

Self-Determination, Coping, and Goal Attainment in Sport

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The aim of the present study was to verify, during a stressful sport competition, the associations between motivational antecedents and consequences of the coping process. Using a two-wave design, we tested a model that incorporates motivational orientations, coping dimensions, goal attainment, and affective states among athletes ($N = 122$). Path analyses using EQS revealed that self-determination toward sport positively predicted the use of task-oriented coping strategies during a stressful sport competition, while non-self-determined motivation predicted the use of disengagement-oriented coping strategies. Task-oriented coping, in turn, was positively associated with the level of goal attainment experienced in the competition, whereas disengagement-oriented coping was negatively associated with goal attainment. Finally, level of goal attainment was positively linked to an increase in positive emotional states from pre- to postcompetition, and negatively associated with an increase in negative emotional states. Findings are discussed in light of coping frameworks, self-determination theory, and the consequences of motivational and coping processes on psychological functioning.

Key Words: motivation, stress management, emotions, performance

Adaptation processes in performance contexts are particularly important for identifying the mechanisms by which individuals strive and meet both internal and external demands. In the context of sport, the significance attributed to victories and defeats renders modern athletic competition extremely stressful (e.g., Gould, Jackson, & Finch, 1993). Sport competition thus creates a natural laboratory whereby the study of psychological phenomena carries high relevance and ecological validity and which allows for the examination of stress-management strategies in an involving context. In such stressful encounters, however, athletes differ in how they react and cope with stress (Gaudreau & Blondin, in press; Gould, Eklund, & Jackson, 1993), leading them to experience different performance and emotional outcomes. As such, this paper addresses the impact of motivational variables that may predispose athletes to cope differently with stress, attain their performance goals, and experience greater emotional adjustment in the context of a sport com-

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petition. Accounting for evidence showing the relevance of self-determination theory in sport settings (Vallerand & Rousseau, 2001), this paper aims to explore athletes' motivational orientations as predictors of the coping strategies they use when dealing with the stress of a sport competition.

Coping in Sport Competitions

Based on the seminal work of Lazarus and Folkman (1984), several researchers have defined coping as the person's behavioral and cognitive actions to manage the internal and external demands experienced during a stressful situation (for a review, see Skinner, Edge, Altman, & Sherwood, 2003). Accounting for conceptual models proposed in mainstream psychology, distinctions have been made between different dimensions of coping. Although labeled differently across conceptual models, some dimensions have been proposed more systematically.

The task-oriented dimension of coping, also labeled primary control coping, refers to the strategies aimed at doing something concrete in altering the source of the stress; it includes the coping actions used to change or to act directly on some aspects of the stressful situation. The emotion-oriented dimension, or secondary control coping, includes coping strategies aimed at changing the meaning of a stressful situation and at regulating negative emotions that arise from this situation. It has recently been proposed that these two dimensions could be regrouped into a higher-order coping dimension, given that they both lead to more positive outcomes in times of stress, promote a constructive engagement with stressors or with the self's reactions to them, and are organized, flexible, and constructive (Skinner et al., 2003).

Another higher-order dimension, referring to disengagement-oriented coping, pertains to the strategies employed in order to disengage oneself from the task and to focus on task-irrelevant cues. This dimension is represented by strategies such as mental and behavioral disengagement, denial, and the use of alcohol or drugs. Because disengagement-oriented coping has been characterized by rigid, disorganized, or derogatory ways of coping, and involves dealing harshly with the self or with the stressful situation, this last coping dimension has been associated with less positive outcomes. These higher-order dimensions of coping have been proposed to be useful in accounting for how coping mediates the relationship between stress and outcomes such as mental health (Skinner et al., 2003).

Sport scientists have recently devoted more empirical attention to coping actions in the sport domain. While several qualitative studies have provided in-depth descriptions of the basic mechanisms through which athletes manage the demands of sport competitions (e.g., Gould, Eklund, & Jackson, 1993), quantitative investigations have developed and validated coping instruments designed for use with athletic populations (e.g., Kowalski & Crocker, 2001). With these newly developed self-reported questionnaires, research conducted during specific stressful encounters has revealed positive associations between task-oriented coping and positive affective states, as well as positive links between disengagement-oriented coping and negative affective states (Gaudreau & Blondin, 2002; Ntoumanis, Biddle, & Haddock, 1999).

Despite the compelling nature of these results, Crocker and Graham (1995) have suggested that other variables might be responsible for the association between coping and affective states. Using data collected before, during, and after a sport

competition, Gaudreau, Blondin, and Lapierre (2002) provided support for the mediating effect of performance goal attainment (i.e., discrepancy between one's goal and performance) in the coping/affect relationship. While providing evidence for the potential role of coping in the attainment of one's performance goal, this study also highlighted the need to account for self-referenced criteria of athletic performance in order to understand athletes' emotional adjustment in sport competitions.

Based on these results, we propose that researchers should examine more thoroughly the variables that may improve our understanding of coping utilization in performance settings. According to Lazarus (1991), research on coping must consider the motivational antecedents leading to the selection of particular modes of coping. While individuals may engage in an activity for various reasons, it remains to be determined how these reasons affect the way people cope with the demands encountered in performance settings. One theoretical framework that may help us understand the psychological significance of these reasons is self-determination theory.

Self-Determination Theory

Self-determination theory (SDT; Deci & Ryan, 1985) provides a framework that categorizes the various reasons underlying the pursuit of an activity into six types of motivation. According to SDT, self-determined behaviors are emitted out of choice and pleasure, because they allow the attainment of important goals, and because they are coherent with one's values. Self-determined forms of motivation include intrinsic motivation as well as the integrated and identified regulations. However, behaviors that are not chosen but which instead stem from internal or external pressure are not self-determined, and include the introjected and external regulations as well as amotivation. Self-determined forms of motivation have been proposed to promote a more active engagement of the self when dealing with stressful situations, thus leading to the use of adaptive coping processes. However, non-self-determination should not lead to such a constructive engagement, thus eliciting less adaptive forms of coping during stress (Skinner & Edge, 2002). As such, the present study aimed to determine whether these motivation types can predict specific coping patterns when dealing with the stress of a sport competition.

Much research has associated self-determined forms of motivation with positive behavioral, cognitive, and emotional outcomes (for a review, see Vallerand & Rousseau, 2001). The present study examines two outcomes, namely performance-related goal attainment and affective states, both of which can be considered as important consequences in the context of achievement situations (Vallerand, 1997). Self-determination has been linked to performance variables in different life contexts, such as education (for a review, see Vallerand, 1997). But despite the central role of performance in sport settings, little empirical attention has been devoted to the relationship between self-determination and performance in the context of sport (for an exception, see Beauchamp, Halliwell, Fournier, & Koestner, 1996). Self-determination has also been associated with positive well-being indicators, even in the context of stressful (Boggiano, 1998) or changing situations (Koestner, Fichman, & Mallet, 2002, as cited in Koestner & Losier, 2002). However, in the context of stressful situations, the exact processes that may mediate the relationship between motivational types and positive outcomes such as goal attainment and affective states remain to be investigated.

Self-Determination and Coping

Accounting for the possibility that coping actions may vary according to individuals' motivation in a particular context (Lazarus, 1991), two studies have explored the associations between self-determination and coping. In a one-semester prospective study, Knee and Zuckerman (1998) observed a significant association between motivation and coping. Whereas self-determined motivation was negatively associated with disengagement-oriented coping (i.e., denial, behavioral and mental disengagement), and marginally positively associated with task-oriented coping strategies (i.e., planning, seeking of social support for instrumental reasons), non-self-determined motivation was associated with a greater use of disengagement-oriented coping. Knee, Patrick, Viator, Nanayakkara, and Neighbors (2002) replicated these results when examining the associations between self-determination and coping strategies used in the context of a stressful argument with one's romantic partner. In their study, a self-determined orientation was positively associated with task-oriented coping and with accommodation-oriented coping (i.e., positive reappraisal, acceptance of the event), whereas a non-self-determined orientation was positively associated with disengagement-oriented coping.

Clearly, these studies provide initial support for Lazarus' contention (1991) by showing significant and meaningful relationships between motivation and the use of coping strategies. However, it remains to be established whether self-determination can prospectively predict the coping strategies used in a specific stressful situation. Moreover, self-determination has been associated with coping strategies and with psychological well-being, but it remains to be verified whether coping can mediate the relationship between motivation and emotional adjustment.

The Present Study

The present study examined the relationships between self-determination in sport, coping strategies, goal attainment, and affective states. Specifically, it was designed to test for the mediating role of goal attainment in the relationship between coping and emotions, as well as to verify whether motivational variables predispose athletes to use specific types of coping strategies. The study also aimed at testing whether coping mediates the relationship between motivation and goal attainment. As presented in Figure 1, it was anticipated that self-determined motivation toward sport should positively predict the use of task-oriented coping during the competition, while non-self-determined motivation should positively predict in-competition disengagement-oriented coping. Whereas task-oriented coping strategies used during the competition should lead to enhanced goal attainment, it was hypothesized that disengagement-oriented coping would be negatively associated with goal attainment. Finally, goal attainment should lead to an increase in positive affect from precompetition to postcompetition phases, but to a decrease in negative affect throughout those phases.

Method

Participants

A total of 129 participants (61.5% females) from 14 to 28 years of age ($M = 18$ yrs) took part in this study. With respect to language, 83% were Francophone

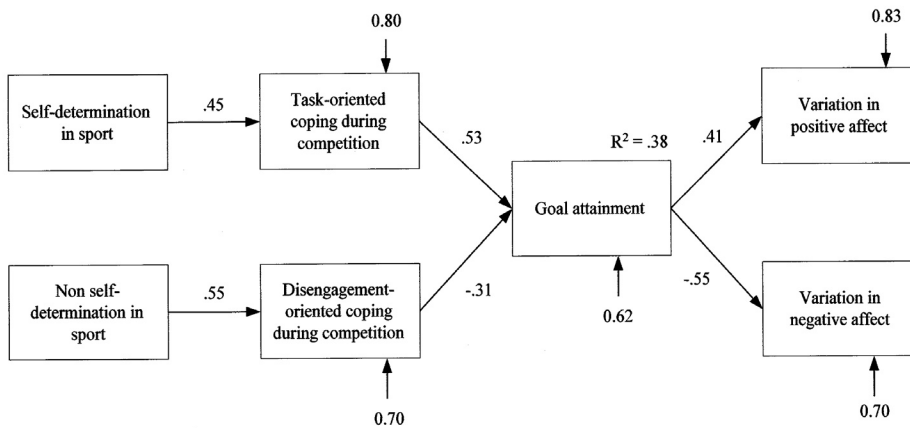


Figure 1 — Model illustrating the associations between self-determination, coping, goal attainment, and variations in affect from pre- to postcompetition. Error variances were fixed to correct for the unreliability of each manifest variable.

and 17% were Anglophone. These athletes were competing in national (11%), provincial (78%), and regional (11%) events at the time of the study. The average number of years at competing in their sport was 6.5 years (range = 1 to 18 yrs). On average, participants trained in their sport approximately 10 hours a week for a period of 42 weeks annually. They were taking part in individual sports such as badminton (8%), swimming (10%), and Alpine skiing (3%), as well as team sports such as basketball (44%) and soccer (34%).

The target competition in which these athletes participated at the time of the study was perceived by the majority of participants (69%) to be the most or one of the most important competitions of the season. The rest of the athletes perceived the competition as being at least as important as the other competitions of the season. On a 1- to 11-point scale, athletes reported being moderately anxious ($M = 4.34$, $SD = 2.18$) and tensed ($M = 4.64$, $SD = 2.33$) about the upcoming competition, thus confirming the importance of the chosen competition for athletes, as well as the moderately strong reactions this situation elicited.

Design and Procedure

Participants were recruited during the last training session held before the competition. Standard ethical procedures were followed for the study. Participants were asked not to give their name on the questionnaire, but to indicate each of their parents' initials for matching purposes. The second questionnaire was completed during the first training session following the competition. The mean time elapsed between the completion of the first questionnaire and the competition was 2.85 days (range = 3 hrs to 4 days prior to the competition). The average time elapsed between the competition and the completion of the second questionnaire was 2.25 days (range = 8 hrs to 3.75 days after the competition). These variations in time did not moderate any of the associations under study.¹

Measuring Instruments

Participants completed two questionnaires. The first was composed of a measure of contextual motivation in sport, namely the Sport Motivation Scale (Brière, Vallerand, Blais, & Pelletier, 1995; Pelletier, Fortier, Vallerand, et al., 1995), as well as the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988), which was used to assess positive and negative affect. The second questionnaire was composed of the Positive and Negative Affect Schedule, the Coping Inventory for Competitive Sport (Gaudreau & Blondin, 2002), which is a sport-specific measure of coping, as well as the Attainment of Sport Achievement Goals Scale (Gaudreau, Amiot, Blondin, & Blanchard, 2002), which measures goal attainment in the context of a sport competition. To ascertain their equivalence in English and French, all instruments had been translated using a back-to-back translation procedure (see Vallerand, 1989).

Motivation Toward Sport. We used a short version of the Sport Motivation Scale (SMS; 16-items) to measure an individual's level of motivation toward sport. When completing this scale, participants were asked to indicate, on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree, the extent to which each item represented a reason why they generally practice their sport. Based on the motivation constructs identified by Deci and Ryan (1985), the four types of motivation measured in this study were, from lowest to highest level of self-determination: amotivation ("It is not clear to me anymore; I don't really think my place is in this sport"); external regulation ("For the prestige of being an athlete"); identified regulation ("Because it allows me to attain objectives that are important for me"); and intrinsic motivation ("For the excitement I feel when I am really involved in my sport"). Alpha coefficients obtained for those subscales ranged from .66 to .81.

The SMS has been shown to possess good levels of reliability, validity, and internal consistency both in French and English. Results of exploratory and confirmatory factor analyses have empirically supported the first-order structure of this scale (Brière et al., 1995; Pelletier et al., 1995). Based on the widespread use of composite scores representing non-self-determined and self-determined orientations (e.g., Knee et al., 2002; Knee & Zuckerman, 1998), and because of the aforementioned theoretical postulates of SDT, a self-determined motivation variable was computed and regrouped the subscales of intrinsic motivation and identified regulation, while non-self-determined motivation included the amotivation and external regulation subscales.

Coping. The Coping Inventory for Competitive Sport (CICS) assessed coping strategies used by athletes during the competition. The CICS was constructed based on a hierarchical approach to coping. It contains one 3-item and nine 4-item subscales: mental imagery, logical analysis, relaxation, control over thoughts, effort expenditure, social support, distancing, venting of unpleasant emotions, disengagement/resignation, and mental distraction. In completing this instrument, participants were instructed to indicate to what extent each item represented what they had done or thought about during the competition in which they had just taken part. Each item was rated on a 5-point Likert scale ranging from 1 = does not correspond at all to 5 = corresponds very strongly. The CICS possesses adequate levels of convergent, concurrent, and differential validity, as well as acceptable internal consistency (Gaudreau & Blondin, 2002). Results from a first-order confirmatory

factor analysis supported the 10-factor structure of this questionnaire. In the present study, reliability coefficients ranged from .67 to .89.

Because coping strategies can be theoretically regrouped into higher-order dimensions of coping, such dimensionality was tested using an exploratory factor analysis. This procedure also allowed us to add parsimony in our analyses by regrouping and using fewer dimensions of coping. A principal component analysis with an oblimin rotation was thus conducted on the 10 subscales of the CICS. The Bartlett test of sphericity confirmed the legitimacy of regrouping these subscales into factors, $\chi^2_{(45)} = 368.94, p < .001$. Results yielded a two-component solution that explained 55% of the variance, which is acceptable considering that models of coping based on factor scores typically explain less than 40% of variance (e.g., Amirkhan, 1990). Eigenvalues for each component were greater than 1. Component 1 included the coping subscales of relaxation, logical analysis, control over thoughts, mental imagery, social support, distancing, and effort expenditure. Based on the theoretical taxonomies of coping (Skinner et al., 2003), this first component was considered to represent a higher-order task-oriented coping dimension. The second component included the disengagement/ resignation, venting of unpleasant emotions, and mental distraction subscales, thus representing the higher-order disengagement-oriented coping dimension. All subscales presented loadings greater than .30 on their respective component.

Affective States. The Positive and Negative Affect Schedule (PANAS) was used to assess pre- and postcompetition affective states. This adjective checklist consists of two scales representing 10 positive and 10 negative affective states. For the precompetition format of this checklist, athletes were instructed to indicate the extent to which each adjective represented how they were currently feeling while thinking about the upcoming competition. For the postcompetition format they were instructed to indicate the extent to which each adjective represented how they were currently feeling. Each adjective was rated on a 5-point Likert scale ranging from 1 = not at all or a little to 5 = extremely. The positive affect subscale presented a mean reliability of .82 across time, while a mean reliability of .78 was obtained for the negative affect subscale. Difference scores in positive and negative affect were created by subtracting precompetition from postcompetition scores and were used in further analyses.

Perceived Goal Attainment. According to achievement goal theory, athletes can use mastery, self-referenced, and normative standards to judge their level of competence in an achievement task (Elliot & McGregor, 2001). The Attainment of Sport Achievement Goals Scale (A-SAGS) was created in order to capture these dimensions of goal achievement specific to a sport competition. This questionnaire consists of 12 items representing one of the three goal achievement dimensions: mastery goal achievement (“I mastered the difficulties of the situation”); self-referenced goal achievement (“I did better than my usual performances”); and normative goal achievement (“I outperformed other athletes”). When completing the A-SAGS, athletes were instructed to indicate the extent to which each item represented how they had performed during the competition on a 7-point Likert scale ranging from 1 = does not correspond at all to 7 = corresponds completely. Results from second-order confirmatory factor analyses supported both the hypothesized three-factor structure of goal attainment at a lower level and the second-order goal attainment factor (Gaudreau, Amiot, et al., 2002). In the present study, a global score of goal attainment was computed by regrouping the three subscales ($\alpha = .93$).

Results

Prior to analyses, the main variables were examined for accuracy of data entry, missing values, and fit between their distributions and the assumptions of multivariate analysis (Tabachnick & Fidell, 2001). When a participant had completed most of the items of a scale, the missing score was replaced by that participant's mean on the variable. Two participants had more than 20% of their data missing, and one participant presented a non-random pattern of missing data (i.e., the last scales of the questionnaires were not completed). These three participants were thus removed from the analyses. The remaining missing data (less than 1.5% of the data file) were replaced using the regression imputation procedure.

Normality indices showed appropriate levels of skewness and kurtosis for all variables (see Table 1). The Mardia coefficient also indicated low levels of multivariate kurtosis (2.88, normalized coefficient = 1.42). Three cases with univariate outlying scores on more than two variables were inspected and excluded from the analyses. Finally, one participant was identified through Mahalanobis distance as a multivariate outlier, $\chi^2_{(32)} = 59.70, p < .001$. Thus, 122 participants were retained for the analyses. Upon inspection, it was found that the seven cases not used in the analyses were similar to those of the entire sample in terms of age, language, gender, number of years competing, and number of weeks and hours spent practicing their sport.

Main Analyses

Prior to testing the hypothesized relationships, we conducted descriptive statistics and correlations between the variables (see Table 1). Inspection of the pattern of correlations provided preliminary support for the hypothesized associa-

Table 1 Means, Standard Deviations, and Correlations Obtained for Motivation Types, Coping, Goal Attainment, and Affects

	<i>M</i>	<i>SD</i>	SK	KU	1	2	3	4	5	6
1. Self-determined motivation	5.37	0.82	-0.41	-0.09	-					
2. Non-self-determined motivation	2.31	0.84	1.08	3.70	.10	-				
3. Task-oriented coping	2.96	0.61	0.22	-0.21	.37***	.06	-			
4. Disengagement-oriented coping	1.87	0.61	1.02	0.77	-.07	.43***	-.13	-		
5. Goal attainment	4.04	1.35	0.05	-0.78	.24**	-.13	.52***	-.33***	-	
6. Variation in positive affect	-0.48	0.63	-0.34	-0.31	.02	-.01	.24*	-.12	.29**	
7. Variation in negative affect	-0.07	0.63	0.74	1.01	-.08	.21*	-.08	.28**	.36***	-.20*

Note: SK = skewness, KU = kurtosis. * $p < .05$, ** $p < .01$, *** $p < .001$

tions. Nevertheless, the mediating role of coping and goal attainment was tested using the following model-fitting procedures.

Hypotheses regarding the associations between self-determination, coping, goal attainment, and emotions were simultaneously tested using structural equation modeling (SEM). Given the sample size of less than 200 participants, we conducted a path analysis using manifest variables (Byrne, 1994). The covariance matrix was used as input, and EQS 5.7 generated parameter estimates based on maximum likelihood estimation. Paths were specified as per Figure 1. In every path analysis presented, each error variance was set as the variance of the variable multiplied by 1 minus its coefficient of internal consistency, thus allowing us to correct for the unreliability of the manifest variables.

To evaluate the overall fit of the model, we examined the chi-square statistic, which should ideally be nonsignificant. We also examined incremental fit indices such as the non-normed fit index (NNFI) and the comparative fit index (CFI), for which the conventional lower cutoff of acceptable fit of the model to the data is .90. Finally, the residual mean square of approximation (RMSEA) was also used. Values smaller than .08 on the RMSEA indicate acceptable fit of the model whereas values smaller than .05 represent good fit.

The model presented an adequate fit to the data, $\chi^2(15, N = 122) = 17.77, p = .28, NNFI = .967, CFI = .976, RMSEA = .040$. All of the hypothesized associations and other estimated parameters were significant ($z > 1.96, p < .05$), and none of the modification indices obtained (i.e., Lagrange Multiplier, Wald Test) provided statistically or conceptually significant suggestions for improving the model. Thus no change was brought to the hypothesized model. Overall, results obtained from the path analysis supported our hypotheses.

In order to further test for the mediating role of both coping and goal attainment, we tested a second model and compared it to the first model. Four paths were added to those already included in the first model. These paths linked: (a) self-determination to goal attainment; (b) non-self-determination to goal attainment; (c) task-oriented coping to variation in positive affect; and (d) disengagement-oriented coping to variation in negative affect. Differences in χ^2 were used to compare the fit of those two nested models. This variation is χ^2 -distributed, with degrees of freedom equal to the difference in degrees of freedom of the two models. A significant variation in χ^2 indicates a substantial improvement in model fit from the first to the second model (Byrne, 1994). Results pertaining to the second model showed that the addition of the four parameters into the model did not yield a statistically better-fitting model, $\Delta\chi^2_{(4)} = 5.61, p > .05$. Furthermore, except for the fourth path added, all other paths were not significant. These results assert the mediating effect of coping in the relationship between motivation and goal attainment as well as the mediating effect of goal attainment in the relationship between coping and affective changes.

As a further test of the mediating effect of coping and goal attainment, we tested a final model using the significance test of direct and indirect effects provided in the EQS program. This model included six additional direct paths leading from: (a) self-determination to goal attainment and to change in positive affect; (b) non-self-determination to goal attainment and to change in negative affect; (c) task-oriented coping to change in positive affect; and (d) disengagement-oriented coping to change in negative affect (see Table 2). Each relationship can be broken

Table 2 Total, Direct, and Indirect Effects of Parameter Estimates

Parameter	Total effect	Direct effect			Indirect effect		
	β	β	SE	Z	β	SE	Z
Self-determination → Goal attainment	0.499	0.085	0.190	0.445	0.415	0.123	3.361*
Non-self-determination → Goal attainment	-0.362	-0.099	0.207	-0.477	-0.263	0.119	-2.222*
Task-oriented coping → Variation in positive affect	0.312	0.176	0.130	1.358	0.136	0.064	2.141*
Disengagement-oriented coping → Variation in negative affect	0.234	0.145	0.137	1.055	0.089	0.045	1.977*
Self-determination → Variation in positive affect	0.014	-0.112	0.104	-1.082	0.126	0.054	2.324*
Non-self-determination → Variation in negative affect	0.220	0.108	0.109	0.993	0.113	0.063	1.798†

Note: β = unstandardized beta. SE = standard error of parameter estimate.

* $p < .05$; † $p = .07$

down into direct and indirect effects that are both amenable to tests of significance. Whereas a direct effect represents the direct association between an independent variable and a dependent variable, an indirect effect corresponds to the effect of one or more mediating variables in that relationship.

A relationship is assumed to be fully mediated when its indirect effect is significant whereas its direct effect is nonsignificant. Results indicated that all direct effects were nonsignificant. Indirect effects accounted for approximately 38 to 83% of the total effects. While five indirect effects were significant at the 0.05 level, the indirect effect of non-self-determination on change in negative affect was marginally significant, $p = 0.07$, but still accounted for approximately 50% of the total effect. Considering that all direct effects were nonsignificant, these results indicate that the relationships between motivation and outcomes (i.e., goal attainment and changes in affective states), and between coping and changes in affective states, were mediated by the intervening variables included in the model.

Complementary Analyses

Although sample size greater than 200 should be preferred in SEM, the analytical approach of this study, which relied on manifest rather than latent variables, yielded a participants-to-parameters ratio close to 20:1. Based on this ratio, the modeling strategy provided reliable parameter estimates for the hypotheses under study (Tabachnick & Fidell, 2001). For each of the six relationships included in our model, results of post-hoc power analyses indicated that the likelihood of rejecting the null hypothesis ($r = 0$) with an alpha of 0.05 was acceptable with a sample size of 122. Specifically, Cohen's (1977) power estimation of correlation coefficients yielded power estimates ranging from 0.90 to 0.99 ($M = 0.97$, $SD = 0.04$). Also,

we elected to assess the power of each path coefficient in our model using the SEM approach described by Kaplan (1995).

Satorra (1989) demonstrated that the modification indices (i.e., Wald test) are an approximation of the noncentrality parameter (NCP). Using the NCP and its respective degree of freedom ($df = 1$), we estimated the power of each path coefficient using a noncentral chi-square distribution. With this method, power estimates for our path coefficients ranged from 0.93 to 1.00 ($M = 0.98$, $SD = 0.03$), thus indicating that a sample size of 122 was adequate to reject the null hypothesis ($\beta = 0$) with an alpha of 0.05. This result is not surprising, as our predictor(s) accounted for substantial amounts of variance in each dependent variable (Cohen, 1977).

Based on the recommendation of MacCallum, Browne, and Sugawara (1996), we estimated the power of the whole SEM model using a power estimate based on the RMSEA. This was done to determine the likelihood of rejecting the conclusion that the model provides a close fit ($RMSEA < 0.05$) when it actually does not. Given a sample size of 122 and 15 degrees of freedom, the power for the test of close fit was 0.21. With this number of degrees of freedom, a sample size of more than 500 would have been needed to provide a power of 0.80.

Based on the recommendations of MacCallum and colleagues (1996), one way to increase power given a same sample size is to increase the number of degrees of freedom in the SEM. This can be achieved by using analyses based on latent variables rather than a path analysis that relies exclusively on manifest variables. However, although compelling from a power perspective, using a latent variable analysis with 122 participants would yield low participants-to-parameters ratio, thus increasing the likelihood of obtaining unreliable parameter estimates. Furthermore, results of a recent simulation study (Curran, Bollen, Paxton, Kirby, & Chen, 2002) indicate that power estimations based on the RMSEA should be interpreted cautiously with small sample size ($N < 200$), given that the accuracy of the underlying calculations of these estimations degrades as a function of decreasing sample size.

Hancock and Freeman (2001) also questioned the utility of the RMSEA-based power analysis for models with manifest variables, as their small number of degrees of freedom produce substantial lack of power to reject the test of close fit. Given these limitations as well as the results yielded by the two preceding methods for assessing the power of our path coefficients, we conclude that our sample of 122 athletes provided a reasonable test of the hypotheses under study.

Discussion

The present study aimed at verifying the impact of motivational variables on positive outcomes experienced in the context of a sport competition, and at testing for the mediating role of coping and goal attainment in these relationships. Overall, our results provided support for the hypothesized model. Using path analyses, we found that self-determined motivation positively predicted the use of task-oriented coping strategies during a competition, whereas non-self-determined motivation positively predicted the use of disengagement-oriented coping. Coping was also found to be associated with goal attainment. While task-oriented coping was positively associated with goal attainment during the competition, disengagement-oriented coping was negatively associated with it. Finally, goal attainment was positively associated with an increase in positive emotions from precompetition

to postcompetition, but negatively linked to an increase in negative emotions. The mediating role of coping and goal attainment was further verified and confirmed through alternative models.

These findings replicate and extend previous results obtained using the SDT framework. As revealed in the correlational and SEM analyses, not only was self-determined motivation associated with positive consequences such as higher goal attainment, but it also positively predicted the use of task-oriented coping, a process that has been shown to predict positive outcomes in stressful situations (e.g., Gaudreau & Blondin, 2002; Skinner et al., 2003). Non-self-determined motivation, however, was found to be associated with disengagement-oriented coping and with more negative consequences, such as an increase in negative affect from pre- to postcompetition. This study was also innovative in providing evidence for the association between self-determination and performance as assessed by measuring athletes' subjective levels of goal attainment.

At a methodological level, this study was among the few that employed a two-wave design to examine the process of coping during a sport competition. Although motivation and coping were assessed at different points in time, which enables inference about the direction of their relationship, methodological improvements could be brought to future studies on coping processes. First, note that coping and its consequences were both assessed in the second questionnaire distributed after the competition, which might have introduced retrospective biases and does not ensure that coping influenced goal attainment or vice-versa. Future studies should attempt to measure coping during the competition per se and to assess consequences after the competition in order to provide stronger support for those associations. Also, the use of daily diary methods, which have been shown to provide precise measurements of coping processes (e.g., Schwartz, Neale, Marco, Shiffman, & Stone, 1999), could be implemented in the context of sports. Such an implementation should nevertheless be made in a manner that does not interfere with participants' pre-, in-, and postcompetition routines.

The sample in the present study was also quite diversified in terms of age and expertise level. While our study was not designed to assess the moderating role of these variables on the relationships being examined, future studies should systematically investigate whether these associations vary as a function of age and expertise. Doing so will help determine whether the impact of motivation and coping on goal attainment and well-being is the same for athletes of varying ages and developmental stages. Also, it seems important to test for the generalizability of these associations among athletes of higher levels of expertise, as they are likely to have a stronger athletic identity, to be more psychologically invested in their sport, and to be more vulnerable to distress when failing to reach their goal.

Another limitation of the present study pertains to sample size. Although the participants-to-variables ratio was acceptable, and conventional power analyses performed on the associations tested in our model yielded satisfactory power estimates, the SEM procedure advocated by MacCallum et al. (1996) pinpointed a lack of power in our path model. While the use of the method proposed by MacCallum et al. has been questioned when calculating the power of path analyses involving manifest rather than latent variables (Hancock & Freeman, 2001), we strongly feel that the present results should be replicated using larger sample sizes ($N > 200$) and employ analytical strategies that rely on latent rather than manifest variables.

Doing so will not only increase the power of the test in line with the propositions of MacCallum et al. (1996) but will also yield more stable and reliable estimates of the relationships under study (Byrne, 1994).

At the conceptual level, future studies should also aim to identify the mechanisms by which self-determination is linked to coping. It might be through appraisals that self-determination leads to the use of more adaptive forms of coping strategies. According to the transactional model of stress (Lazarus & Folkman, 1984), appraisals, which precede coping, refer to the perceptions and emotions that arise from an evaluation of the situation. While appraisals of challenge have been linked to the use of more adaptive coping strategies, appraisals of threat have been associated with the use of less adaptive forms of coping (Skinner et al., 2003). Because self-determination has been associated with lesser amounts of anxiety (Vallerand, 1997), it could be through cognitive appraisals of challenge rather than threat that self-determination fosters a more adaptive plan of action for dealing with stress (Skinner & Edge, 2002). Future studies should thus examine the mediating role of appraisals in the self-determination/coping relationship.

Other antecedents of coping could be further examined. For instance, it has been shown that coaches' autonomy-supportive behaviors have a positive impact on athletes' self-determination (Pelletier, Fortier, Vallerand, & Brière, 2001). While coaches also have an important effect on athletes' use of coping strategies in sports (e.g., Ntoumanis et al., 1999), future research and interventions could aim at testing for the synergistic effect of coaches' behaviors with respect to both coping training and autonomy support. Doing so could enhance our theoretical understanding of the coping process in sport and would also provide practical information on how coaches can have a positive impact on their athletes' coping patterns.

In sum, the present study provided support for the model by which motivation toward sport predicts the strategies athletes use for coping with the stress of an important sport competition. In turn, these strategies predict athletes' performance in the competition, as operationalized by their subjective level of goal attainment. Finally, such goal attainment is associated with athletes' emotional adjustment following the competition. While the present study focused on the process of coping by relying on a two-wave design, further methodological, statistical, and conceptual advances will be possible and should be implemented in future studies in order to enhance our understanding of the adaptation processes involved during stressful achievement situations.

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Note

¹ The moderating role of two moderating variables: (a) time elapsed between completion of Questionnaire 1 and competition, and (b) time elapsed between competition and completion of Questionnaire 2, was tested on each of the 6 anticipated relationships (see Figure 1). Twelve hierarchical moderated multiple regressions (HMMR) were conducted (Aiken & West, 1991). For each HMMR, predicting variables were placed in the following order: independent variable, moderating variable, and interaction between them. Only one interaction term was entered at a time in each regression. In fact, the inclusion of more than one interaction term increases both type II error and multicollinearity, given that the two interaction terms are created using the same moderating variable. Results revealed no significant interaction effect, even at $p < .10$. However, our moderating variables had significant main effects in three regressions. First, over and above the variance accounted for by non-self-determination, the time elapsed between competition and completion of Questionnaire 2 negatively predicted disengagement-oriented coping. This suggests that with time, self-serving biases might become more prominent when reporting disengagement-oriented coping. Second, above the variance accounted for by task-oriented coping, the time elapsed between completion of Questionnaire 1 and competition negatively predicted goal attainment. Finally, above the variance accounted for by goal attainment, the time elapsed between completion of Questionnaire 1 and competition positively predicted a variation in negative affect. These two last effects are not as readily interpretable, as goal attainment and variation in negative affect both involve measurements taken in Questionnaire 2.

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