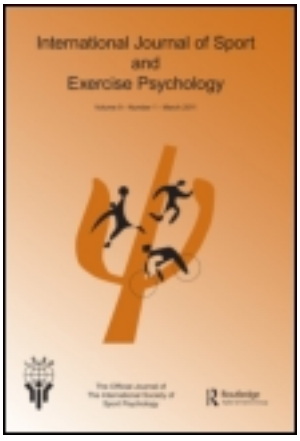

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On the dynamic relationships between contextual (or general) and situational (or state) motivation toward exercise and physical activity: A longitudinal test of the top-down and bottom-up hypotheses

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On the Dynamic Relationships between Contextual (or General) and Situational (or State) Motivation toward Exercise and Physical Activity: A Longitudinal Test of the Top-Down and Bottom-Up Hypotheses

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Abstract

The present research sought to test key postulates of the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM, Vallerand, 1997) in two different physical activity settings. Specifically, the top-down and the recursive (bottom-up) effects were tested with adult participants (n = 89) in a fitness center as well as with high school students (n = 168) in physical activity classes. Study 1 further assessed the positive consequences resulting from a self-determined situational motivation while Study 2 tested the impact of the perceived motivational climate on students' situational motivation. Two short-term longitudinal designs (with three measurement times in Study 1 and five measurement times in Study 2) were used. These models enabled the investigation of the interplay between the contextual and the situational levels of the motivational hierarchy over time. Overall, the results of Study 1 and Study 2 supported the postulates of the HMIEM (Vallerand, 1997). Furthermore, the results of Study 1 showed that self-determined situational motivation predicted positive outcome variables (i.e., positive emotions and concentration) while the results of Study 2 showed the significant relationship between a perceived mastery climate and self-determined situational motivation. The present findings allow us to hypothesize the existence of a dynamic process through which changes in contextual self-determined motivation may take place over time.

Keywords: hierarchical model, self-determined motivation, top-down effect, recursive effect, mastery motivational climate

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Physical activity has been identified as an important contributor to physical and psychological health (Armstrong, Bauman, & Davies, 2000). However, inactivity seems to prevail in the general population. In Canada, only 21% of citizens report being physically active (Statistics Canada, 2001), while in the United States only 24% of the population is engaging in vigorous leisure-time physical activity at least three times per week (National Center for Health Statistics, 2004). In light of the significant importance of physical activity, it becomes important to identify the factors that predict regular engagement in physical activity. One important factor is the construct of motivation (Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Vazou, Ntoumanis, & Duda, 2006). Well developed and empirically supported theories and models in the field of motivation have proven helpful in the understanding of human behavior in the context of sports and exercise (to this effect, see Roberts, 2001). One model in particular is the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM, Vallerand, 1997). The HMIEM proposes postulates and corollaries for the conceptualization of motivation in sports and exercise including mechanisms through which motivational orientations toward specific activities can be changed over time. The purpose of the present studies was to test some of these postulates in physical activity settings, thereby allowing us to understand the nature of psychological processes through which changes in motivation may take place over time.

The Hierarchical Model of Intrinsic and Extrinsic Motivation

The HMIEM (Vallerand, 1997; Vallerand & Ratelle, 2002) is based in part on Deci and Ryan's (1985, 1991, 2000) self-determination theory (SDT). SDT postulates that there exist multiple forms of motivation which can be distributed along a continuum from high to low levels of self-determination. The different forms of motivations can be divided into three broad categories: intrinsic motivation (i.e., doing something for its own sake), extrinsic motivation (i.e., doing something for instrumental reasons), and amotivation (i.e., complete lack of purpose). Extrinsic motivation entails different degrees of self-determination (Deci & Ryan, 1985). Those degrees of self-determined motivation, arranged from lowest to highest, are external regulation, introjected regulation, and identified regulation. The higher the level of self-determination, the more autonomously internalized is the activity within the self. Because the different forms of self-determined motivation are distributed along a continuum, an index of self-determination can be constructed with higher values representing motivational orientations that are mostly intrinsic and identified and lower values representing motivational orientations that are more introjected and externally regulated (Vallerand, 1997).

The HMIEM (Vallerand, 1997, 2001, 2007a, 2007b; Vallerand & Perreault, 1999; Vallerand & Ratelle, 2002) posits that motivation can exist at three different levels of generality. Specifically, the highest level of the hierarchy is the global level. At this level, motivation refers to the motivational tendency to interact with one's environment in a generally intrinsic, extrinsic, or amotivated fashion. The second level, contextual motivation, refers to an individual's general motivational orientation in a specific context or life

domain (e.g., physical activity, education, etc.). Finally, the lowest level of generality is situational motivation. At this level of generality, motivation is experienced at a given moment in time toward a specific activity. Distinguishing between the three levels of the hierarchy is important because it provides a clearer and deeper understanding of the various intra-personal sources of inf uence on situational motivation, as well as the nature of the processes through which changes in contextual and global motivation may take place (Vallerand, 2007b).

The HMIEM's Recursive and Top-Down Effects

A first postulate from the HMIEM proposes that motivation experienced at one level in the hierarchy can have a recursive (bottom-up) inf uence on the motivational construct of the next higher level in the hierarchy (Vallerand, 1997). This postulate underscores the relation between motivations at different levels of generality and serves to explain motivational changes that may take place over time (Vallerand, 1997, 2007, in press). For instance, repeatedly experiencing self-determined motivation at the situational level can, through the recursive effect, eventually generate higher levels of self-determined motivation at the corresponding contextual level. Someone who feels repeatedly intrinsically motivated when exercising is expected, over time, to develop a general (or contextual) intrinsic motivational orientation toward most forms of exercise. Conversely, someone who repeatedly experiences amotivation in the gym will develop an amotivated contextual motivation toward exercising over time.

To our knowledge, little research has looked at the recursive effect. Research conducted to date, however, suggests that the effect does take place. For instance, in the area of education, it has been shown that self-determined school motivation measured five years earlier predicted subsequent higher levels of self-determined global motivation (Guay et al., 2003; Study 1). The more self-determined the contextual motivation, the more self-determined the subsequent global motivation. Of particular interest for the present research is the research by Blanchard, Mask, Vallerand, de la Sablonnière, and Provencher (2007; Study 1), which showed that basketball players' situational motivation, measured immediately after two important games of a tournament, predicted their subsequent contextual motivation toward basketball both during the tournament and 10 days later. These findings were replicated over the course of a whole basketball season (Blanchard et al., 2007; Study 2).

Vallerand (1997) further suggests that motivation at one level of generality can also have an inf uence on motivation at the next lower level in the hierarchy (i.e., top-down effect). That is, global motivation can exert an inf uence on contextual motivation which can impact on situational motivation. Someone who has a high level of self-determined global motivation should have a high level of contextual motivation toward physical activity in general, and should, in turn, display a high level of self-determined motivation in a physical activity session at a specific point in time (i.e., at the situational level). This hypothesis from the HMIEM (Vallerand, 1997) provides an opportunity to look at someone's motivation from an intra-personal perspective (Vallerand, 2007b). Much research

has provided support for the top-down effect of the HMIEM (Guay, Mageau, & Vallerand, 2003; Vallerand, 1997, 2001, 2007a, 2007b; Williams, Grow, Freedman, Ryan, & Deci, 1996). For instance, Ntoumanis and Blaymires (2003) showed that students' situational motivation toward physical activity was positively predicted by their contextual motivation toward physical activity, measured one month before. Additional support for the top-down effect was obtained from a study with young gymnasts (Gagné, Ryan, & Bargmann, 2003) and showed that their contextual motivation, measured on Day 1, was positively correlated to their situational motivations for each of the following 15 days.

The HMIEM also proposes that a specific motivational sequence (i.e., "Social factors → Self-Determined Motivation → Consequences") exists at each level of the hierarchy. Specifically, at the situational level, a person who interacts at a specific point in time with a supportive training coach or physical activity teacher (social factors) should experience higher levels of intrinsic motivation and identified regulation in that particular physical activity session (situational motivation), which is likely to result in positive affective, cognitive, and behavioral outcomes (consequences). Past research (for reviews, see Deci, 1980; Deci & Ryan, 1985; Vallerand, 1997) has shown that the most positive outcomes emerge from intrinsic and identified regulation while the worst outcomes result from amotivation and to a lesser degree from external regulation. Much research using structural equation modeling has provided support for this sequence of events at the contextual level in education (Guay & Vallerand, 1997; Vallerand, Fortier, & Guay, 1997; Williams, Weiner, Markakis, Reeve, & Deci, 1994) and in sports and exercise settings (Pelletier, Fortier, Vallerand, & Brière, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Standage, Duda, & Ntoumanis, 2003; Wilson & Rodgers, 2004). Moreover, using an experimental design, Grouzet, Vallerand, Thill, and Provencher (2004) demonstrated the validity of the integrated motivational sequence at the situational level.

The Present Research

The present paper reports the results of two studies that seek to provide a better understanding of the dynamic processes of relationships between two levels of the motivational hierarchy (i.e., between contextual self-determined motivation toward physical activity in general and situational self-determined motivation toward specific physical activity sessions). Specifically, the top-down effect as well as the recursive (bottom-up) effect postulated by the HMIEM (Vallerand, 1997) were tested in physical activity settings with adults (Study 1) and high school students (Study 2). With respect to the top-down effect, it was hypothesized that higher levels of self-determined contextual motivation toward fitness training (Study 1) as well as toward physical activity (Study 2) would predict subsequent higher levels of self-determined situational motivation toward a specific training session (Study 1) and toward specific physical activity classes (Study 2). In turn, bottom-up effects were anticipated whereby situational motivation would predict subsequent contextual motivation. Furthermore, Study 1 involved the assessment of positive consequences (i.e., positive emotions and concentration) resulting from situational motivation toward a specific training session. Study 2 assessed the influence of the motivational climate (i.e., mastery climate or performance climate) instilled by physical activity

teachers on high school students' situational self-determined motivation. Following the motivational sequence postulated by the HMIEM (Vallerand, 1997), it was hypothesized that a mastery climate would positively predict subsequent levels of self-determined situational motivation and that a performance climate should only weakly and negatively predict subsequent levels of self-determined situational motivation (Duda, Chi, Newton, Walling, & Catley, 1995; Duda & Nicholls, 1992; Jackson & Roberts, 1992; Kavussanu & Roberts, 1996; Study 2). In turn, higher levels of self-determined situational motivation would predict experiences of positive emotions and concentration (Study 1) during a specific physical activity session.

Study 1

The purpose of Study 1 was to test several key elements of the HMIEM (Vallerand, 1997) in physical activity settings with members of the general population, thereby allowing us to identify the nature of the psychological processes involved in the change of motivation toward exercising. Specifically, data were collected at three time points over a three-month period in order to test the following propositions: (1) the top-down effect from contextual motivation to situational motivation, (2) the recursive effect between situational motivation and contextual motivation, and (3) the immediate consequences of situational motivation. It was hypothesized that a more self-determined contextual motivation toward fitness training and exercising at Time 1 would positively predict subsequent levels of self-determined situational motivation at Time 2 (the top-down effect). In turn, situational self-determined motivation at Time 2 was expected to positively predict subsequent levels of contextual self-determined motivation at Time 3. While past research (Guay et al., 2003; Vallerand, 1997) has suggested that contextual motivation is a moderately stable construct, it was hypothesized that only low to moderate stability would be present between Time 1 and Time 3 contextual motivation toward exercise, due to the novelty of the fitness context for the sample of Study 1. It was also hypothesized that self-determined situational motivation at Time 2 would predict the experiences of immediate positive consequences (i.e., positive emotions and concentration during the exercise session). In sum, Study 1 allowed us to test several key postulates from the HMIEM which, taken together, provide a coherent analysis of the motivational processes that occur in real-life situations.

Method

Participants

Participants were adults from the region of Montréal (Canada) who were starting a fitness program. A total of 243 male and female adults (78% females) participated at Time 1, 216 at time 2, and 89 at Time 3. No differences were found between participants who participated at all three times and those who did not. Only those who responded to the questionnaires at all three times were included in the final analysis, which explains the large loss of participants between Time 1 and Time 3. Final participants were 89 male and female adults (82% females) with a mean age of 39.41 years (SD=10.89

years). Only one variable showed a statistically significant mean difference between genders. Situational concentration at Time 2 was significantly higher for men than for women (F (1, 88) = 7.99, $p < .01$).

Procedure

Participants met with a trained experimenter on three occasions in the fitness center. Their fitness program lasted for a total of three months. Thus, the three measurement times of the present study correspond to the beginning, middle, and end of their fitness programs, respectively. They first met in March when the experimenter explained to the participants the procedure and purpose of the study. Participants received the first questionnaire, which was to be completed later at home. They met again one month later, in April, when the second questionnaire was given and completed in the fitness center immediately after their training session. Finally, participants met again with the experimenter one month later, in May, for the third questionnaire, which was completed later at home. It was explained that the purpose of the research was to learn more about people's attitudes and behaviors toward exercise. Informed consent was obtained from all participants.

Questionnaire at Time 1

Contextual motivation toward exercise. This scale was a 16-item scale adapted for the exercise context from the Sport Motivation Scale (SMS, Brière, Vallerand, Blais, & Pelletier, 1995). The SMS has been found to represent a valid and reliable measure of contextual motivation in sports (Brière et al., 1995; Pelletier et al., 1995). In the present study, the contextual motivation scale contained three questions dealing with different aspects of the fitness program (i.e., "Why are you participating in the cardiovascular exercises of the program?" "Why are you participating in the f oor exercises of the program?" and "In general, why are you exercising?"). Each of the questions was followed by four items: one for intrinsic motivation (e.g., "Because I have fun doing it"), one for identified regulation (e.g., "Because I choose to do it for my own good"), one for introjected regulation (e.g., "Because I feel I have to do it"), and one for amotivation (e.g., "I do it but I am not sure if it is worth it"). Thus, four subscales of three items each were created. Cronbach's α were .85 (3 items) for intrinsic motivation, .81 (3 items) for identified regulation, .83 (3 items) for introjected regulation, and .86 (3 items) for amotivation.

In order to use a single motivation score, a contextual self-determined motivation index (see Vallerand, 1997) was constructed (α=.84) by a summation of specifically weighted scores from the different motivational subscales according to their position on the self-determination continuum (i.e., 2 * [contextual intrinsic motivation score] + 1 * [contextual identified regulation score] - 1 * [contextual introjected regulation score] - 2 * [contextual amotivation score]).

Questionnaire at Time 2

Situational motivation toward exercise. Participants completed a 14-item adapted version of the Situational Motivation Scale (SIMS; Guay, Vallerand, & Blanchard, 2000). This scale measured participants' situational motivation by asking why they had participated in the fitness training they had just finished. Four items assessed their intrinsic motivation (e.g., "Because this training is really fun"), three items assessed identified regulation (e.g., "Because I believe this training is important"), three items assessed external regulation (e.g., "Because I did not have other choice than to participate in today's training"), and four items assessed amotivation (e.g., "I don't know, I don't see what it brings me"). Cronbach's α for the various situational motivation subscales as well as for the situational self-determined motivation index ranged between .61 and .86.

Situational positive emotions and concentration. Participants' situational positive emotions were assessed with four items (e.g., "During the training session I was in a good mood," α=.92; Vallerand et al., 1993; Vallerand, Blais, Brière, & Pelletier, 1989). Similarly, participants' concentration during their training session that particular day was assessed with four items (e.g., "During the training session I was concentrated," α=.78; Vallerand et al., 1993).

Questionnaire at Time 3

Contextual motivation toward exercise. This scale was the same as the one completed at Time 1 by participants. Cronbach's α were .85 (3 items) for intrinsic motivation, .72 (3 items) for identified regulation, .70 (3 items) for introjected regulation, and .68 (3 items) for amotivation. A contextual self-determined motivation index was constructed similarly to the contextual self-determined motivation index of Time 1 (α=.74). All of the above measures had items scored on a 7-point Likert scale, ranging from 1 ("Does not correspond at all") to 7 ("Corresponds exactly").

Results

Path Analysis

Due to the limited sample size, a model involving only the structural dimension of the analysis (i.e., path analysis) was preferred over a model in which both the measurement and structural dimensions are analyzed. That is, the ratio of sample size to estimated parameters would have been too small for an accurate estimation of a hybrid model (see Kline, 2005 on this issue). Table 1 presents the correlation matrix with means and standard deviations involving all five variables. The hypothesized model was tested with LISREL 8.80. The covariance matrix served as a database for the path analysis and the method of estimation was maximum likelihood. Much research indicates that maximum likelihood performs well when data are multivariate and normally distributed (Chou & Bentler, 1995), which is the case with the present data set. The model contained one exogenous variable (i.e., Contextual self-determined motivation at Time 1) and four endogenous variables (i.e., Situational self-determined motivation at Time 2, Situational

Table 1. Correlation Matrix Involving all Variables of Study 1

	M	SD	T1 Contextual Motivation	T2 Situational Motivation	T3 Contextual Motivation	Positive Emotions
T1 Contextual Motivation	5.86	4.66				
T2 Situational Motivation	11.21	3.57	.36**			
T3 Contextual Motivation	5.49	4.81	.28**	.34**		
T2 Positive Emotions	5.42	1.19	.34**	.60**	.26*	
T2 Concentration	5.64	1.01	.17	.44**	.09	.41**

Note. N = 89, ** p < .01, * p < .05

positive emotions at Time 2, Situational concentration at Time 2, and Contextual self-determined motivation at Time 3). Paths were specified according to the hypothesis. Results of the path analysis revealed a satisfactory fit of the model to the data. The chi-square value was not significant, χ^2 (df = 5, N = 89) = 6.52, p > .05 and the other fit indices were acceptable (NC = 1.30, NFI = .94, NNFI = .96, CFI = .98, RMSEA = .06 [0.0; 0.17], and SRMR = .05), indicating good model fit.

As shown in Figure 1, significant path values (p < .05) were obtained between the Time 1 index of contextual self-determined motivation and the Time 2 index of situational self-determined motivation (top-down effect, γ = .36). The estimated path between the Time 2 index of situational self-determined motivation and the Time 3 index of contextual self-determined motivation (recursive effect, ß = .27) was also found to be significant (p < .05). The estimated path between the Time 1 index of contextual self-determined motivation and the Time 3 index of contextual self-determined motivation (γ = .18) was found to be marginally significant (p < .10). Finally, the Time 2 index of situational motivation was found to significantly (p < .05) predict Time 2 positive emotions (ß = .60) and Time 2 concentration (ß = .44).[1]

Discussion

The main purpose of Study 1 was to test a model incorporating the top-down and bottom-up effects between physical activity self-determined contextual and situational motivation, as well as the immediate consequences resulting from self-determined situational motivation. Overall, the hypothesized effects were supported by the results of the path analysis. Specifically, the top-down effect was supported by the significant path coefficient found between contextual self-determined motivation at Time 1 and situational self-determined motivation at Time 2. In turn, the recursive (bottom-up) effect was supported

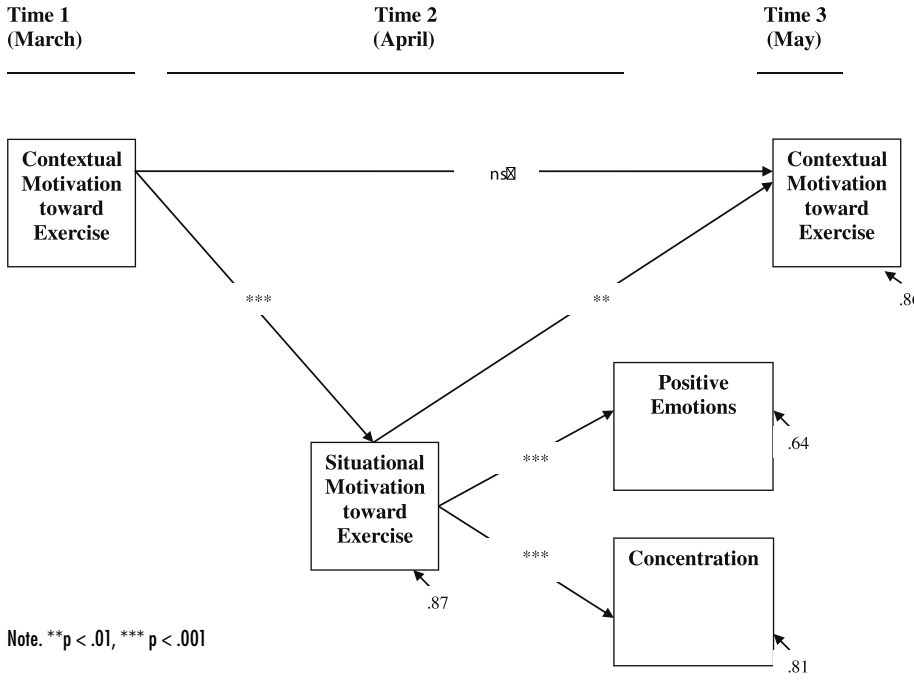

Figure 1. Results of Study 1 Path Analysis

by the significant path coefficient found between situational self-determined motivation at Time 2 and contextual self-determined motivation at Time 3. Furthermore, higher levels of self-determined situational motivation predicted the immediate experiences of positive emotions and greater concentration during the training session. This last result provides support for the motivational sequence postulated by the HMIEM (Vallerand, 1997). Overall, these results suggest the existence of a mechanism through which people's contextual motivation toward a specific context can be rendered more self-determined in nature via the experience of self-determined situational motivation. However, the small sample size as well as the low internal consistency of one subscale from the SIMS (external regulation) suggest that further replication of the model is warranted.

Study 2

Study 2 sought to make a number of improvements relative to Study 1. Study 1 only involved one measure of situational motivation (Time 2). However, the HMIEM (Vallerand, 1997) postulates that it is the repeated experience of self-determined situational motivation that should eventually lead to changes in contextual motivation. Thus, Study 2 involved two additional measurement points, one at the situational level and one at

the contextual level. With five measurement points, the proposed interplay between the contextual and the situational levels of the motivational hierarchy can be explored with greater precision.

Further, Study 1 did not assess the influence that social factors have on self-determined motivation. SDT (Deci & Ryan, 1985, 1991, 2000) and the HMIEM (Vallerand, 1997; Vallerand & Ratelle, 2002) posit that social factors exert a significant influence on the level of self-determined motivation experienced. The HMIEM (Vallerand, 1997) further posits that social factors can play an influential role at each level of the hierarchy. Much work has already been conducted in the field of SDT looking at the influence that autonomy support and competence feedback can have on self-determined motivation (e.g., Mageau & Vallerand, 2003; Vallerand & Reid, 1984, 1988; Pelletier et al., 2001; Williams, Gagné, Ryan, & Deci, 2002; Williams et al., 2006). However, achievement goal theory (for reviews, see Duda, 2005; Duda & Hall, 2001; Roberts, 2001) proposes another source of social influence with the distinction made between mastery and performance motivational climates. A mastery (or task-involving) climate is characterized by a structure which supports effort and education while a performance (or ego-involving) climate is characterized by competition and normative comparisons (Roberts, Treasure, & Conroy, 2007). Much research has shown that a mastery motivational climate leads to positive consequences such as higher levels of well-being, persistence, task perseverance, and adaptive achievement strategies (Kuczka & Treasure, 2005; Miller, Roberts, & Ommundsen, 2004; Ommundsen & Roberts, 1999; Standage, Duda, & Ntoumanis, 2003). Furthermore, Parish and Treasure (2003) showed that a mastery climate was strongly related to self-determined forms of motivation (intrinsic and identified regulation) while a performance climate was related to less self-determined forms of motivation (external regulation and amotivation). Other studies have also demonstrated this effect (e.g., Biddle, Soos, & Chatzisarantis, 1999; Brunel, 1999). Finally, a last purpose of Study 2 was to replicate the findings of Study 1 in another culture, namely France, with another population (students).

In sum, the goals of Study 2 were to replicate and extend the results of Study 1 by adding two additional measurement points (i.e., one at the situational level and one at the contextual level), incorporating the notions of mastery and performance climates as determinants of self-determined situational motivations at Times 2 and 4, as well as to replicate the results of Study 1 in another culture (France). For this purpose, a sample of high school students (n = 168) involved in physical activity classes were assessed on five occasions within their school environment. It was hypothesized that the top-down and bottom-up effects would be present between the contextual and the situational levels of the motivational hierarchy as were found in Study 1. In line with past research (Duda, Chi, Newton, Walling, & Catley, 1995; Duda & Nicholls, 1992; Jackson & Roberts, 1992; Kavussanu & Roberts, 1996), it was further hypothesized that perceptions of a mastery climate within physical activity classes would positively predict subsequent levels of self-determined situational motivation while perceptions of a performance climate would be negatively related or unrelated to self-determined situational motivation.

Method

Participants

Participants were high school students from a middle size city in France (n = 168; 48.2% males) with a mean age of 14.32 years (SD = .90; ranging between 13 and 17 years of age). Only those students who were present at all five time points (n = 168) were included in the final analysis (53.8% of the original sample). The large attrition found in the present sample was mostly due to students' irregular attendance of their physical activity classes. No differences were found between participants who participated at all five measurement points and those who did not, nor between genders.

Procedure

Participants met with a trained experimenter on five occasions. The questionnaires were administered according to standardized instructions. It was explained that the purpose of the study was to learn more about students' attitudes and behaviors toward physical activity. Students met with the experimenter every week for a period of five weeks. At Times 1, 3, and 5, participants were met in a normal classroom. At Times 2 and 4, students were met at the end of their physical activity class. These classes mostly involved organized sports (e.g., volleyball, badminton, and basketball). Students completed the questionnaires individually and they all provided informed consent for their participation.

Questionnaires

Students completed a 16-item scale measuring their contextual motivation toward physical activity classes on three occasions (i.e., at Times 1, 3, and 5). This scale was based on Ryan and Connell (1989) as well as the French version of the academic motivation scale (Vallerand et al., 1989), and was composed of four subscales each assessing a different degree of self-determination by asking students why they go to their physical activity classes. There are four items assessing students' intrinsic motivation (e.g., "For the pleasure I experience when I am surpassing myself"), four items assessing their identified regulation (e.g., "Because it is a good way of learning many things that can be helpful in other life domains"), four items assessing their external regulation (e.g., "In order to get good grades"), and finally four items assessing their amotivation (e.g., "Honestly, I really don't know, I feel as if I am wasting my time").

In line with Study 1, a contextual self-determined motivation index was constructed by a summation of specifically weighted scores from the different motivational subscales according to their position on the self-determination continuum (i.e., 2 * [contextual intrinsic motivation score] + 1 * [contextual identified regulation score] - 1 * [contextual external regulation score] - 2 * [contextual amotivation score]; see Vallerand, 1997 for support of its validity).

At Times 2 and 4, participants completed the same Situational Motivation Scale as in Study 1 (SIMS; Guay, Vallerand, & Blanchard, 2000). This scale measured students' situational motivation by asking why they had done the physical activity that they had

just finished moments earlier. A situational self-determined motivation index was constructed similarly to the contextual self-determined motivation index. Cronbach's α for all subscales and the index at the various phases varied from .70 to .93. All of the above items were scored on a 7-point Likert scale, ranging from (1) *not at all in agreement* to (7) *very highly in agreement.*

Finally, at times 2 and 4 students' perceptions of the physical activity classroom's climate were assessed (Biddle, Cury, Goudas, Sarrazin, Famose, & Durand, 1995). This scale was adapted so as to pertain to the physical activity class which had finished moments earlier. Four items assessed their perceptions of the situational mastery climate (e.g., "My physical activity teacher was pleased when everybody learned something new"; α = .87) that was prevalent that day in the gymnasium. Similarly, three items assessed students' perceptions of the situational performance climate (e.g., "My physical activity teacher particularly liked those students who were winning"; α = .85). These items were scored on a 5-point Likert scale, ranging from 1 ("Not at all in agreement") to 7 ("Totally in agreement").

Results

Due to a small sample size to free parameters ratio and in line with Study 1, the model tested was specified as a path analysis (Kline, 2005). The model of Study 2 had nine observed variables: 5 exogenous variables (i.e., Contextual motivation at Time 1, Mastery climate at Time 2, Performance climate at Time 2, Mastery climate at Time 4, and Performance climate at Time 4), as well as 4 endogenous variables (i.e., Situational motivation at Time 2, Contextual motivation at Time 3, Situational motivation at Time 4, and Contextual Motivation at Time 5). Table 2 presents the correlation matrix involving all variables for the final sample of students along with the means and standard deviations. The hypothesized model was tested with LISREL 8.80. The covariance matrix served as a database for the analysis and the method of estimation was maximum likelihood. Paths were specified according to the hypothesis. Results provided support for the model, χ^2 (df = 15, N = 168) = 33.98, $p < .05$, NC = 2.27, NFI = .97, NNFI = .96, CFI = .98, RMSEA = .08, and SRMR = 0.06.

Figure 2 displays all the path coefficients of the integrated model. The estimated paths dealing with the postulated top-down effect were all found to be significant ($p < .05$). Namely, the path between contextual self-determined motivation toward physical activity at Time 1 and situational self-determined motivation toward physical activity at Time 2 (γ = .42), as well as that between contextual self-determined motivation toward physical activity at Time 3 and situational self-determined motivation toward physical activity at Time 4 (ß = .31) were found to be significant. The estimated paths dealing with the postulated recursive (bottom-up) effect were also found to be significant. Specifically, the path between situational self-determined motivation toward physical activity at Time 2 and contextual self-determined motivation toward physical activity at Time 3 (ß = 13; $p < .05$), as well as that between situational self-determined motivation toward physical activity at Time 4 and contextual self-determined motivation toward physical activity at Time 5 (ß = .37; $p < .05$) were found to be significant. Furthermore, the various paths

Table 2. Correlation Matrix Involving all Variables of Study 2

	M	SD	T1 Contextual Motivation	T2 Situational Motivation	T2 Mastery Climate	T2 Performance Climate	T3 Contextual Motivation	T4 Situational Motivation	T4 Mastery Climate	T4 Performance Climate
T1 Contextual Motivation	4.61	6.63								
T2 Situational Motivation	4.42	6.72	.55**							
T2 Mastery Climate	4.06	.90	.44**	.43**						
T2 Performance Climate	2.14	1.06	-.36**	-.37**	-.54**					
T3 Contextual Motivation	4.47	7.40	.70**	.47**	.39**	-.34**				
T4 Situational Motivation	3.72	6.65	.50**	.40**	.41**	-.32**	.55**			
T4 Mastery Climate	3.98	.86	.38**	.24**	.47**	-.39**	.44**	.58**		
T4 Performance Climate	2.35	1.06	-.32**	-.23**	-.27**	.46**	-.38**	-.44**	-.55**	
T5 Contextual Motivation	4.14	6.14	.61**	.30**	.36**	-.22**	.70**	.65**	.45**	-.39**

Note. N = 168, ** $p < .01$

were found to be significant even when controlling for the stability of contextual motivation over time (see Figure 2). In addition, as expected, the stability coefficient between situational self-determined motivation toward physical activity at Time 2 and situational self-determined motivation toward physical activity at Time 4 was not found to be significant because greater intra-individual variability is proposed to exist at the situational level of the motivational hierarchy than at the contextual or global levels (Vallerand,

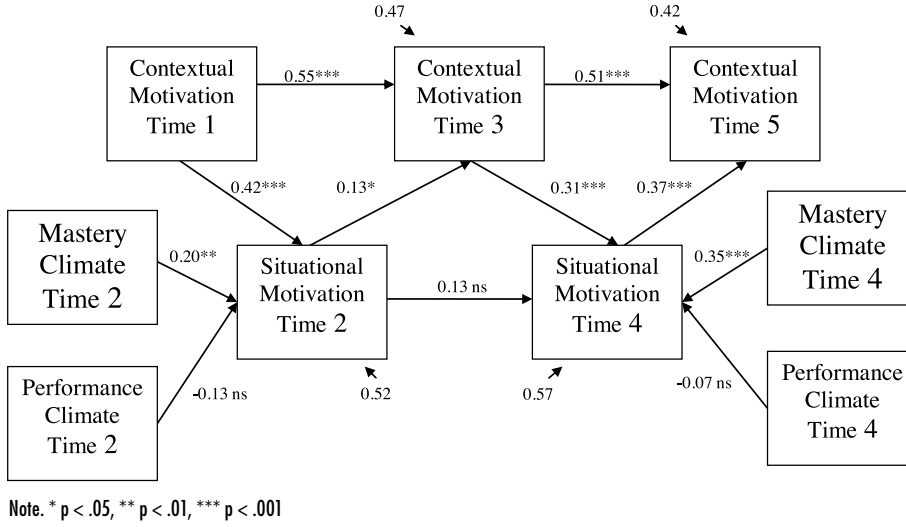

Figure 2. Results of Study 2 Path Analysis

1997). Furthermore, students' perceptions of the situational mastery climate significantly predicted situational self-determined motivation toward physical activity at both Time 2 and Time 4 (β = .20 and β = .35, respectively). As expected, students' perceptions of the situational performance climate within the classroom was only weakly related to their situational self-determined motivation toward physical activity (β = -.13 and β = -.07, for Time 2 and Time 4, respectively).[2]

Discussion

The purposes of Study 2 were to test the top-down and bottom-up postulates of the HMIEM (Vallerand, 1997) over five measurement points with high school students, to determine the impact that the students' perceptions of mastery and performance motivational climates have on their self-determined situational motivation toward specific physical activity classes, and to replicate the findings of Study 1 in another culture. Overall, the top-down effect (between contextual motivation at Time 1 and situational motivation at Time 2, and between contextual motivation at Time 3 and situational motivation at Time 4) and the bottom-up effect (between situational motivation at Time 2 and contextual motivation at Time 3, and between situational motivation at Time 4 and contextual motivation at Time 5) were supported by the findings of Study 2. Further, students' perceptions of a mastery climate within their physical activity classes proved to be an important positive predictor of their self-determined situational motivation, while their perceptions of a performance climate was not significantly related to their self-determined situational motivation (although there was a tendency, p < .10). In spite of

the small time interval between measurement points, which was conducive to high levels of contextual motivation stability, the results of Study 2 regarding the bottom-up and top-down effects replicated those of Study 1. Hence, Study 2 replicated the findings of Study 1 with a younger sample of participants from a different (European) culture. Furthermore, Study 2 also extended the results of Study 1 by providing support for the interplay between contextual and situational motivation over multiple assessments and underscored the role of the motivational climate in the process.

General Discussion

The purpose of the present research was to test some aspects of the Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 1997) within physical activity settings. Specifically, the top-down effect as well as the recursive (bottom-up) effect (Vallerand, 1997) were tested in physical activity settings with adult participants from Canada (Study 1) and high school students from France (Study 2). It was hypothesized that higher initial levels of self-determined contextual motivation toward physical activity would predict subsequent self-determined situational motivation toward a specific fitness session (Study 1) or toward specific physical activity classes (Study 2). In turn, the repeated experience of self-determined situational motivation was hypothesized to positively inf uence subsequent levels of self-determined contextual motivation toward physical activity in general. The results of both studies provided support for the hypothesis. The present findings lead to a number of implications. These are discussed below.

A Dynamic Process of Motivational Change

A first implication of the present findings is that they help untangle a dynamic process underlying the changes in contextual self-determined motivation toward fitness training that took place over a three-month period as well as toward physical activity classes over a period of five weeks. More precisely, the present results suggest that different levels of the motivation hierarchy can inf uence each other in order to eventually produce changes in motivational orientations over time. Results from the structural equation modeling analyses of Study 1 and Study 2 revealed that the paths from self-determined contextual motivations to subsequent self-determined situational motivations were significant. That is, individuals with self-determined contextual motivational orientations toward fitness and physical activity were more likely to be self-determined during a specific training session or a specific physical activity class (i.e., at the situational level). These findings are supportive of the top-down effect and are in line with past research (Blanchard et al., 2007; Gagné et al., 2003; Ntoumanis & Blaymires, 2003; Williams et al., 1996) that demonstrated that one's motivational representation at one level of generality can inf uence motivational representations at the next lower level of the hierarchy. Moreover, individuals experiencing higher levels of self-determined situational motivation toward a specific training session or specific physical activity class may be more likely to develop, over time, a self-determined contextual motivation toward fitness training and physical activity in general (i.e., bottom-up effect). Thus, the results suggest that changes in self-

determined contextual motivation can occur over time in part through changes in situational motivation. Furthermore, based on the results of Study 2 and the significant paths from the perceived mastery climate to students' situational self-determined motivation (Times 2 and 4), it appears that motivational changes occurring due to the bottom-up effect can be triggered by social factors. The impact of social factors on situational motivation represents an important entry point that can facilitate a more self-determined situational motivation (if triggered by a mastery climate) that, in turn, can lead to an increase in self-determined contextual motivation over time. We return to the inf uence of social factors in the next section.

Situational motivation was only assessed at one point in time in Study 1 (i.e., Time 2). However, results from Study 2 that assessed situational motivation at two points in time (i.e., Times 2 and 4) suggest that repeated experiences of self-determined situational motivation and the recursive effect of these positive experiences on contextual motivation may represent the process through which, over time, contextual motivation changes. Repeatedly experiencing situational motivation in the gym or in physical activity classes is likely to positively echo on contextual motivation toward physical activity. To the extent that situational motivation is affected by social factors that increase its self-determined nature (such as a mastery climate), subsequent contextual motivation should eventually become more self-determined. However, if the situational motivation one experiences regularly is non-self-determined in nature, the ensuing contextual motivation should progressively become less self-determined. The present findings are in line with past research (Guay et al., 2003, Study 2) which showed that motivational models including both the top-down and the recursive inf uences on people's motivation provide an adequate representation of the dynamic motivational processes at work.

As expected, the path between Time 1 and Time 3 contextual motivations in Study 1 was only found to be marginally significant ($\gamma = .18$, $p < .10$). This result is likely due to the relative novelty of the exercise context for participants. In fact, 78% of the participants had never participated in a similar exercise program in the past. However, the results of Study 2 involving physical activity revealed that contextual motivation stability coefficients ($\beta = .55$ and $\beta = .51$, $p < .05$) were highly significant. Students of this age have had extensive experiences with physical activity classes over the years, which can explain the relatively high level of stability. In fact, within familiar contexts, contextual motivation appears to be relatively stable (Guay et al., 2003). Thus, the lack of stability found in Study 1 suggests that in relatively novel situations, contextual motivation is less stable and is thus amenable to greater changes through the impact of situational motivation than in well-known situations. Future research is needed in order to determine the importance of situational motivation as a determinant of changes in contextual motivation as a function of the novelty of the life context, as well as to understand what other factors could exert an inf uence on contextual self-determined motivation. However, it is important to underscore that the general stability of contextual motivation does not suggest that the latter is not readily malleable. Throughout life, people are in contact with numerous environments from which different situational experiences are derived. From these multiple situational experiences, people's motivational orientations are shaped in a form that is more or less

self-determined. In contexts like those that were prevalent in Study 2, the moderate level of stability in contextual motivation may have been due to either the proximity in time of the measurement points or the extended experiences individuals have already accumulated with the life context of physical activity. Thus, the present results suggest a mechanism of motivational changes with which interventions could be designed in order to impact on people's motivation toward a specific context in a proactive manner as opposed to the observational orientation taken by the present studies.

The Impact of Social Factors on Situational Motivation

A second implication of the present findings concerns the impact of social factors on situational motivation. Within SDT (Deci & Ryan, 1985, 1991, 2000), social factors have long been recognized as important motivational determinants. In Study 2, we tested the role of the motivational climate instilled by the physical activity teachers as a determinant of students' situational motivation. While much research has focused on the role of autonomy support (e.g., Mageau & Vallerand, 2003; Pelletier et al., 2001; Williams, Gagné, Ryan, & Deci, 2002; Williams et al., 2006) and competence feedback (e.g., Vallerand & Reid, 1984, 1988) in self-determined motivation, much less research has focused on perceived mastery and performance motivational climates (e.g., Sarrazin et al., 2002). According to achievement goal theory (see Duda, 2005; Duda & Hall, 2001; Roberts, 2001), it was hypothesized that the perceived motivational climate would be highly relevant to students' motivation. The significant paths observed between students' perceptions of a mastery climate and their self-determined situational motivations ($\beta = .20$ at Time 2 and $\beta = .35$ at Time 4, $p < .05$) support this hypothesis. Furthermore, as anticipated, perceptions of a performance-oriented climate weakly predicted students' situational motivation at Time 2 ($\beta = -.13$, $p < .10$) and did not predict students' situational motivation at Time 4 ($\beta = -.07$, non-significant). These last results are in line with research that has shown that performance climate or ego orientation is generally unrelated or weakly negatively related to intrinsic interest, satisfaction, and enjoyment (e.g., Duda, Chi, Newton, Walling, & Catley, 1995; Duda & Nicholls, 1992; Jackson & Roberts, 1992; Kavussanu & Roberts, 1996).

Within SDT (Deci & Ryan, 1985, 1991, 2000; Vallerand, 1997) three basic human needs have been postulated, the needs for autonomy (i.e., feeling free to choose one's course of action), competence (i.e., interacting effectively with the environment), and relatedness (i.e., feeling connected to significant others). The satisfaction of these basic psychological needs depends in part on the motivational climate that characterizes the relevant environment. Thus, future research exploring the impact motivational climates have on the satisfaction of the three basic psychological needs would be highly relevant because such situational social factors represent key elements that trigger a sequence of motivational effects and changes (see Grouzet et al., 2004, for experimental evidence of such effects). That is, situational social factors inf uence the situational motivation people experience on a daily basis, which, by means of the recursive effect, brings about changes in their contextual motivation.

On Motivation and Outcomes

The results of Study 1 further provide support for the impact of situational motivation on immediate situational outcome variables. It was shown that situational self-determined motivation positively predicted participants' experiences of positive emotions and concentration. Much research has provided support for this motivational sequence where self-determined styles of motivation positively predict numerous outcome variables such as exercise behavior, attitudes, and physical fitness, both at the situational and contextual levels (Kowal & Fortier, 2000; Wilson & Rodgers, 2004; Wilson, Rodgers, Blanchard, & Gessell, 2003; Wilson, Rodgers, & Fraser, 2002; Wilson, Rodgers, Fraser, & Murray, 2004). The present findings provide support for the HMIEM (Vallerand, 1997) in that situational outcomes were predicted by situational motivation. Furthermore, in line with SDT (Deci & Ryan, 1985, 1991, 2000), the more self-determined the situational motivation, the more positive the affective and cognitive outcomes. Future research would benefit from a deeper exploration of the motivational sequence with the combined inclusion of social factors and outcome variables to more formally test the sequence at different levels of the hierarchy in field settings.

Limitations

Some limitations of the present research can be noted. First, the sample size of Study 1 was rather small. Second, the contextual motivation indices of Studies 1 and 2 were composed of slightly different motivational subscales. This could limit the comparison between the two studies. Third, although structural equation modeling techniques provided a glimpse of the causal processes at work, the design used in both studies was correlational. Therefore, conclusions about causality cannot be drawn. Future research using experimental designs should be used to replicate and confirm the proposed model. For instance, the climate (mastery or performance) could be manipulated at the situational level, and motivation at the situational and contextual level could be subsequently assessed. Such a methodological strategy would allow us to test the proposed processes within an experimental design and thus to make a more definitive claim regarding causality issues. Fourth, participants' self-reports were used. Future research should seek to replicate the present findings with objective observation or informants' responses (e.g., the fitness trainer, physical activity teachers).

In sum, a dynamic process of motivational change was uncovered in the present studies. Specifically, in line with postulates and hypotheses of the HMIEM (Vallerand, 1997), it was demonstrated in two studies that individuals' contextual motivational orientation toward exercise, jointly with the motivational climate (Study 2), predicted situational motivation which, over time, predicted changes in participants' subsequent contextual motivation toward exercise. These findings were obtained using different types of physical activity with different populations (students and middle-age adults) from two different cultures (Québec and France). We believe that the present findings contribute to the understanding of the motivational processes that influence changes in peoples' self-determined motivation toward certain important life contexts such as physical activity.

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Endnotes

[1] The design of Study 1 did not involve any experimental manipulations that could have generated changes in motivation at the situational level in one consistent direction (e.g., an increase in all participants) that could translate into actual and consistent changes (e.g., an increase) in participants' contextual self-determined motivation from Time 1 to Time 3. Therefore, it is not surprising that the results from a dependent sample t-test revealed the absence of change in contextual self-determined motivation from Time 1 to Time 3, $t(176) = .52$, $p > .05$. However, in order to provide additional information on the potential role of situational motivation in changes in contextual motivation, we conducted an ANCOVA, which assessed the influence of high vs. low self-determined situational motivation at Time 2 (split half at the mean) on subsequent contextual self-determined motivation at Time 3 while controlling for Time 1 contextual self-determined motivation. The results revealed that both self-determined situational motivation at Time 2 and contextual self-determined motivation at Time 1 had marginal main effects on contextual self-determined motivation at Time 3 (both $p < .10$). These results suggest that situational self-determined motivation has the potential to directly influence changes in contextual motivation experienced at a later time.

[2] Similarly to Study 1, because no systematic changes in the situational motivation were induced, we did not expect any systematic changes in contextual motivation. This assumption was supported by non-significant dependent sample t-tests performed between contextual self-determined motivation at Time 1 and Time 3, and between contextual motivation at Time 3 and Time 5, both $t < 1$. However, we conducted additional analyses of covariance in order to determine the following: (1) those individuals who experienced higher levels of mastery climate at Time 2 should experience higher levels of situational motivation at Time 2, controlling for contextual motivation at Time 1; and similarly those individuals who experienced higher levels of mastery climate at Time 4 should experience higher levels of situational motivation at Time 4, controlling for contextual motivation at Time 3; (2) individuals who experienced higher levels of situational motivation at Time 2 should experience a subsequent increase in contextual motivation at Time 3 (controlling for contextual motivation at Time 1); similarly individuals who experienced higher levels of situational motivation at Time 4 should experience a subsequent increase in contextual motivation at Time 5 (controlling for contextual motivation at Time 3). Results from a series of ANCOVAs provided support for all of these hypotheses (all $p < .05$). Overall, these results are consistent with the postulates of the Hierarchical Model with respect to the top-down and bottom-up processes and the impact of social factors on motivation. Specifically, experiences in situational motivation produced by one's pre-existing contextual motivation and situationally-induced social factors (e.g., mastery climate) are expected to lead to changes in subsequent contextual motivation. However, it should be noted that because no experimental paradigm was used in the present research, no definitive statements can be made with respect to causality. Future research on this issue is thus warranted.