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Sport Education and Extracurricular Sport Participation: An Examination Using the Trans-Contextual Model of Motivation

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In this study, we used the trans-contextual model of motivation (TCM) to examine the effect of Sport Education (SE) on students' participation in a voluntary lunch recess sport club. A total of 192 participants (ages 9–14 years) completed measures of the TCM constructs before and after a 12-week SE intervention period. Participants had the opportunity to participate in weekly, voluntary lunch recess sport club sessions during the intervention period. SE elicited a moderate increase in autonomous motives in physical education. The TCM accounted for a significant proportion of the explained variance in lunch recess sport club intention and participation. Autonomy-supportive curricular models, such as SE, may have the potential to facilitate transfer of motivation and participation in physical activity from a physical education to an extracurricular context.

Key words: autonomous motivation, lunch recess physical activity, physical education

Research has indicated that increasing young people's physical activity levels yields immediate and long-term health benefits, including weight control and obesity management (Strong et al., 2005). This health-related discourse regarding obesity prevention and treatment has created a renewed focus on physical education as a potential agent of change for increasing youth physical activity (National Association for Sport and Physical Education, 2004). Unfortunately, research examining physical education curricula to promote extracurricular physical activity participation is lacking and warrants further attention (Shen, McCaughtry, & Martin, 2007).

There is considerable evidence identifying the motivational factors that are positively associated with physical activity behavior in young people (Sallis, Prochaska, & Taylor, 2000; Vallerand & Rousseau, 2001). Research has also shown that teacher behaviors, such as positive feedback statements, are strong predictors of students' intrinsic motivation in physical education (Koka & Hein, 2005). Few studies have examined the process by which curricula that influence motivational factors in physical education are translated into physical activity participation in choice-based leisure-time settings (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003). In the current study, we used the trans-contextual model of motivation (TCM) to study the effect of an autonomy-supporting physical education instructional model (Sport Education; Siedentop, Hastie, & Van der Mars, 2004) on students' participation in a lunch recess sport-based physical activity opportunity.

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Trans-Contextual Model of Motivation

The TCM specifies the processes by which motivation for physical activity in a physical education context are transferred into a leisure-time physical activity context (Hagger et al., 2003). The model draws from three prominent theories—self-determination theory (Deci & Ryan, 2000), theory of planned behavior (Ajzen, 1985), and the hierarchical model of motivation (Vallerand & Ratelle, 2002)—to provide a comprehensive explanation of these motivational processes. Self-determination theory pro-

vides the starting point for the trans-theoretical model and the key dispositional motivational constructs that energize behavior in both physical education and leisure-time contexts. The theory of planned behavior maps the process by which motivational constructs from self-determination theory are translated into action. Finally, the hierarchical model provides a unifying framework that describes the top-down links between the generalized, context-tied self-determination theory constructs and the specific, situational constructs from the theory of planned behavior.

Self-Determination Theory. Self-determination theory (SDT) is a dialectic, organismic theory of human motivation (Deci & Ryan, 2000). Its central theme is the distinction between autonomous and controlling forms of motivation. This distinction is often viewed on a continuum reflecting the perceived origin or cause of an individual's motivated behavior in a given context—known as the perceived locus of causality (Ryan & Connell, 1989). Autonomous motivation reflects behavior engagement, because it satisfies personally relevant goals and meets innate psychological needs for autonomy, competence, and relatedness. The prototypical form of autonomous motivation is intrinsic motivation, which is at one extreme of the continuum and represents behavioral engagement with no real or perceived external contingency or reinforcement. Identified regulation lies adjacent to intrinsic motivation and represents motivation to engage in a behavior because it serves an intrinsic or personally relevant goal. Conversely, external regulation reflects the prototypical form of extrinsic motivation. At the opposite extreme from intrinsic motivation, external regulation reflects behavior engagement due to external reinforcement, such as pressure from significant others. Adjacent to external regulation is introjected regulation, which reflects participation in a behavior due to perceived internal pressure, such as avoiding negative affective states like shame or guilt or gaining contingent self-worth or pride.

Self-determination theorists proposed that certain autonomy-supportive behaviors of significant others can influence autonomous motivation (e.g., Reeve, Bolt, & Cai, 1999). This has been supported empirically, and the level of perceived autonomy support by others is associated with autonomous motivation forms and behavioral persistence in a number of domains (Williams, 2002; Williams, Gagne, Ryan, & Deci, 2002), particularly in education (e.g. Vansteenkiste, Simons, Lens, & Sheldon, 2004).

Theory of Planned Behavior. The theory of planned behavior (TPB) is a social cognitive model that aims to explain the proximal determinants of specific volitional behaviors. It posits that an individual's stated intention is the most proximal influence on the behavior (Ajzen, 1985). Intention reflects the degree of planning and effort an individual is prepared to invest in pursuing that behavior. Intention is a function of three belief sets: attitudes, subjective norm, and perceived behavioral control (PBC). Attitudes are a person's overall positive or negative evaluation of the target behavior. Subjective norms summarize a person's expectation that significant others want him/her to engage in the behavior. PBC comprises a person's overall judgment of her/his ability and resources to engage in the target behavior. Intention is hypothesized to mediate the effects of these belief-based social cognitive constructs on behavior. Meta-analytic reviews have supported these hypothesized relationships in a variety of volitional behaviors (Armitage & Conner, 2001), including physical activity (Hagger, Chatzisarantis, & Biddle, 2002b).

Hierarchical Model of Motivation. Drawing from self-determination theory, Vallerand and Ratelle (2002) hypothesized that motivation from the perceived locus of causality could be conceptualized as operating at three general levels: global, contextual, and specific. Global motivation reflects generalized tendencies to be autonomously motivated and is expected to have an affect on behavioral engagement across a number of contexts. Motivation at the contextual level represents autonomous motivation to engage in various behaviors in a given context (Ryan & Connell, 1989), such as physical education or leisure-time physical activity (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003). Motivation at the situational level refers to autonomous motivation toward specific bouts of a given behavior. Motivation is often seen as emanating from the global to the situational level in a top-down fashion (Vallerand & Ratelle, 2002). The model also suggests that bottom-up effects exist, but there is little evidence to support these effects (Guay, Mageau, & Vallerand, 2003).

Integration of the Theories. The TCM's multitheory approach is based on the premise that SDT and TPB can offer complimentary explanations of motivation (Hagger, 2009), a premise supported empirically across many studies in exercise and health behavior (Hagger & Chatzisarantis, 2009). The hierarchical model is integrated in the TCM, because it offers a general framework to support the model relationships in terms of their trans-contextual nature and relative differences in generality. Four premises form the basis for integrating these theories (Hagger, Chatzisarantis, Barkoukis, Wang, & Baranowski, 2005). First, when forming social cognitive judgments in the TPB, individuals draw from the motivational orientations outlined by SDT for information. Deci and Ryan (2000) suggested that autonomous motivation in SDT should provide a basis for forming social cognitive judgments toward specific behaviors. This is based on the proposition that such motivational orientations need to be channeled into intentions to enact the appropriate need-satisfying behavior (Elliot, McGregor, & Thrash, 2002). Similarly, Ajzen (1985) has suggested that forming social cognitive constructs from the TPB draws from dispositional constructs, such as motivational orientations and personality as well as beliefs regarding the behavior. Therefore, generalized autonomous motives and perceived autonomous support

mechanisms act as an informative precursor in forming judgments and expectations regarding future behavior.

Second, the contextual-level motivational orientations from SDT affect judgments regarding future behavior, such as intention from the TPB, because such judgments reflect situational-level cognition and motivation. This distinction is based on hypotheses from the hierarchical model of motivation (Vallerand & Ratelle, 2002). The perceived locus of causality constructs are motivational orientations defined as acting in given context (Ryan & Connell, 1989), such as physical education or leisure-time physical activity (Chatzisarantis et al., 2003). On the other hand, the TPB constructs refer to a specific behavior bout, which is defined in terms of the specific action, the context in which it will be performed, the action target, and the time frame in which it will be performed.

Third, and most importantly for the TCM, Vallerand and Ratelle (2002) hypothesized there was cross-contextual interplay between motivation at the contextual level, suggesting that motives in one context can affect motivation in others. For example, if an individual exhibits a high level of autonomous motivation in an educational context, such as PE, this may also influence an autonomous motivational orientation in another related context outside of school, such as leisure-time physical activity. This provides a basis for transferring autonomous motivation across contexts, a central hypothesis in the TCM.

The fourth and final premise for integrating these theories refers to measuring the SDT and TPB constructs. At the empirical level, measures of the SDT motivational orientations are designed to reflect an individual's *current* perceived motivational status, while the TPB constructs are measured as expectancies regarding *future* behavioral engagement. Therefore, these constructs differ in their conceptual focus and measurement and, thus, should demonstrate discriminant validity empirically, but they are hypothesized to offer complimentary explanations of the processes leading to intentional behavior.

Tests of the TCM supported integration of these theories and the hypothesized relationships among the model constructs (Barkoukis & Hagger, 2009; Hagger et al., 2003; Hagger et al., 2005; Hagger & Chatzisarantis, 2007). Central to the TCM is students' perceived autonomy support from significant others. Specifically, perceived support in physical education can affect autonomous motivation in a leisure-time context via mediation of autonomous motivation in physical education. Consistent with previous research (Standage, Duda, & Ntoumanis, 2003), Hagger et al. (2003) found that perceived autonomy support in a physical education context influenced motivation in physical education. In the TCM, autonomous motives are hypothesized to mediate the effect of perceived support on behavioral outcomes, suggesting that motivational orientation is necessary to translate perceptions of support from significant others into behavior. Autonomous motivation in physical education has been found to affect autonomous motivation in a leisure-time context (Hagger et al., 2005). Further, autonomous motivation in leisure time was found to influence intention and behavior via mediating the proximal determinants of intentions, namely attitudes, subjective norms, and PBC (Hagger et al., 2005). These effects were based on the premises outlined previously and support other research adopting this integrated approach (Hagger & Chatzisarantis, 2009; Hagger, Chatzisarantis, & Biddle, 2002a; Hagger, Chatzisarantis, & Harris, 2006). The entire process was termed a motivational sequence comprising several mediation effects among the motivational variables from the constituent theories (Hagger et al., 2003). Overall, the indirect effects through proposed motivational sequence ($r = .16$, $p < .01$) accounted for the significant correlation between perceived autonomy support from physical education teachers and leisure-time physical activity behavior ($r = .33$, $p < .01$). The model accounted for 28% of the variance in physical activity behavior. Therefore, the TCM provided an explanatory system of the processes involved in transferring motivation from a physical education context into in leisure-time physical activity. However, little research has attempted to manipulate the physical education context through curricular intervention to promote an autonomy-supportive environment and analyze the effect of this experience on students' leisure-time physical activity participation.

Sport Education

The Sport Education (SE) model was designed to provide positive motivational sport experiences for all students in physical education by simulating key contextual features of authentic sport (Siedentop et al., 2004). In addition to helping students improve their sport skills, SE encourages their autonomy in physical education with the expectation that they fulfill other sport-related roles, such as referee, team coach, captain, or trainer. Within the structure of this model, students gradually assume greater responsibility for learning, and teachers relinquish traditional up-front direct teaching roles. The teacher provides autonomy support by assuming the role of facilitator to student social knowledge and skill learning through a range of peer teaching strategies that differ from the traditional teacher-led instructional model (Siedentop et al., 2004). These strategies include teaching behaviors validated as autonomy-supportive, including, "student time spent talking, time allowing students to work in their own way, offering encouragements, and being responsive to student-generated questions" (Reeve & Jang, 2006, p. 216). Several studies showed the positive effects of SE on student enthusiasm and motivation for physical education (Alexander & Luckman, 2001; Carlson & Hastie, 1997; Grant, 1992; Wallhead & Ntoumanis, 2004).

The aim of the present study was to use the TCM to examine the effect of the SE model on physical education students' participation in a voluntary lunch recess sport-based physical activity opportunity. Figure 1 delineates the proposed motivational sequence of the TCM. We hypothesized that SE would increase students' perceived autonomy support from their teacher and classmates and that this increase would positively affect autonomous motivation in a lunch recess context via an increase in autonomous motivation in physical education. In addition, we hypothesized that the perceived support would positively predict autonomous motivation in the lunch recess context, which in turn would predict the proximal determinants of intentions to participate, namely, attitudes and PBC. We proposed the effects of autonomous motivation would be indirect via the proximal predictors of intention, as hypothesized by Ajzen (1985). In addition, we anticipated that the autonomous motivation would mediate the effects of perceived autonomy support from friends and parents on the proximal determinants of intention. Finally, we anticipated that SE would facilitate participation in lunch recess sport-based physical activity through intention alone, with no direct effects from perceived autonomy support or autonomous motivation.

Method

Participants

Participants were 192 students (97 boys, 95 girls; age range 9–15 years, *M* age = 10.9 years) and 5 teachers from four elementary and one junior high school in the Rocky Mountain region of the United States. Participants self-reported their ethnic background as follows: 130 Caucasian (boys = 69, girls = 67; *M* age = 11.1 years), 56 American Indian (boys = 28, girls = 28; *M* age = 10.4 years), and 6 either African American or Asian (boys = 4, girls = 2; *M* age = 10.6 years). Most students were from low to lower middle socioeconomic backgrounds. None had any prior experience with the SE model, but all had been previously exposed to a program in which a direct style of instruction predominated.

The teachers were 4 preservice teachers completing their final practicum of a physical education teacher education program and 1 inservice teacher with 10 years teaching experience. None had previously taught physical education using the SE model. Prior to beginning the intervention, the teachers completed a 10-hr training program on the SE model, which included practical instruction on management and content delivery strategies (Siedentop et al., 2004). Prior to data collection, we obtained parental consent, permission from school principals, and university institutional review board approval.

Research Design

For this study, we adopted a single group pre/posttest prospective design (Campbell & Stanley, 1963) without a control condition due to the logistical constraints of a large sample control treatment group. Although the study design attempted to manipulate the level of actual autonomy support in the physical education context through an SE intervention, the design's pre-experimental nature limited cause-effect assertions of findings. During the pretest, participants completed self-report measures of perceived autonomy support from physical education teachers and classmates and the Perceived Locus of Causality (PLOC) in a physical education context (Hagger et al., 2003). Following a 12-week SE intervention period, we readministered these self-report measures, and 1 week following the initial posttest assessment we administered a second questionnaire containing measures of the TPB components (Ajzen, 1985), PLOC in a leisure-time physical activity context (Mullan, Markland, & Ingledew, 1997), and perceived autonomy support from peers and parents. Consistent with previous studies (Hagger et al., 2003, 2005), the 1-week interval between posttest measures was used to minimize common method variance due to similar methods used to measure the PLOC constructs. Students completed questionnaire data in a quiet classroom conditions and were isolated from each other so they could not copy or discuss responses. All questionnaires were anonymous to preserve confidentiality and questionnaires were coded for pre- and posttest matching.

Measures

Perceived Autonomy Support. To measure support for the four salient referents: physical education teacher, physical education classmates, peers, and parents (Hagger et al., 2007), we used the 12-item perceived autonomy support scale for exercise settings (PASSES). For this study, we reworded the PASSES to produce a measure of perceived autonomy support; for example: "I feel that my [salient referent(s)] provide(s) me with choices, options, and opportunities about how to participate during class," with "PE teacher," "classmates," "parents," or "friends" as the salient referent in each scale. This was in keeping with the development of the PASSES, which demonstrated invariance in factor structure across participants who completed the scale for different sources or referents, supporting its flexibility for use with multiple sources of autonomy support (Hagger et al., 2007). Participants recorded their responses on 7-point scales ranging from 1 = strongly disagree to 7 = strongly agree. The internal reliability (Cronbachs' α) for the scales from physical education teacher (α = .91), physical education classmates (α = 0.95), parents (α = .96), and friends (α = 0.96) were satisfactory.

PLOC in Physical Education and Sport Club Contexts. We used Ryan and Connell's (1989) PLOC scales, modified for use in a physical education context, to measure autonomous motivation. Participants were asked, "Why do you participate in PE?" followed by 16 reasons, four from each regulation style: intrinsic motivation (e.g., "because PE is fun"), identified regulation (e.g., "because I value PE"), introjected regulation (e.g., "because I will feel ashamed if I do not do PE"), and external regulation (e.g., "because important others want me to do PE"). Responses were measured on 4-point scales ranging from 1 = not true at all to 4 = very true. The internal reliabilities for these scales were typically satisfactory for intrinsic motivation ($\alpha = .85$), identified regulation ($\alpha = .81$), introjected regulation ($\alpha = .93$), and external regulation ($\alpha = .84$).

We used Mullen and Markland's (1997) Behavioral Regulations in Exercise Questionnaire to measure PLOC in the lunch recess context. Participants were asked, "Why do you participate in the lunch recess sport club?" followed by four reasons from each regulation style. Items measuring intrinsic motivation (e.g., "I participate in the lunch recess sport club because it is fun"), identified regulation (e.g., "I participate in the lunch recess sport club because it is important to make the effort"), introjected regulation (e.g., "I participate in the lunch recess sport club because I will feel guilty if I do not"), and external regulation (e.g., "I participate in the lunch recess sport club because others said I should") were assessed on 7-point scales ranging from 1 = not true at all to 7 = very true. Reliability coefficients were satisfactory for intrinsic motivation ($\alpha = .93$), identified regulation ($\alpha = .89$), introjected regulation ($\alpha = .95$), and external regulation ($\alpha = .95$).

The Theory of Planned Behavior. Measures of the TPB constructs were developed according to guidelines (Ajzen, 2003). The intention scale contained three items (e.g., "I intend to participate in the lunch recess sport club next week...") on 7-point scales anchored by 1 = strongly agree to 7 = strongly disagree. Internal consistency statistics for this scale were satisfactory ($\alpha = .98$). Attitudes were measured on five 7-point semantic differential scales with the bipolar adjectives: bad-good, harmful-beneficial, unenjoyable-enjoyable, useful-useless, and boring-interesting in response to the common stem: "My participating in the lunch recess sport club is...." These items achieved satisfactory internal consistency ($\alpha = .95$). Three items comprised the measure of PBC (e.g., "I feel in complete control over whether I participate in the lunch recess sport club") on 7-point scales ranging from 1 = no control to 7 = complete control. Internal consistency was adequate for this scale ($\alpha = .96$). Due to a printing error, subjective norm items were not collected for a large portion of the sample, so we excluded this variable from data analyses.

Physical Activity Behavior. We used participation in the lunch recess sport club to assess participants' leisure-time physical activity behavior. The regular physical education teacher supervised the weekly, 30-min sport club sessions, which consisted of game play in the relevant activity. In four of the five school sites, the SE intervention teacher did not also supervise the sport club opportunity. Activities included five sessions of badminton followed by five sessions of tag rugby. These coincided with the SE units being taught during the physical education intervention. The SE intervention teacher provided no external contingency rewards (e.g., grade enhancement) for students' sport club participation. To obtain an estimate of physical activity volume during each session, participants wore a pedometer (Accusplit Eagle 170; Accusplit, Livermore, CA) and recorded their total step count. This pedometer has been shown to be valid and reliable in estimating step rate at various speeds (Lloyd, Price, & Slivka, 2003).

Procedures

Sport Education Intervention. During the intervention semester, students participated in two consecutive, 6-week units of SE. Each 30-min lesson occurred twice weekly for the 12-week intervention period. The primary researcher designed plans for both SE units, with each following a recognized SE format (Hastie, 2000). The unit protocol included lessons focusing on team selection and roles (Lessons 1 and 2), teacher-directed skill development (Lessons 3 and 4), preseason peer teaching phase (Lessons 5–9), and a formal tournament and culminating event (Lessons 10–12). The preseason and formal tournament phases (Lessons 5–12) were designed primarily for students to develop content knowledge and refine performance within peer teaching instruction. Student role responsibilities included trainer, equipment manager, coach, and referee. Each role has organizational and observational components with the potential to increase the prevalence of sedentary behavior during lessons. A primary focus of the SE units was to maintain high levels of physical activity participation (Hastie & Trost, 2002). For this reason, a separate duty team was not used, and coaches, referees, and trainers were expected to fulfill their roles while rotating into team practices and game play. These strategies maintained consistency with the structural features of SE (Siedentop et al., 2004). Due to curricular constraints at the elementary school sites, each SE season was relatively short compared to contemporary recommendations (Siedentop et al., 2004). This factor must be considered when interpreting the potential efficacy of SE in facilitating changes in extracurricular PA behavior.

Treatment Fidelity. Researchers place increasing importance on the fidelity of treatments in intervention designs (i.e., whether the stipulated intervention components are effectively and accurately delivered by those administering it; Bellg et al., 2004; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). The SE benchmark observational instru-

ment (Ko, Wallhead, & Ward, 2006) was used to code teacher pedagogical behavior during the SE intervention. All lessons were videotaped and coded off-line. Analysis across teachers revealed 100% compliance with season, formal competition, responsibility, and culminating event benchmarks. For affiliation and record-keeping structural features, analysis revealed 65% and 80% benchmark congruency, respectively. Incongruence occurred because all the teachers failed to use the pedagogical benchmark of team cheers or posters to promote team affiliation, and 3 of the 5 teachers failed to use peer assessment strategies for effective record keeping during their SE units. Although revealing some lack of fidelity with the SE features of team affiliation and record keeping, this incongruence was deemed relatively unimportant to study objectives. These benchmarks did not generally require a substantial level of autonomy supportive teaching behaviors (Reeve & Jang, 2006), but such behaviors were consistently used within the benchmarks of responsibility. The reliability of benchmark identification was obtained through a peer-debrief of sample lessons. Interobserver agreement was .85 for SE benchmarks coding across lessons.

Preliminary Analyses

Data Reduction. Mean composites of the TCM variables were computed for use in path analyses. The non-latent variables are shown in Figure 1. Prior to analyses, the motivational styles from the PLOC continuum were reduced to a single index of autonomous motivation by calculating a relative autonomy index (RAI) as recommended by Guay, Mageau, and Vallerand (2003). We assigned weights to each PLOC item: intrinsic motivation (+2), identified regulation (+1), introjected regulation (-1), and extrinsic regulation (-2) items. Each weighted item was then aggregated to form four indicators of two latent RAI constructs, one in each context (RAI-PE and RAI-LT). Change scores for the physical education variables of perceived autonomy support from teachers and classmates and autonomous motivation were calculated as an arithmetic difference (postscores minus prescores).

Independence of Observations. According to Kenny and La Voie (1985), to determine if the individual or group should be the unit of analysis one must perform a test of nonindependence of individual observations. Within group-based interventions, the individual may be used as

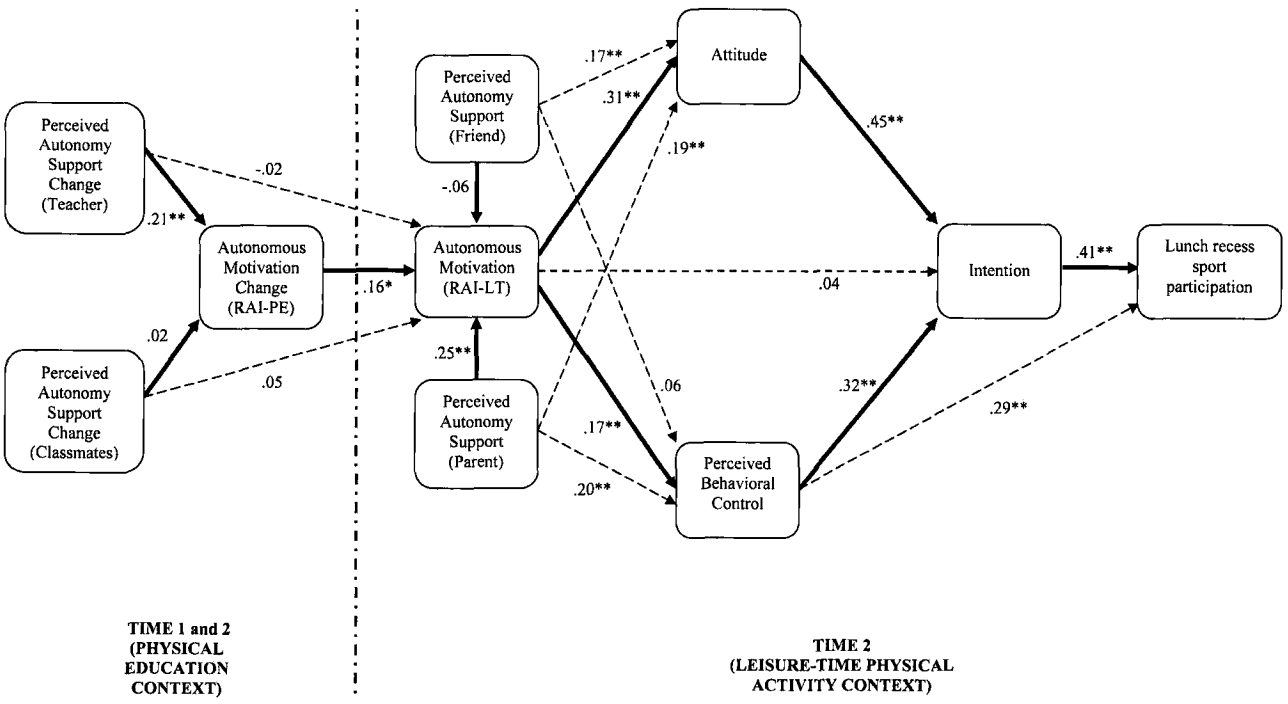

Figure 1. Standardized path coefficients for the trans-contextual model.Calculation of the total variance explained in lunch recess sport participation included the small nonsignificant effects of autonomous motivation in leisure time (α = .015) and autonomous motivation change in physical education (α = -.093) on recess sport participation, which is not shown in the figure. The total variance was $R^2 = 1 - (.408 + .293 + .015 - .093) = .377$ or 38% when rounded to two decimal places. RAI-PE = relative autonomy index in the physical education context; RAI-LT = relative autonomy index in the leisure-time context; for clarity, error covariances among the attitude and perceived behavioral control constructs and among the perceived autonomy support constructs were omitted; solid lines illustrate the effects from the proposed motivational sequence tested in the model; broken lines indicate paths set to be free to test mediation effects. $^*p < .05$, $^{**}p < .01$.

an alternative form of analysis when the intraclass correlation (ICC) suggests low autocorrelation among responses, indicating response independency (Zhang, Hausenblas, Barkouras & Pease, 2002). ICCs can range from -1 to +1, with a positive ICC indicating group members are more similar than nongroup members and, therefore, that the group should be the unit of analysis. With a negative or nonsignificant positive ICC, the unit of analysis should be at the individual level, because there is no evidence the independent observation assumption is being violated (Kenny & LaVoie, 1985). ICCs calculated on student physical education motivational indexes revealed negative or nonsignificant ICC's for pre- and postteacher PAS (r = -.21, r = .08), pre- and postclassmate PAS (r = -.23, r = -.05), and pre- and postautonomous motivation in physical education (r = .03, r = .08). Thus, the individual was the unit of analysis in subsequent analyses.

We assessed change in physical education dependent variables (RAI-PE and PAS teachers and classmates) using multivariate analysis of variance repeated measures with univariate post hoc Tukey tests. The assumption of equal variance was met; however, normality was not. Thus, graphical techniques were used to examine the distribution of data such that it could be trimmed to minimize power reductions and errors for conclusions based on F tests (Lix & Keselman, 1998). These procedures are consistent with existing recommendations for inferential statistics (Chen & Zhu, 2001). Of the data, 5.3% were trimmed based on graphical observation, which likely increased the robustness of the F test, as data distribution was symmetrical, group size was equal, and group size was reasonable (Clinch & Keselman, 1982; Tan, 1982). We computed Hedges g effect size to assess the magnitude of change for RAI-PE and perceived autonomy support from teachers and classmates (Hedges, 1985). Statistical significance was set a priori at $p < .05$, and all analyses were performed using SPSS 16.0 (SPSS, Inc., 2007).

Confirmatory Factor Analysis. Prior to analysis, a confirmatory factor analytic (CFA) model was initially estimated in which observed items from the study measures were set to indicate latent constructs representing their proposed factors. The CFA for the self-determined motivational and TPB constructs were conducted separately, as there were too many parameters to estimate an omnibus model. We expected these constructs would exhibit discriminant validity based on the premises for theory integration and, specifically, their level of generality and focus (Hagger et al., 2006). We followed the method of Hagger et al. (2003) to establish the discriminant validity of these measures. A series of two-step CFA models were conducted as advocated by Mulaik and Millsap (2000). The first involved an estimate of a two-factor discriminant validity CFA model, in which the constructs being tested were separate latent factors and freely correlated. The second used a congeneric CFA model estimate, in which all items from both constructs indicated a single latent factor. We expected the congeneric model to exhibit inferior fit compared to the CFA model. We used the two-step process to test the discriminant validity of the RAI construct in physical education and leisure-time contexts, attitude, and TPB constructs, for a total of 10 analyses. The discriminant validity of the PASSES measures were reported in detail elsewhere (Hagger et al., 2006). Table 1 shows results of the two-step discriminant validity analyses. In all cases, the CFA models exhibited good data fit according to the criteria. This supported the discriminant validity of the RAI in the physical education and leisure-time contexts from the TPB constructs. In contrast, none of the congeneric CFA models met the cut-off criteria for acceptable fit, thus, supporting the hypothesis of discriminant validity among the model constructs.

Table 1. Fit indexes of congeneric and discriminant validity confirmatory factor analytic models examining the discriminant validity of key components in the trans-contextual model of motivation

Model	χ^{2a}	*df*	CFI	SRMSR	AIC
RAI in PE and LT are assumed to be congeneric	163.10*	20	.80	.21	123.11
RAI in PE and LT are assumed to be distinct	35.28*	19	.98	.06	-2.72
RAI in PE and attitudes are assumed to be congeneric	207.46*	27	.76	.19	153.46
RAI in PE and attitudes assumed to be distinct	32.49*	26	.99	.05	-19.51
RAI in LT and attitudes are assumed to be congeneric	428.44*	27	.65	.24	374.44
RAI in LT and attitudes are assumed to be distinct	35.36*	26	.99	.04	-16.64
RAI in PE and PBC are assumed to be congeneric	225.11*	14	.69	.24	197.11
RAI in PE and PBC assumed to be distinct	37.69*	13	.96	.06	11.69
RAI in LT and PBC are assumed to be congeneric	515.10*	14	.55	.34	487.10
RAI in LT and PBC are assumed to be distinct	20.50	13	.99	.04	-5.51

Note. df = model degrees of freedom; CFI = comparative fit index; SRMSR = Standardized root mean squared residuals; AIC = Akaike's information criterion; RAI = relative autonomy index; PE = physical education context; LT = leisure-time context; PBC = perceived behavioral control.

[a]Sattora & Bentler (1988) corrected goodness-of-fit chi-square;

*$p < .01$.

Bootstrapping the CFA Model. Analyses were conducted using the EQS computer program (Bentler, 2004) and a robust maximum likelihood method with correlated factors (Satorra & Bentler, 1988). Goodness-of-fit was evaluated using multiple recommended indexes: comparative fit index (CFI), non-normed fit index (NNFI), and standardized root mean squared residuals (SRMSR). A cut-off value of 0.90 or above for the CFI and NNFI indicates an acceptable model, although a value greater than 0.95 is preferable. A value of .06 or less for the SRMSR is deemed satisfactory for a well fitting model (Hu & Bentler, 1999). We conducted a bootstrap resampling analysis for the path analysis model to confirm that satisfactory goodness-of-fit statistics for the models could be replicated in samples based on the original. In each bootstrap analysis, we assumed the data in question to be that of the population, and drew samples randomly from this data set, with replacement, equal in size to the original sample. We then estimated the specified model in the simulated samples and replicated the procedure 2,000 times. All replications resulted in a successful fit of the specified model—a 100% success rate. The average CFI value exceeded the cut-off values with narrow 95% confidence intervals. Furthermore, the CFI distribution was significantly and negatively skewed in each analysis, such that CFI values from the replications tended to be stacked at upper values. This is desirable in bootstrap analyses, as it indicates a large number of well fitting models in the replicated samples. The hypothesized model exhibited good fit with the data ($\chi^{2,17} = 26.78$, $p = .06$; CFI = .98; NNFI = .94; SRMSR = .06). Overall, these analyses provided further support for the adequacy of the hypothesized model.

Path Analysis. Main study hypotheses were conducted by path analyses using the nonlatent averaged composites of the study variables. The path analysis was estimated using the EQS computer program and a maximum likelihood method. Prediction error was explicitly modeled in the analysis such that each endogenous dependent variable was a function of its predictors and some residual error. The adequacy of the proposed model in accounting for the correlation matrix among study variables was evaluated using the goodness-of-fit chi-square value and the multiple goodness-of-fit indexes. Indirect effects within the path model were computed using the product of the terms comprising the effect.

Results

Analysis of Change in Perceived Autonomy Support and Autonomous Motivation in Physical Education

Pre- and postintervention descriptive statistics for autonomous motivation in physical education (RAI-PE) and perceived autonomy support (PAS) from physical education teachers and classmates are presented in Table 2. The SE intervention produced an increase in autonomous motivation in physical education ($F = 9.22$, $p < .01$); however, classmate PAS ($F = 1.43$, $p = .31$) and teacher PAS ($F = 1.12$, $p = .43$) did not increase significantly. Correspondingly, the effect size for positive change in autonomous motivation was moderate (Hedges $g = 0.41$) and small for classmate and teacher PAS (Hedges $g = .13$ and Hedges $g = .11$, respectively).

Relationships in the TCM

Standardized path coefficients for the free parameters in the path analyses are shown in Figure 1. The coefficient order follows the hypothesized relationships from left to right, beginning with the most distal constructs. Overall, the model accounted for 53% of the variance in intentions to attend the lunch recess sport club and 38% of the variance in actual participation. The next sections report the specific results with respect to each set of hypothesized relationships.

Relations Between Change in Perceived Autonomy Support From Teachers and Classmates and Autonomous Motivation in Lunch Recess

We hypothesized that change in perceived autonomy support would have an indirect effect[2] on autonomous motivation in lunch recess through the effect of autonomous motivation in a physical education context. According to Table 2, there were no significant correlations between change in perceived autonomy support from classmates or teachers and autonomous motivation in lunch recess. In the path analysis model (see Figure 1), there was a significant direct effect of change in perceived autonomy support from physical education teachers on change in autonomous motivation in physical education ($\alpha = .21$, $p < .01$). There was also a significant direct effect of change in autonomous motivation in physical education on autonomous motivation in the lunch recess context ($\alpha = .16$, $p < .05$). There was also a small indirect effect of change in perceived autonomy support from physical education teachers on autonomous motivation in lunch recess mediated by change in autonomous motivation in physical education ($\alpha = .03$, $p < .05$). These findings provide some support for the hypothesis.

Perceived Autonomy and Autonomous Motivation. We expected perceived autonomy support from friends and parents to be related to autonomous motivation in a lunch recess context. Results indicated that perceived support from parents was significantly related to autonomous motivation ($\alpha = .25$, $p < .01$). In contrast, there was no significant direct effect of perceived support from friends.

Autonomous Motivation and PAS. We expected autonomous motivation in lunch recess to have direct effects on

the TPB variables of attitudes and PBC, and there were significant direct effects on attitudes ($\alpha = .31$, $p < .01$) and PBC ($\alpha = .17$, $p < .01$). We also expected that any effects of perceived autonomy support from friends and parents on the TPB constructs would be mediated by autonomous motivation in lunch recess. There were direct effects of perceived autonomy support from parents on attitudes ($\alpha = .19$, $p < .01$) and PBC ($\alpha = .20$, $p < .01$). Perceived support from friends had a direct effect on attitudes only ($\alpha = .17$, $p < .01$). Therefore, there was a significant total effect of perceived autonomy support from parents on attitudes ($\alpha = .26$, $p < .01$), which was direct ($\alpha = .19$, $p < .01$) and indirect ($\alpha = .07$, $p < .05$) via mediation of autonomous motivation in lunch recess. There were no indirect effects of perceived autonomy support from friends on attitudes or PBC via mediation of autonomous motivation. As a result, the expected mediation was rejected. It should be noted, however, that the relative size of the effects of these variables on the TPB constructs, while significant, was comparatively small. This means the net effect of these constructs on intentions and recess sport participation is negligible compared to the more proximal variables.

Autonomous Motivation and Intention. We expected autonomous motivation to have a significant effect on intentions to participate in the sport club, but we expected this effect to be mediated by attitudes and PBC. There were no direct effects of autonomous motivation on intention. Both attitudes ($\alpha = .45$, $p < .01$) and PBC ($\alpha = .32$, $p < .01$) were significantly related to intention. The effects of autonomous motivation on intentions were, therefore, indirect ($\alpha = .19$, $p < .01$) via attitudes and PBC supporting the hypothesis.

Predicting Sport Club Participation. Participants attended a mean of 5.16 ± 2.21 lunch recess sport club sessions and averaged $1{,}835 \pm 456$ pedometer step counts per session (see Table 2). We hypothesized that sport club participation would be a function of intention and PBC, with no direct effects from autonomous motivation in lunch recess or physical education contexts or perceived autonomy support in a physical education context. Sport club participation was significantly related to intention ($\alpha = .41$, $p < .01$) and PBC ($\alpha = .29$, $p < .01$).

Discussion

We used the TCM to examine the effect of the SE model on students' participation in a voluntary lunch recess sport-based physical activity. The results of this study provide general support for the proposed motivational sequence in the TCM. Findings also confirm the previously untested premise that an autonomy-supporting

Table 2. Descriptive statistics and intercorrelations among the trans-contextual model of motivation constructs

Factor	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. PAS-teacher												
Pre	5.53	0.91										
Post	5.64	1.14										
Change	+.11	1.27	—									
2. PAS-class												
Pre	5.34	0.94										
Post	5.48	1.21										
Change	+.14	1.19	-.45**	—								
3. RAI-PE												
Pre	3.25	2.04										
Post	4.15	2.32										
Change	+0.9**	2.45	.20**	.07	—							
4. PAS-friend	5.11	1.42	-.05	-.11*	.01	—						
5. PAS-parent	5.44	1.25	.10	.05	.02	.54**	—					
6. RAI-LT	8.69	5.77	.01	.07	.16*	.07	.22**	—				
7. Attitude	5.91	1.11	.01	.01	.05	.29**	.35**	.36**	—			
8. PBC	5.49	1.34	.01	.02	.03	.19*	.27**	.22**	.49**	—		
9. Intention	5.17	1.50	.03	.01	.16*	.19*	.25**	.29**	.55**	.63**	—	
10. Participation												
(sessions)	5.16	2.21	.01	.01	-.02	.13	.18*	.18*	.40**	.52**	.56**	—
(step count)	1,835	456										

Note. PAS = perceived autonomy support from (-teachers, -classmates, , -friends, -parents); RAI-PE = relative autonomy index in the physical education context; RAI-LT = RAI in the leisure-time context; PBC = perceived behavioral control.
*$p < .05$.
**$p < .01$.

physical education curriculum model (SE) would increase autonomous motives in a physical education context, which would transfer in part into autonomous motivation to participate in the sport activity opportunity, especially when controlling for the effect of perceived support from other sources (Hagger et al., 2003; 2005).

The present study contributes to the extant literature on the transfer of motivation from a physical education context to a leisure-time physical activity context in three ways: (a) it demonstrates that an established physical education curriculum model (SE) is effective in changing levels of autonomous motives in the physical education context, which is related to motivation in a leisure-time context in school; (b) it accounts for the influence of alternative forms of perceived autonomy support in the physical education context (i.e., classmates); and (c) it used a leisure-time physical activity that directly corresponded with the physical education intervention program.

The slight change in perceived autonomy support in physical education occurred predominantly through an increase in perceived classmate support. This finding provides some support for research showing the effectiveness of the SE structures to empower student voice and choice in a physical education setting (Hastie & Buchanan, 2000). Path analysis revealed, however, that the increase in classmate PAS had no effect on autonomous motives in either the physical education or lunch recess settings. This study was an initial attempt to assess the effects of autonomy support from significant others, apart from teachers, within the physical education setting. The apparent negligible effect of the increase in classmate PAS on autonomous motives may be attributed to the preadolescent phase of most of the sample (Gallahue & Cleland-Donnelly, 2003). Future studies should examine developmental influences of alternative sources of support in the physical education setting, such as friends or classmates, on autonomous motives for leisure-time physical activity participation, particularly among adolescents who have shown a substantial decline in physical activity participation.

The slight increase in perceived autonomy support from physical education teachers had a significant direct effect on autonomous motives in physical education and an indirect effect on the lunch recess context, even when the effects of other perceived support constructs were considered. The absence of direct effects on autonomous motives in lunch recess activity are evidence for the mediating influence of autonomous motives in physical education on motivation transfer across contexts (Hagger, et al., 2003; 2005).

Together these findings have two important implications. First, the presentation of sport-based activities using the structural features of SE can potentially increase autonomous motivation in that context, which relates to autonomous motivation in a lunch recess context. This finding is encouraging, as such motivation in physical education is the key mediating variable in the TCM for translating motivation from a physical education to a leisure-time context. Second, changes in perceived autonomy support from either the teacher or classmates did not fully explain this increase. The nonsignificant increases in these variables suggest that SE may have features of autonomy support that are not captured effectively through the PASSES instrument. Further research is needed to examine the degree of congruence between specific items on the PASSES and the pedagogical strategies consistently used in the SE model.

Path analyses within the lunch recess context revealed that perceived support from additional salient sources, such as parents and friends, had pervasive effects on the motivational constructs in the model. Specifically, parents exerted a strong influence on autonomous motivation in the lunch recess context. However, the autonomous motivation construct in lunch recess did not fully mediate the direct effects of the perceived support from parents on the attitudes and PBC variables from the TPB. This finding suggests that parents influence students' motives for extracurricular physical activities in school and outcome expectancies and beliefs regarding students' capacity for successful participation in those activities. This finding is consistent with previous research that showed the effects of perceived parental support on intentions in a leisure-time physical activity context (e.g., Wilson & Rodgers, 2004). From a practical perspective, this result highlights the importance of effective communication between physical educators and parents on the value of presenting physical activities in an autonomy-supportive rather than a controlling style to their children.

Perceived autonomy support from friends had a negligible influence on autonomous motives in the leisure-time context and a direct effect on attitude, which was not mediated by autonomous motives in the lunch recess setting. This finding suggests that participants drew on perceived autonomy support from friends as an information source for expectations regarding potential outcomes of the lunch recess participation but not to inform their motives toward the specific activities. This finding differs from previous evaluations of the influence of perceived peer support on TPB variables within the TCM. Hagger et al. (2007) found that high school students across three cultures used perceived autonomy support from peers for personal motivational orientations, which affected decision making regarding their leisure-time physical activity behavior. These differential influences again may be attributed to developmental influences across the sample populations. Despite evidence to suggest that the proposed pattern of relationships in the TCM exhibit a high degree of congruence across school grade (Hagger et al., 2002a; Hagger et al., 2005; Hagger et al., 2003), the developmental literature has suggested that as children mature peer influence on attitudes and intention toward

social behavior increases (Gallahue & Cleland-Donnelly, 2003). Future research needs to examine the developmental influence of perceived peer support on proximal decision-making constructs of leisure-time physical activity.

As with previous examinations of the TCM (e.g., Hagger et al., 2003), we found that lunch recess sport club participation was directly related to intention. PBC was also shown to directly regulate participants' attendance. This latter result contrasts with previous research that found no association between PBC and physical activity behavior (e.g., Martin et al., 2005; Shen, McCaughtry & Martin, 2007). However, Ajzen (1985) suggested the extent to which PBC is an accurate proxy for actual control will predict behavior, because it reflects genuine constraints on behavioral engagement not just perceived barriers hindering the decision-making process. These differences may be a function of the specificity of the target behavior used in the TPB instrument. In this study, the salient physical activity behavior was specific, which may have facilitated a more accurate reflection of participants' control over their behavior.

Sport club participation data revealed that most participants attended the sessions regularly and were generally physically active during participation. Research has suggested that an active lunch recess contributes 18 min of moderate to vigorous physical activity in 6–12-year-old boys (Wickel & Eisenmann, 2007). A limitation of our study was the lack of measurement of physical activity intensity. From a childhood obesity prevention perspective, however, an active lunch recess sport club may further contribute to achieving the current health-promoting recommendations for physical activity in children and assist with meeting the 60 min of daily moderate intensity physical activity (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2005).

This study is not without further limitations. First, the TPB variable of subjective norm was not assessed fully through the data collection protocol. Evidence suggests this omission may not have limited explanatory findings, as subjective norm has been found to reflect controlling rather than autonomous influences and seldom has been shown to have predictive efficacy in tests of the TCM (Hagger, Chatzisarantis, & Biddle, 2002a; Hagger et al., 2003). However, without complete analysis of all TPB components, full explanation of the mediating effects of these variables on physical activity behavior is limited. Second, data analyses were not stratified to account for participants' heterogeneous ethnic background. Although previous research showed the TCM constructs to be replicable and consistent among young people from different cultures (Hagger et al., 2005), cross-cultural differences between Caucasian and American Indian participants cannot be fully discounted. Third, a portion of the preservice teachers' final practicum grade was based on their consistent application of the SE benchmark observational instrument. It could be argued that this grading accountability limited generalizability of findings to contexts in which this is not feasible (e.g., inservice teacher sites). No difference in SE treatment fidelity was observed at the inservice teacher intervention site. This evaluation suggests the quality of the SE training provision and support by relevant stakeholders (e.g., supervisors and children's responses) during the intervention may be more important to SE treatment fidelity than providing external contingencies, such as teacher grading procedures.

Future research should examine the role of alternative autonomy support sources in physical education and leisure-time contexts on developmental changes. Such evidence will allow those involved in curriculum development to use developmentally appropriate models that optimize contextual conditions for promoting physical activity messages to students to maximize their leisure-time participation. Future studies should also provide further experimental evidence to support the efficacy of these curriculum models. In particular, intervention studies are needed that model the synergy between intervention studies based on the TCM, such as SE, and interventions within the leisure-time context that target TPB constructs. This is consistent with the recent trends toward hybrid or interactive intervention models at different stages of motivation (Prestwich, Lawton, & Connor, 2003).

In summary, results of this study provided initial evidence for the positive effect of SE on student autonomous motivation in physical education that transferred to motivation to participate in a school-based lunch recess physical activity context. Parents and teachers appear to have influence on children's autonomous motives to attend these physical activity opportunities within school. This finding provides some support for the recommendation that physical education teachers use autonomy-supportive curricular models when presenting physical activities to students (Hagger et al., 2003). It also emphasizes the need for physical education teachers to think more expansively about curriculum design, to define a quality physical education experience more broadly than just instructional innovation in lesson time, and provide school-based extracurricular opportunities. This may be potentially critical in contexts in which children and adolescents have limited access to gymnasia and parks, making it more difficult to be physically active (Sallis et al., 1996).

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Note

1. The test of the indirect effect is the equivalent of the Sobel test used in mediation analyses using linear multiple regression techniques. In this and all subsequent analyses involving significant indirect effects, the following criteria proposed by Baron and Kenny (1986) were met: (a) significant correlations between the dependent variable and

the independent (predictor) variable(s); (b) significant correlations between the mediator and the independent variable(s); (c) a significant unique effect of the mediator on the dependent variable when it is included alongside the independent variable(s) in a multivariate test of these relationships; and (d) the significant effect of the independent variable on the dependent is attenuated or extinguished when the mediator is included as an independent predictor of the dependent variable.

Authors' Notes

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