A Test of the Theory of Planned Behavior to Explain Physical Activity in a Large Population Sample of Adolescents From Alberta, Canada

Ronald C. Plotnikoff, Ph.D.¹,²,*, David R. Lubans, Ph.D.¹, Sarah A. Costigan ³, Linda Trinh, M.A.⁴, John C. Spence, Ph.D.⁴, Shauna Downs, M.Sc⁵, and Linda McCargar, Ph.D.⁶

¹ School of Education, Faculty of Education and Arts, University of Newcastle, Callaghan, New South Wales, Australia
² School of Public Health, Faculty of Physical Education, University of Alberta, Edmonton, Alberta, Canada
³ Behavioural Medicine Laboratory, University of Alberta, Edmonton, Alberta, Canada
⁴ Faculty of Physical Education and Recreation, University of Alberta, Edmonton, Alberta, Canada
⁵ Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta, Canada

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ABSTRACT

Purpose: To test the Theory of Planned Behavior (TPB) in a large population sample of adolescents from Alberta, Canada.

Methods: 4,073 adolescents completed a self-administered web-based survey related to physical activity (PA).

Results: TPB explained 59% and 43% of the variance for intention and behavior, respectively. Moderating (by gender) and mediating tests were supported.

Conclusions: TPB is useful for understanding PA in this population.

The Theory of Planned Behavior (TPB) [1] is a major social-cognitive theory that has been applied to explain physical activity (PA) behavior in numerous populations. Briefly, the TPB proposes that a person’s intention to perform a behavior is the central determinant of that behavior because it reflects the level of motivation a person is willing to exert to perform the behavior [1]. Intention is hypothesized to be determined by attitude, subjective norm, and perceived behavioral control. Attitude is reflected in a positive or negative evaluation of performing the behavior. Subjective norm is defined as the perceived social pressure to perform the behavior, whereas perceived behavioral control is defined as the perceived ease or difficulty of performing the behavior. Perceived behavioral control is also hypothesized to directly predict behavior. However, the core tenets of the TPB have not been thoroughly tested for PA in adolescent populations. The primary objective of this study was to examine the explanatory power of the TPB to explain PA behavior in a large population sample of adolescents. Secondary objectives were (i) to examine the moderating effects of gender on the TPB, and (ii) to test the mediating effects of intention on the relationship between attitude, subjective norm, and perceived behavioral control with behavior.

Methods

The Web-Survey of Physical Activity and Nutrition was self-administered to students in grades 7–10, across the province of Alberta, Canada. Of the 59 school boards in the province, 85% agreed to have schools participate. Of 271 schools contacted, 109 schools across 37 school boards participated, reflecting a school board and school response rates of 64% and 40%, respectively. Overall, 4,073 of a potential 9,071 adolescents consented and completed the survey, yielding a student response rate of 44.9%. Ethics approval was obtained from the University of Alberta.

Measures

Validated, short measures (5-point response options) of core TPB constructs (the measures of attitude, subjective norm, and intention were modified from Hagger et al [2]) were used to
minimize response burden. A two-item construct was used to assess attitude on the basis of enjoyment and PA importance [2]. A single-item assessed subjective norm [2] which asked: “Most people important to me think I should take part in regular PA.” As a proxy to perceived behavioral control, a 4-item self-efficacy measure (α = .83) [3] assessed confidence in participating in PA under various circumstances (e.g., when tired, having homework). A single-item construct was used to assess intention, for instance, “I plan to be physically active on a regular basis over the next month.” The validated Physical Activity Questionnaire for Older Children [4] was used to assess PA levels of the participants during the previous 7-day period.

Model testing (primary objective)

Structural equation models were examined using analysis of moment structures (AMOS) 17.0. To correct for the clustering of effects at the school level, all variables were adjusted for school, using multiple linear regression, and the unstandardized residuals were used in the analyses. The proposed model was tested using maximum likelihood analysis in AMOS and the Physical Activity Questionnaire for Older Children score was used as the dependent variable.

Moderation and mediation analyses (secondary objective)

Gender was identified as a potential moderator of the TPB model. Multigroup moderation analyses were conducted using a series of models, starting from unrestricted to fully constrained [5]. A Δ comparative fit index (CFI) ≤ .01 indicates that the null hypothesis of invariance should not be rejected [6] for testing multigroup invariance.

Intention is thought to mediate the relationship between attitude, subjective norm, perceived behavioral control, and the behavior itself. The indirect effects of attitude, subjective norm, and perceived behavioral control were examined using single and multiple mediator models and asymmetric confidence intervals tested the significance of the indirect effects [7]. The product of the standardized coefficients was calculated to provide an estimate of effect size and interpreted as small (d = .2), medium (d = .5), and large (d = .8) [8].

Results

Overview

The sample reflects the age/sex distribution for Alberta youth. The mean age of our sample was 13.6 (±1.4) versus 13.3 (±1.3) years in the total population of Alberta of students in grades 7–10 (N = 130,000). The proportion of boys in our sample was 46% versus 51% (grades 7–10) for the province. The sample (N = 4,073) included 1,785 boys and 2,270 girls (18 students did not provide gender).

Model testing

Although the χ² statistic was significant (χ² = 364.57, df = 22, p < .001), the TPB model represented an excellent fit to the data based on varying indices (goodness of fit [GFI] = .98, adjusted goodness of fit [AGFI] = .96, CFI = .98, root mean square error of approximation [RMSEA] = .06). All the pathways were significant (p < .001) and the model explained 59% and 43%, respectively, of the variance for intention and behavior (Figure 1).

Moderation analyses

The model was tested separately for boys and girls. In both groups, the model was found to be an excellent fit to the data (boys: χ² = 121.12, df = 22, p < .001, GFI = .99, AGFI = .97, CFI = .99, RMSEA = .05; girls: χ² = 214.88, df = 22, p < .001, GFI = .98, AGFI = .96, CFI = .98, RMSEA = .06). Model 1 (unrestricted model) was not significantly different from model 2 (measurement of equivalent model which includes equal factor loading across sub-samples). Model 3 (model constraints plus equal factor variance and covariances) was significantly different (ΔCFI = -.08) from model 2, suggesting that the relationship between constructs was stronger among boys. Similarly, model 4 (included model 3 constraints plus equal paths) was significantly different (ΔCFI = -.03) from model 3, indicating stronger path coefficients for boys. Model 5 (fully constrained model with the model 4 constraints plus equal factor residuals) was also significantly different from model 4 (ΔCFI = -.10).
Mediation analyses

The indirect effects of attitude, subjective norm, and perceived behavioral control are reported in Table 1. Intention to be active was found to mediate the relationship between these variables and PA in both single and multiple mediator models. All the hypothesized mediation pathways were statistically significant, supporting the role of intention to be physically active as a mediator of the relationship between attitude, subjective norm, perceived behavioral control, and PA behavior. The largest effects were found when intention was tested as a mediator of the relationship between attitude and behavior ($\alpha \beta = .20$ in the single mediator model and $\alpha \beta = .07$ in the multiple mediator model).

Discussion

This research appears to be the largest TPB study on youth conducted with a representative sample. Overall, our results support the TPB with statistically significant values for all construct pathways. Perceived behavioral control and intention accounted for 43% of the variance in behavior for the overall sample. Attitude, subjective norm, and perceived behavioral control explained 59% of the variance for intention. These results are generally consistent with PA-TPB literature in both adolescent and adult populations [9,10].

Differences existed in the strength of associations between TPB constructs when comparing the gender-specific models. However, for both genders, perceived behavioral control was the strongest correlate of behavior, and attitude was the strongest correlate of intention. This highlights the importance of practitioners/teachers to provide enjoyable activities and strategies to enhance adolescents’ confidence to adopt and sustain regular PA.

Finally, the assumptions for mediation were satisfied for all three TPB constructs (i.e., attitude, subjective norm, perceived behavioral control). Although the sizes of the mediated effects were small, they did have important implications at the population level.

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References