PREDICTION OF PHYSICAL ACTIVITY INTENTION AND BEHAVIOR IN A LONGITUDINAL SAMPLE OF ADOLESCENT GIRLS

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Summary.—The purpose of the present study was to investigate a theory of planned behavior model for the prediction of physical activity in adolescent girls using a 1-yr. longitudinal design. A secondary purpose was to examine the moderating influence of intention stability and past behavior on intention-behavior relationships. Participants were 236 12- to 13-year-old adolescent girls who completed measures of the theory of planned behavior and physical activity participation (3-Day Physical Activity Recall) across a 1-yr. interval. The standard theoretical variables predicted intentions, as intention, past behavior, and perceived behavioral control predicted behavior. The temporal stability of intentions and past behavior moderated relationships between intention and behavior. An autoregressive path model showed that intention and perceived behavioral control predicted changes in physical activity and physical activity predicted changes in intention, affective attitude, and perceived behavioral control. This study supports the use of the theory of planned behavior in gaining an understanding of the physical activity intention and behavior of adolescent girls.

Physical activity is an important predictor of the short- and long-term health of children and adolescents (Biddle, Gorely, & Stensel, 2004). Children and adolescents who participate in more physical activity are less likely to display risk factors for cardiovascular disease and more likely to have positive outcomes in weight regulation (Strong, Malina, Blimkie, Daniels, Dishman, Gutin, et al., 2005). However, increasing evidence indicates that young people do not participate in physical activity of sufficient intensity, duration, and frequency for health benefits (Biddle, et al., 2004). For example, in one population-based study, the median physical activity during leisure time among girls ages 9 to 18 years has declined by about 80% (Kimm, Glynn, & Kriska, 2002). To slow down or reverse this trend, gaining greater insight into the cognitive determinants of children’s physical activity behavior is required.

Research on correlates of physical activity behavior is increasingly adopting different theoretical frameworks as a means of understanding changes in behavior (Godin, 1994). One popular psychological model which has received wide attention in health behavior research is the theory of planned behavior (Ajzen, 1991). This theory suggest that the proxi-
mal predictor of behavior is an individual’s stated intention to perform the target behavior in a given context and at a given time. Intention is considered to be a motivational variable and is a context-specific representation of goal-directed behavior (Ajzen, 2002). Intention is a function of three variables, namely, person’s attitude, subjective norms, and perceived behavioral control over the target behavior (e.g., physical activity). A number of recent applications of this theory has indicated the desirability of reconceptualizing each of the major constructs of the model as having two components (Ajzen, 2002; Rhodes, MacDonald, & McKay, 2006). Accordingly, the first construct attitude includes one’s affective (e.g., “It is enjoyable versus unenjoyable”) and instrumental (e.g., “It is harmful versus beneficial”) evaluations of performing the physical activity. The second construct is subjective norm which includes the injunctive (e.g., “My social network thinks I should engage in activity”) and descriptive (e.g., “My social network will engage in activity”) aspects of perceived social pressure on performing the physical activity behaviors. The final determinant is perceived behavioral control which is a person’s perception of the extent to which performance of the behavior is within control or is easy or difficult. The concept is similar to Bandura’s (1986) self-efficacy concept. Perceived behavioral control determines both intention and behavior (Conner & Godin, 2007).

Meta-analytic results (Hausenblas, Carron, & Mack, 1997; Hagger, Chatzisarantis, & Biddle, 2002) have shown that the theory of planned behavior explains approximately 40% of the variance in physical activity intention and approximately 30% in physical activity behavior across several populations. More specifically, results suggest that intention has a large effect on behavior and that attitude and perceived behavioral control have large independent effects on intention (Hagger, et al., 2002). Despite the demonstrated predictive power of the theory, it is clear that there is a substantial gap between intention and behavior (Sheeran, 2002). For example, a review of health behaviors indicated that 47% of participants with positive intentions subsequently did not perform their intended behavior (Sheeran, 2002). Whilst some of this is likely attributable to measurement problems and other factors linked to the nature of data, an important factor explored in recent studies is the temporal stability of intentions (Connor & Godin, 2007), which has been defined as “the extent to which . . . the cognitive variable remains unchanged over time regardless of whether or not it is challenged” (Sheeran, Orbell, & Trafimow, 1999, p. 724). As Ajzen (1996) argued, “. . . to obtain accurate prediction of behavior, intentions . . . must remain reasonably stable over time until the behavior is performed” (p. 389). The moderating role of temporal stability of intentions on intention-behavior relationships has been demonstrated in a number of studies.
(Sheeran, 2002; Sheeran & Abraham, 2003) over a 1- to 6-year time period. Recently, Conner and Godin (2007) reported the moderating influence of intention stability on intention-behavior relations for six different health behaviors (physical activity, exercise, general health goals, etc.). Specifically, greater intention stability was associated with significantly stronger intention–behavior relations. This was consistent despite variations in behavior, sample, and time interval over which predictions were made.

An interesting development in the application of the theory of planned behavior to health behaviors of children is the role past behavioral experience plays in the formation of the situation-specific cognitions and intentions prior to action (Sheeran & Abraham, 2003). Some studies suggest that having established a regular pattern of physical activity in childhood is an important determinant of physical activity behavior in adolescent years and adulthood (Malina, 2001). In addition, past physical activity behavior has been shown empirically to account for a large proportion of the variance in later health behaviors of adults (Conner & Armitage, 1998). Despite this, there is little evidence to date on the role of past physical activity behavior in the prediction of physical activity intentions and behavior of children and adolescents (Hagger, Chatzisarantis, Biddle, & Orbell, 2001). Hagger, et al. (2001), for example, showed that past physical activity behavior indicated additive rather than attenuating effects on follow-up physical activity.

To date, there have been relatively few tests of the theory of planned behavior with adolescent girls (Rhodes, et al., 2006). Nevertheless, there is some evidence to indicate that the theory of planned behavior may be useful to explain the cognitive influences of adolescents’ physical activity intentions and behaviors (Hagger, et al., 2001; Rhodes, et al., 2006). However, only a limited number of studies employing the theory of planned behavior (Nigg, 2001; Trost, Saunders, & Ward, 2002; Rhodes, et al., 2006) has involved adolescent girls. These studies provide mixed support for the efficacy of the theory of planned behavior, with three studies supporting its utility (Craig, Goldberg, & Dietz, 1996; Mummery, Spence, & Hudec, 2000; Rhodes, et al., 2006), and one study suggesting that associations between the theoretical variables and behavior are weak (Trost, et al., 2002). Moreover, researchers have advocated the need for long-term designs when evaluating the utility of the theory with physical activity among adolescent girls (Craig, et al., 1996; Mummery, et al., 2000; Rhodes, et al., 2006). Employing longitudinal techniques would indicate whether predictors of changes in cognition and behavior can be identified (Hagger, et al., 2001; Rhodes, et al., 2006).

The purpose of the present study was to investigate a theory of planned behavior model for the prediction of adolescent girls’ physical activity us-
ing a longitudinal design. Based on the tenets of the theory (Ajzen, 1991) and previous research (Hagger, et al., 2001; Rhodes, et al., 2006), it was expected that attitude, and subjective norm with perceived behavioral control would predict girls’ intention to engage in regular physical activity, and intention and perceived behavioral control would predict physical activity. A secondary purpose was to examine the moderating influence of intention stability and past behavior on intention–behavior relations for adolescent girls’ physical activity. It was hypothesized that both stability of intentions and past behavior would moderate the relationship of intention and behavior.

**Method**

**Participants**

Participants were 236 girls ranging in age at the beginning of the study from 12 to 13 years (M = 12.7 yr., SD = .5). Participants were recruited through their schools; all healthy subjects from a class participating regularly in the school physical education program. This age group was chosen mainly because habitual physical activity decreases markedly during late childhood and early adolescence, especially that of girls (Kimm, et al., 2002). All participants’ parents provided written informed consent and all girls provided written assent.

**Procedure**

The university ethics committee and relevant school educational authorities approved the study. The measures were translated into Estonian. A back-translation procedure was used to verify the consistency of the meanings by two researchers in sport psychology. Questionnaires were administered at two time points separated by a 1-yr. interval. Administration of the questionnaires was conducted in a school setting using a small station that consisted of a table and chairs for three to four students to complete the questionnaire at a time. A research assistant was present at this station to inform participants of the definition of “physical activity” and to answer students’ questions.

**Measures**

*Attitude* toward physical activity was measured with four items (Trost, et al., 2002). The affective component of attitude was measured with two items: (1) Doing physical activity every day for the next 1 yr. would be fun, and (2) Doing physical activity every day for the next 1 yr. would be enjoyable. The instrumental component was measured with two items: (1) Doing physical activity every day for the next 1 yr. would be good for me, and (2) Doing physical activity every day for the next 1 yr. would be important for me. All items were rated on a 4-point scale using anchors of 1: Disagree in a big way and 4: Agree in a big way.
Subjective Norm toward physical activity was measured with six items. The three injunctive norm items were: (1) My family wants me to be physically active every day over the next 1 yr., (2) My friends want me to be physically active every day over the next 1 yr., and (3) My teachers want me to be physically active every day over the next 1 yr. The three descriptive norm items were: (1) My family will be physically active every day over the next 1 yr., (2) My friends will be physically active every day over the next 1 yr., and (3) My teachers will be physically active every day over the next 1 yr. Subjective norm items were rated on a 4-point scale using anchors of 1: Disagree in a big way and 4: Agree in a big way. Internal consistencies were acceptable.

Perceived Behavioral Control over physical activity was measured with three items: (1) I could be physically active every day over the next 1 yr. if I really wanted to, (2) I have the time to be physically active every day over the next 1 yr. if I wanted to, and (3) I have a place to be physically active every day over the next 1 yr. if I wanted to. Items were rated on a 4-point scale using anchors of 1: Disagree in a big way and 4: Agree in a big way.

Physical Activity Intention was assessed by two items: (1) I plan to be physically active every day over the next 1 yr., and (2) I intend to be physically active every day over the next 1 yr. Items were rated on a 4-point scale using anchors of 1: Disagree in a big way and 4: Agree in a big way.

Stability of Intention

A number of indices of temporal stability has been reported in the literature. Based on previous research (e.g., Sheeran & Abraham, 2003), the absolute difference between the sums of the items used to tap intentions at the second time point minus the sum of the same items at the first time point was used. To ensure that high scores on the measure of stability represented greater stability, the scores were reversed by multiplying the stability scores by minus one.

Physical Activity

Self-reported physical activity was assessed by the 3-Day Physical Activity Recall (Pate, Ross, Dowda, Trost, & Sirard, 2003). This procedure required participants to recall physical activity behavior from three previous days of the week. The three days were segmented into 34 30-min. blocks, beginning at 7:00 a.m. and continuing through to 12:00 a.m. The 34, 30-min. blocks were grouped into broader time periods (e.g., before school, during school, and lunchtime). A list of 55 commonly performed activities grouped into broad categories (e.g., eating, work, after school/spare time/hobbies, transportation, physical activities, and sports) was included. For each of the 34 30-min. time blocks, girls reported the main activity performed and rated the relative intensity of the activity based on
illustrations depicting activities of the various intensities. On the basis of specific activity and its intensity, each 30-min. block was assigned a Metabolic Equivalent (MET) value. The MET values were summed over each of the days, and this measure is a global one representing all types of physical activities. The validity of the physical activity recall as a measure of physical activity has been estimated on the basis of correlations with an objective measure of physical activity derived from accelerometry (Pate, et al., 2003).

Data Analysis

The analyses first explored the intercorrelations of measures T₁ and T₂. The procedure recommended by Aiken and West (1991) was used to test whether stability of intention and past behavior moderated the relations between intention and behavior. This involved a three-step hierarchical regression analysis for both moderators. Intention, perceived behavioral control, intention stability, and past behavior were entered in Step 1. The two-way interaction terms (i.e., Intention × Stability, Intention × Past Behavior) were entered in Step 2. The three-way interaction term (i.e., Intention × Stability × Past Behavior) was entered in Step 3 to examine the hypothesized effects. Moderation is indicated when the interaction term has a significant regression coefficient and is associated with a significant increment in the explained variance. Prior to all analyses, variables were standardized to reduce potential multicollinearity (Aiken & West, 1991).

All of the main analyses were conducted using structural equation modeling using LISREL 8.7 for Windows (Jöreskog & Sörbom, 2004). Structural equation modeling allows both statistical significance tests for the size of each theoretical relation in the model and the assessment of overall model fit. Models were estimated with maximum likelihood procedures. To reduce the proportionality constraints of the models and improve power, fixed measurement models of the theoretical constructs were employed. These fixed error variance estimates were based on the suggested procedures of Schumacker and Lomax (1996) and used an averaged error for each construct of 1 − α. Specifically, as α represents the proportion of true score variance in a scale, then 1 − α represents the proportion of error variance in the scale (Rhodes, et al., 2006).

Further, a longitudinal model of the theoretical constructs across the two waves of data collected was created. In this model, cross-lagged autoregressive predictors of the constructs and physical activity were employed, as this strategy provides an analysis of longitudinal change (McCallum & Austin, 2000). That is, to test whether the variables at T₁ influence behavior at T₂, the effect of behavior T₁ on behavior T₂ should be statistically controlled. Similar autoregressive effects for each construct in the model were employed. This procedure allows examination of the pre-
dictive change from one time to another not confounded by prior relations between the same constructs. In this model, the effects of $T_1$ physical activity on follow-up constructs were freed, as prior behavioral experiences are likely an important influence on follow-up cognitions (Ajzen, 1991).

**Assessment of Model Fit**

A number of statistics exist to assess the adequacy of structural models (Hu & Bentler, 1999). The most common statistic is the $\chi^2$. The $\chi^2$ goodness-of-fit test assesses the adequacy of the theorized model's creation of a covariance matrix and estimated coefficients in comparison with the observed covariance matrix. Models which result in a created covariance matrix that significantly deviates from the observed covariance matrix are judged to be inadequate. However, the $\chi^2$ test has been criticized as an insufficient test alone to assess model fit adequately, generally because of sample size and power estimation problems or assumptions. Therefore, inclusion of absolute and incremental fit indices are recommended (Hu & Bentler, 1999). Absolute fit indices assess how well an *a priori* model reproduces the sample data, while incremental fit indexes measure the proportionate improvement in fit by comparing a target model with a more restricted baseline model. For the current study, root mean square error of approximation was included as an absolute fit index and the comparative fit index was included as an index of incremental fit. General rules of thumb for acceptability of model fit using these indexes are $> .94$ for the comparative fit index (CFI) and $< .07$ for root mean square error of approximation (RMSEA; Hu & Bentler, 1999).

**Results**

Before the theoretical models were estimated, the discriminant validity of affective attitude from instrumental attitude was tested. Construct distinction was achieved by constraining the correlations of affective attitude and instrumental attitude to unity, and then comparing this $\chi^2$ with a $\chi^2$ estimated as two correlated constructs (Anderson & Gerbing, 1988). A model consisting of correlated constructs for affective and instrumental attitude was a significantly better fit than a model with the correlation constrained to unity with $\chi^2$ difference $(1) = 73.67$ ($p < .05$). Therefore, affective and instrumental attitudes were included in the theoretical models as separate constructs. A similar procedure was applied to assess the discriminant validity of injunctive norms from descriptive norms. A model of the correlated constructs for injunctive and descriptive norms yielded a significantly better fit than a model with the correlation constrained to unity with $\chi^2$ difference, so injunctive and descriptive subjective norms were included in the models as a single construct of subjective norm.

Descriptive statistics for all constructs are presented in Table 1. The constructs had a full range of possible responses (i.e., 1 to 4) across par-
TABLE 1
MEANS, STANDARD DEVIATIONS, CRONBACH ALPHAS BY THEORY OF PLANNED BEHAVIOR VARIABLES AND PHYSICAL ACTIVITY (N = 236)

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. Items</th>
<th>Cronbach α</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective attitude T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>2</td>
<td>.74</td>
<td>3.38</td>
<td>.45</td>
<td>1–4</td>
</tr>
<tr>
<td>Instrumental attitude T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>2</td>
<td>.72</td>
<td>3.07</td>
<td>.39</td>
<td>1–4</td>
</tr>
<tr>
<td>Subjective norm T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>6</td>
<td>.72</td>
<td>3.15</td>
<td>.42</td>
<td>1–4</td>
</tr>
<tr>
<td>Perceived behavioral control T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>3</td>
<td>.71</td>
<td>3.19</td>
<td>.42</td>
<td>1–4</td>
</tr>
<tr>
<td>Intention T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>2</td>
<td>.81</td>
<td>3.17</td>
<td>.42</td>
<td>1–4</td>
</tr>
<tr>
<td>Physical activity T&lt;sub&gt;1&lt;/sub&gt;&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td></td>
<td>74.60</td>
<td>6.50</td>
<td></td>
</tr>
<tr>
<td>Physical activity T&lt;sub&gt;2&lt;/sub&gt;&lt;sup&gt;*&lt;/sup&gt;</td>
<td>2</td>
<td></td>
<td>69.60</td>
<td>6.90</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Measured as METs. <sup>*</sup>p < .05.

Participants, but the means were above 3.0 suggesting favorable cognitions toward physical activity. The means for the constructs did not change statistically significantly across two measurement points. The mean physical activity decreased significantly throughout the 1-yr. period. Table 2 shows correlations between constructs and physical activity behavior for T<sub>2</sub>. Intention, affective attitude, perceived behavioral control, and past behavior were all significantly correlated with later behavior, whereas all theoretical constructs were significantly associated with intention.

TABLE 2
INTERCORRELATIONS FOR THE THEORETICAL CONSTRUCTS AND PHYSICAL ACTIVITY (N = 236)

<table>
<thead>
<tr>
<th>Construct</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Affective attitude</td>
<td>.40*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Instrumental attitude</td>
<td>.22*</td>
<td>.30*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Subjective norm</td>
<td>.25*</td>
<td>.12</td>
<td>.17*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Perceived behavioral control</td>
<td>.31*</td>
<td>.38*</td>
<td>.28*</td>
<td>.18*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Past behavior&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.34*</td>
<td>.16*</td>
<td>.09</td>
<td>-.06</td>
<td>.46*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Future behavior&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.42*</td>
<td>.22*</td>
<td>.17*</td>
<td>.11</td>
<td>.38*</td>
<td>.47*</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Physical activity T<sub>1</sub>; <sup>b</sup>Physical activity T<sub>2</sub>; *p < .05.

Temporal Stability and Past Behavior as Moderators

The contributions of individual predictors in explaining physical activity behavior at T<sub>2</sub> are presented in Table 3. Physical activity intention (β = .31, p < .01), stability of intentions (β = .15, p < .05), past behavior (β = .27, p < .05), the interaction between intention and stability (β = .16, p < .05), intention and past behavior (β = .19, p < .05), and three-way interaction (β = .26, p < .05) were significant. An additional 5% of variance was explained by the three-way interaction. The simple slope analysis revealed that the intention-behavior relation was strong and positive (β = .48, p < .01) when the intention was stable, whereas the intention–behavior relation was weak (β = .08, p > .05) when the intention was unstable. Additionally, the intention–behavior relationship was positive and significant (β = .44,
When past physical activity was high, the intention–behavior relation was positive ($\beta = .38, p < .05$), whereas the intention–behavior relation was negative ($\beta = -.04, p > .05$) when past physical activity was low.

### TABLE 3

**Intention Stability and Past Behavior as Moderators of Intentions When Predicting Physical Activity ($N=236$)**

<table>
<thead>
<tr>
<th>Step</th>
<th>Variable Entered</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>1</td>
<td>Intention</td>
<td>.38†</td>
</tr>
<tr>
<td></td>
<td>Perceived behavioral control</td>
<td>.26*</td>
</tr>
<tr>
<td></td>
<td>Intention stability</td>
<td>.16*</td>
</tr>
<tr>
<td></td>
<td>Past behavior</td>
<td>.35†</td>
</tr>
<tr>
<td>2</td>
<td>Intention × stability</td>
<td>.14*</td>
</tr>
<tr>
<td></td>
<td>Intention × past behavior</td>
<td>.18*</td>
</tr>
<tr>
<td>3</td>
<td>Intention × stability × past behavior</td>
<td>.26*</td>
</tr>
<tr>
<td></td>
<td>$R^2$</td>
<td>.42</td>
</tr>
<tr>
<td></td>
<td>Model $F$</td>
<td>23.45‡</td>
</tr>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>.04†</td>
</tr>
</tbody>
</table>

*Note.* — Physical activity at $T_2$ was the dependent variable. *$p < .05$. †$p < .01$. ‡$p < .001$.

$p < .05$) when past physical activity was high, whereas the intention–behavior relation was negative ($\beta = -.04, p > .05$) when past physical activity was low.

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**Fig. 1.** Longitudinal model of the theory of planned behavior and physical activity across a 1-yr. time interval. All effects are standardized. *$p < .05$.**
The proposed longitudinal model was an acceptable fit of the data (Hu & Bentler, 1999) with $\chi^2 = 44.23$ ($p < .05$); RMSEA = .04; CFI = .97. The structural effects are presented in Fig. 1. In the first wave, affective attitude $T_1$ (standardized effect = .38), subjective norm Time 1 (standardized effect = .27), and perceived behavioral control $T_1$ (standardized effect = .39) were significant ($p < .05$) correlates of intention $T_1$, while instrumental attitude was not. In addition, intention $T_1$ (standardized effect = .31; $p < .05$) and perceived behavioral control $T_1$ (standardized effect = .33; $p < .05$) predicted physical activity at $T_2$.

**Discussion**

This research explored the applicability of the theory of planned behavior in understanding physical activity behavior in adolescent girls. The findings partly support the first hypothesis, according to which attitudes, subjective norms, and perceived behavioral control predicted intention and perceived behavioral control and intention predicted physical activity. The temporal stability of intentions and past behavior moderate the relationship between intention and behavior. Specifically, higher intention stability and more past behavior were associated with significantly stronger intention–behavior relationship. The longitudinal model showed that changes in physical activity and in related cognitions were predicted across one year. However, these findings do not identify potentially reciprocal influences of physical activity change on the theoretical variables. Experimental research is needed to identify the causal influence of cognitions in explaining change in physical activity in children and adolescents. However, the current study improved upon past limited longitudinal research (Hagger, et al., 2001; Rhodes, et al., 2006) by supporting the use of the theory of planned behavior as a framework for demonstrating the salient social cognitive influences on adolescent girls’ physical activity intentions and behavior.

The current results provide considerable support for the efficacy of the theory of planned behavior model in predicting girls’ physical activity. As expected, attitudes and perceived behavioral control significantly predicted girls’ intentions to engage in regular physical activity across a 1-yr. period. However, a significant effect of instrumental attitude in girls’ physical activity intentions emerged only in the follow-up measurement, and the effect of subjective norm on intention was significant in the first wave of data collection. These findings suggest that girls who have more favorable attitudes toward performing physical activity, perceive pressure from “significant others” to perform physical activity, and who believe they have more confidence in their ability to perform physical activity, will have stronger intentions to engage in physical activity on a regular...
basis. Strong intentions to perform physical activity, in turn, predicted the actual amount of physical activity. The significant influence of attitudes on physical activity intentions corroborates the results of several studies in which a significant effect of this variable on children’s and adolescents’ physical activity has been observed (Mummery, et al., 2000; Hagger, et al., 2001; Trost, et al., 2002; Hamilton & White, 2008). Further, the majority of studies using the theory of planned behavior in physical activity behavioral research has shown that attitudes have the most pervasive influence on intentions and also confirm the complete mediation of attitudes on behavior by intention (Mummery, et al., 2000; Hagger, et al., 2002). In contrast, the recent study by Rhodes, et al. (2006) indicated that children’s attitudes did not predict physical activity intention across a 3-mo. time interval.

A novel finding of the current study is that the influence of affective attitude on adolescent girls’ physical activity intention was more constant than the effect of instrumental attitude on intention. According to this finding, girls may intend to engage in physical activity largely on the immediate affective assessment of their attitudes regarding that behavior. For example, Hagger, et al. (2001) proposed that children’s attitudinal assessment will largely be a function of their current positive and negative evaluation of the attributes of the behavior. It is possible that for 12- to 13-year-old girls, their physical activity intentions will be mainly a function of a direct effect of their current affective attitudes. Interestingly, in a follow-up measurement 1 yr. later, the influence of instrumental attitude (e.g., “Doing physical activity for the next 12 months would be good and important for me”) on physical activity intention became significant, whereas the effect of affective attitude on intention, although still significant, decreased in absolute value. In addition, the stability of girls’ instrumental attitudes across the 1-yr. period (autoregressive effect) was markedly lower than the stability of affective attitudes. These results suggest that interventions for promoting increased physical activity in children and the adolescent population should focus on the promotion of a positive affective attitude as well as a positive instrumental attitude toward regular participation in physical activity.

The significant influence of perceived behavioral control on intention and participation in physical activity corroborates the results of a majority of studies in which a significant effect of this variable in adolescents’ physical activity context has been noted (Hagger, et al., 2001; Nigg, 2001). The strength of the present association is comparable with those of other studies on the adolescent population as well as with meta-analytic reviews of the theory of planned behavior for physical activity behavior (Hausenblas, et al., 1997; Hagger, et al., 2001). The current results also confirm the
conclusion that the contribution of perceived behavioral control to intentions is as substantial as that of attitude (Hausenblas, et al., 1997; Hagger, et al., 2001).

Contrary to perceived behavioral control and attitude, the influence of subjective norm on physical activity intention within the theory of planned behavior is more peripheral (Hagger, et al., 2001). The finding of the present study regarding to what subjective norm had a peripheral influence on physical activity intention corroborates the findings of Hausenblas and colleagues (1997), who noted that “attitude was over two times more useful as a predictor of intention than of subjective norm” (p. 43). However, in the first measurement, the influence of subjective norm on intention was, although in absolute value only low to moderate, statistically significant. Whereas several studies have shown a greatly reduced or nonsignificant effect of subjective norms on physical activity intentions among children and adolescents (Hagger, et al., 2001; Trost, et al., 2002), others have reported a significant effect of that variable on intention (Mummery, et al., 2000; Rhodes, et al., 2006). The inconsistency of these findings across studies is somewhat unexpected given that previous studies have shown parental and significant others’ support for physical activity to be an important correlate of children’s physical activity behavior (Sallis, Prochaska, & Taylor, 2000). It is possible that the construct of subjective norm, as operationalized by Ajzen (1991), may not be meaningful to young children. Specifically, as most children perceive habitual physical activity as health enhancing behavior, they may be reluctant to believe that important adult role models such as parents, teachers, and coaches would not want them to participate in physical activity. Alternatively, subjective norms regarding physical activity may be a salient influence on physical activity intentions in certain age groups of children but not in others (Trost, et al., 2002).

Thus, when examined across large and diverse groups of children, the explanatory power of subjective norms is attenuated. This is also congruent with Ajzen’s original thoughts (1991) that the relative contributions of the predictors of intentions may vary depending on behavior type as well as sample characteristics.

Present results supported the second hypothesis according to which stability of intention and past physical activity moderated the effect between intention and physical activity. Specifically, the inclusion of the interaction between the moderator variables (e.g., stability of intentions or past behavior) with intention was associated with a significant increment in the variance explained in physical activity. Therefore, the present research constitutes an advance in understanding intention–behavior discrepancies in several respects. First, this is the only study in which, simultaneously, two important moderator variables were tested and confirmed
that stability of intention and past physical activity behavior are associated with improved prediction of girls’ physical activity behavior by intention. Moreover, the consideration that the interaction term of intention by stability, but not intention alone, predicted behavior is consistent with Ajzen’s theoretical proposal (1991) that stability of intention is a precondition for a causal effect of intention on behavior. Furthermore, including past behavior as a predictor of intentions does not always extinguish the effect of social cognitive influences of the theory of planned behavior on intentions, as proposed by some researchers (Ajzen, 1991; Conner & Armitage, 1998). Therefore, if some effects of attitudes, perceived behavioral control, and subjective norms on intentions remain after controlling for past behavior, it indicates that the behavioral intention is influenced by situation-specific evaluations regarding the behavior as well as evaluations about the behavior executed in the past (Hagger, et al., 2001).

The longitudinal examination of girls’ cognitions related to physical activity behavior illustrates the complexity of the decision-making process. The longitudinal model showed that changes in physical activity and related cognitions were predicted across one year. The relatively low stability of intention, instrumental attitude, and subjective norms over time suggest that the autoregressive path coefficients do not perfectly model girls’ temporal cognition change. In contrast, the stability for affective attitude and perceived behavioral control across one year showed that these two cognitive predictors of girls’ physical activity remained relatively stable. In addition, the present results suggested that past physical activity predicted changes in affective attitude and perceived behavioral control, and that affective attitudes, instrumental attitudes, and perceived behavioral control predicted changes in intention. Moreover, intention and perceived behavioral control predicted changes in physical activity behavior. Using Cohen’s effect size \( r \) (1992) as an interpretational reference, girls’ physical activity had medium effects on changes in both affective attitude and perceived behavioral control, and perceived behavioral control across one year, and, in turn, perceived behavioral control had large effects and intention had medium effects on the change in physical activity. These findings indicate the reciprocal prediction between girls’ physical activity behavior and cognition, which is consistent with the hypothesis of reciprocal determinism put forth by Bandura (1998). More importantly, the findings also indicate that the theory of planned behavior is a valid model for predicting physical activity in a sample of girls.

Despite the promising findings, there are limitations that need to be considered. First, the sample size was relatively small; a larger number of participants from different age groups would have provided stronger evidence for the applicability of the theory of planned behavior in children.
Regional variability may also account for differences in previous and subsequent studies. Second, the theory of planned behavior showed utility for predicting intention and physical activity behavior, but use of additional psychosocial variables (beliefs, planning, self-efficacy, etc.) may be important to include in research. Third, although the 3-Day Physical Activity Recall is validated for use with this age group (Pate, et al., 2003), objective measures of physical activity (accelerometers, observation, etc.) are far more desirable, particularly for children. Finally, comment should be made on the inclusion of past behavior–behavior relationships in models such as the theory of planned behavior. Some researchers have suggested that the inclusion of past behavior–behavior relation in the theory of planned behavior has little “useful purpose” (Hagger, et al., 2001) and its effects should be mediated by the intention component (Ajzen, 1991). However, many studies have reported a unique effect of past behavior on later intention and behavior (Sutton, 1994; Hagger, et al., 2001). The present study has focused on the notion that past behavior may control for the habitual effects (Triandis, 1977) and allows testing the unique effects of recent behavior on current cognitions. Further, past behavior is also viewed as an additional source of information (Conner & Armitage, 1998) for the $T_1$ and $T_2$ theory of planned behavior cognitions and has additive effects on the cognitions (Hagger, et al., 2001).

Notwithstanding the above limitations, the present study extended the prior literature concerning the theory of planned behavior and physical activity in adolescents by including a longitudinal design. Overall, the current study provided support for the efficacy of the theory of planned behavior model in understanding adolescent girls’ physical activity intention and behavior. Physical activity and the theory of planned behavior predicted changes in physical activity and cognitions across a 1-yr. period. The current study yielded support for the inclusion of stability of intention and past behavior, within the theory of planned behavior model, as important moderators of adolescents’ physical activity intention and behavior. Finally, the present results should have implications for health and exercise professionals. Given the decline in adolescent physical activity and the current crisis of both national and international childhood obesity, determining the important cognitive factors in predicting physical activity is essential to enable the development of normative and control-based interventions to combat youths’ inactivity.

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