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Social Cognitive Theory and Physical Activity Among Korean Male High-School Students

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Abstract

The most critical step in developing and implementing effective physical activity interventions is to understand the determinants and correlates of physical activity, and it is strongly suggested that such effort should be based on theories. The purpose of this study is to test the direct, indirect, and total effect of social cognitive theory constructs on physical activity among Korean male high-school students. Three-hundred and forty-one 10th-grade male students were recruited from a private single-sex high school located in Seoul, South Korea. Structural equation modeling was used to test the expected relationships among the latent variables. The proposed model accounted for 42% of the variance in physical activity. Self-efficacy had the strongest total effect on physical activity. Self-efficacy for being physically active was positively associated with physical activity ($p < .01$). Self-efficacy also had positive indirect effects on physical activity through perceived benefits ($p < .05$) and goal setting ($p < .01$). The results of this study indicated that the social cognitive theory is a useful framework to understand physical activity among Korean male adolescents. Physical activity interventions targeting Korean male high-school students should focus on the major sources of efficacy.

Keywords

physical activity, social cognitive theory, adolescent, structural equation modeling, male

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Considerable evidence suggests that regular physical activity has important health benefits for adolescents (Strong et al., 2005; Warburton, Nicol, & Bredin, 2006; World Health Organization, n.d.). Engaging in regular physical activity has been reported to reduce the risk of various kinds of chronic diseases such as diabetes, osteoporosis, obesity, cancer, and hypertension and improve psychological well-being through reduced depression, anxiety, and stress. Performing physical activity has been identified to decrease the risk of premature death in school-age youth (Strong et al., 2005; Warburton et al., 2006; World Health Organization, n.d.). Despite these tremendous health benefits of regular physical activity, the results of the Korea Youth Risk Behavior Web-Based Survey (KYRBS) indicates that less than 15% of Korean high-school students participated in at least 60 min of moderate-to-vigorous physical activity on 5 or more days per week in 2015 (Centers for Disease Control and Prevention, n.d.). This is critically low compared to the United States where 48.6% of high-school students were moderately to vigorously active at least 60 min per day on 5 or more days per week in the same year (Centers for Disease Control and Prevention, n.d.). Given the beneficial health effects of regular physical activity, more attention should be paid to physical activity among adolescents because individual lifestyle behaviors established during adolescence are likely to remain unchanged throughout life (Heitzler et al., 2011).

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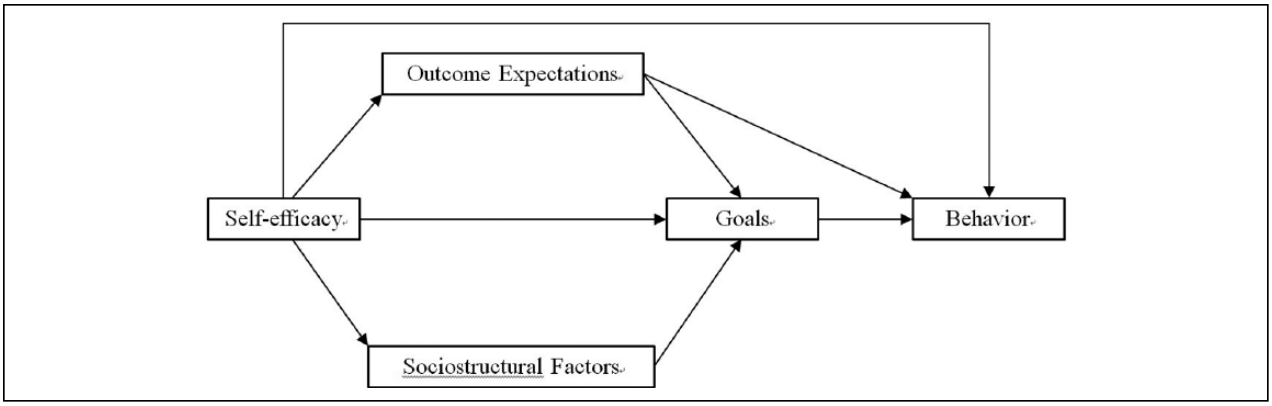

Figure 1. Social Cognitive Theory (Bandura, 2004).

The most critical step in developing and implementing effective physical activity interventions for adolescents is to understand the determinants and correlates of physical activity (Baranowski, Anderson, & Carmack, 1998; Pearson, Braithwaite, Biddle, van Sluijs, & Atkin, 2014), and it is strongly suggested that such effort should be based on theories because an atheoretical approach often has been identified as ineffective (Michie & Abraham, 2004). One of the theories that has received widespread attention in predicting and explaining health behaviors is Bandura's social cognitive theory (Bandura, 1986; Bandura, 1997; Bandura, 2004). Social cognitive theory emphasizes reciprocal determinism in person–environment interaction. Social cognitive theory posits that individual behavior is determined by the dynamic interaction of personal, behavioral, and environmental influences. While this theory recognizes how environments affect behavior, it also focuses on the individual's potential abilities to alter environments to achieve his or her purpose (Bandura, 1997). The two primary determinants of behavior in social cognitive theory are self-efficacy and outcome expectations. Self-efficacy is defined as an individual's beliefs about his or her capacity to perform behavior (Bandura, 2004). As presented in Figure 1, self-efficacy is expected to have a direct influence on behavior as well as indirect influences through all other components in social cognitive theory. Self-efficacy is widely known as one of the strongest determinants of physical activity participation (Rhodes & Nigg, 2011), and the majority of studies have identified that self-efficacy is consistently and strongly associated with physical activity (McAuley & Blissmer, 2000). Outcome expectations represent an individual's beliefs about the value and likelihood of the consequences of performing a behavior (Bandura, 2004). Social cognitive theory assumes that the individual will act in ways that he or she believes will lead to positive outcomes and avoid behaviors that he or she believes will result in negative outcomes (Williams, Anderson, & Winett, 2005). Goals and socio-structural factors are other core constructs of the social cognitive theory. As presented in Figure 1, goals are not only expected to have a direct effect on behavior but also expected to mediate the effect of all other social cognitive theory constructs (Bandura, 2004). Goals provide further guides and self-incentives for performing behavior. Long-term goals can serve as a general guide and short-term goals can inform current actions (Bandura, 1997). Socio-structural factors include various impediments and facilitators to performing behavior and are expected to influence behavior indirectly through goal setting (Bandura, 2004). These factors are also assumed to mediate the effect of self-efficacy on behavior.

Across studies, social cognitive theory constructs were consistently and strongly associated with physical activity participation among adolescents (Plotnikoff, Costigan, Karunamuni, & Lubans, 2013). However, although researchers should include all core constructs that are detailed in Figure 1 when comprehensively assessing the social cognitive theory, many previous studies that examined the effect of social cognitive theory constructs on adolescent physical activity did not include all four constructs (i.e., self-efficacy, outcome expectations, goals, and socio-structural factors; Petosa, Hortz, Cardina, & Suminski, 2005; Taymoori, Rhodes, & Berry, 2010; Winters, Petosa, & Charlton, 2003). Moreover, among these adolescent studies, only one study used structural equation modeling (path analysis) that allowed for investigation of total, direct, and indirect effects (Taymoori et al., 2010). Structural equation modeling enables researchers to identify how the theoretical process works to affect the outcome of interest because it models sequential systems of predictor, mediator, and outcome variables and assesses the relationships among them (Kline, 2016; Schumacher & Lomax, 2004). Therefore, researchers should ensure that all core social cognitive theory constructs are correctly specified with the appropriate direct and indirect pathways as presented in Figure 1. Reporting of the total, direct, and indirect effects of all core constructs on behavior is needed to confirm a valid determination of the actual utility of the social cognitive theory in the domain of adolescent physical activity (Young, Plotnikoff, Collins, Callister, & Morgan, 2014). The purpose of this study is to use structural equation modeling to test the direct, indirect, and total effect of social cognitive theory constructs on Korean adolescent physical activity. Only male adolescents were included in this study because male participants were substantially underrepresented in previous studies that used social cognitive theory to predict physical activity (Young et al., 2014).

Methods

Data

Tenth-grade male students were recruited from a private single-sex high school located in Seoul, South Korea. The school principal provided permission for student participation, and physical education teachers agreed to administer the survey during their classes. The authors trained physical education teachers to conduct the survey during their classes and to present the opportunity to participate in the survey to all 10th-grade students enrolled in the target school. The physical education teachers also distributed consent forms to target students and their parents/legal guardians. Out of the total of 347 tenth-grade students enrolled in this school, 341 (98.3%) students provided written assent and parental consent for completing the survey. The authors collected the consent forms from the physical education teachers. Participating students were then given a packet that included an incentive worth $3, letters of support, and survey questionnaires. During the survey, the physical education teachers remained in the classroom and responded to any questions posed by participating students. All survey data were collected in May 2016 because extremely hot or cold weather during the summer and winter months in South Korea may adversely limit physical activity participation of adolescents. This study was approved by Seoul National University Institutional Review Board (IRB No. 1604/002-003).

Measures

An English version of the questionnaire was translated for Korean male high-school students. The translation was conducted by a bilingual health behavior professor using Banville et al.'s procedures (Banville, Desrosiers, & Genet-Volet, 2000). A back translation was performed by one bilingual physical education professor and two bilingual graduate students majoring in physical education. Then, the questionnaire was edited by the same panel of bilingual experts based on a comparison between the original version and the back-translated version. Since selecting a middle or neutral response category is common among adolescents (Adkins, Sherwoo, Story, & Davis, 2004; Si & Cullen, 1998), 4-point and 6-point Likert scales were selected.

Self-efficacy for being physically active was measured with eight items adapted from previous studies (Reynolds et al., 1990; Saunders et al., 1997). A sample item for self-efficacy is "I am confident that I can make time for exercise no matter how busy my day." A 6-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*) was used to assess these items. The 10-item Perceived Benefits Scale and the 9-item Perceived Barriers Scale, which were developed for adolescents (Robbins, Wu, Sikorskii, & Morley, 2008), were used to assess perceived benefits (i.e., outcome expectations) of and perceived barriers (i.e., socio-structural factors) to physical activity. A sample item for perceived benefits is "I can spend time with family, friends, or team members when I exercise." Perceived Barriers Scale was supplemented with six items that were developed based on a pilot study to assess perceived barriers to physical activity among participating South Korean students. A sample item for perceived barriers is "I feel self-conscious or concerned about my looks when I exercise." Participants rated each item of the Perceived Benefits Scale and Perceived Barriers Scale on a 4-point Likert scale ranging from 1 (not at all true) to 4 (very true). Goal setting was assessed by the 10-item Exercise Goal-Setting Scale (EGS), which was developed by Rovniak, Anderson, Winett, & Stephens (2002). A sample item for goal setting is "I tend to break more difficult exercise goals down into a series of smaller goals." A 4-point Likert scale (1 = *does not describe* to 4 = *describes completely*) was used to assess these items.

An abridged version of the Physical Activity Questionnaire for Adolescents (PAQ-A) was used to assess the level of physical activity from the past 7 days because this questionnaire has been validated for use with adolescents (Kowalski, Crocker, & Donen, 2004). Five items were used to specifically measure physical activity (i.e., sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others) during physical education classes, right after school, during lunch break, in the evenings, and over the weekend, and one item was used to assess overall level of physical activity in free time during the past week. Each item of the questionnaire was scored on a 5-point scale.

Statistical Analysis

The present study examined direct and indirect effects of the social cognitive theory constructs (i.e., self-efficacy, perceived benefits, perceived barriers, and goal setting) on

Table 1. Descriptive Statistics of Social Cognitive Theory Constructs and Physical Activity Among Participants (N = 431).

Variables	Number of items	CR	Mean (*SD*)	Range
Self-efficacy	8	0.94	3.89 (1.19)	1–6
Perceived benefits	10	0.93	3.35 (0.52)	1–4
Perceived barriers	15	0.88	1.84 (0.48)	1–4
Goal setting	10	0.94	2.34 (0.69)	1–4
Physical activity	6	0.84	2.67 (0.91)	1–5

Note. SD = standard deviation; CR = composite reliability.

physical activity among South Korean male high-school students. The confirmatory factor analysis was used to test an overall measurement model that included five correlated latent variables (i.e., self-efficacy, perceived benefits, perceived barriers, goal setting, and physical activity). Then, structural equation modeling was used to test the expected relationships among the latent variables. The order of variable entry in the model was based on the hypothesized theoretical framework presented in Figure 1. The direct and indirect relationships of the variables were examined using the structural equation modeling. The parameters in the structural equation models were estimated using the full-information maximum likelihood (FIML) method. FIML method was used because it has been proved to be an optimal method to treat missing values (Arbuckle & Wothke, 1999; Enders, 2001). There were missing values on variables, ranging from 0.88% (n = 3) for goal setting to 3.52% (n = 12) for perceived benefits and self-efficacy. Indirect effects were tested using the Sobel method (Sobel, 1982). Four model fit indices were used to evaluate goodness of fit (i.e., χ^2, root mean square error of approximation [RMSEA], standardized root mean square residual (SRMR), and comparative fit index (CFI). The analyses were conducted using Mplus Version 7 (Muthen & Muthen, 2010).

Results

Descriptive Statistics

The descriptive statistics of social cognitive theory constructs and physical activity are presented in Table 1. The mean scores of self-efficacy for being physically active and perceived benefits of physical activity were high, whereas the mean scores of perceived barriers to physical activity, goal setting, and physical activity were relatively low. All composite reliabilities were much greater than the suggested value of 0.80.

The Measurement Model

The standardized paths from self-efficacy, perceived benefits, perceived barriers, goal setting, and physical activity latent variables to their respective items were specified in Figure 2. The correlations among all latent variables were allowed in the model specification. Although the χ^2 value was significant (χ^2 = 2877.810, df = 1117, p < .01), RMSEA was 0.068, SRMR was 0.075, and CFI was 0.834, indicating that the measurement model is representing the data accurately (Steiger, 2007; Hu & Bentler, 1996; Iacobucci, 2010).

The Structural Model

Fit indices indicated that the proposed theoretical model fits the data (χ^2 = 2897.399 [df = 1119, p < .01], RMSEA = .068, SRMR was .082, and CFI = .833). As presented in Figure 3, all standardized paths were significant except for the path from perceived benefits of physical activity to goal setting. Self-efficacy for being physically active was positively associated with perceived benefits (β = .408, SE = .049, p < .01), goal setting (β = .583, SE = .050, p < .01), and physical activity (β = .461, SE = .061, p < .01) and negatively associated with perceived barriers to physical activity (β = −.421, SE = .050, p < .01). Perceived barriers to physical activity was positively associated with goal setting (β = .115, SE = .056, p < .05). Both goal setting (β = .171, SE = .062, p < .01) and perceived benefits (β = .143, SE = .055, p < .01) were positively associated with physical activity. In addition, the model explained 17% of the variance in perceived benefits of physical activity, 18% of the variance in perceived barriers to physical activity, 35% of the variance in goal setting, and 42% of the variance in physical activity.

The indirect effects from self-efficacy, perceived benefits of physical activity, and perceived barriers to physical activity were also examined (Table 2). Self-efficacy for being physically active had positive indirect effects on physical activity through perceived benefits (β = .058, SE = .023, p < .05) and goal setting (β = .100, SE = .037, p < .01). Perceived benefits of and perceived barriers to physical activity did not have any significant indirect effect on physical activity through goal setting.

Discussion

The present study used structural equation modeling to investigate how the social cognitive theory works to affect physical activity among Korean male high-school students. Unlike previous studies, this study also included all core constructs that are detailed in Figure 1 to comprehensively assess the social cognitive theory (Petosa, Hortz, Cardina, & Suminski, 2005; Taymoori et al., 2010; Winters et al., 2003). It is important to confirm that all core social cognitive theory constructs are accurately specified with the appropriate direct and indirect pathways because examining the total, direct, and indirect effects of all core constructs on behavior is needed to

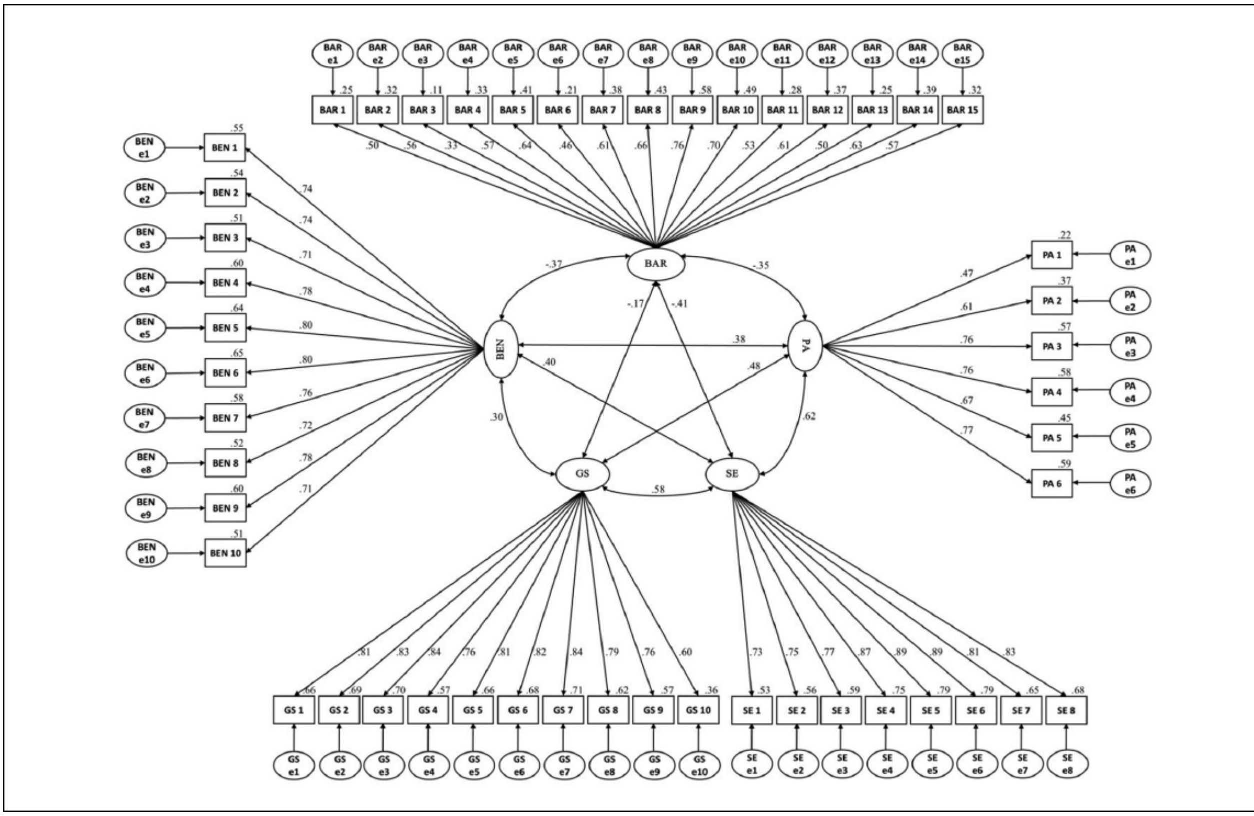

Figure 2. The Measurement Model.

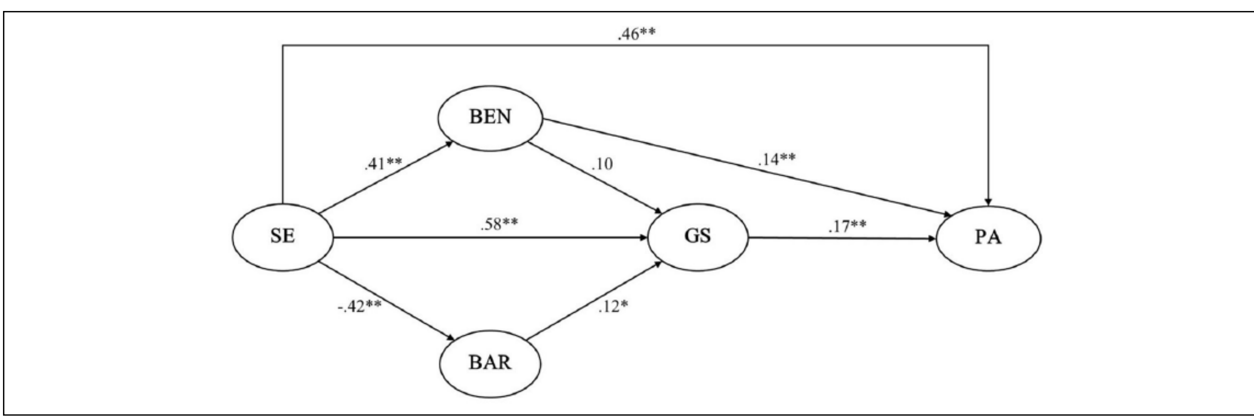

Figure 3. The Structural Model.

Table 2. The Indirect Effects of Social Cognitive Theory Constructs on Physical Activity Among Participants.

Indirect effects				Coefficients	95% CI
Self-efficacy	→ Perceived benefits		→ PA	0.058*	[0.012, 0.104]
Self-efficacy	→ Goal setting		→ PA	0.100**	[0.026, 0.174]
Self-efficacy	→ Perceived benefits	→ Goal setting	→ PA	0.007	[−0.003, 0.017]
Self-efficacy	→ Perceived barriers	→ Goal setting	→ PA	−0.008	[−0.018, 0.002]
Perceived benefits	→ Goal setting		→ PA	0.017	[−0.005, 0.039]
Perceived barriers	→ Goal setting		→ PA	0.020	[−0.004, 0.044]

Note. PA = physical activity; CI = confidence interval.
*p < .05. **p < .01.

confirm whether social cognitive theory is a useful tool in the domain of adolescent physical activity (Young et al., 2014). The results identified that the proposed theoretical model fits the data and all paths presented in Figure 3 were significant except for the path from perceived benefits to goal setting. In addition, self-efficacy also had significant indirect effects on physical activity behavior through goal setting and perceived benefits. The social cognitive theory accounted for 42% of the variance in physical activity behavior among Korean male high-school students. This is much higher than Baranowski et al.'s recommendation for a theoretical model to be considered useful to design intervention ($R^2 \geq .30$; Baranowski et al., 1998). Previous studies that examined the effect of social cognitive theory constructs on adolescent physical activity reported similar results ($.29 \leq R^2 \leq .52$; Petosa, Hortz, Cardina, & Suminski, 2005; Taymoori et al., 2010; Winters et al., 2003), indicating that the social cognitive theory may be a useful framework for designing physical activity intervention for adolescents. Therefore, it is necessary to develop physical activity promotion programs for Korean male high-school students based on the social cognitive theory. However, since there are other factors accounting for 58% of the variance in physical activity behavior, future studies need to include other variables as well when examining the social cognitive theory.

Among the four social cognitive theory constructs, self-efficacy had the strongest total effect on physical activity. Korean male high-school students with higher self-efficacy for being physically active were significantly more active than those with lower self-efficacy were. The present study is in line with the established body of evidence indicating that self-efficacy is strongly associated with physical activity behavior (McAuley & Blissmer, 2000). Since self-efficacy exerted the strongest total effect on physical activity, physical activity interventions targeting Korean male high-school students should focus on enhancing self-efficacy.

Previous studies that examined the relationship between perceived barriers to physical activity and goal setting produced mixed findings (Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2008; Ramirez, Kulinna, & Cothran, 2012), and none of the previous studies that examined the effect of social cognitive theory constructs on adolescent physical activity investigated this relationship (Petosa et al., 2005; Taymoori et al., 2010; Winters et al., 2003). In this study, perceived barriers were positively associated with goal setting among Korean male high-school students. According to the construal theory, decisions that are made about future behavior will focus much more on desirability than feasibility of performing the behavior (Liberman & Trope, 1998). People may respond positively to restrictions on the behavior if the positive aspect of performing the behavior is stronger than the negative aspect of expending effort to perform the behavior (Chernev, 2003; Chernev, 2005; Gourville & Soman, 2005; Iyengar & Lepper, 2000; Schwartz, 2004). Korean male high-school students may be motivated enough to set goals for physical activity because their perceived benefits of doing physical activity (mean ± standard deviation [*SD*] = 3.35 ± 0.52) are stronger than perceived barriers to physical activity (mean ± *SD* = 1.84 ± 0.48).

The present study is subject to several limitations. First, all the social cognitive theory constructs used in this study were self-reported, which could introduce recall bias or response bias. Second, although this study used an already validated physical activity questionnaire for high-school students (Kowalski, Crocker, & Donen, 2004), it would have been desirable to use objectively measured physical activity (Newell, Girgis, Sanson-Fisher, & Savolainen, 1999). Third, due to the cross-sectional design of the present study, some caution is required in interpreting the results of this study. However, although causal relationships among study variables cannot be determined, the proposed model tested in this study was derived from the social cognitive theory (Bandura, 2004). Because the results are quite consistent with the social cognitive theory, they are sufficient to encourage intervention studies, which can determine whether changes in social cognitive theory constructs affect physical activity among Korean male high-school students. Despite these limitations, the results of this study may contribute to the literature by providing valuable information suggesting that the social cognitive theory may be a useful framework for understanding physical activity behavior among Korean male high-school students.

Declaration of Conflicting Interests

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