Temporal Ordering of Motivational Quality and Athlete Burnout in Elite Sport

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ABSTRACT

LONSDALE, C., and K. HODGE. Temporal Ordering of Motivational Quality and Athlete Burnout in Elite Sport. *Med. Sci. Sports Exerc.*, Vol. 43, No. 5, pp. 913–921, 2011. **Introduction**: Using self-determination theory as the theoretical framework, we conducted a longitudinal investigation of the relationships between motivation and athlete burnout. We tested four hypotheses: H_0: low self-determination (SD) does not precede burnout, and burnout does not precede low SD; H_1: low SD precedes burnout; H_2: burnout precedes low SD; and H_3: burnout and motivation have a reciprocal relationship. **Methods**: We used a two-wave design, with the follow-up assessment 4 months after baseline. Elite New Zealand athletes (n = 119, mean age = 24.74 yr (standard deviation = 8.54 yr); 57.14% of whom were females) completed the Athlete Burnout Questionnaire and the Behavioral Regulation in Sport Questionnaire. Structural equation modeling of cross-lagged panel models was used to test the hypotheses. **Results**: The relationship between motivation and burnout varied depending on the type of motivation assessed. Analyses related to overall levels of self-determined motivation, amotivation, and controlled forms of extrinsic motivation provided support for H_1: low SD precedes burnout. When compared with external regulation, introjected regulation seemed to be a clearer antecedent of athlete burnout. Analyses related to the self-determined forms of extrinsic motivation provided support for H_2: burnout precedes low SD. The only analyses in which the null hypothesis could not be rejected were those relating to intrinsic motivation. Finally, there was little support for a reciprocal effects model. **Conclusions**: Low levels of self-determination may lead to increases in athlete burnout, whereas athlete burnout may precede decrements in self-determined extrinsic motivation. Particular efforts could be made to help support the basic psychological needs of athletes with controlled forms of motivation, thereby leading to an internalization of motivation and decreased risk of burnout. **Key Words:** AUTONOMOUS, CONTROLLED, MOTIVATION, SELF-DETERMINATION THEORY

Athlete burnout is a syndrome that can result from intensive sport participation (34) and may lead to a variety of negative consequences, such as illness, injury, or dropout (3). As a result, preventing burnout has been viewed as an important issue (11,12). Early studies investigating this topic were based on a variety conceptual definitions that lead to confusion regarding the nature of athlete burnout (7). More recently, researchers have provided empirical evidence (9,28) supporting Raedeke's (27) definition of athlete burnout as a syndrome characterized by (i) emotional and physical exhaustion, (ii) sport devaluation, and (iii) a reduced sense of accomplishment. This symptom-based definition provides a means by which potential athlete burnout antecedents, such as psychosocial stressors (30) and maladaptive participation motives (19), can be investigated, and as a result, the past decade has seen an increase in the number of studies published on this syndrome (12).

In particular, self-determination theory (SDT) (32) is a useful theoretical model to examine the potential antecedents of athlete burnout (4,5,14,17,19,26). Ryan and Deci (32) have proposed that the extent to which an individual's behavior is *regulated* by processes that are congruent with the individual's sense of self then the greater the individual's level of self-determined motivation. SDT consists of six behavioral regulations that are considered to exist along a continuum, ranging from high self-determination (i.e., intrinsic motivation (IM)) to low self-determination (i.e., external regulation). The SDT continuum represents three broad types of motivation: IM, extrinsic motivation (EM), and amotivation. The hallmark of IM is when an athlete participates because of interest or enjoyment in the activity itself. EM represents participation that is regulated by a desire to obtain separable outcomes, whereas an amotivated athlete lacks motivation and feels as though he or she is "going through the motions."

Whereas Ryan and Deci (32) posited IM and amotivation to be unitary constructs, they proposed that EM consists of four types of behavioral regulation. Integrated regulation is the most self-determined form of EM—an athlete views sport as being congruent with deeply held values and his or her sense of self. Identified regulation exists when an athlete

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participates to realize benefits he or she deems personally important. Introjected regulation refers to behavior that is performed to avoid feelings such as guilt or shame or to enhance feelings of self-worth. Finally, external regulation is the least self-determined type of EM and occurs when an athlete participates to satisfy an external demand or avoid punishment that could result from a decision to discontinue participation. External and introjected regulation have been described as non–self-determined or controlled regulatory styles, whereas identified and integrated regulation are considered self-determined or autonomous regulatory styles (10).

In a general sense, controlled regulatory styles can be characterized as athletes feeling they "have to" participate (obligation) to receive the desired separable outcomes (lack of volition; contingent self-worth), whereas autonomous regulatory styles exist when athletes feel they "want to" participate because of their sense of control and self-directedness (volition and internal locus of causality). A central tenet of SDT is that humans have an innate need to be motivated by factors that are intrinsic or in line with one's core values. Controlled regulatory styles are considered maladaptive, as they are often connected to negative issues such as stress, anxiety, and conditional approval from others. On the other hand, individuals with an autonomous regulatory style are motivated to achieve valued outcomes and/or express their sense of self, and consequently, they are likely to experience positive outcomes. There is considerable research in sport that demonstrates a strong positive relationship between autonomous regulatory styles and adaptive outcomes such as effort, persistence, performance, and indices of optimal psychological well-being (36). On the other hand, there is empirical evidence that controlled regulatory styles have substantial relationships with indices of ill-being in sport, such as antisocial moral attitudes (24). As a result, autonomous motives are viewed as being of higher quality than controlled motivation.

From a theoretical viewpoint, one would expect (i) amotivation and controlling regulatory styles to be positively related to maladaptive outcomes such as athlete burnout and (ii) autonomous regulatory styles to be negatively related to maladaptive outcomes such as athlete burnout. Recent cross-sectional burnout research has largely supported these contentions (18,19), but the temporal ordering of motivational quality and burnout is not clear. Thus, longitudinal, prospective research designs are needed. Cresswell and Eklund (5) noted that, based on SDT propositions, one would expect motivational quality to directly influence levels of athlete burnout over time. However, it also seems plausible that an increase in burnout could lead to a shift over time in the quality of an athlete's motivation (i.e., from autonomous to controlled motivation). A third possibility is that motivational quality and burnout have a reciprocal relationship.

Cresswell and Eklund (5) originally examined the relationship between motivation and athlete burnout using cross-sectional data gathered from top amateur rugby players in New Zealand. They tentatively concluded that a reciprocal model in which controlled motivation caused burnout and burnout also caused controlled motivation fit their data better, compared with models in which (a) controlled motivation caused burnout, but burnout did not lead to low controlled motivation; or (b) burnout caused controlled motivation, but controlled motivation did not lead to burnout. However, the authors acknowledged that the cross-sectional nature of their research design was an important limitation and "longitudinal designs that describe the progression or development of the syndrome relative to self-determination contentions are also warranted" (p. 476).

Following on from their cross-sectional study, Cresswell and Eklund (6) used a longitudinal design to reexamine relations between motivation and burnout in professional New Zealand rugby players. They found that changes in burnout were associated with changes in motivation. However, the analyses they used did not shed light on the research question from their previous study; namely, did controlled motivation predict increases in burnout or did burnout predict changes in motivation, or alternatively did these two variables have a reciprocal relationship? An additional limitation of their study involved problems encountered when measuring motivation using the Sport Motivation Scale (25). Because of the poor reliability of evidence related to several EM subscale scores, Cresswell and Eklund were forced to collapse the EM subscales into one composite score. Examining EM as a unitary construct is problematic because a fundamental tenet of SDT that differentiates it from other theories (32) is that some types of EM (i.e., autonomous EM: identified and integrated regulation) will be adaptive, whereas others (i.e., controlled EM: external and introjected regulation) will be maladaptive.

Lemyre et al. (17) also used a longitudinal design to examine athlete burnout. They showed that decreases in swimmers' self-determined motivation over a season predicted their level of burnout at the end of the season. A limitation with this study was the fact that burnout was only measured at the end of the season, and therefore, the authors could not assess the change in burnout over time. The inclusion of dependent variable change (e.g., autoregressive influences) is an important aspect of longitudinal studies in which one variable is hypothesized to influence another. As MacCallum and Austin (20, p. 206) pointed out, "if one hypothesizes that variable A at time 1 ($A1$) influences B at time 2 ($B2$), one should also measure $B1$ and include in the model the influence of $B1$ on $B2$ as well as the correlation of $A1$ with $B1$. Failure to do so can result in a highly biased estimate of the effect of $A1$ on $B2$… one might conclude that there is a strong influence of $A1$ on $B2$ when in fact that apparent influence is in part spurious and due to the autoregressive influence of $B1$ on $B2$ and the correlation of $B1$ with $A1$."

Also, Lemyre et al. (17) did not examine the relationship between burnout and different types of motivation; instead,

they focused on a global index of self-determined motivation (SDI). This type of index is quite common in SDT-based motivation research (19), but additional examination of the distinct types of motivation (behavioral regulations) on the self-determination continuum can provide information that is not possible when only using a composite index (16).

PURPOSE AND HYPOTHESES

Our purpose was to examine the relationship between motivational quality and athlete burnout over time. Specifically, our goal was to determine the temporal ordering of athlete burnout and motivation, viewed from the perspective of SDT. We accomplished this goal by using a two-wave cross-lag panel design—a design that has frequently been used to examine relationships between variables for which a reciprocal relationship is hypothesized (e.g., Marsh et al. (22,23)). We tested four hypotheses:

H_0: Motivational quality does not predict changes in burnout, and burnout does not predict changes in motivational quality.

H_1: Motivational quality predicts changes in burnout, but burnout does not predict changes in motivational quality (SDT-based model).

H_2: Burnout predicts changes in motivational quality, but motivational quality does not predict changes in burnout.

H_3: Burnout and motivation have a reciprocal relationship—motivational quality predicts changes in burnout, and burnout predicts changes in motivational quality (5).

METHODS

Participants and Procedures

After ethical clearance from the university research ethics committee, data collection occurred at two time points during a 4-month period. Burnout is considered to be an enduring phenomenon; thus, substantial time is needed to note changes. That said, it is not clear how long this period needs to be. Cresswell and Eklund (4) showed that burnout varied during the course of a 12-wk tournament. Similar intervals have been used in previous athlete burnout investigations (1,17). Thus, we judged 4 months to be an adequate period for any changes in burnout to occur. Time 1 was in October 2004; time 2 was in February 2005. At time 1, New Zealand Academy of Sport athletes ($N = 571$) were sent an e-mail in which they were invited participate; 343 athletes (60.01%) provided informed consent and responded to the online survey. The online survey program prompted participants when they did not respond to an item; therefore, there were no missing data. Previous research has shown that athlete burnout levels may vary across different phases of the competitive season (4). To reduce the effect of this potential moderating variable, we only included data from athletes who, at time 1, reported being in their preseason or early season phase ($n = 181$). Athletes in other phases (midseason, late-season, or off-season) at time 1 were excluded from further analyses.

Approximately two-thirds (65.74%, $n = 119$) of eligible time 1 participants also responded to the questionnaire at time 2. The mean age of the participants who responded at both time points was 24.74 yr (standard deviation = 8.54 yr, range = 14–53 yr, 78.15% between 18 and 35 yr), with females ($n = 68$) outnumbering males ($n = 51$). Athletes came from 17 different sports including individual sport participants ($n = 57$), team sport athletes ($n = 24$), and participants whose sport was not easily categorized as team or individual (e.g., rowing, sailing; $n = 38$). The majority of athletes (67%) had represented New Zealand at the senior national level. Other athletes were senior provincial, junior national, and junior provincial representatives. The mean duration of participation at their current level was 3.89 yr (standard deviation = 2.79 yr).

Instruments

In contrast to previous burnout studies in which the Sport Motivation Scale was used and found to have psychometric problems (e.g., Cresswell and Eklund (4) and Raedeke and Smith (29)), we measured motivation using the 24-item Behavioral Regulation in Sport Questionnaire (BRSQ) (18). This questionnaire included subscales designed to measure amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and IM. Previous research has supported the reliability and construct validity of scores derived from these items (18). In addition to individual subscale scores, a self-determination index can be formed by multiplying subscale scores by a coefficient intended to represent a global level of self-determination.

The Athlete Burnout Questionnaire (ABQ) (29) was also used. This 15-item measure included three subscales designed to measure physical/emotional exhaustion, devaluation, and reduced sense of accomplishment. Previous research has supported the reliability and construct validity of ABQ scores (8,29).

Statistical Analyses

Preliminary analyses. We screened the data set for multivariate outliers and examined the normality of the distributions. To investigate the possibility of self-selection bias, we used MANOVA to compare the time 1 motivation and burnout scores of time 2 responders and time 2 nonresponders. We also used MANOVA to test the effect of potential moderating variables, including age, gender, level of competition, and experience. MANOVA was also used to test differences in motivation or burnout scores between athletes from team versus individual sports, as well as athletes in preseason versus early season (time 1) and midseason versus late-season (time 2).

Finally, we examined the correlations among the BRSQ scores. To justify the creation of an SDI, these correlations would need to approximate a simplex pattern. This pattern

occurs when scores representing constructs that are closer together on a hypothetical continuum are more strongly and positively correlated than scores derived from subscales intended to represent constructs that are expected to be more distally related.

Measurement model. As seen in Figure 1, all possible paths between latent variables were estimated. As a result, the fit indices for the measurement model were necessarily the same as those for the structural model and are therefore not reported separately.

Main analyses. We tested our hypotheses using structural equation modeling (with maximum likelihood estimation). Each model was a cross-lag panel design (e.g., Marsh et al. (23)). The null hypotheses would be supported if neither of the coefficients associated with path c or d (from Fig. 1) was significantly different from zero. If path c, but not d, was significant, then H_1 (motivation predicts changes in burnout) would be supported. If path d, but not path c, was significant, then H_2 (burnout predicts changes in motivation) would be supported. Finally, if both paths c and d were significant, then H_3 (reciprocal effects) would be supported.

We tested three series of models, with seven models in each series. In the first series, the burnout variable was reduced sense of accomplishment. In the second series, the burnout variable was exhaustion; in the third, it was devaluation.

In the first model of each series, the latent motivation variables were self-determination indices (SDI) at times 1 and 2. An SDI is formed by adding weighted scores from subscales intended to represent different forms of motivation. We weighted BRSQ item scores ($-2 \times$ external regulation, $-2 \times$ introjected regulation, $1 \times$ identified regulation, $1 \times$ integrated regulation, $2 \times$ IM). We did not include amotivation scores in the calculation of the SDI. In contrast to other forms of regulation on the self-determination continuum, amotivation does not reflect a reason for action. Therefore, although the other regulations differ in terms of the *quality* of motivation, amotivation differs in terms of the *quantity* of motivation. To understand the relationship between overall *quality* of motivation and athlete burnout, an SDI without amotivation was deemed more appropriate (e.g., Ryan and Connell (31)). We randomly selected one item from each of the five BRSQ subscales and after applying the appropriate weighting (-2, $+1$, or $+2$), we summed these scores to create a single SDI-observed score indicator. This process was repeated a further three times because each subscale contained four items. The result was four self-determination index observed score indicators (33).

In the second through seventh structural models, we used item scores to form a latent variable representing a single form of motivation, namely, amotivation (model 2), external regulation (model 3), introjected regulation (model 4), identified regulation (model 5), integrated regulation (model 6), and IM (model 7).

During all structural equation modeling analyses, model identification was achieved by fixing to 1.0 one path from each latent variable to a single observed score indicator. Uniqueness terms associated with observed scores were not allowed to correlate within a data wave. However, to account for common method variance (23), the uniqueness term associated with each observed score at time 1 was allowed to correlate with the same term at time 2. Model fit was assessed using a selection of fit indices and criteria: RMSEA ($\leq$0.06), standardized root mean square residual (SRMR) ($\leq$0.08), CFI ($\geq$0.95), and TLI ($\geq$0.95) (15).

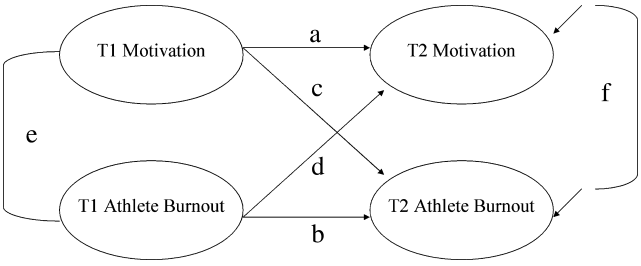

FIGURE 1—Reciprocal model of motivation and athlete burnout.

RESULTS

Preliminary analyses. MANOVA revealed that there was no difference between time 2 responders (n = 119) and nonresponders (n = 62) in terms of their time 1 BRSQ and ABQ scores ($P > 0.05$). MANOVA also revealed that age, gender, level of competition, experience, and sport type (i.e., team vs individual vs unclassified) were unrelated to BRSQ and ABQ scores ($P > 0.05$). Finally, MANOVA showed that time of season (i.e., preseason vs early season at time 1 and midseason vs late season at time 2) was not related to participants' scores on motivation and burnout measures ($P > 0.05$). Examination of the subscale score correlation matrix (Table 1) revealed that the pattern of correlations largely conformed to the hypothesized simplex structure. However, as in previous studies (18,19), scores representing external and introjected regulations (controlled EM) showed similar relationships with other BRSQ subscale scores. Scores representing identified and integrated regulation (autonomous EM) also had similar correlations with other BRSQ subscales. Given the observed pattern of correlations the proposed weighting system, in which the external and introjected regulation scores were weighted equally (scores multiplied by -2), and the identified and integrated regulation scores were also given equal weighting ($+1$), was appropriate.

Main analyses. Complete results from all structural equation model analyses can be viewed in Table 2. Models in which exhaustion or reduced sense of accomplishment was the burnout variable fit the data well, with fit indices surpassing the stated criteria. Models in which devaluation was the burnout variable showed some evidence of good fit (e.g., all CFI $\geq$ 0.95) but also some evidence of marginal

TABLE 1. Time 1 and time 2 correlations.

	1	2	3	4	5	6	7	8	9	10
1. Reduced sense of accomplishment	*0.80/0.85*	0.32*	0.63*	0.63*	0.46*	0.45*	−0.41*	−0.37*	−0.49*	−0.57*
2. Exhaustion	0.17*	*0.88/0.92*	0.38*	0.50*	0.32*	0.30*	−0.15	−0.13	−0.41*	−0.37*
3. Devaluation	0.44*	0.38*	*0.92/0.88*	0.76*	0.60*	0.48*	−0.43*	−0.29*	−0.60*	−0.64*
4. Amotivation	0.58*	0.44*	0.66*	*0.89/0.92*	0.69*	0.65*	−0.44*	−0.36*	−0.70*	−0.78*
5. External regulation	0.44*	0.17*	0.44*	0.63*	*0.94/0.94*	0.76*	−0.38*	−0.27*	−0.64*	−0.88*
6. Introjected regulation	0.41*	0.26*	0.43*	0.63*	0.67*	*0.86/0.91*	−0.24*	−0.15	−0.50*	−0.83*
7. Identified regulation	−0.28*	−0.08	−0.12	−0.18*	−0.19*	−0.05	*0.82/0.85*	0.68*	0.54*	0.61*
8. Integrated regulation	−0.24*	0.00	−0.16*	−0.13	−0.14	0.01	0.63*	*0.82/0.79*	0.58*	0.54*
9. IM	−0.43*	−0.27*	−0.52*	−0.61*	−0.49*	−0.45*	0.35*	0.48*	*0.94/0.95*	0.83*
10. Self-determination index	−0.54*	−0.26*	−0.53*	−0.71*	−0.82*	−0.79*	0.45*	0.45*	0.79*	*0.95/0.97*
Time 1, mean (standard deviation)	2.23 (0.64)	2.61 (0.77)	1.93 (0.73)	2.26 (1.28)	1.91 (1.12)	2.61 (1.46)	5.71 (1.07)	5.55 (1.14)	6.13 (1.00)	57.94 (26.97)
Time 2, mean (standard deviation)	2.27 (0.73)	2.68 (0.84)	1.98 (0.83)	2.35 (1.40)	2.07 (1.22)	2.74 (1.57)	5.51 (1.15)	5.53 (1.08)	6.04 (1.05)	53.98 (31.16)

Time 1 correlations listed below the diagonal; time 2 correlations are above the diagonal.
* Correlation is significant at the 0.05 level (one-tailed). α Coefficients are listed in italics on the diagonal (time 1/time 2). Athlete burnout scores are measured on a 1–5 scale. Motivation subscale scores are measured on a 1–7 scale. Self-determination index scores are measured on a −24 to +24 scale.

fit (e.g., RMSEA = 0.08 in all models). Further examination indicated that, in most models, this reduced fit was due to one devaluation item ("the effort I spend in my sport would be better spent doing other things") loading marginally on the latent variables at time 1 ($\lambda = 0.49$) and time 2 ($\lambda = 0.52$). However, the fit of the models was not poor enough to warrant removal of this item's scores from the analysis (e.g., all RMSEA 90% CI encompassed the criterion of 0.06). As a result, we interpreted the path coefficients from these *a priori* specified models. An exception to this statement related to the model examining the relationship between amotivation and devaluation. In this model, the RMSEA (0.12) and SRMR (0.10) indicated poor fit of the data to the model. Examination of modification indices revealed that two items from the time 2 devaluation subscale cross-loaded onto the time 2 amotivation construct. These results suggested that amotivation and devaluation constructs as measured by the ABQ and BRSQ were not clearly distinct, and the meaningfulness of parameter estimates from this model was questionable.

In all three models in which SDI scores were used to form the latent motivation variable, the paths from motivation to burnout were significantly different from zero ($P < 0.05$). Paths from burnout to SDI were not significant.

Time 1 amotivation scores predicted time 2 exhaustion scores ($P < 0.05$) and time 2 reduced the sense of accomplishment scores ($P < 0.05$). Neither of these burnout symptom scores at time 1 was a significant predictor of amotivation at time 2. The relationship between amotivation and devaluation seemed reciprocal, as paths from both constructs at time 1 predicted the other construct at time 2. However, these findings should be interpreted with caution, as fit indices for this model were marginal. A particularly questionable finding was the negative association between time 2 devaluation and time 3 amotivation; findings that were contrary to the bivariate correlations observed between these variables at time 1 ($r = 0.66$) and time 2 ($r = 0.76$).

Time 1 external regulation scores predicted time 2 exhaustion scores ($P < 0.05$) and showed a marginal relationship with time 2 devaluation scores ($P = 0.07$). None of the paths from time 1 burnout scores to time 2 external regulation were significantly different from zero; however, the path from devaluation to time 2 external regulation was marginal ($P = 0.06$). Paths from time 1 introjected regulation to all three burnout symptoms at time 2 were significant ($P < 0.05$). Paths from these burnout symptom scores at time 1 to introjected regulation at time 2 were not significant.

Paths from time 1 autonomous EM scores (identified regulation and integrated regulation) to time 2 burnout variables were not significant. However, paths from time 1 reduced sense of accomplishment to both forms of time 2 autonomous EM were significantly different from zero ($P < 0.05$). Also, the path from time 1 devaluation to time 2 identified regulation was significant ($P < 0.05$), whereas the path from time 1 devaluation to time 2 integrated regulation was marginal ($P = 0.07$). In the IM models, neither the path from time 1 motivation to time 2 burnout nor the path from time 1 burnout to time 2 motivation was significant.

DISCUSSION

The purpose of this study was to examine the relationship between motivational quality and athlete burnout over time. Overall, our results suggested that the relationship between motivational quality and burnout varied depending on the type of motivation assessed. The only set of analyses in which the null hypothesis could not be rejected was that relating to IM. Although burnout and IM were significantly negatively correlated at both times 1 and 2 (Table 1), our analyses indicated that neither variable at time 1 could predict changes in the other from time 1 to time 2. In some respects, this result are surprising and somewhat contradictory, as according to theory, athletes high in IM would show a decrease in negative consequences (e.g., burnout) over time (35). One interpretation of the current findings is that athletes with high IM at time 1 also reported low burnout scores at this point in the season, and these low burnout scores remained low across time. This burnout floor effect for athletes with high IM is in line with the theoretical

TABLE 2. Model testing.

Model	χ^2	*df*	TLI	CFI	SRMR	RMSEA (90% CI)	(a) Time 1 Motivation → Time 2 Motivation	(b) Time 1 Burnout → Time 2 Burnout	(c) Time 1 Motivation → Time 2 Burnout	(d) Time 1 Burnout → Time 2 Motivation
1. SDI										
Reduced sense of accomplishment	149.00*	120	0.99	0.99	0.05	0.05 (0.01–0.07)	0.87*	0.58*	−0.24*	−0.01
Exhaustion	142.09	120	1.00	1.00	0.08	0.03 (0.00–0.06)	0.88*	0.72*	−0.16*	−0.01
Devaluation	199.16*	120	0.98	0.98	0.09	0.08 (0.06–0.09)	0.88*	0.60*	−0.25*	0.00
2. Amotivation										
Reduced sense of accomplishment	164.08*	120	0.98	0.99	0.06	0.06 (0.03–0.08)	0.85*	0.49*	0.35*	0.07
Exhaustion	207.16*	120	0.97	0.98	0.08	0.08 (0.06–0.09)	0.92*	0.53*	0.25*	−0.05
Devaluation	308.02*	120	0.96	0.97	0.10	0.12 (0.10–0.13)	1.04*	0.46*	0.38*	−0.21*
3. External regulation										
Reduced sense of accomplishment	170.65*	120	0.98	0.99	0.05	0.05 (0.02–0.07)	0.72*	0.68*	0.09	0.12
Exhaustion	166.09*	120	0.98	0.99	0.04	0.05 (0.02–0.07)	0.77*	0.73*	0.17*	0.05
Devaluation	226.09*	120	0.97	0.97	0.08	0.08 (0.07–0.10)	0.70*	0.66*	0.16	0.16
4. Introjected regulation										
Reduced sense of accomplishment	158.24*	120	0.97	0.98	0.06	0.05 (0.03–0.07)	0.79*	0.63*	0.19*	0.01
Exhaustion	128.53	120	0.99	1.00	0.05	0.02 (0.00–0.05)	0.78*	0.72*	0.17*	0.01
Devaluation	219.25*	120	0.96	0.97	0.10	0.08 (0.07–0.10)	0.80*	0.61*	0.28*	−0.04
5. Identified regulation										
Reduced sense of accomplishment	159.64*	120	0.98	0.98	0.07	0.05 (0.03–0.07)	0.73*	0.69*	−0.09	−0.18*
Exhaustion	153.48*	120	0.98	0.98	0.06	0.05 (0.02–0.07)	0.77*	0.77*	0.07	−0.05
Devaluation	204.27*	120	0.96	0.96	0.08	0.08 (0.06–0.10)	0.76*	0.72*	−0.08	−0.17*
6. Integrated regulation										
Reduced sense of accomplishment	195.98*	120	0.95	0.96	0.08	0.07 (0.05–0.09)	0.62*	0.69*	−0.10	−0.28*
Exhaustion	128.33	120	0.99	1.00	0.05	0.02 (0.00–0.05)	0.70*	0.76*	0.08	−0.09
Devaluation	205.46*	120	0.94	0.95	0.08	0.08 (0.06–0.09)	0.69*	0.74*	0.06	−0.16
7. IM										
Reduced sense of accomplishment	167.34*	120	0.98	0.98	0.06	0.06 (0.03–0.08)	0.81*	0.68*	−0.08	−0.13
Exhaustion	136.81	120	0.99	0.99	0.04	0.03 (0.00–0.06)	0.86*	0.73*	−0.11	−0.05
Devaluation	205.07*	120	0.97	0.98	0.09	0.08 (0.06–0.10)	0.84*	0.65*	−0.15	−0.05

* Significantly different from zero. Letters (a) to (d) refer to paths from Figure 1.

predictions and may have masked increases in burnout among athletes with lower IM.

Analysis related to SDI scores provided support for H_1: motivational quality predicted changes in burnout, but burnout did not predict changes in motivational quality (SDT-based model). These findings are in line with the SDT tenet that controlled motivation leads to maladaptive outcomes (32). These results also corroborate previous research (17,19) in which low SDI scores have been associated with higher burnout, but importantly, this is the first study to provide evidence concerning the temporal ordering of this relationship.

Amotivation, as expected, was strongly correlated with reduced sense of accomplishment and devaluation and was moderately correlated with exhaustion. Because amotivation is characterized as "lacking in motivation" and "going through the motions," it should come as no surprise that this construct was strongly related to the negative syndrome of athlete burnout. Amotivation at time 1 predicted exhaustion and reduced sense of accomplishment at time 2. Neither of these burnout symptom scores at time 1 was a significant predictor of amotivation at time 2, thus providing support for H_1 that amotivation precedes increases in burnout. These findings corroborate previous cross-sectional (i.e., Cresswell and Eklund (5), Lonsdale et al. (19), Raedeke and Smith (29)) and longitudinal (i.e., Cresswell and Eklund (4,6)) research in which high levels of amotivation have been positively associated with athlete burnout. In our findings, the relationship between amotivation and devaluation seemed to be reciprocal; however, the SEM modification indices indicated that the amotivation and devaluation constructs as measured by the ABQ and BRSQ were not clearly distinct. Consequently, these findings need to be interpreted with caution, as these relationships are likely a measurement artifact.

Analyses of controlled motivation-related models also provided general support for the SDT-based hypothesis. However, our results suggest that when compared with external regulation, introjected regulation may be a clearer antecedent of athlete burnout. Initially, this finding seemed somewhat contrary to SDT tenets, but a closer examination of the psychological underpinnings of the individual behavioral regulations that represent controlled EM indicates a subtle, but potentially crucial, connection between introjected regulation and the hallmarks of athlete burnout.

One could argue that the external regulation is less affective and more analytical regarding the logical desire to "avoid punishment or satisfy an external demand." Motivation from this perspective is "other-referenced" with respect to social/external pressure and expectations from others in the social environment. Although it is frustrating for the athlete if he/she does not obtain the rewards or avoid the punishment, the psychological influence of that frustration could be viewed as being more "matter-of-fact" and less emotional/affective that the emotions of shame and guilt that characterize introjected regulation.

Behavior that is regulated by introjected motivation is explained by reference to internal pressure and personal expectations driven by externally imposed pressures from significant others in the social environment—internalized esteem-based pressures to act (initiated by conditional approval from others and contingent self-worth), such as avoidance of guilt, shame, and lowered self-worth. Thus, this type of motivation is affective, emotional, and personal—as is burnout. If one feels guilty then one usually feels somewhat embarrassed; therefore, it seems logical that an athlete would potentially become cynical and detached (devaluation) as an ego-protective, defense mechanism to minimize the guilt affect.

According to Appleton et al. (2), the processes that lead to athlete burnout may involve more than maladaptive cognition and heightened social expectations. A preoccupation with concern about mistakes, and doubts about action and social approval are a direct consequence of the introjected belief that acceptance from others is crucial for self-esteem (i.e., contingent self-worth). Shame is then a natural reaction to failure to meet these externally imposed but internally driven standards. As Appleton et al. (2) suggested this means that when fears over negative evaluation from others and the avoidance of disapproval infiltrate the appraisal process, they heighten the perceived threat to self, which increases the likelihood of experiencing subsequent burnout. Indeed, individuals may become preoccupied with the avoidance of failure and negative evaluation and with the subsequent shame and guilt that accompanies the sought-after self-validation gained from approval from others. Clearly, without effective coping strategies to protect against its negative effects, introjected motivation may render athletes increasingly vulnerable to burnout—especially if an individual has perfectionist tendencies as well (13).

In contrast to the controlled EM findings, analyses related to the autonomous forms of EM provided partial support for H_2: Burnout predicted decreases in autonomous EM, but autonomous EM motivation did not predict decreases in burnout. Reduced sense of accomplishment was the burnout symptom most closely associated with these decreases in autonomous motivation. From a SDT perspective, burnout leading to a decrease in autonomous EM is a slightly unexpected finding. But it seems logical that, over time, as the athlete begins to feel somewhat "burned-out" and, in particular, feels he/she is not accomplishing much in sport, then he/she would be less likely to be motivated by factors such as perceived benefits (i.e., identified regulation) and a desire to participate in an activity that is in line with one's core values (i.e., integrated regulation). Finally, there was little support for a reciprocal effects model where motivational quality predicted changes in burnout and burnout predicted changes in motivation quality. This finding contradicts the Cresswell and Eklund's (5) conclusions after a cross-sectional study of motivation and burnout in rugby players and, perhaps, underscores the importance of using longitudinal designs when

examining the temporal ordering of motivation and burnout constructs.

Limitations and future research directions. One of the strengths of this study was the inclusion of athletes from a variety of different sports (17). However, dealing with so many disciplines meant that logistical constraints precluded data collection from athletes at the precise beginning of each training phase. As a result, we were only able to collect data at two time points, corresponding with rather crude training cycle indicators ("preseason" or "early season" at time 1 and "mid" or "late" season at time 2). Future researchers may wish to collect data at a greater number of time points that correspond with potentially meaningful transitions (4). For example, it may be the case that burnout increases during training phases for which important competitions are far in the future but then decreases when these important contests draw closer. On the other hand, it may be the case that burnout only decreases when the athlete has time away from sport.

Intervention studies designed to prevent or minimize burnout would be another avenue for future research. The athlete burnout literature currently suffers from a lack intervention studies, and although experimental manipulation of burnout (i.e., burnout → motivation) would not be possible because of ethical concerns, it would be useful to investigate the effect of a burnout prevention program, focused on developing autonomous motivation (e.g., promoting an autonomy-supportive coaching climate), on levels of athlete burnout (i.e., motivation → burnout). Further work could also be conducted with larger samples to determine whether devaluation and amotivation are separable constructs. Our results indicated large overlap in the variance accounted for by items intended to measure these constructs. But a larger sample would be needed to investigate this issue fully. One possibility is that amotivation may result from prolonged sport involvement that is based on controlled regulation.

In this study, we only examined relationships between motivation and burnout. Other constructs outlined in SDT, such as the influence of autonomy-supportive and controlling coaching climates (i.e., the social context), the effect of basic needs satisfaction, and the influence of personality characteristics (e.g., general causality orientations), were not included in this study. As a result, our data cannot shed light on the origin of maladaptive forms of motivation that we found preceded increased athlete burnout.

A further limitation of our work was the exclusive focus on psychological precursors of athlete burnout. Unfortunately, there is little evidence regarding the manner in which physical factors such as an excessive training load and a shortage of recovery may interact with psychological factors to produce athlete burnout. This type of multidisciplinary research is needed if investigators and practitioners are to understand and prevent, or at least minimize, a syndrome that is quite possibly caused by physical and psychological factors.

Implications and conclusions. Despite these limitations, our investigation has implications for those involved in elite sport. Results indicated that low levels of overall self-determination and, in particular, the presence of controlled motivation were antecedents of increased athlete burnout. As a result, understanding athletes' motives for participation at the beginning of a season may help identify those who are at risk of increased burnout as the season progresses. Particular efforts could be made to foster autonomy-supportive coaching climates to support these athletes' basic psychological needs for autonomy, competence, and relatedness (21), thereby leading to an internalization of motivation and, hopefully, decreased risk of burnout.

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