimates for these students. To adjust for the sampling design and produce population-based estimates of means, totals, ratios and proportions of student characteristics of interest, each responding student was assigned a sampling weight. Participants completed the questionnaire in their classrooms. Procedures were designed to ensure the participants anonymity. Active or passive parental consent and student assent were obtained depending on the requirements of the local school district. All procedures were approved by the Institutional Review Board of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

Sample Characteristics

Of the 9,011 adolescents who completed the U.S. 2005/2006 HBSC survey (response rate was 85%), 48.6% were boys and 51.4% were girls. Adolescents were distributed across Grades 6 to 10 (Grade 6: 26.2%, Grade 7: 20.5%, Grade 8: 19.8%, Grade 9: 16.2%, and Grade 10: 17.3%), with an average age of 14.1 years old. As we have an oversample of African- and Hispanic-Americans, 43.2% were white, 20.1% were African American, 25.5% were Hispanic American, and 11.2% were of other race/ethnicity. Of the 9,011 adolescents, 162 (1.8%) were Hispanic American, and 11.2% were of other race/ethnicity. Of the 9,011 adolescents, 162 (1.8%) were excluded from our analyses due to missing data which could not be estimated by the Full Information Maximum Likelihood (FIML).

Measures

Demographics. Demographic variables included gender, age, and family affluence. The family affluence scale, FAS, was used as the proxy for socioeconomic status (SES). It consists of 4 items assessing family material wealth (eg, having own bedroom). The 4 items were combined to produce a linear composite score, with a range from 0 (lowest affluence) to 9 (highest affluence). This scale has shown desirable reliability and validity.
Physical Activity. A definition of physical activity, “any activity that usually increases your heart rate and makes you get out of breath some of the time,” followed by examples, preceded the 3 items assessing physical activity. The first item asked, “How often over the past 7 days have you been physically active for a total of at least 60 minutes per day,” and was scored on a scale ranging from 0 to 7 days. The second item assessed how many times per week the respondent exercised on a scale ranging from never, less than once per month, once a month, once a week, 2 to 3 times per week, 4 to 6 times per week, and every day. The third item asked how many total hours per week the respondent exercised, ranging from none to 7 or more hours per week. All 3 items were used to measure the latent variable reflecting current physical activity.

Motivation Questions. Items used in the 1985 to 1986 HBSC survey were modified to measure motivations for general physical activity rather than being limited to sports-related physical activity. The stem for all items read “Here is a list of reasons that some youth give for taking part in physical activity in their free time. For each reason, please choose how important it is for you.” Ten of the original 11 items were included in the 2005 to 2006 HBSC survey. The item “be like a sports star” was not included because it was judged to be too sports-specific. Responses were anchored on a 3-point scale: 1 (not important), 2 (fairly important), and 3 (very important).

Analyses

To confirm the factor structure of motivation items and to test its relation with physical activity, we conducted the analyses in 2 steps. The first step was to perform 2 confirmatory factor analysis models (CFA): one tested how well the 10 items measured the 3 dimensions of motivation; the other was applied to the 3 physical activity (PA) items. Confirmatory factor analysis can be considered as a measurement model, which tests the relationship between a set of items and the constructs they measure (ie, factors or latent variables). Because there are dramatic age and gender differences in PA during early adolescence, we examined whether the factor structure was invariant across gender and grade. Multiple group approaches were used for both CFA models, with 4 groups created by gender and grade: males in grades 6 through 8, females in grades 6 through 8, males in grades 9 and 10, and females in grades 9 and 10. The second step was to develop a structural equation model (SEM) to examine the association between the 3 motivations and level of physical activity. In this model, all of the 4 variables were treated as latent variables, measured by several indicators as tested in the previous CFA models. To examine if the association differs by gender, a multiple group approach was used with gender as the grouping variable. As previous studies showed level of physical activity may decrease by grade or age and increase with SES and FAS (as a proxy of SES) were included as covariates.

All analyses were performed with Mplus software. There are several advantages of Mplus for our analyses. First, it allows the use of ordered categorical variables as indicators. In the current study, items of physical activity motivation only have 3 categories. It would be inappropriate to consider them as continuous variables. Second, the complex survey design was taken into account by the special feature of Mplus dealing with complex survey data. Specifically, weights were applied to generalize results to the population, and clustering was performed for the primary sampling units, with stratification using the stratum variable, thus adjusting standard errors for the complex sampling design. Another advantage of using Mplus is it enables us to make use of all available data, even for cases with some missing responses, through the estimation of Full Information Maximum Likelihood, FIML.

To evaluate the fit of our models, we used 3 indices of model fit: 2 comparative fit indexes (CFI and TLI); and the root mean square error of approximation (RMSEA). The CFI and TLI reflect the degree to which the sample variances and covariances are reproduced by the hypothesized model structure. CFI and TLI values above .90 usually indicate acceptable fit. RMSEA is used for assessing approximate fit, preferably with values less than or equal to .06. Chi-square statistics were less suitable in our study, given the large sample size.

Results

CFA—Measures of PA Motivations and Measures of PA

The result of the CFA of motivations revealed some problematic items (ie, CFI = .85, TLI = .86, and RMSEA = .07). Two items (to be good at sport and to win) were deleted from the 10-item original measure of motivations for sport. Item selection was based on both standardized factor loadings, R-square of items, as well as consideration of the measurement focus switching from “sports” to “physical activity.” By deleting 2 items, the goodness of fit indices showed acceptable fit; CFI = .92, TLI = .91, and RMSEA = .06. The result of CFA for physical activity items showed a very good fit, CFI = .99, TLI = .90, and RMSEA = .03. The factor loadings of motivation and PA items included in subsequent SEM are reported in Table 1.

SEM—Associations Between Motivations and Physical Activity

Results of the structural equation modeling (see Figure 1) showed a desirable fit (CFI = .92, TLI = .91, and RMSEA = .05).

Bivariate Correlations

The estimated bivariate correlations among the latent variables of the 3 motivations (social, health and external) and physical activity were reported in Table 2. For
<table>
<thead>
<tr>
<th>Items</th>
<th>Motivation</th>
<th>Social</th>
<th>Health</th>
<th>External</th>
<th>PA&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Make new friends&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. See my friends</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Have fun</td>
<td>0.69</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Get in good shape&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Improve my health</td>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Enjoy feeling of using body</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Look good&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Please my parents</td>
<td>0.72</td>
<td></td>
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</tbody>
</table>

Physical Activity
1. Exercise—times a week<sup>c</sup> | 1.000 |        |        |          |              |
2. Exercise—hours a week | 0.713 |        |        |          |              |
3. Physical activity in the past 7 days | 0.980 |        |        |          |              |

<sup>a</sup> Two items (to be good at sport and to win) were deleted from the 10 original measures of motivations, based on the result of 3-factor CFA. <sup>b</sup> PA = Physical Activity.
<sup>c</sup> Item was set as the reference variable for the factor it measures and the corresponding factor loading was fixed to 1.

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**Figure 1** — Structural equation modeling for the relationship of motivation and physical activities (male: N = 4280; female: N = 4569). Note: Ovals indicate latent construct. Rectangles indicate observed variables. Values are standardized coefficients. For graphical simplicity, factor loadings and measurement errors are not included. Covariates included age and family influence. * P < .05 ** P < .01 *** P < .001.
both boys and girls, health motivation had the strongest association with physical activity (.31 for boys and .24 for girls).

Regression Coefficients

Estimates of the standardized regression coefficients and correlations between the 3 motivations are reported for both boys and girls in Figure 1. Among all adolescents, health motivation had a strong and positive influence on PA (the standardized regression coefficient, $\beta$, is .56 for males and .54 for females). Social motivation had a relatively small but positive association with PA among female adolescents only ($\beta = .22$). When controlling for other motivations, external motivation was negatively related to PA (male: $\beta = -.34$; female: $\beta = -.53$). In addition, age was negatively related to PA among girls, in that 1 year increase in age was associated with .13 standard deviations decrease in PA (the unstandardized regression coefficient, $\beta = -.13$). FAS was positively associated with PA for both boys and girls (male: $\beta = .13$; female: $\beta = .19$). The predictors in the model explained 17.5% of the variation in PA among boys, and 28.5% among girls.

Discussion

One goal of the current study was to develop and validate a measure of multiple motives for adolescent physical activity. We modified a set of items obtained from previous work\textsuperscript{20} and tested its 3-factor structure measuring external, social, and health motivations for physical activity. The result of the 3-factor confirmatory factor analysis on the original 10 motivation items shows a desirable goodness-of-fit after 2 items (to be good at sport and to win) were removed. The item selection was based on the result of the factor loadings, as well as on the fact that the 2 items were designed to measure sports participation rather than general physical activity.

The 3-factor CFA indicates that a modified set of items obtained from previous work\textsuperscript{20} can be used to construct a motivational scale to predict physical activity in adolescents. The creation of a short scale to assess motivations for physical activity in adolescent populations is an important addition to the current literature. The scale derived in this study is appropriate for U.S. adolescents ages 10 to 17. The briefness of the measure is also an asset; it reduces the potential of participants experiencing “survey fatigue.” Although brief, the measure is able to identify 3 distinct factors (social, external, and health) that differentially predict adolescent physical activity. The multidimensional nature of this scale is one of its strengths.

Based on Self-Determination Theory,\textsuperscript{15} it was predicted that students who reported that external motivations for PA were important to them would have the lowest levels of PA and that students who reported that internal motivations for PA were important would have the highest levels of PA. When all 3 motivations were in the model, external motivations were negatively associated with PA; that is, if students reported external motivations as important they were more likely to have lower levels of PA. This is consistent with the hypothesis.

It was expected that students for whom social motivation was important would have the highest level of PA. Although social motivation was positively related to PA in the overall sample, it was significantly related to PA in the SEM for females only. This would suggest that internal motivation might be particularly important to maintain PA in adolescent girls. Female adolescents are less likely to engage in regular physical activity than their male peers\textsuperscript{8} and social motivation may be one way to reduce this difference.

Health motivation, a motivation that is on the internal end of the external motivation continuum, was significantly related to PA in the entire sample in both the male and female SEM models. It appears that adolescents recognize that PA has health consequences and believe

Table 2  Bivariate Correlations Among the 3 Motivations and Physical Activity

<table>
<thead>
<tr>
<th></th>
<th>Social motivation</th>
<th>Health motivation</th>
<th>External motivation</th>
<th>Physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social motivation</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health motivation</td>
<td>.49</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External motivation</td>
<td>.46</td>
<td>.78</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>.15</td>
<td>.31</td>
<td>.11</td>
<td>1.00</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social motivation</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health motivation</td>
<td>.30</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External motivation</td>
<td>.49</td>
<td>.69</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>.13</td>
<td>.24</td>
<td>-.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>
that these health consequences motivate their leisure-time PA. This would suggest that increased efforts to communicate the health benefits of physical activity may have a positive effect on adolescent PA.

The gender differences in the role of intrinsic motivation are surprising. Adolescent males and females frequently report that having fun is a major reason for engaging in sports and other physical activities but may be age-dependent.22 It has also been suggested that the effect of intrinsic motivation on PA may be mediated by perceived behavioral control. Perceived behavioral control was not assessed in this survey. However, perceived access to opportunities for PA may vary more and therefore be more important for the effect of social motivation in girls than in boys; boys may feel that they have ample opportunities for PA at school and in their neighborhoods. Explanation of this effect may depend on further exploration of mediators and moderators of the effect of intrinsic motivation on adolescent PA.37

This study has a number of limitations and assets. First, all the data are self-report. However, personal motivations are usually based on self-report and the items used to assess physical activity have been shown to have reasonable reliability and validity.29 A second limitation is that the study is cross-sectional, making it impossible to discern temporal associations. Future studies should focus on determining if changes in motivations for physical activity temporally precede changes in physical activity. Strengths of the study include the large, nationally-representative sample which suggests the findings are likely to generalize across adolescence and geographic regions of the U.S. In addition, the current study goes beyond simply classifying motivations for physical activity; it provides insight into how motivations that vary in their position along an external-internal continuum relate to physical activity. Finally, the findings of the current study have potential implications for interventions and public health efforts to increase physical activity in adolescent populations. By focusing on specific motivations that are predictive of physical activity, such interventions are likely to be more effective. As the childhood obesity epidemic continues to escalate,38 it is important for public health officials to understand motivational factors that may increase the likelihood that children will engage in regular physical activity.

In conclusion, the current study validates a short instrument that can be used to assess physical activity motivations in adolescent populations. The measure includes subscales reflecting different levels of internal/external motivations and the differential effect of internal versus external motivations would support further exploration of the application of Self-Determination Theory to adolescent physical activity.

Acknowledgments

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