

Perceived Autonomy Support in Physical Education and Leisure-Time Physical Activity: A Cross-Cultural Evaluation of the Trans-Contextual Model

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This study tested the replicability and cross-cultural invariance of a trans-contextual model of motivation across 4 samples from diverse cultures. The model proposes a motivational sequence in which perceived autonomy support (PAS) in physical education (PE) predicts autonomous motivation, intentions, and behavior in a leisure-time (LT) physical activity context. High-school pupils from Britain, Greece, Poland, and Singapore completed measures of PAS and autonomous motives in a PE context. Good-fitting path-analytic models supported the main hypotheses of the trans-contextual model in the British, Greek, and Singaporean samples. PAS in PE had significant total effects on autonomous motives in LT, except in the Polish sample. The effect of autonomous motives in LT on physical activity intentions and behavior was mediated by theory of planned behavior constructs in all samples. Results supported the main hypotheses of the trans-contextual model across cultures, although the effect of PAS was not pervasive in the Polish sample.

Keywords: self-determination theory, theory of planned behavior, theoretical integration, path analysis

Physical education (PE) has been cited as a useful existing network in which health promotion messages to support the adoption of health-related physical activity in young people can be promulgated (Shephard & Trudeau, 2000). In PE, teachers have a captive audience in which to convey health-related physical activity messages (Hagger, Biddle, Chow, Stambulova, & Kavussanu, 2003). However, the declining levels of PE observed throughout adolescence (U.S. Department of Health and Human Services, 1996) have made opportunities for intervention more limited. The provision of strategies that get physical activity messages across to children in a quick, efficient, and effective manner during these increasingly limited periods is accordingly necessary if the health

benefits of physical activity are to be promoted. This has catalyzed research into theoretical models designed to identify the salient antecedent variables and mechanisms that underpin motivation in PE contexts.

A key question that arises from this research is whether the antecedent variables and environmental factors that affect motivation in a PE context can be transferred to increased motivation toward extramural physical activity in a leisure-time (LT) context. The present study aims to address this question and to evaluate whether such a transfer can be supported in samples from diverse cultures. A trans-contextual model (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) will be presented, which hypothesizes that the perceived level of autonomy support provided by PE teachers can promote autonomous forms of motivation in PE and LT contexts. Self-determination theory (Deci & Ryan, 1985), Vallerand's (1997) hierarchical model of motivation, and the theory of planned behavior (Ajzen, 1985) form the basis of the trans-contextual model. The key premise of the model is that fostering young people's autonomous motivation toward physical activity will result in the adoption of self-directed active pastimes when these individuals are left to their own devices and are free from extrinsic reinforcement. The present study will contribute to the extant literature by illustrating that the pattern of motivation transfer across contexts offered by the proposed model is not unique to individualistic cultures from Western European and

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North American nations (Bond & Smith, 1996; Triandis, 1995) but can be similarly applied to a variety of national groups that vary in the cultural norms they endorse.

Self-Determination Theory

Self-determination theory posits that individuals strive to satisfy three basic and universal psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 1985, 2000; Sheldon, Elliot, Kim, & Kasser, 2001). The needs determine the direction and persistence of an individual toward goal-directed behaviors that are likely to result in satisfying these needs. To the extent that the behaviors and activities fulfill the goals to satisfy these needs, individuals will experience increased levels of desirable outcomes, such as satisfaction and psychological well-being (Deci & Ryan, 2000). Context and motivational climate are important contributing factors that scaffold an individual's pursuit of need-satisfying behaviors (Reeve, 2002). The tenets of self-determination theory have been shown to be consistent across research on intrinsic motivation in a number of meta-analyses (Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Deci, Koestner, & Ryan, 1999).

Central to self-determination theory is the distinction between *autonomous* and *controlled* motivation (Deci & Ryan, 1985). This distinction can be viewed in terms of a continuum of motivation known as the *perceived locus of causality* (Ryan & Connell, 1989). Intrinsic motivation lies at one extreme pole of the continuum. Intrinsically motivated behaviors are those performed when there is no external contingency for performing the behavior (Deci & Ryan, 1985, 2000). The experience of intrinsic motivation is characterized by enjoyment, satisfaction, interest, and a sense of choice. Individuals intrinsically motivated to perform an activity will participate in that activity spontaneously and free from any external reinforcement. Such participation is likely to satisfy the basic psychological needs of autonomy, competence, and relatedness. In addition, Deci and Ryan (2000) proposed that individuals make the distinction between the person and the self as origins or causes of their behavior, and intrinsic motivation is viewed as both emanating from the person and internal to the self.

Alongside intrinsic motivation lie three forms or qualities of extrinsic motivation: external regulation, identified regulation, and introjected regulation. Extrinsically motivated behaviors are those that are instrumental to some separable outcome. The most extreme is *external regulation*, which lies on the pole opposite to intrinsic motivation on the perceived locus of causality. External regulation is defined as the engagement in an activity through reinforcement, such as gaining contingent outcomes, including rewards, praise, or feedback, or through the avoidance of negative reinforcements, such as punishment. Externally regulated behaviors are perceived by an individual as originating from outside both the person and the self (Deci, Eghrari, Patrick, & Leone, 1994). Externally regulated behaviors are accompanied by lower levels of satisfaction and enjoyment, and they persist only as long as the reinforcing contingencies are present.

Deci and Ryan (2000) proposed that some forms of extrinsic motivation may satisfy basic psychological needs and can be viewed as being internal to the person. This depends on whether the behavior has been internalized by the individual because it serves an instrumental or autonomous goal or may produce valued outcomes. Adjacent to intrinsic motivation on the continuum is *identified regulation*, a construct that reflects motivation to engage

in behaviors for the attainment of valued goals and outcomes. These goals and outcomes have been fully internalized and are viewed as important to the individual's authentic sense of self. Adjacent to the external pole of the continuum lies the construct of *introjected regulation*. This is the motivation to pursue behaviors in order to avoid negative internal states, such as guilt and shame, or to attain positive internal states, such as increasing self-esteem. The motivation for introjected behaviors is perceived as internal to the person but external to the self. This reflects a less complete form of internalization of extrinsically motivated behaviors.

Importance of Context and Autonomy Support

Fostering autonomous forms of motivation is an attractive proposition for teachers and educational psychologists because it is likely to increase self-directed pursuit of school activities in the absence of external reinforcement (Reeve, 2002). Research has shown that an autonomy-supportive context is efficacious in producing adaptive outcomes in educational settings, such as academic achievement (Flink, Boggiano, & Barrett, 1990) and persistence (Reeve, 2002). The proposed mechanism for the influence of autonomy support on these adaptive outcomes is the positive effect that autonomy support has on autonomous forms of motivation (Deci & Ryan, 2000). Research has highlighted the importance of autonomous motives as a mediator of relationships between autonomy support and academic-related behaviors, such as persistence in school (Ratelle, Larose, Guay, & Senécal, 2003).

Theory of Planned Behavior

An important social-cognitive theory that aims to explain the volitional antecedents of intentional behavior is the theory of planned behavior (Ajzen, 1985). The theory hypothesizes that intention is the most proximal predictor of behavior. Intentions reflect deliberative plans to act toward a specific target behavior, in a given context and specific time frame. Intentions are proposed to mediate the influence of three belief-based personal, social, and control-related social-cognitive antecedents on behavior. Attitudes reflect an individual's personal orientation toward participating in the behavior, subjective norms reflect the perceived social pressure from significant others with respect to the behavior, and perceived behavioral control (PBC) reflects the impact of perceived abilities and barriers toward engaging in the behavior.¹ The theory of planned behavior has demonstrated efficacy in the prediction of intentions and behaviors in a variety of contexts (Armitage & Conner, 2001). Nevertheless, the theory is not without its critics. It does not completely account for all of the variance in intentions and behavior (Hagger, Chatzisarantis, & Biddle, 2002b), and its long-range predictive validity is limited because of the situation-specific nature of its constructs (Chatzisarantis, Biddle, & Meek, 1997). It has therefore been proposed that the theory of planned behavior should be augmented to incorporate more generalized constructs from self-determination theory to

¹ Ajzen (1985) stated that PBC can also be a proxy measure for actual control over behavior. In such cases, it is hypothesized that PBC will affect behavior directly in addition to the intention-mediated influence. Such a dual route was proposed as an alternative version of the theory of planned behavior.

explain the origins of its situation-specific constructs (Chatzisarantis et al., 1997; Deci & Ryan, 1985; Hagger, Chatzisarantis, et al., 2003).

Integrating the Theories: A Trans-Contextual Model

Recent research has sought to integrate self-determination theory and the theory of planned behavior because the processes they explain are complementary (Deci & Ryan, 1985). A growing body of research has indicated that autonomous motives from the perceived locus of causality (intrinsic motivation and identified regulation) have strong influences on attitudes and that attitudes mediate the influence of these motives on intentions (e.g., Chatzisarantis et al., 1997; Chatzisarantis, Hagger, Biddle, Smith, & Sage, in press; Hagger, Chatzisarantis, & Biddle, 2002a; Hagger, Chatzisarantis, et al., 2003). Theoretically, these integrative models are based on three premises. First, it is hypothesized that motives related to fundamental psychological needs form the basis of social-cognitive constructs involved in action (Deci & Ryan, 2000). Second, it is expected that generalized, context-level motives from self-determination theory serve as sources of information for the formation of more specific, situational-level evaluations of future behavioral engagement in the theory of planned behavior (Vallerand, 1997). Third, autonomous motives from self-determination theory reflect the subjective degree of internality that a behavioral domain holds for an individual, whereas the theory of planned behavior focuses on expectancies regarding future behavioral engagement.

The first premise for the proposed theoretical integration focuses on the role of autonomous motives from self-determination theory in the formation of decision-making variables in models of social cognition like the theory of planned behavior. According to self-determination theory, individuals form autonomous motives toward physical activities because they expect that future participation in these kinds of behaviors is likely to satisfy psychological needs because they have done so in the past. In addition, Ajzen's (1985) original account of the theory of planned behavior hypothesized that attitudes, subjective norms, and PBC are the sole proximal predictors of intentions and will mediate the influence of all other external variables on intention. Therefore, the influence of autonomous motives on intentions and behavior is expected to be indirect. There is also empirical evidence that constructs related to psychological need satisfaction will predict social-cognitive variables. For example, cognitive dissonance research has shown that the provision of choice, one of the defining characteristics of intrinsic motivation, influences attitude change (e.g., Festinger & Carlsmith, 1958). Further, recent research has demonstrated that psychological need satisfaction influences attitudes and perceived behavioral control from the theory of planned behavior (Hagger, Chatzisarantis, & Harris, in press).

The second premise that underpins the effect of autonomous motives on social-cognitive constructs like attitudes, subjective norms, and PBC is based on Vallerand's (1997) hierarchical model of motivation. Vallerand's model proposes that autonomous motives operate at different levels of generality and suggests that contextual-level motivation will affect motivation and cognition at the situational level. It is hypothesized that more generalized, contextual-level constructs, such as autonomous motives from self-determination theory, affect the specific situational-level

decision-making constructs from the theory of planned behavior in a top-down fashion (Hagger et al., in press). The theory of planned behavior constructs reflect situational-level motivation because measures of the theory constructs make reference to specific action, target, context, and time. Involving autonomous motives within the framework of the theory of planned behavior assists in explaining how more general, contextual-level motives in a physical context are translated into plans to act toward specific bouts of physical activity.

Finally, autonomous motives from self-determination theory are a subjective evaluation of whether behaviors in a particular domain, such as LT physical activity, are either internal to the individual and psychological need satisfying or more external to the individual and therefore less likely to be need satisfying (Deci & Ryan, 2000). Attitude, subjective norm, PBC, and intention constructs are not perceptions of causality but expectancies regarding future behavior bound to the boundary conditions of the theory (Chatzisarantis et al., 1997). Such constructs operate in the context of information-processing models of social cognition. Their relation lies in whether the autonomous motives are instrumental in the formation of expectancies regarding future behavior.

In summary, self-determination theory and the theory of planned behavior are complementary because autonomous motives from self-determination theory form the basis of expectancies regarding future behavior in the theory of planned behavior; autonomous motives are generalized and context tied, whereas attitudes, subjective norms, and PBC are situation specific, supporting a top-down motivational sequence; and autonomous motives relate to the relative degree of internalization of the behavior, whereas the theory of planned behavior constructs reflect expectancies regarding future behavioral engagement.

Hagger, Chatzisarantis, et al. (2003) used these premises as a basis for the integration of these theories, coupled with research demonstrating the importance of perceived autonomy support in fostering autonomous forms of motivation (Ratelle et al., 2003), to propose the trans-contextual model of motivation. The model proposed that perceived autonomy support in a PE context would influence autonomous motives within the same context (Chatzisarantis, Hagger, Smith, & Sage, in press; Standage, Duda, & Ntoumanis, 2003). It also hypothesized that perceived autonomy support in PE would be transferred into autonomous motives in a noneducational setting, that of LT physical activity. It was further expected that this influence would be indirect through autonomous motives in PE. Autonomous motives in LT were expected to influence the situational-level decision-making variables within the theory of planned behavior on the basis of the premises outlined previously and in research that has integrated the theories (Chatzisarantis et al., 1997; Hagger et al., 2002a; Hagger, Chatzisarantis, et al., 2003). Further, it was proposed that attitudes, subjective norms, and PBC would mediate the influence of autonomous motives on intention and behavior (Ratelle et al., 2003). Findings from an initial test of the model supported the proposed motivational sequence with no direct effects of perceived autonomy support or motives on intention and behavior (Hagger, Chatzisarantis, et al., 2003). The model provided a comprehensive framework to explain how autonomy support in a PE context is translated into motivation, intentions, and behavior in an LT context.

Cross-Cultural Research on Autonomous Motivation

Research has supported the notion that the needs for autonomy, competence, and relatedness in self-determination theory are also universal across cultures (Sheldon et al., 2001). Research in educational contexts in cultures that endorse more collectivistic cultural norms (Triandis, 1995) has also suggested that autonomous motives have similar effects on behavior and outcomes to those noted in more individualistic cultures (Reeve, 2002), although levels of intrinsic motivation were typically lower. For example, autonomous motives have a strong influence on subjective well-being, (Chirkov & Ryan, 2001), adaptive coping in the classroom (Hayamizu, 1997), and learning outcomes (Yamauchi & Tanaka, 1998) in cultures that tend to endorse collectivistic values. Further, research in other contexts like the workplace has also suggested that intrinsic motivation is predictive of adaptive outcomes in Eastern European nations that are traditionally more collectivistic in orientation than Western European and North American nations (Deci et al., 2001). Furthermore, there is evidence supporting a pervasive role for perceived autonomy support in an educational setting in the prediction of autonomous forms of regulation in

collectivistic cultures (Chirkov & Ryan, 2001). Some researchers, however, have noted that choices made by significant others have potentially more effect on intrinsic motivation in collectivist cultures than do personal choices (Iyengar & Lepper, 1999), and “group autonomy” may be more appropriate than personal autonomy in these cultures.

The Present Study

Given the converging evidence that supports the universality of the hypotheses of self-determination theory across cultures (Deci & Ryan, 2000; Sheldon et al., 2001), in the present study we hypothesized that there would be congruencies in the motivational processes that underpin behavior across contexts, regardless of cultural background. In the present study, we therefore sought to replicate the trans-contextual model in samples of schoolchildren drawn from four countries that endorse different cultural norms: Great Britain, Greece, Poland, and Singapore. The proposed trans-contextual model is represented schematically in Figure 1. The hypothesized links between perceived autonomy support and autonomous motives in a PE context were expected to be consistent

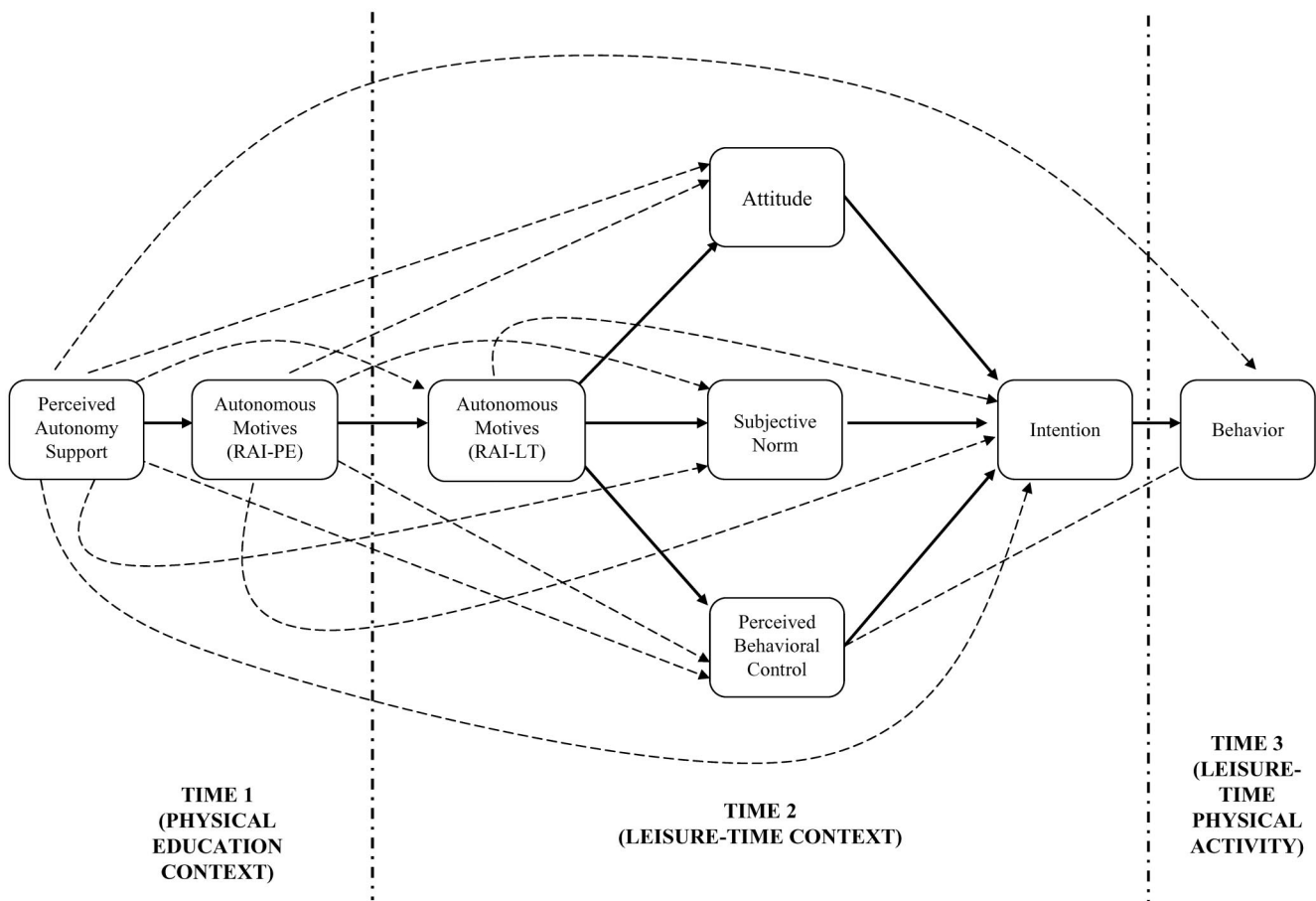


Figure 1. The trans-contextual model. For clarity, error covariances among attitude, subjective norm, and perceived behavioral control constructs are omitted. Broken lines indicate paths freed in the test of the trans-contextual model but hypothesized to be zero, with the exception of the perceived behavioral control–behavior relationship, which was freed according to the Lagrange Multiplier test in the Singaporean sample only. RAI-PE = relative autonomy index in a physical education context; RAI-LT = RAI in a leisure-time context.

across these cultures. Furthermore, we expected that there would be an indirect effect of perceived autonomy support on autonomous motives in an LT physical activity context via autonomous motives in a PE context and that this pattern of effects would be consistent across samples. We also hypothesized that relationships between autonomous motives in an LT context with attitudes and PBC toward the target behavior would exhibit a pattern consistent with the trans-contextual model in the cultures studied. However, research has suggested that there are cross-cultural variations in the contributions of personal and social variables to intentions (Bagozzi, Lee, & Van Loo, 2001). One possible reason for this is the elevated role for subjective norms in collectivist cultures. Cross-cultural variations in the theory of planned behavior relationships were therefore expected.

Method

Participants

Participants were recruited from coeducational high schools in Great Britain, Greece, Poland, and Singapore. The British participants ($N = 295$) were recruited from three state high schools. School statistics from the previous year indicated that the majority of the pupils in each school were of White European ethnicity, with less than 10% from other ethnic minority groups. Data from the National Office for Standards in Education indicated that the school pupils were generally from a background that matched the socioeconomic distribution of U.K. schools on the basis of an income means test used to determine whether a child was eligible for free school meals. The Greek sample ($N = 183$) was collected from a school in the suburbs of Thessaloniki, Greece. Details on the socioeconomic status of the participants were given by the school director. The school draws its students from an area characterized as middle-class, and the school director judged the school population to match the distribution of socioeconomic status levels among schoolchildren in mainland Greece. The majority of the pupils were Greek nationals with a small minority of children who spoke Greek as their first language but were born in Greece to immigrant parents. The Polish sample ($N = 120$) was recruited from three government-run secondary schools in Bytom near Katowice, Poland. Two of the schools are based in housing estates in the outskirts of the town, and one school was near the town center. Details on ethnicity were not available, but the local government register of information indicated that the catchment areas from which the pupils of the schools were drawn were of lower socioeconomic status. The sample from Singapore ($N = 217$) was recruited from one junior college in the Nanyang area of Singapore. The majority of the participants were from a Chinese ethnic group (78%), which tends to follow the Buddhist, Taoist, Confucian, or Christian religion. The remainder were from the Malay ethnic group (15%), which tends to be of Muslim faith, and the Indian ethnic group (7%), which tends to have a Hindu or Tamil religious affiliation. According to the principal, the student body of the junior college, as with all junior colleges in Singapore, was highly representative of the national average in level of socioeconomic status.

In all cases, the school principals granted initial consent for data to be collected in their schools. The students were recruited at the schools' convenience from lessons for which there was no specific syllabus content to be fulfilled. Consent from the participants' parents was also obtained via a letter sent home with students that outlined the study prior to data collection. A preprinted form was provided for parents to sign and return to the students' homeroom teacher if they did not want their child to participate in the study. No forms were returned in any case.

Research Design

A three-wave prospective design was used. In the first wave of data collection, self-report measures of perceived autonomy support in PE and

the perceived locus of causality in a PE context were administered (Hagger, Chatzisarantis, et al., 2003). One week later, a second-wave questionnaire measured the components of the theory of planned behavior (Ajzen, 1985) and perceived locus of causality in an LT physical activity context (Mullan, Markland, & Ingledew, 1997). The 1-week latency period was used to allay the common method variance associated with the use of similar methods to measure the self-determination theory constructs. After 5 weeks, self-reported physical activity behavior was measured with the Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). As the majority of tests of social-cognitive models focus on predicting exercise behavior over a 4-week period or less, a 5-week period was used because it permits a longer range prediction (Hagger et al., 2002b).

Researchers conducted the data collection in quiet classroom conditions. Participants were informed that they would be asked to complete a series of short questionnaires over the coming weeks as part of a survey on young people. Participants were separated so that they could not copy or discuss responses. All of the questionnaires were completed anonymously to preserve confidentiality. Measures across time points were matched by using birth date and gender.

Measures

Perceived autonomy support in PE. A measure of perceived autonomy support in PE was developed in accordance with measures used in previous studies (Hagger, Chatzisarantis, et al., 2003). The measure asked respondents to rate the extent that significant authoritative others supported their autonomy in a given context. For the present study, the authoritative others were specified as the students' PE teachers. The scale comprised 15 items (e.g., "I feel that my PE teacher makes sure I really understand the goals of the lesson and what I need to do"), and responses were recorded on 7-point Likert-type scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal reliability (Cronbach's alpha) for this scale was satisfactory across samples (British sample, $\alpha = .91$; Greek sample, $\alpha = .82$; Polish sample, $\alpha = .91$; Singaporean sample, $\alpha = .95$).

Perceived locus of causality in PE and LT contexts. Perceived locus of causality in a PE context was measured with a modified version of Ryan and Connell's (1989) measure of the same construct in an educational setting. Participants were presented with the question, "Why do you participate in PE?" followed by eight reasons, two 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"), and external regulation (e.g., "because important others want me to do it"). Responses were measured on 4-point Likert-type scales ranging from 1 (*very true*) to 4 (*not true at all*). The internal reliabilities for these scales were typically satisfactory across samples for the Intrinsic Motivation ($\alpha = .87, .78, .91, \text{ and } .95$, for the British, Greek, Polish, and Singaporean samples, respectively) and Identified Regulation ($\alpha = .60, .71, .75, \text{ and } .71$, for the British, Greek, Polish, and Singaporean samples, respectively) scales, but suboptimal for some of the Introjected ($\alpha = .66, .48, .44, \text{ and } .71$, for the British, Greek, Polish, and Singaporean samples, respectively) and Extrinsic Regulation ($\alpha = .62, .61, .46, \text{ and } .44$, for the British, Greek, Polish, and Singaporean samples, respectively) scales. Measures of perceived locus of causality in an LT physical activity context were derived from Mullan et al.'s (1997) Behavioral Regulations in Exercise Questionnaire. Participants were asked "Why do you participate in active sports and/or vigorous physical activities in your spare time?" followed by three reasons from each regulation style from the perceived locus of causality. The items measuring intrinsic motivation (e.g., "I exercise because it is fun"), identified regulation (e.g., "I exercise because it is important to make the effort"), introjected regulation (e.g., "I exercise because I will feel guilty if I do not"), and external regulation (e.g., "I exercise because others say I should") were assessed on 7-point Likert-type scales ranging from 1 (*not true at all*) to 7 (*very true*). Reliability coefficients were satisfactory for the intrinsic motivation ($\alpha = .74, .72, .81, \text{ and } .85$, for the British, Greek, Polish, and Singaporean samples, respectively),

identified regulation ($\alpha = .78, .67, .74$, and $.85$, for the British, Greek, Polish, and Singaporean samples, respectively), introjected regulation ($\alpha = .75, .61, .68$, and $.85$, for the British, Greek, Polish, and Singaporean samples, respectively), and external regulation ($\alpha = .77, .62, .61$, and $.68$, for the British, Greek, Polish, and Singaporean samples, respectively) measures.

Theory of planned behavior. The theory of planned behavior questionnaire was developed according to published guidelines (Ajzen, 2003). Three items measured behavioral intentions (e.g., "I intend to do active sports and/or vigorous physical activities in the next 5 weeks") on 7-point Likert-type scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal reliability coefficients for this scale were satisfactory ($\alpha = .91, .73, .97$, and $.95$, for the British, Greek, Polish, and Singaporean samples, respectively). Attitudes were assessed in response to the following question: "Participating in active sports and/or vigorous physical activities during my LT in the next 5 weeks is . . ."; responses were measured on four 7-point semantic differential scales with the following bipolar adjectives: *bad-good*, *harmful-beneficial*, *unenjoyable-enjoyable*, and *useful-useless*. These items achieved satisfactory internal reliability ($\alpha = .90, .92, .92$, and $.90$, for the British, Greek, Polish, and Singaporean samples, respectively). Subjective norms were measured by two items (e.g., "People important to me think that I should do active sports and/or vigorous physical activities during my LT in the next 5 weeks") on 7-point Likert-type scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal reliability of this scale was less than satisfactory for the British ($\alpha = .55$), Greek ($\alpha = .48$), and Singaporean ($\alpha = .57$) samples but acceptable for the Polish sample ($\alpha = .70$). Such measures of subjective norms have typically been criticized in meta-analytic reviews for their poor reliability and lack of prediction, perhaps because they tap nonsalient social influences (Armitage & Conner, 2001; Hagger et al., 2002b). This must be recognized as a limitation when adopting standardized theory of planned behavior measures. PBC was assessed through three items (e.g., "I feel in complete control over whether I do active sports and/or vigorous physical activities in my LT in the next 5 weeks") measured on 7-point Likert-type scales ranging from 1 (*no control*) to 7 (*complete control*). The internal consistency of this scale was adequate ($\alpha = .58, .69, .69$, and $.59$, for the British, Greek, Polish, and Singaporean samples, respectively).

Self-reported physical activity behavior. LT physical activity behavior was assessed at the third wave of data collection through an adaptation of Godin and Shephard's (1985) LTEQ. Participants were initially presented with the definition of vigorous physical activity given by Godin and Shephard (1986). Vigorous physical activity was defined as all active sports and vigorous physical activities, but not low-level activities or walking to school. Participants were requested to consider, on average, how many times per week they engaged in vigorous physical activity over the previous 5 weeks, recorded on a single 7-point scale, with the scale markers *not at all*, *once per week*, *a couple of days per week (2 times)*, *several days per week (3 to 4 times)*, *most days of the week (5 to 6 times)*, and *everyday (7 times)*.

Independent evaluations of the LTEQ have found it an easy-to-administer self-report measure with satisfactory validity and reliability statistics. The LTEQ fares well in concurrent validity checks against gold-standard measures of physical activity (Cale, 1994; Jacobs, Ainsworth, Hartman, & Leon, 1993; Kowalski, Crocker, & Kowalski, 1997; Sallis, Buono, Roby, Micale, & Nelson, 1993). Studies have found that the LTEQ was significantly correlated with Caltrac accelerometer motion scores ($r = .32, p < .01$; Jacobs et al., 1993), the Physical Activity Questionnaire for Adolescents ($r = .57, p < .01$; Kowalski et al., 1997), the Seven-Day Physical Activity Recall Questionnaire ($r = .39, p < .01$; Sallis et al., 1993), and the interview-administered 4-by-1-day Recall Physical Activity Questionnaire ($r = .47, p < .01$; Cale, 1994). Studies examining the test-retest reliability of the LTEQ have found a high and significant correlation ($r = .96, p < .01$) over a 7-day period in 11th-grade children, an age group comparable to the current sample (Sallis et al.,

1993). In addition, the LTEQ exhibits significant correlations with external criteria, such as skinfolds, an indicator of adiposity ($r = .76, p < .01$; Sallis et al., 1993), aerobic fitness ($r = .56, p < .01$; Jacobs et al., 1993), and muscular endurance ($r = .54, p < .01$; Godin, Jobin, & Bouillon, 1986). In addition, the LTEQ has been used successfully in many studies using social-cognitive models (e.g., Godin & Shephard, 1986; Hagger, Chatzisarantis, Biddle, & Orbell, 2001). Recently, a two-item version of this measure was shown to exhibit adequate construct validity in a confirmatory factor analysis and satisfactory composite reliability ($r = .85, p < .01$; Hagger & Chatzisarantis, in press). Together these data provide converging evidence supporting the validity and reliability of this simple measure of LT physical activity behavior.

Past physical activity behavior. In accordance with previous studies (e.g., Hagger, Chatzisarantis, et al., 2003; Norman, Conner, & Bell, 2000), we also included a brief self-report measure of past physical activity behavior at the second wave of data collection. The measure was identical to that used to measure self-reported physical activity behavior in the third wave of data collection, with the exception that the time frame given was the previous 6 months rather than 5 weeks. The definition of vigorous physical activity cited previously was given prior to the administration of this behavioral measure.

Translation Procedures

Standardized back-translation techniques (Brislin, 1986) were used in the development of language-specific questionnaires for use with the Greek and Polish samples. The procedure involved the construction of a draft version of questionnaires by a bilingual translator. This was vetted by two independent and proficient bilingual translators who translated the questionnaires back into English. The back-translated versions were then compared with the original English version, and any inconsistencies, errors, biases, and incongruities were highlighted. These inconsistencies were removed in a further translation and the back-translation comparison process was repeated until the versions were identical, as recommended by Bracken and Barona (1991). The final versions exhibited no discrepancies with the original English version of the measures when back-translated. The questionnaires for the Singaporean sample were administered in English as it is a national language of Singapore.

Results

Participants

Attrition across the three waves of data collection because of absences and inaccessibility resulted in final sample sizes of 222 participants in the British sample (118 girls, 104 boys; age, $M = 14.68$ years, $SD = 1.47$), 93 participants in the Greek sample (57 girls, 36 boys; age, $M = 13.99$ years, $SD = 0.80$), 103 participants in the Polish sample (56 girls, 47 boys; age, $M = 16.28$ years, $SD = 1.12$), and 133 participants in the Singaporean sample (67 girls, 66 boys; age, $M = 13.32$ years, $SD = 0.47$). A chi-square test indicated that the proportion of girls to boys was not significantly different across the samples, and t tests indicated no differences in age across the gender groups within the British, Greek, and Polish samples. However, the boys were significantly older (age, $M = 13.42$ years, $SD = 0.50$) than the girls (age, $M = 13.24$ years, $SD = 0.43$) in the Singaporean sample, $t(1, 137) = 2.21, p < .05$. A univariate F test revealed significant differences in age across all of the national groups, $F(3, 546) = 145.14, p < .01$.

Preliminary Analyses

Validity of perceived locus of causality measures. Preliminary checks were run to ensure the adequacy of the measures of per-

ceived locus of causality in the PE and LT contexts adopted in the present study and to confirm their within- and between-context discriminant validity. It was expected that items pertaining to internal perceived loci of causality and items from the external loci of causality would load on separate factors and that these factors would be segregated by context. Items from the perceived locus of causality measures were subjected to a principal components analysis followed by oblimin rotation of the extracted factors in each national sample. Four factors were extracted in each analysis, and a clear, theoretically predictable pattern emerged from the rotated factor solutions in all four samples. Two factors represented intrinsic motives in PE and LT. These were defined by items from the scales situated at the autonomous pole of the perceived locus of causality, intrinsic motivation and identified regulation, loading together. Two factors reflected external motives in PE and LT. These were defined by items from the scales aligned with the controlled pole of the perceived locus of causality, external regulation and introjected regulation, loading together. The factors were well-defined with few cross-loadings.² According to Ryan and Connell (1989), the extraction of two factors representing the internal–external extremes of the perceived locus of causality is typical with such measures due to high correlations for the polar (i.e., intrinsic motivation and external regulation) measures with their respective intermediate (i.e., identified regulation and introjected regulation) measures.

An additional check for the validity and differentiation of the polar and intermediate measures of the perceived locus of causality regulatory styles was provided by an examination of the zero-order correlations among these constructs.³ Ryan and Connell (1989) reported that the arrangement of these correlations should conform to a simplexlike pattern. In this simplex, the polar constructs should exhibit progressively weaker correlations with the other constructs as distance along the perceived locus of causality continuum increases. Examination of the pattern of correlations among the locus of causality constructs indicated that this pattern was consistent for virtually all of the scales, although the intrinsic motivation–introjected regulation correlation was higher than the intrinsic motivation–identified regulation correlation and the external regulation–identified regulation correlation was higher than the external regulation–introjected regulation correlation in the PE context for the Greek sample. This minor inconsistency may suggest that the scale did not satisfactorily differentiate between the subtle variations among the regulatory styles in this sample, but the factor analysis and low correlations between the extremes suggest that the internal–external distinction in the perceived locus of causality were distinct. Overall, these results support the construct and discriminant validity of the perceived locus of causality.

Calculation of relative autonomy index (RAI). The number of constructs in subsequent analyses was reduced by calculating an RAI from the perceived locus of causality constructs (Guay, Mageau, & Vallerand, 2003). This also had the effect of addressing the low internal consistency statistics observed for some of the scales. Weights were assigned to each individual's intrinsic motivation (+2), identified regulation (+1), introjected regulation (−1), and extrinsic regulation (−2) score, and the RAI was the composite of these weighted scores. The RAI therefore reflected participants' level of autonomous motivation in a physical activity context. Descriptive statistics and intercorrelations for the perceived autonomy support, RAI composites in both contexts, the

theory of planned behavior variables, and physical activity behavior are given in Table 1.

Cross-cultural invariance of measures. To establish whether the structure of the study measures was invariant across cultures, we conducted a series of multisample mean and covariance structure (MACS) analyses in accordance with the guidelines of Little (1997). In each analysis, a confirmatory factor analytic (CFA) model was initially estimated in which the observed items from the study measures were set as indicators of latent constructs representing their proposed factors. The structural components of this model, namely, the factor loadings, were then tested for invariance across the four cultural groups. This provided evidence to support a common factor pattern and structure for the proposed factors across cultures. Thereafter, the invariance of the reproduced means of the latent variables was tested to compare differences in the average levels of the study constructs across groups. According to Byrne, Shavelson, and Muthén (1989), invariance of factor loadings is considered the minimum acceptable criterion for measurement invariance across groups, although models can exhibit partial measurement invariance.

The analyses were conducted by using a robust maximum likelihood method with the EQS computer program (Version 6.1; Bentler, 2004). Overall goodness of fit of the proposed models with the data was evaluated by using multiple indices of good fit rather than the goodness-of-fit chi-square, which is considered overrestrictive as an evaluation of good fit because of its sensitivity to sample size. The comparative fit index (CFI) and root-mean-square error of approximation (RMSEA) were used to evaluate the adequacy of models as simulation studies have shown that these fit indexes are least influenced by sample size (Fan, Thompson, & Wang, 1999). A cutoff value of .90 or above for the CFI is typically considered an acceptable criterion for model fit, although a value greater than .95 is preferable (Hu & Bentler, 1999). A critical value of .08 or below for the RMSEA was considered satisfactory for good fit (Hu & Bentler, 1999).

Because of small sample sizes, we conducted the MACS analyses for the self-determination theory constructs (RAI in PE and RAI in LT) and theory of planned behavior constructs (intention, attitudes, subjective norm, and PBC) separately. In the first MACS analysis, we estimated a model in which the four weighted items used to form the composite RAI construct were set as indicators of their respective latent constructs in accordance with previous latent variable models using these indices (e.g., Guay et al., 2003). Separate RAI factors for PE and LT were hypothesized, and these factors were set to be correlated, as is typical in CFA models. The initial baseline model with no constraints to test the invariance of the structural parameters yielded satisfactory multigroup fit indexes, $\chi^2(16, N = 551) = 25.38, p = .06$ (CFI = .98, RMSEA = .03). This supported the proposed number of factors and pattern across the cultural groups. Constraining the factor loadings to be invariant across the samples resulted in a significant decrease in model fit, $\chi^2(25, N = 551) = 57.15, p < .01$ (CFI = .93,

² Full results of the exploratory factor analysis, including the rotated factor solution and factor loadings, are available on request from Martin S. Hagger.

³ The correlation matrix for the perceived locus of causality constructs in PE and LT for all samples is available on request from Martin S. Hagger.

Table 1
Descriptive Statistics and Intercorrelations Among the Trans-Contextual Model Components

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Perceived autonomy support (PE)			—							
British	4.83	0.90								
Greek	4.91	0.82								
Polish	2.97	1.11								
Singaporean	4.53	.95								
2. Relative autonomy index (PE)				—						
British	12.13	2.41	.26**							
Greek	12.36	2.79	.24*							
Polish	12.57	1.90	.21*							
Singaporean	11.30	1.74	.21**							
3. Relative autonomy index (LT)					—					
British	16.05	4.48	.29**	.45**						
Greek	19.60	4.30	.42**	.24*						
Polish	20.20	5.01	.04	.40**						
Singaporean	17.14	3.71	.32**	.28**						
4. Attitudes						—				
British	5.63	1.13	.30**	.27**	.49**					
Greek	5.54	1.39	.38**	.17	.60**					
Polish	6.03	1.25	.07	.27**	.60**					
Singaporean	5.14	1.16	.24**	.27**	.57**					
5. Subjective norm							—			
British	4.80	1.46	.14*	-.11	-.26**	-.03				
Greek	4.23	1.48	.19	.13	.31**	.22*				
Polish	3.92	1.87	.05	-.12	-.19*	-.12				
Singaporean	4.42	1.05	-.11	-.05	-.02	-.08				
6. Perceived behavioral control								—		
British	5.30	1.17	.12	.01	.21**	.35**	-.07			
Greek	5.10	1.27	.31*	.11	.56**	.56**	.29**			
Polish	4.60	1.15	.14	.02	.35**	.49**	.22*			
Singaporean	4.41	0.96	-.01	.02	.39**	.35**	.11			
7. Intention									—	
British	4.61	1.62	.27**	.13*	.38**	.64**	-.05	.39**		
Greek	4.31	1.61	.23**	.02	.45**	.60**	.18	.58**		
Polish	5.14	1.99	.10	.17	.49**	.68**	.08	.60**		
Singaporean	4.28	1.56	.20*	.29**	.57**	.50**	-.09	.46**		
8. Leisure-time exercise behavior										—
British	3.97	1.21	.13	.18**	.23**	.29**	-.09	.17*	.45**	
Greek	3.33	1.68	.23*	-.01	.41**	.41**	.19	.39**	.45**	
Polish	3.90	1.70	.13	.08	.35**	.52**	.07	.49**	.78**	
Singaporean	2.84	1.31	.22*	.10	.50**	.45**	-.01	.42**	.64**	

Note. For British sample, $N = 222$; Greek sample, $N = 93$; Polish sample, $N = 103$; Singaporean sample, $N = 133$. PE = physical education context; LT = leisure-time context.

* $p < .05$. ** $p < .01$.

RMSEA = .06), but only two constraint parameters were primarily responsible for this invariance, and freeing them restored model fit, $\chi^2(23, N = 551) = 39.95, p = .02$ (CFI = .97, RMSEA = .04), to within an acceptable range of the baseline model (Cheung & Rensfold, 2002). This suggests that with the exception of two factor loadings, invariance of the RAI measures is acceptable across groups and that the model exhibited partial invariance (Byrne et al., 1989). Subsequent tests of latent means structure revealed that the reproduced mean levels RAI for PE and LT for the British sample were higher compared with the other samples. In addition, the means for the RAI in LT were significantly higher in the Greek sample compared with the Polish and Singaporean samples. There were no other mean differences.

A similar analysis was conducted with the theory of planned behavior constructs. Items from the intention, attitude, subjective norm, and PBC measures were set as indicators of their respective

factors. The baseline multigroup model exhibited satisfactory model fit, $\chi^2(192, N = 551) = 430.54, p < .01$ (CFI = .91, RMSEA = .05), supporting the adequacy of the factor pattern across cultural groups. Constraining the factor loadings significantly reduced the goodness of fit, $\chi^2(216, N = 551) = 508.73, p < .01$ (CFI = .89, RMSEA = .05), indicating that some of the factor loadings were noninvariant across groups. Four constraint parameters from the total of 24 were responsible for the majority of the discrepancy in fit from the baseline model. These parameters were for two of the PBC items that were noninvariant across the British and Polish samples and across the British and Singaporean samples. Freeing these constrained parameters resulted in a restoration of adequate fit to within acceptable limits of the baseline model, $\chi^2(212, N = 551) = 476.89, p < .01$ (CFI = .90, RMSEA = .05). An analysis of the latent mean structure of the model revealed that the mean level of attitude was significantly

higher in the British sample compared with the Greek, Polish, and Singaporean samples, whereas the level of intention was significantly lower in the Greek sample compared with all other national groups. In addition, the British sample exhibited significantly higher mean levels of PBC and subjective norms than did the Singaporean sample, but no differences in levels of intention. Attitudes were also significantly higher in the Polish sample compared with the Greek and Singaporean samples. Although there were some variant items across the samples, the MACS analyses supported the hypothesis of structural invariance of the self-determination theory and theory of planned behavior measures across these samples. Given support for structural invariance, the differences in the reproduced means reported in these analyses are likely due to variations in actual levels of these constructs rather than to structural discrepancies.

Discriminant validity of the theory of planned behavior and autonomous motivation constructs. In addition to the invariance of these measures across samples, it was also important to support the discriminant validity of the theory of planned behavior measures of attitude and subjective norm from the self-determination theory measure of relative autonomy. Although they share similar content, the intrinsic motivation and attitude scales and the subjective norm and external regulation scales are considered conceptually distinct on the basis of their level of generality and orientation. We followed the method of Hagger, Chatzisarantis, et al. (2003) to establish the discriminant validity of these measures. A series of two-step CFA models was conducted as advocated by Mulaik and Millsap (2000). In the first step, a two-factor discriminant validity CFA model was estimated. In this model, the first factor reflected the RAI and was indicated by items from the perceived locus of causality construct in accordance with Guay et al.'s (2003) model. The second factor was indicated by items from the theory of planned behavior construct under scrutiny. These factors were set to be correlated. This model was contrasted with a congeneric CFA model in which a single factor was indicated by the items from the RAI and the theory of planned behavior construct in question. This two-step process was followed to test the discriminant validity of autonomous motives in PE and LT contexts with the attitude and subjective norm constructs, a total of eight analyses. To ensure cross-cultural validity, a multisample approach to the estimation of models was adopted. Model fit was

evaluated by using the criteria previously specified. In all cases, the discriminant validity models exhibited excellent fit with the data across all four samples in the PE context for attitude, $\chi^2(52, N = 551) = 115.74, p < .01$ (CFI = .95, RMSEA = .05), and subjective norms, $\chi^2(4, N = 551) = 4.06, p = .397$ (CFI = 1.00, RMSEA = .01), and the LT context for attitude, $\chi^2(76, N = 551) = 146.39, p < .01$ (CFI = .96, RMSEA = .04), and subjective norms, $\chi^2(16, N = 551) = 18.00, p = .32$ (CFI = 1.00, RMSEA = .01). Supporting hypotheses of discriminant validity, the congeneric models all exhibited substantial discrepancies in fit, and none of the models met the cutoff criteria for acceptable fit.

Path Analyses

Single-sample analyses. The hypothesized relationships among the trans-contextual model constructs shown in Figure 1 were tested with path analysis by using a simultaneous process and a maximum likelihood estimation method with the EQS computer software (Bentler, 2004). Model fit was evaluated by using the goodness-of-fit indexes cited previously. Goodness-of-fit indexes for the hypothesized model estimated for the data in each sample are given in Table 2. For the British, Greek, and Polish samples, the hypothesized model exhibited excellent fit with the data with nonsignificant goodness-of-fit chi-square values and incremental fit indexes that exceeded the stringent cutoff criterion in all cases. However, the hypothesized model did not result in an optimal fit for all criteria in the Singaporean sample, $\chi^2(5, N = 133) = 12.48, p < .05$ (CFI = .97, RMSEA = .11). A Lagrange Multiplier (LM) test was also conducted for each model. The LM test flags fixed parameters in the model that would make a significant change in the goodness-of-fit chi-square value if freed. The LM test for the model estimated by using the Singapore data revealed that a direct path between PBC and behavior should be freed. The indiscriminate introduction of paths on the basis of the LM test represents a capitalization on chance to improve model fit unless a sound theoretical basis can be provided (MacCallum, Roznowski, & Necowitz, 1992). However, the direct PBC-behavior link was theoretically justifiable (Ajzen, 1985), so it was freed in the Singapore sample, which resulted in a well-fitting model (see

Table 2
Goodness-of-Fit Statistics for Single-Sample Trans-Contextual Model Path Analyses

Sample						Bootstrap statistics ^b					
	χ^2 ^a			CFI	RMSEA	χ^2 ^a		CFI			
	Value	df	p			Mean value	Mean p	M	CI ₉₅ (LB)	CI ₉₅ (UB)	Skewness
British	4.91	5	.43	1.00	.00	9.98	.20	.99	.96	1.00	-1.31**
Greek	6.71	5	.24	.99	.06	11.71	.17	.97	.91	1.00	-1.22**
Polish	1.36	5	.93	1.00	.00	6.33	.42	.99	.97	1.00	-2.08**
Singaporean	6.62	4 ^c	.16	.99	.07	10.64	.13	.98	.94	1.00	-1.16**

Note. CFI = comparative fit index; RMSEA = root-mean-square error of approximation; CI₉₅ (LB) = 95% confidence interval, lower bound; CI₉₅ (UB) = 95% confidence interval, upper bound.

^a Goodness-of-fit chi-square. ^b Bootstrap statistics are for 999 replications. ^c This model had an additional parameter because the theoretically plausible path between perceived behavioral control and behavior was set free on the basis of the Lagrange Multiplier test.

* $p < .01$.

Table 2). These results support the expected replicability of the trans-contextual model in each sample.⁴

Given that previous researchers have claimed that the effects of social-cognitive variables may be an artifact of previous decision making (Ajzen, 2002), we also included a measure of past behavior in our design. To test for the influence of past behavior, we respecified the path analysis models while controlling for the effect of past behavior at Time 2. In the alternative models, paths were freed from the past behavior measure to all of the Time 2 and Time 3 constructs. These models exhibited satisfactory fit with the data in each sample, but the pattern of relationships in the model remained virtually unchanged with the inclusion of past behavior, so in the interests of parsimony this variable was dropped in subsequent analyses.

Bootstrap procedure. To ensure the robustness of the path analytic models and that they were not adversely affected by such artifacts as sample size and nonnormality, we conducted a "bootstrap" resampling analysis for the model in each sample. In these analyses, the data set in question was assumed to be that of the "population," and samples were drawn randomly from this data set, with replacement, equal in size to the original sample. The specified model was then estimated in the generated samples, and the bootstrap procedure was replicated 999 times. The average goodness-of-fit chi-square and the average CFI with 95% confidence intervals (CI_{95}) and skewness statistics for the analyses are given in Table 2. For each cultural sample, all of the replications resulted in a successful fit of the specified model. The average goodness-of-fit chi-square value was nonsignificant, and the average CFI value exceeded the cutoff criterion (Hu & Bentler, 1999) for the analysis in each cultural sample. In addition, the upper-bound CI_{95} for the CFI reached unity, and the lower bound was greater than the minimum acceptable cutoff criterion in each analysis. Furthermore, the distribution of the CFI was significantly and negatively skewed in each analysis, such that the CFI values from the analyses tended to be stacked toward the upper bound. This is desirable in bootstrap analyses as it is indicative of a large number of good-fitting models in the replicated samples. Overall, these resampling analyses provided further support for the robustness of the hypothesized model in each cultural sample.

Multisample analysis. To test for differences in the pattern of relationships in the hypothesized model across the data from the national samples, we conducted a multisample analysis that constrained the free parameters to be invariant across all groups. The invariance analysis resulted in a model that exhibited suboptimal fit with the data on the basis of the multiple criteria adopted, $\chi^2(79, N = 551) = 165.07, p < .01$ (CFI = .92, RMSEA = .05). The LM test indicated the invariance constraints that were responsible for model misspecification. Overall, 12 constraints were recommended to be freed, and a respecification of the model releasing these parameters resulted in a model with satisfactory fit, $\chi^2(67, N = 551) = 74.05, p = .26$ (CFI = .99, RMSEA = .05).

Relationships in the Path Analytic Models Across Samples

The standardized path coefficients for the free parameters in the models from each national sample are given in Table 3. The parameters flagged as invariant in the multisample analyses are also shown. In Table 3, the effects of autonomy support and autonomous motives (RAI) in both contexts on the theory of

planned behavior variables, intentions, and physical activity behavior are dealt with in turn, starting with the effects on the most proximal constructs. Overall, the pattern of relationships was similar but not identical across national groups. The model accounted for 45.0%, 45.5%, 62.6%, and 43.0% of the variance in intentions to perform LT physical activity in the British, Greek, Polish, and Singaporean samples, respectively, and 20.3%, 22.3%, 57.0%, and 43.9% of the variance in physical activity behavior in these samples.

Effects of autonomy support. There were significant total effects of perceived autonomy support on autonomous motives in an LT context in the British (total effect = .29, $p < .01$), Greek (total effect = .42, $p < .01$), and Singaporean samples (total effect = .36, $p < .01$), as indicated by the correlations in Table 1. The hypothesis that perceived autonomy support in a PE context would have an indirect influence on autonomous motives in an LT context through the effect of autonomous motives in a PE context was supported only in the British sample. Only direct effects of perceived autonomy support on autonomous motives in an LT context were present in the Greek and Singaporean samples. In the Polish sample, the total effect of perceived autonomy support on autonomous motives in an LT context was nonsignificant. These results indicate a lesser role for autonomous motives in a PE context than originally proposed. In summary, across all four samples, perceived autonomy support in a PE context had a direct effect on autonomous motives in an LT context, with the exception of the Polish sample; perceived autonomy support also had a direct effect on autonomous motives in a PE context in all countries, with the exception of the Singaporean sample; autonomous motives in a PE context had direct effects on autonomous motives in an LT context in all but the Polish sample; and there was a significant

⁴ We tested an alternative model that excluded the theory of planned behavior constructs of attitudes, subjective norms, and PBC. The rationale for this model was to check whether excluding these constructs resulted in the same amount of variance in behavioral intentions being explained. This would indicate that these constructs were redundant in the trans-contextual model. In the alternative model, the motivational sequence from the trans-contextual model was estimated. The only exception was that autonomous motives in an LT context were hypothesized to influence intentions directly unmediated by attitudes, subjective norms, and PBC. The path analyses of these models fit the data from each national sample satisfactorily, although the fit indexes indicated that the trans-contextual model exhibited better fit with the data in each case. It is important to note that the alternative model explained far less of the variance in behavioral intentions than did the trans-contextual model. The alternative model accounted for 17.8%, 21.5%, 24.7%, and 34.1% of the variance in behavioral intentions in the British, Greek, Polish, and Singaporean samples, respectively, as opposed to 45.0%, 45.5%, 62.6%, and 43.0% in the trans-contextual model. As behavioral intention was the only significant predictor of LT physical activity behavior in the trans-contextual and alternative models, the percentage of variance accounted for in behavior was identical. These results suggest that not only are the constructs of attitude and PBC implicated in the mechanism behind the translation of motives into intentions, but they also account for more variance in intentions. This suggests that interventions can target contextual-level constructs like autonomous motives as well as situational-level constructs like attitudes to effect a change in intentions.

Table 3
Standardized Parameter Estimates and Univariate Comparisons From the Path Analyses of the Trans-Contextual Model for Each National Sample

Path	Parameter estimate			
	British	Greek	Polish	Singaporean
PAS → RAI-PE	.26**	.24**	.21**	.15
PAS → RAI-LT	.19***	.39***	-.04	.33***
PAS → ATT	.16**	.15	.04	.03
PAS → SN	.25 ^{a,b,c**}	.06 ^d	.07 ^d	-.01 ^d
PAS → PBC	.08	.10	.16	-.07
PAS → BI	.09	-.03	.01	.01
PAS → B	.01	.14	.06	.10
RAI-PE → RAI-LT	.40 ^{a,b,c**}	.15 ^{a,d}	.41 ^{b,c,d**}	.22 ^{a,d**}
RAI-PE → ATT	.04	.01	.03	.09
RAI-PE → SN	-.03	.05	-.08	.01
RAI-PE → PBC	-.12	-.04	-.18	-.05
RAI-PE → BI	-.08 ^c	-.09 ^c	-.01	.12 ^{b,d}
RAI-LT → ATT	.42 ^{a,b,c**}	.54 ^{d**}	.59 ^{d**}	.60 ^{d**}
RAI-LT → SN	-.32 ^{b,c**}	.28 ^{a,c,d**}	.16 ^{b,c}	-.04 ^{a,b,d}
RAI-LT → PBC	.24 ^{b**}	.53 ^{a,c,d**}	.41 ^{b**}	.40 ^{b**}
RAI-LT → BI	.10 ^c	.05 ^c	.12 ^c	.37 ^{a,b,d**}
ATT → BI	.52 ^{b,c**}	.40 ^{a,c,d**}	.47 ^{b,c**}	.11 ^{a,b,d}
SN → BI	-.02	-.01	.10	-.12
PBC → BI	.17***	.35***	.31 ^{b,c,d**}	.27***
BI → B	.45 ^{a,b,c**}	.42 ^{a,d**}	.78 ^{b,c,d**}	.54 ^{a,d**}
PBC → B ^e	—	—	—	.18*
R ² BI	.45**	.46**	.63**	.43**
R ² B	.20**	.22**	.57**	.44**

Note. PAS = perceived autonomy support (physical education [PE] context); RAI-PE = relative autonomy index (PE context); RAI-LT = relative autonomy index (leisure-time [LT] context); ATT = attitude; SN = subjective norm; PBC = perceived behavioral control; BI = behavioral intention; B = physical activity behavior.
^a Significantly different from Polish sample. ^b Significantly different from Greek sample. ^c Significantly different from Singaporean sample. ^d Significantly different from British sample. ^e Path estimated in Singaporean sample only.
 * $p < .05$. ** $p < .01$.

indirect effect of perceived autonomy support in a PE context on autonomous motives in an LT context for the British sample only.

Effects of autonomous motives on theory of planned behavior constructs. The within-context relationships between autonomous motives in an LT context and the constructs from the theory of planned behavior supported a priori hypotheses. It is important to note that the pattern of influence was generally the same across samples although there were variations in the strength of the relationships. The autonomous motives in an LT context had a significant influence on attitude (parameter estimate range = .42 to .60, $p < .01$) and PBC (parameter estimate range = .24 to .53, $p < .01$) in all samples. There was a significant influence of autonomous motives on subjective norm in the British (parameter estimate = $-.32$, $p < .01$) and Greek samples (parameter estimate = $.28$, $p < .01$), although these influences had no motivational relevance because the subjective norm–intention relationship was nonsignificant in all samples. There were no significant effects of perceived autonomy support or autonomous motives in a PE context on any of the theory of planned behavior constructs. The only exceptions were the small direct effects of perceived autonomy support in a PE context on attitudes (parameter estimate = $.16$, $p < .01$) and subjective norms (parameter estimate = $.25$, $p < .01$) in the British sample. In summary, autonomous motives in an LT context had direct effects on attitudes and PBC across all

samples; autonomous motives in an LT context had direct effects on subjective norms for the British and Greek samples only; and there were no direct effects of perceived autonomy support or autonomous motives in a PE context on the theory of planned behavior variables, with the exception of the direct effects of autonomous motives in a PE context on attitudes and subjective norms in the British sample only.

Prediction of intention and behavior. Intentions to participate in physical activity were a function of attitudes (parameter estimate range = $.40$ to $.47$, $p < .01$) and PBC (parameter estimate range = $.17$ to $.35$, $p < .01$) in all samples as hypothesized, with the exception of the Singaporean sample in which autonomous motives in an LT context and PBC were the only significant predictors. However, despite the mutual pattern of significance in these samples for the attitude–intention and PBC–intention relationships, they were still noninvariant across samples. This supports Ajzen’s (1985) and Bagozzi et al.’s (2001) hypothesis that the pattern of influence within the theory of planned behavior would vary across contexts and cultures. The significant zero-order correlation between autonomous motives in an LT context and intentions in the British ($r = .38$, $p < .01$), Greek ($r = .45$, $p < .01$), and Polish ($r = .49$, $p < .01$) samples (see Table 1) was completely mediated by the attitude and PBC constructs in the trans-contextual model. This was confirmed by the fact that the

mediator variables (attitude and PBC) were significantly correlated with the two variables involved in the mediated relationship (autonomous motives in LT and intention), and the inclusion of the mediators in a multivariate test showed no significant direct effect of the autonomous motives in LT on intentions (Baron & Kenny, 1986). However, attitude construct did not mediate the influence of autonomous motives in an LT context on intentions in the Singaporean sample. Instead, the relationship swamped the significant attitude–intention correlation observed in Table 1. To check this, we fixed the path from autonomous motives in an LT context to intention and respecified the model. Results showed that the attitude–intention relationship was restored. Finally, LT physical activity behavior was significantly influenced by behavioral intentions alone for the British, Greek, and Polish samples, although the strength of the relationship varied across samples. PBC had a direct influence on physical activity behavior alongside intention in the Singaporean sample only.

In summary, attitudes and PBC had direct effects on behavioral intentions, and intentions had a direct effect on physical activity behavior for the British, Greek, and Polish samples; there were also no direct effects of autonomous motives in an LT context on intentions; the attitude and PBC constructs mediated the effect of autonomous motives in PE on intentions for the British, Greek, and Polish samples; there were direct effects of PBC and autonomous motives in LT on intentions and direct effects of intentions and PBC on behavior in the Singaporean sample; and the effect of autonomous motives mediated the attitude–intention relationship in the Singaporean sample.

Discussion

The purpose of the present study was to evaluate the replicability and cross-cultural invariance of proposed relationships of a trans-contextual model of motivation in four samples of differing cultural backgrounds. There was an overall congruence in the pattern of the relationships from the trans-contextual model across cultures, although there were a number of variations in the significance and strength of the relationships. Overall, autonomous motives in a PE context had significant total effects on autonomous motives in an LT context in the British, Polish, and Singaporean samples. The hypothesized indirect effect of perceived autonomy support on autonomous motives in an LT context via autonomous motives in PE was found only in the British sample. Only in the Polish sample did perceived autonomy support not have any influence, direct or indirect, on autonomous motives in an LT context. Autonomous motives in an LT context predicted attitudes and PBC, and these variables mediated the influence of autonomous motives on intentions to participate in physical activity, although there was also a direct effect in the Singaporean sample.

The effect of perceived autonomy support on autonomous motives in an LT context was sufficiently pervasive in the present study to substantiate the hypothesis that supporting autonomy in one context (PE) may promote autonomous motives in a different but related context (LT). This is congruent with the majority of research in education that cites the importance of autonomy support in encouraging autonomous forms of motivated behavior within contexts (Reeve, 2002; Standage et al., 2003). Current findings extend these results to suggest that, in accordance with

Vallerand's (1997) theory and the trans-contextual model, perceived autonomy support in an educational context can promote autonomous motivation in another related but noneducational context. However, only in the British sample was the proposed motivational sequence supported consistent with previous studies (Hagger, Chatzisarantis, et al., 2003). In the other samples, the proposed indirect effect of perceived autonomy support on autonomous motives in LT was untenable. Nevertheless, whether the effect of perceived autonomy support on autonomous motives in LT was direct or indirect, there was a significant total effect of perceived autonomy support in a PE context on autonomous motives in an LT context in all but the Polish sample. These data support the pattern of influence of perceived autonomy support on autonomous motives observed in other studies (Hagger, Chatzisarantis, et al., 2003; Ratelle et al., 2003), but there is little evidence that autonomous motives in the proximal context are implicated in this process.

It is important to note that the hypothesis that perceived autonomy support had an influence on autonomous motives in either context had to be rejected in the Polish sample. It is interesting that the average level of autonomy support among the Polish sample was far lower than those in the other samples. This indicates that Polish students did not rate the support for their autonomy in a PE context as highly as did their counterparts in the other samples, a finding that has been noted in other Eastern European cultures (Chirkov & Ryan, 2001). A possible explanation for this is that autonomy support may be less important in this particular culture. It may be that adolescents in a Polish culture do not respond to autonomy support in a PE context in the same manner as do adolescents in the other cultures. Indeed, there is some evidence from collectivistic cultures that intrinsic motivation in individuals may be thwarted when individuals are offered a personal choice but supported if a significant other made the choice for them (Iyengar & Lepper, 1999). Future studies should therefore tap into relatedness and group autonomy as a means for fostering intrinsic motivation rather than personal autonomy support.

An alternative explanation may be that the PE teachers in the Polish school tended not to adopt autonomy-supportive behaviors or that the school had a particularly controlling style of teaching. Further, the potential for the significantly greater age of this sample to confound results should not be discounted and must be recognized as a limitation of these findings. Nevertheless, it seems that although perceived autonomy support was low in this sample of Polish students and not influential in the motivational sequence proposed by the trans-theoretical model, autonomous motives did influence situational-level decisions to act. Indeed, although the antecedent variables of autonomous motives in an LT context differed in this sample, autonomous motives toward LT physical activity were highly endorsed and influenced intention via the mediation of attitudes and perceived control, an identical pattern to the process modeled in the other samples.

Notwithstanding the inconsistency across samples in the impact of perceived autonomy support on autonomous motives within and across contexts, there was a consistent pattern of results linking autonomous motives in an LT context with the social–cognitive antecedents of intentions and behavior. Furthermore, we found that these relationships were largely unaffected by the inclusion of past physical activity behavior. LT-relative autonomy influenced intentions via the mediation of attitudes and PBC, although the mag-

nitude of these influences was noninvariant across samples. This supports previous studies that have shown the importance of context-tied motives in the prediction of intentions and behavior and the relevance of the personal and social precursors of planning to act in accounting for these influences (Chatzisarantis et al., 1997; Hagger et al., 2002a; Hagger, Chatzisarantis, et al., 2003; Hagger et al., in press). Furthermore, there were no direct influences of autonomous motives on actual physical activity behavior at Time 3. It seems that across cultures, the effects of context-tied autonomous motives on plans to act and action are mediated by the social-cognitive constructs from the theory of planned behavior at the situational level.

Together these findings are concordant with Vallerand's (1997) hierarchical model and Deci and Ryan's (1985) original proposal that theories of social cognition like the theory of planned behavior and self-determination theory can complement each other. According to Deci and Ryan, self-determination theory serves to explain the formation of decision-making variables like attitudes, subjective norms, and PBC (Chatzisarantis et al., 1997), whereas the influence of such motives on action can be explained only via the mediation of attitudes, subjective norms, PBC, and intentions (Hagger et al., 2002a). Finally, it is clear that there were no direct effects of perceived autonomy support on behavior in any of the samples. This finding is consistent with the growing body of evidence that supports the indirect effect of perceived autonomy support on action via the motivational sequence proposed in the present study (Hagger et al., 2002a; Ratelle et al., 2003; Reeve, 2002; Standage et al., 2003).

The findings from the present study suggest that perceived autonomy support in a PE context is implicated in enhancing motives in an extramural context and may result in the initiation of physical activity behavior. This seems to be consistent in three of the four national samples and adds further to the growing body of research on the positive effects of perceived autonomy support in educational settings in both individualist (Reeve, 2002; Standage et al., 2003) and collectivist cultures (Chirkov & Ryan, 2001). Reeve (2002) identified the specific behaviors exhibited by teachers that are likely to support autonomy in school pupils. These include motivational strategies, such as providing students with choice in their PE tasks (Chatzisarantis, Hagger, Biddle, et al., in press), fostering a mastery-involved motivational climate (Ames, 1992), avoiding competition and external references for success (Deci & Ryan, 1985), and providing informational and competence-related feedback (Deci et al., 1994).

A major strength of the present study is its prospective design, permitting the inference of causality. However, it must be noted that the prospective design does not rule out the potential influence of additional constructs that may cause both the proposed independent and dependent constructs in the causal relationships reported here. Further, it must be recognized that within-time relationships are cross-sectional in nature and, as with any cross-sectional study, must be cited as a possible limitation to the inference of causality. There were also significant differences in age across the samples. The Polish sample, in particular, had a significantly higher average age. This may have affected results, particularly in attitudes toward physical activity, which tends to decrease with age (Fox, 1988). In addition, the self-report measures of physical activity behavior and past behavior in the present study should be expressed as a limitation, despite exhibiting sat-

isfactory validity statistics against objective physical activity and physical fitness criteria and adequate test-retest reliability. Future studies should adopt objective measures of physical activity that are not subject to the response biases associated with self-report behavioral measures.

A further limitation is that the role of perceived autonomy support tells only part of the picture in terms of the influences of the motivational climate on pupils' motivation in PE. Objective measures of PE teachers' perceptions of their autonomy support and even observational quantification of the autonomy-supportive behaviors exhibited by the PE teachers may have explained further variance in motivation in PE and LT contexts. In addition, perceived autonomy support from peers or parents was not measured in the present study. Considering the evidence supporting the pervasive influence of perceived peer-group support on adolescents' behavior (Suls, Lemos, & Stewart, 2002) and peer choice on intrinsic motivation across cultures (Iyengar & Lepper, 1999), perceived autonomy support from peers may account for additional variance in autonomous motives in the trans-contextual model. This is coupled with the pervasive influence that parents have on children's choice of LT activities and autonomous motivation (Ratelle et al., 2003). Future studies should include these additional sources of support to further understand the environmental influences on autonomous motivation and action in educational and extramural contexts.

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