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Nicolas Gillet [a]; Sophie Berjot [a]; Lucie Gobancé [a]
[a] Laboratoire de Psychologie Appliquée, Université de Reims, Reims, France

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ORIGINAL ARTICLE

A motivational model of performance in the sport domain

NICOLAS GILLET, SOPHIE BERJOT, & LUCIE GOBANCÉ

Laboratoire de Psychologie Appliquée, Université de Reims, Reims, France

Abstract
The aim of the present study was to propose and test a motivational model of sport performance based on the hierarchical model of intrinsic and extrinsic motivation (Vallerand, 1997). Tennis players completed the French version of the Sport Motivation Scale (Brière *et al.*, 1995) at the beginning of the season. Two years later, they completed the same instrument and also a questionnaire designed to assess their perceptions of competence, autonomy, and relatedness. Their performances during three seasons were obtained via the French Tennis Federation. First, the present results reveal that self-determined motivation has a positive impact on sport performance both during one and two seasons. The results also provide support for the mediating role of psychological need satisfaction in the relationship between sport performance and athletes' motivation. Results are discussed in light of self-determination theory (Deci & Ryan, 1985).

Keywords: *Motivation, performance, sport, self-determination theory*

Introduction

In self-determination theory (Deci & Ryan, 1985), motivation is considered to be a complex multidimensional construct. Specifically, three major forms of motivation have been described along a continuum of self-determination: intrinsic motivation, extrinsic motivation, and amotivation. *Intrinsic motivation* represents the more self-determined motivation. An athlete is intrinsically motivated when he or she is involved in an activity for pleasure and satisfaction inherent in the activity (Deci, 1975). Vallerand and colleagues (Vallerand, Blais, Brière, & Pelletier, 1989) have proposed three types of intrinsic motivation, namely intrinsic motivation to accomplish things, intrinsic motivation to know, and intrinsic motivation to experience stimulation. Intrinsic motivation to accomplish things can be defined as engaging in an activity for the satisfaction of attempting to surpass oneself. Intrinsic motivation to know occurs when individuals perform activities for the pleasure they feel while they try to understand something new. Intrinsic motivation to experience stimulation refers to engaging in an activity to experience pleasant sensations derived from the activity itself.

Deci and Ryan (1985, 1991) have proposed three forms of *extrinsic motivation*: identified regulation, introjected regulation, and external regulation. Identified regulation is the most self-determined form of extrinsic motivation, followed by introjected regulation and external regulation. First, identified regulation involves engaging in an activity that is freely chosen even if it is not attractive in itself. For instance, an athlete is motivated by identified regulation when he or she practises a sport activity because he or she believes that it is one of the best ways to develop other aspects of him or herself. Second, introjected regulation occurs when behaviours are performed to avoid negative feelings or to obtain social approval. In this case, an athlete practises a sport because he or she would feel bad if he or she was not taking the time to do it. Finally, external regulation refers to behaviours that are regulated by rewards or external constraints (e.g. trophies, prizes or money).

Amotivation reflects a lack of motivation and is associated with sport dropout (Pelletier, Fortier, Vallerand, & Brière, 2001). Amotivated athletes do not perceive contingencies between their actions and their consequences. They also experience feelings of

Correspondence: N. Gillet, Laboratoire de Psychologie Appliquée, Université de Reims, Champagne-Ardenne, 57, rue Pierre Taittinger, 51096 Reims Cedex, France. E-mail: nicolas.gillet@univ-reims.fr

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incompetence and uncontrollability. Consequently, amotivation is the most non-self-determined type of motivation. According to Vallerand and Ratelle (2002), intrinsic motivation, extrinsic motivation, and amotivation may explain a wide range of human behaviours.

Following this theoretical conceptualization of motivation, Vallerand (1997) has developed a hierarchical model of intrinsic and extrinsic motivation that includes some elements of self-determination theory. In line with cognitive evaluation theory (Deci, 1975; Deci & Ryan, 1980), a sub-theory of self-determination theory, he considers that athletes' perceptions of autonomy, competence, and relatedness constitute psychological mediators of the impact of social factors on their motivation. These perceptions relate to the three basic psychological human needs identified in self-determination theory. The need for autonomy reflects the need to perceive behaviour as freely chosen (deCharms, 1968). The need for competence refers to individuals' propensity to interact effectively with their environment (White, 1959). The need for relatedness pertains to the desire to feel connected and to be accepted by others (Deci & Ryan, 2000). According to self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2002), social events perceived to be supportive of one's feelings of competence, autonomy, and relatedness will have a positive influence on intrinsic motivation. Conversely, social factors that negatively affect these individual perceptions will weaken athletes' self-determined motivation. This is supported by many sport studies that have tried to identify situations in which individuals might satisfy these three psychological needs (for reviews, see Brunel, Vallerand, & Chantal, 2004; Vallerand & Grouzet, 2001).

In a competitive sport setting, performance was found to be a significant determinant of motivation (Vallerand & Losier, 1999). Indeed, according to self-determination theory (Deci & Ryan, 1985, 1991), when someone fails, his or her perceptions of competence and his or her intrinsic motivation for the given activity decrease. Conversely, success increases one's feelings of competence and subsequent intrinsic motivation. A few studies in sport (e.g. Blanchard, Mask, Vallerand, de la Sablonnière, & Provencher, 2007; McAuley & Tammen, 1989; Tauer & Harackiewicz, 2004; Weinberg & Ragan, 1979) have supported these theoretical postulates and revealed that winning or losing a competition represents a determinant of motivation. However, except for the investigation conducted by Blanchard and her colleagues (2007), these studies neglected the mediating role of the perceptions of competence, autonomy, and relatedness. In Blanchard and colleagues' longitudinal study, the sample comprised 150 basketball athletes aged 16–22 years (mean = 18.3). After each game of the season, participants completed a questionnaire package that included measures of personal and team performance, psychological mediators, and motivation. In accordance with their assumptions and the hierarchical model of motivation (Vallerand, 1997), these authors showed that performance was positively associated with self-determined motivation. They also provided support for the mediating role of need satisfaction in the relationship between performance and motivation.

Averaged scores of perceived competence, autonomy, and relatedness were used by Blanchard *et al.* (2007) to characterize a psychological mediator factor. Therefore, it was not possible to investigate the influence of performance on each of the three needs separately. In addition, this investigation only pertained to basketball and thus further research is needed into other sport activities.

The hierarchical model (Vallerand, 1997) also proposes that motivation leads to various affective, cognitive, and behavioural consequences. Based on the self-determination continuum (Deci & Ryan, 1985), self-determined motivation (i.e. intrinsic motivation and identified regulation) should be associated with the most positive outcomes, whereas external regulation and amotivation should lead to negative consequences. Some studies in the sport literature have provided support for this theoretical postulate. For instance, self-determined motivation was associated with many positive consequences, including concentration (Brière, Vallerand, Blais, & Pelletier, 1995; Pelletier *et al.*, 1995), persistence in the activity (Pelletier *et al.*, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002), and sportspersonship orientations (Chantal & Bernache-Assollant, 2003; Chantal, Robin, Vernat, & Bernache-Assollant, 2005).

But sport performance may also be a motivational consequence that researchers should attempt to examine (Vallerand, 2007a). Previous research has supported the positive impact of self-determined motivation on performance in non-sport activities (for a review, see Vallerand, 1997). For example, Guay and Vallerand (1997) tested a motivational model of academic performance that included parental autonomy support, teacher autonomy support, school administration autonomy support, students' perceived competence and autonomy, as well as their self-determined motivation towards school and their academic performance. First, the results revealed that social factors had a significant influence on individuals' perceptions of competence and autonomy. Second, these two perceptions had a positive impact on self-determined motivation. Finally, self-determined motivation predicted school performance

8 months later. However, these findings have not been replicated in sport.

So, as we saw previously, performance may be a determinant and a consequence of sport motivation. That is why several researchers (Fortier, Vallerand, & Guay, 1995; Guay & Vallerand, 1997) have suggested that the relationship between motivation and performance could be bidirectional. However, no investigation to our knowledge has attempted to study sport performance as a determinant and a consequence of sport motivation. Accordingly, using a 3-year longitudinal design, the aims of the present study were: (1) to examine the influence of performance on self-determined motivation through the satisfaction of the basic psychological needs for competence, autonomy, and relatedness; and (2) to show that motivation may predict sport performance during one or two seasons among a sample of young national tennis players. In particular, we wished to address the following research questions. Does self-determined motivation positively predict sport performance? Do sport outcomes influence athletes' motivation? Do perceptions of autonomy, competence, and relatedness mediate the relationship between performance and motivation? Does this motivation influence future performance? These questions were tested using structural equation modelling. Based on past studies in the education domain (e.g. Fortier *et al.*, 1995; Guay & Vallerand, 1997), it was hypothesized that self-determined motivation would positively predict sport performance. Good performances were expected to lead to higher perceived competence, autonomy, and relatedness. In turn, these three perceptions should positively influence self-determined motivation towards sport and future performance.

Methods

Participants and procedure

The participants were 90 French national tennis players aged 13–14 years (mean = 13.4, $s = 0.5$) at the beginning of the study. These players were among the top 150 in France for their respective age group. On average, athletes reported playing tennis for 6.78 years ($s = 1.56$). They also reported practising tennis for an average of 9.29 h a week ($s = 3.66$). Ethical approval was obtained from the French Tennis Federation. Participation in this study was voluntary and parental consent was obtained for all participants. Adolescents were asked to complete a questionnaire to assess their motivation for tennis at the beginning of the season. Two years later, they completed the same questionnaire plus another designed to measure athletes' perceptions of competence, autonomy, and relatedness. Their tennis results during three seasons were obtained from the French Tennis Federation. It is important to note that none of these participants dropped out of tennis over the course of the study.

Questionnaires

Sport motivation. Tennis players completed the French version of the Sport Motivation Scale (SMS; Brière *et al.*, 1995). This questionnaire is a 28-item inventory subdivided into seven subscales that assess intrinsic motivation to know ($\alpha = 0.88$ at Time 1, $\alpha = 0.91$ at Time 2), intrinsic motivation to accomplish things ($\alpha = 0.83$ at Time 1, $\alpha = 0.91$ at Time 2), intrinsic motivation to experience stimulation ($\alpha = 0.77$ at Time 1, $\alpha = 0.75$ at Time 2), identified regulation ($\alpha = 0.71$ at Time 1, $\alpha = 0.83$ at Time 2), introjected regulation ($\alpha = 0.73$ at Time 1, $\alpha = 0.84$ at Time 2), external regulation ($\alpha = 0.76$ at Time 1, $\alpha = 0.84$ at Time 2), and amotivation ($\alpha = 0.71$ at Time 1, $\alpha = 0.75$ at Time 2). There are four items per subscale and individuals respond to each item on a 7-point Likert scale ranging from 1 ("does not correspond at all") to 7 ("corresponds exactly"). The seven subscales were combined into a composite index of self-determined motivation (e.g. Grolnick & Ryan, 1987; Vallerand & Bissonnette, 1992). High positive scores on this index reflect high levels of sport self-determined motivation, whereas low scores reflect low levels of self-determined motivation. This scale has demonstrated acceptable reliability and validity in past research (e.g. Chantal, Guay, Dobreva-Martinova, & Vallerand, 1996; Li & Harmer, 1996; Pelletier & Sarrazin, 2007), even if other authors have criticized its factorial structure (e.g. Mallett, Kawabata, Newcombe, Otero-Rorero, & Jackson, 2007; Martens & Webber, 2002; Reimer, Fink, & Fitzgerald, 2002). [We have inspected the correlations among the SMS subscales with the present data. Results provided support for the self-determination continuum. Specifically, all correlations among the SMS subscales revealed a simplex-like pattern, with stronger positive correlations between factors adjacent on the self-determination continuum and stronger negative correlations between more distal factors. The present results are in agreement with those of Brière *et al.* (1995) and Pelletier *et al.* (1995) and provide additional support for the construct validity of the French version of the SMS.]

Basic needs. Perceptions of competence ($\alpha = 0.72$), autonomy ($\alpha = 0.77$), and relatedness ($\alpha = 0.77$) were assessed with the Basic Psychological Needs in Sport Scale (Gillet, Rosnet, & Vallerand, 2008). This questionnaire is composed of three subscales with a total of 15 items. All responses were indicated on a 7-point Likert scale ranging from 1 ("not at all true")

to 7 ("very true"). Recently, Gillet and his colleagues (2008) have provided strong evidence for the factorial structure, construct validity, and internal consistency of this tool.

Sport performance. The ratio between the number of victories and the number of matches played by an athlete was considered as a good measure of sport performance because it allows one to take into consideration all the matches played by a tennis player. Thus, two performance measures were utilized: the performance during the two seasons after the first measurement of motivation (performance 1) and the performance during the season following the second assessment of motivation (performance 2). For example, the performance of a player who won 20 of these 60 matches during two years equals 0.33. Participants played an average of 118.5 matches ($s = 33.6$) during the two first seasons and an average of 57.4 matches ($s = 27.8$) during the third season.

Results

Means and standard deviations, as well as the correlation matrix of the study variables, are given in Table I. An inspection of the correlations revealed that self-determined motivation was significantly and positively associated with sport performance. In addition, perceptions of competence, autonomy, and relatedness were positively correlated with self-determined motivation at Time 2.

The hypothesized model (i.e. Model 1) was tested in a path analysis using LISREL 8.30© (Jöreskog & Sörbom, 1993). The data were input using the covariance matrix of the observed variables, and maximum likelihood estimation procedures were used. The significance of the chi-square value (χ^2), the chi-square ratio (χ^2/df), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the goodness of fit index (GFI), and the non-normed fit index (NNFI) were used to evaluate the adequacy of the model. Results revealed a poor fit of the model to the data (CFI = 0.74, GFI = 0.87, NNFI = 0.54, and RMSEA = 0.18 [0.13; 0.24]). To revise the model, we examined modification indices. On the basis of recommendations regarding model respecification (MacCallum, 1995), we chose to add a path from self-determined motivation at Time 1 to self-determined motivation at Time 2. Modification indices also suggested that model fit could be improved substantially by allowing error covariances between the three need satisfaction scores because of their significant intercorrelations (see Table I). Thus, perceptions of autonomy, competence, and relatedness were allowed to correlate. We also added an error covariance between performance 1 and performance 2 because these two variables were significantly correlated ($r = 0.23$, $P < 0.05$). Not surprisingly, the overall fit of the structural model improved. The chi-square value was not significant [χ^2 (df = 8, $N = 90$) = 10.58, $P = 0.23$] and the χ^2/df ratio was acceptable (χ^2/df = 1.32) because, according to Kline (1998), a chi-square ratio between 1 and 3 typically reflects a good fit. The other fit indices were also satisfactory: CFI = 0.98, GFI = 0.97, NNFI = 0.93, RMSEA = 0.06 [0.00; 0.15]. In this model, all parameters are standardized and significant at $P < 0.05$ (Figure 1).

Four alternative models were also tested. In Model 2, self-determined motivation at Time 1 and performance during the two seasons following the first measurement of motivation (i.e. performance 1) were related by a covariance link and not a causal link as in the first model. The third and fourth models were also based on the first one. In the third one, a path between performance 1 and self-determined motivation at Time 2 was added, while in the fourth one, performance 1 and performance during the third season (i.e. performance 2) were related by a causal link and not a covariance link as in the first one. Finally, in a fifth model, we combined Models 3 and 4 and added a path between performance 1 and self-determined motivation at Time 1 and between the two measures of performance. However, these models did not exhibit a substantially better fit than the previous model (i.e. Model 1). Table II shows the fit indices for the five models.

As can be seen in Figure 1, results revealed that performance during the two seasons following the first assessment of motivation (i.e. performance 1) was significantly influenced by self-determined

Table I. Means, standard deviations, and correlations among the variables

Variables	Mean	*s*	1	2	3	4	5	6
1. Performance 1	0.58	0.07						
2. Performance 2	0.56	0.12	0.23*					
3. Self-determined motivation (Time 1)	8.33	3.03	0.24*	0.06				
4. Perceptions of autonomy (Time 2)	5.14	0.99	0.25*	0.13	0.33*			
5. Perceptions of competence (Time 2)	5.36	0.95	0.38**	0.28*	0.19	0.34*		
6. Perceptions of relatedness (Time 2)	5.72	0.75	0.23*	0.06	0.25*	0.49**	0.26*	
7. Self-determined motivation (Time 2)	8.73	2.48	0.26*	0.25*	0.46**	0.51**	0.42**	0.52**

*$P < 0.05$, **$P < 0.01$.

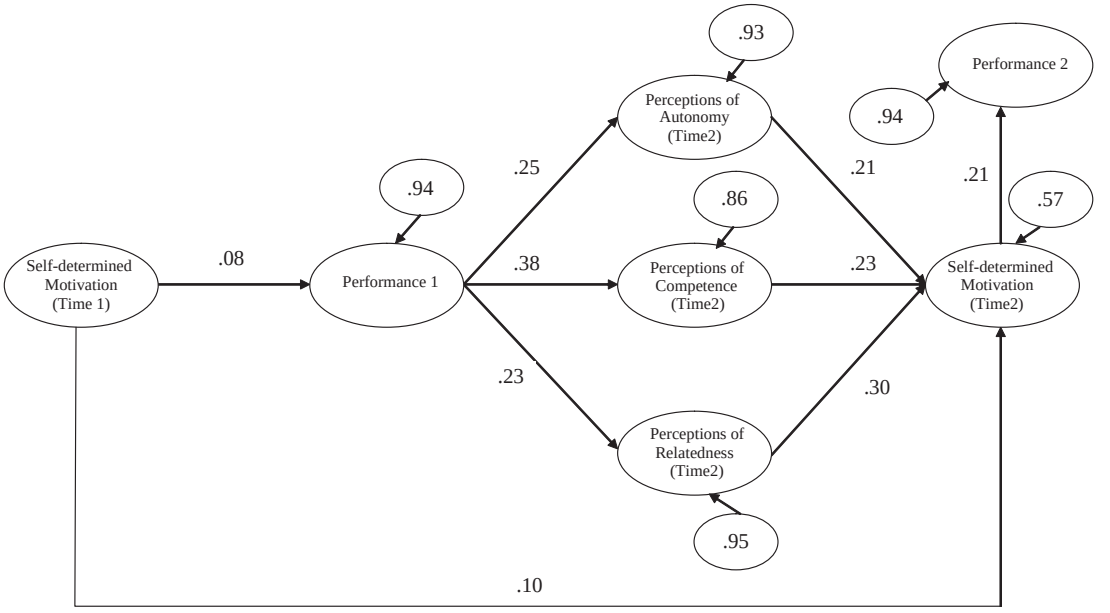

Figure 1. Results of the path analysis of the Motivational Model of Sport Performance.
Note*: For clarity, error covariances are not shown.*

motivation at Time 1 (ß = 0.08). Also, performance during 2 years significantly and positively influenced perceptions of autonomy (ß = 0.25), competence (ß = 0.38), and relatedness (ß = 0.23). In addition, the paths between perceptions of autonomy and self-determined motivation (ß = 0.21), between perceptions of competence and self-determined motivation (ß = 0.23), and between perceptions of relatedness and self-determined motivation (ß = 0.30) were also significant. Finally, self-determined motivation at Time 1 had a positive influence on self-determined motivation at Time 2 (ß = 0.10), and self-determined motivation at Time 2 positively predicted sport performance during the third season (ß = 0.21).

Discussion

The aim of the present study was to test a motivational model of performance in the sport domain. Specifically, sport performance was considered to be a determinant and a consequence of athletes' motivation. It was hypothesized that self-determined motivation at Time 1 would positively predict sport performance during two seasons. In addition, performance was expected to positively influence perceptions of autonomy, competence and relatedness, which, in turn, were hypothesized to positively predict self-determined motivation at Time 2. Finally, we hypothesized that self-determined motivation at Time 2 would positively impact performance during the following season. These hypotheses were tested in a 3-year longitudinal study. Results from the structural equation modelling analyses support these assumptions.

Self-determined motivation towards tennis (Time 1) was a significant and positive predictor of tennis performance during 2 years, and self-determined motivation (Time 2) had a positive influence on performance during the third season. In other words, the more players displayed self-determined motivation towards tennis, the more they obtained good performances. Consequently, increasing self-determined motivation may lead to improved performance. This result was in line with previous studies in the academic domain that showed the positive influence of self-determined motivation on school performance (Fortier *et al.*, 1995; Guay & Vallerand, 1997). It also provided support for Vallerand's (1997) model as well as many other studies in the sport domain which found that self-determined motivation predicted positive consequences as diversified as concentration, flow, persistence in the activity, burnout, and sportspersonship orientations (for reviews, see Vallerand, 2007a,b).

Results of the present study also showed a positive but relatively weak correlation ($r = 0.23$) between the two performance measures. The reliability of objective performance measures was analysed recently by Sturman and colleagues (Sturman, Cheramie, & Cashen, 2005). In a meta-analysis, these researchers showed that objective performance indicators lack temporal stability. Consequently, the present results are not surprising and the weak correlation between performance 1 and performance 2 might reflect the performance changes during adolescence. Results also revealed that sport performance positively predicted individuals' self-determined motivation through their perceptions of competence, autonomy,

and relatedness (Time 2). Blanchard and colleagues (2007) have provided evidence for the mediating role of perceptions of basic need satisfaction in the relationship between performance and self-determined motivation at the situational level in basketball players. In the present research, these findings were replicated with young tennis players.

However, it is important to note that, contrary to Blanchard and colleagues' (2007) study, the two performance variables used in our study were not subjective perceptions provided by the players but an objective calculation based on results obtained by each athlete. Moreover, we examined how performance influences each of the three perceptions separately, whereas Blanchard and her colleagues combined these three perceptions into a single index of psychological need satisfaction, based on a recent investigation in school physical education (Standage, Duda, & Ntoumanis, 2005). More generally, our results demonstrate some support for self-determination theory (Deci & Ryan, 1985) and the hierarchical model of intrinsic and extrinsic motivation (Vallerand, 1997) regarding the mediating role of perceived competence, autonomy, and relatedness in the relationships between social factors and motivation.

The standardized path coefficients revealed that perceptions of relatedness (ß = 0.30) had the strongest influence on self-determined motivation, followed by perceptions of competence (ß = 0.23) and autonomy (ß = 0.21). This was not consistent with Deci and Ryan's (2000) proposition that the need for relatedness plays a more distal role in the enhancement of intrinsic motivation than competence and autonomy. However, results from past studies in sport were also inconsistent regarding the relative influence of the three basic needs on self-determined motivation (Amorose & Anderson-Butcher, 2007; Gillet, Rosnet, & Vallerand, in press; Hollembeak & Amorose, 2005; Sarrazin *et al.*, 2002). According to Vallerand (1997), the impact of fundamental needs on self-determined motivation may vary as a function of tasks and conditions wherein they must be executed. To our knowledge, Gillet *et al.* (in press a) have conducted the only study in sport that has examined the relationship between basic need satisfaction and intrinsic motivation in various environmental conditions. These authors found that perceived autonomy was not the most significant determinant of intrinsic motivation and also showed that the influence of perceived competence and relatedness on intrinsic motivation varied as a function of the standard of competition. One can imagine here that other types of environments may also influence need fulfilment, especially for our sample of adolescents, for whom relatedness might be important. Thus, it would be interesting in future research to analyse differences in the satisfaction of basic psychological needs with regard to, for example, the nature of the sport activity (i.e. individual vs. team sports) and the sport structure (i.e. competitive vs. recreational activities).

As our results highlight the mediating role of need satisfaction in the relationship between motivation and performance, one can also explore other mediating variables that might have an impact on performance. For instance, several researchers have shown that the effects of motivation on performance were mediated by commitment in organizational settings (e.g. Eby, Freeman, Rush & Lance, 1999; Meyer, Paunonen, Gellatly, Goffin, & Jackson, 1989). This is especially the case for affective commitment, which is heightened by intrinsic motivation and which affects several adjustment variables, including stress, satisfaction, and performance. This might be especially pertinent to environments that stress cooperation (i.e. team sports) or populations for whom relatedness is an important need to fulfil to be intrinsically motivated (i.e. adolescents). This also means that additional studies are needed to explore more precisely the role of each need in the relation between contextual motivation and performance.

By showing that self-determined motivation was conducive to the best sport performance and that performance was positively related to self-determined motivation, the present results provided support for a dynamic conception of motivation such as the one proposed by Vallerand (1997) in his hierarchical model. In addition, our results may have implications for practitioners working with young tennis players. In line with the present model, it may be useful to encourage coaches to exhibit behaviours that allow athletes to satisfy their needs for autonomy, competence, and relatedness, because, by doing so, they will promote individuals' self-determined motivation. For instance, coaches could acknowledge athletes' feelings and perspectives or provide non-controlling competence feedback. They could also design activities in which evaluation criteria are based on self-referenced improvement (Ames, 1992). Finally, it is important that coaches encourage cooperation among team members rather than emphasizing competition and inter-individual comparison during training sessions, because competition constitutes a factor that may negatively affect feelings of autonomy and intrinsic motivation (e.g. Fortier, Vallerand, Brière, & Provencher, 1995; Vallerand, Gauvin, & Halliwell, 1986).

We believe that, in view of the lack of studies on the relationship between motivation and performance in sport, this research makes a significant contribution to the sport psychology literature. However, the present investigation is not without limitations. First, our sample only comprised young national tennis players and, consequently, the results may not be generalized to other sports or standards

of competition. Future investigation should examine links between motivation and performance with athletes in other sports but also with older tennis players, because it is possible that motivation could be more unstable during adolescence. It is also important to determine whether the results would be similar in a sample of professional athletes. Second, while the present study used a longitudinal design, we cannot infer causality from the findings. Future research using an experimental design should be conducted to reproduce the present findings under controlled conditions.

Third, we focused on motivation, which represents only one predictive factor of sport performance and it is important to note that the path coefficient from self-determined motivation at Time 1 to performance 1 was small. Many other factors could have an impact on performance in the sport domain. Indeed, some studies have shown that other psychological constructs, such as passion (Vallerand *et al.*, 2008), mood (Cockerill, Nevill, & Lyons, 1991; Terry & Slade, 1995), and anxiety (Jones, Swain, & Hardy, 1993; Martens, Vealey, & Burton, 1990), are linked to sport performance. For instance, Vallerand and colleagues (2008) showed, in a first study with basketball players, that both harmonious and obsessive passions positively influenced deliberate practice, which, in turn, positively impacted performance. In a second investigation with synchronized swimming and water-polo athletes, results revealed that obsessive passion positively predicted mastery goals, performance-approach goals, and performance-avoidance goals, whereas harmonious passion was found to positively predict mastery goals. Moreover, mastery goals were found to positively predict deliberate practice, which was a positive predictor of performance, whereas performance was negatively predicted by performance-avoidance goals. These results suggest that it could be useful to consider both motivation and passion to explain and analyse sport performance. Thus, it would be of interest to include many determinants in the present model to account for a greater amount of variance in sport performance.

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