Running head: Coaching behaviors and burnout

Controlling Coaching Behaviors and Athlete Burnout: Investigating the Mediating Roles of Perfectionism and Motivation.

Kelly Barcza-Renner
College of Arts, Sciences and Technology, Franklin University, USA
Robert C. Eklund
School of Sport, University of Stirling, UK
Alexandre J. S. Morin
Institute for Positive Psychology and Education, Australian Catholic University, Australia
Christine M. Habeeb
School of Sport, University of Stirling, UK

Acknowledgements
We acknowledge Dr. Paul Appleton's provision of the MPS-H version modified for use with athletes in the Appleton, Hall, and Hill, (2009) and extended analytic results on the data obtained in that investigation to facilitate our selection of items for use in the analyses of this report. As well, the third author was supported by a grant from the Australian Research Council (DP140101559) in the preparation of this article.

Corresponding author:
Christine Habeeb
School of Sport
University of Stirling
Scotland UK
Email: c.m.habeeb@stir.ac.uk

This is the prepublication version of the following manuscript:

Barcza-Renner, K., Eklund, R.C., Morin, A.J.S., & Habeeb, C.M. (2016). Controlling coaching behaviors and athlete burnout: The mediating roles of perfectionism and motivation. *Journal of Sport & Exercise Psychology*, *38*, (1), 30-44. doi: 10.1123/jsep.2015-0059.

Abstract

This investigation sought to replicate and extend earlier studies of athlete burnout by examining athlete-perceived controlling coaching behaviors and athlete perfectionism variables as, respectively, environmental and dispositional antecedents of athlete motivation and burnout. Data obtained from NCAA Division 1 swimmers (n = 487) within three weeks of conference championship meets were analyzed for this report. Significant indirect effects were observed between controlling coaching behaviors and burnout through athlete perfectionism (i.e., socially prescribed, self-oriented) and motivation (i.e., autonomous, amotivation). Controlling coaching behaviors predicted athlete perfectionism. In turn, self-oriented perfectionism was positively associated with autonomous motivation and negatively associated with amotivation, while socially prescribed perfectionism was negatively associated with autonomous motivation and positively associated with controlled motivation and amotivation. Autonomous motivation and amotivation, in turn, predicted athlete burnout in expected directions. These findings implicate controlling coaching behaviors as potentially contributing to athlete perfectionism, shaping athlete motivational regulations, and possibility increasing athlete burnout.

Keywords. Ill-being, Self-determination Theory, Mediation, Structural Equation Modeling.

Controlling Coaching Behaviors and Athlete Burnout: The Mediating Roles of Perfectionism and Motivation

Burnout is an aversive chronic experiential state that can develop when individuals undergo prolonged exposure to stress (Maslach, Schaufeli, & Leiter, 2001). This construct, most typically conceptualized as a syndrome, has been found to be associated with decreased performance, low motivation, impaired health, personal dysfunction, increased use of drugs and/or alcohol, insomnia, and marital and family problems among individuals in a variety of workplace and sport settings (Cresswell & Eklund, 2006b; Maslach et al., 2001). Research has revealed that this state of ill-being has considerable relevance for athletes involved in serious sport competition (Eklund & Cresswell, 2007; Gould, Udry, Tuffey, & Loehr, 1996; Raedeke, 2014). The athlete burnout syndrome is characterized by the ongoing experience of emotional and physical exhaustion, sport devaluation (a cynical assessment of the value and benefits of sport involvement), and a reduced sense of accomplishment (Raedeke & Smith, 2001). Individual differences in perfectionism (Gould et al., 1996; Hill, 2013) and motivational regulation (Li, Wang, Pyun, & Kee, 2013) in training and competition environments have been identified as antecedents of athlete burnout. Moreover, coaches play important roles in athletes' experiences because they exercise control over many facets of athletes' lives, both within and outside the sport environment. The demands that athletes perceive in their coaches' behaviors can be stressful. These stress perceptions can lead to positive outcomes for athletes, but, when chronically experienced, can sometimes result in states of ill-being such as burnout (Felton & Jowett, 2012; Vealey, Armstrong, Comar, & Greenleaf, 1998).

Self-determination theory (SDT; Deci & Ryan, 1985) has often been employed in the study of athlete burnout (for reviews, see Li et al., 2013; Eklund & Cresswell, 2007). This theory is grounded in the notion that satisfaction of basic psychological needs results in optimal human functioning, social development and personal well-being whereas thwarting of these needs can result in diminished personal and social functioning and states of ill-being (Ryan & Deci, 2000a, 2000b).The needs for autonomy (i.e., to experience behavioral volition), competence (i.e., to perceive oneself as behaviorally effective), and relatedness (to feel socially interconnected with valued others) are regarded as being not only essential, but also universal among humans (Deci & Ryan, 1985; Ryan & Deci, 2000b).

In SDT (Deci & Ryan, 1985; Ryan & Deci, 2000b), the broad category of *autonomous motivation* includes both self-determined behavioral imperatives to satisfy one's fundamental psychological needs (i.e., intrinsic motivation), and extrinsic but internalized behavioral imperatives that can also satisfy these needs in some degree because they are consistent with one's identity (integrated regulation) and/or personal objectives (identified regulation). *Controlled motivation* is a second broad motivational category implicating external and less self-determined reasons for participation that includes behavior energized by feelings of shame, guilt or pride (introjected regulation) and behaviors fully contingent upon external punishment and rewards (external regulation). Finally, a*motivation*, sometimes described as the motivational signature of athlete burnout (Eklund & Cresswell, 2007), involves a lack of intention to act as a consequence of not valuing an activity, not feeling competent, or not believing that effort will be rewarded by desired achievement (Ryan & Deci, 2000b). As reported in Li et al.'s (2013) systematic review, significant positive correlations have been consistently observed between global athlete burnout scores and amotivation (i.e., r = .31 to .68) while significant negative correlations have also been consistently observed with autonomous motivation constructs (e.g., for intrinsic motivation r = -.44 to -.22), Although the findings are mixed on associations between controlled motivational regulations and athlete burnout, the observed correlations have been positive but trivial in magnitude (r = .09 to .15).

Perfectionism, a construct inherently linked to motivation (Hewitt & Flett, 1991), has also been examined in relation to athlete burnout (e.g., Jowett, Hill, Hall, & Curran, 2013; Lemyre, Hall, & Roberts, 2008). This personal characteristic disposes individuals to the compulsive pursuit of exceedingly high standards and a tendency to engage in overly critical evaluation of their accomplishments (Hewitt & Flett, 1991). Perfectionistic tendencies are most typically evident when individuals (e.g., athletes) perceive themselves to be competent in personally valued achievement domains (e.g., competitive sport) that serve as expressions of self-worth and/or character (Dunn, Dunn, & McDonald, 2012).

Hewitt and Flett's (1991) multidimensional conceptualization of perfectionism includes the constructs of self-oriented perfectionism and socially prescribed perfectionism. *Self-oriented perfectionism* involves an intrapersonal need to pursue perfection accompanied by compulsive self-directed strivings to that end (i.e., in SDT terms, strivings that are more autonomously controlled). *Socially prescribed perfectionism* also involves self-directed compulsive perfectionistic strivings but the standards involved are perceived to be externally imposed by valued significant others, including coaches (Dunn et al., 2006), whom the individual desires to please or avoid displeasing (i.e., in SDT terms, strivings that are more controlled in nature). As noted by Hewitt and Flett, these dimensions of perfectionism coexist within individuals and both provide impetus for perfectionistic behavior. When common variance in perfectionism constructs is accounted for, research has shown that athlete burnout is positively associated with socially prescribed perfectionism and negatively associated with self-oriented perfectionism (e.g., Appleton, Hall, & Hill, 2009; Appleton & Hill, 2012).

Athletes' perceptions of their coaches' behaviors may also represent a critical determinant of athlete burnout (Felton & Jowett, 2012; Vealey et al., 1998). Athletes in Vealey et al.'s (1998) investigation, for example, reported that athletes experiencing high levels of burnout described their coaches as being less empathic, more autocratic, prone to communicating dispraise, and placing an emphasis on winning rather than improvement. From a SDT perspective, the controlling style of coaching described may have contributed to the development of burnout among those athletes through thwarting of their fundamental psychological needs and autonomous motivation in their sport involvements. In contrast, athletes in Vealey et al.'s study reporting lower levels of burnout and stronger perceptions of accomplishment saw their coaches as more empathic, less autocratic, prone to giving praise and encouragement, and being more growth-oriented. From a SDT perspective, these athletes may have experienced lower levels of burnout because they perceived their coaches' style of leadership to be supportive of their psychological need satisfaction and autonomous motivation in sport. More recently, Isoard-Gautheur, Guillet-Descas, & Lemyre (2012) conducted a prospective study of handball players at elite training centers in France that provided support for those theoretical speculations. Specifically, Isoard-Gautheur et al. showed that athletes reporting perceptions of controlling coaching styles tended to experience elevations in athlete burnout with those effects being mediated through athlete autonomy need satisfaction, autonomous motivational regulations, and amotivation.

A need to go beyond the examination of general coaching styles to the examination of specific controlling coaching behaviors is evident. Bartholomew, Ntoumanis, and Thøgersen-Ntoumani (2009, 2010) have identified four specific SDT-relevant controlling coaching behaviors on this account. They have indicated that the *controlling use of rewards* (i.e., use of extrinsic rewards and praise to cause athletes to engage in desired behaviors) is the most prominent of these behaviors but coaches may also seek to exert *excessive personal control* through intrusive monitoring and regulation of athletes' engagements within and beyond sport. *Negative conditional regard* can also occur when coaches conceal attention and affection when desired attributes or behaviors are not displayed by their athletes. The last of these behaviors, *intimidation*, appears in displays of power to belittle and humiliate athletes

through verbal threats, abusive language, and the threat and/or use of punishment.

The purpose of the present study was to extend SDT research on athlete well-being by examining whether athlete perceptions of controlling coaching behaviors would be related to athlete burnout with the effects being mediated through athlete perfectionistic tendencies and motivational regulations. Figure 1 provides an overview of the models tested to evaluate our mediational hypotheses. Extant research provided support for the pattern of mediated associations among the variables of interest in the study.

With regard to perfectionism, evidence indicates that coaches play a role in the development of athlete perfectionistic behaviors (Dunn et al., 2006). Conceptually, self-oriented perfectionism should be less influenced by controlling coaching behaviors than socially prescribed perfectionism because it is grounded in personal standards rather than social pressures. Moreover, associations between athlete perfectionism and burnout variables have been found to potentially be mediated by motivation constructs. Appleton and Hill (2012), for example, observed amotivation and intrinsic motivation in elite junior sport academy athletes to be mediators of the negative relationship between socially prescribed perfectionism and athlete burnout, but the positive relationship between self-oriented perfectionism and athlete burnout was only mediated by amotivation. Controlling coaching interpersonal styles and controlling coaching behaviors have previously been reported to have psychological need satisfaction mediated effects that increase athlete amotivation while undermining athlete autonomous motivations (Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009; Matosic, Cox, & Amorose, 2014) and elevating states of athlete ill-being such as athlete burnout (Balaguer, González, Fabra, Castillo, Mercé & Duda, 2012; Isoard-Gautheur et al., 2012). Finally, as mentioned earlier, trivial associations, albeit sometimes significant, between controlled motivation and athlete burnout have been routinely reported in the extant literature (Li et al., 2013).

Taken together, we hypothesized that the effects of controlling coaching behaviors (i.e., controlling use of rewards, negative conditional regard, intimidation, and excessive personal control) on athlete burnout would be sequentially mediated by athlete perfectionism (i.e., socially prescribed, self-oriented) and motivation (i.e., autonomous, controlled, amotivation) as specified in Figure 1. In these mediated effects, we expected to see increases in perceived controlling coaching behaviors to be reflected in increased athlete burnout. In testing this mediation hypothesis, we anticipated that observing full mediation in the model would be unrealistic given previous findings in the area (e.g., Appleton et al, 2012; Jowett et al., 2012), so we tested a series of models, as recommended by Anderson and Gerbing (1988), to evaluate whether inferences on full or partial mediation were warranted. Based on extant research mentioned above, we hypothesized positive direct effects in the fully mediated model from athletes' perceptions of controlling coaching behaviors to both perfectionism variables. Positive direct effects were expected from the socially prescribed perfectionism to amotivation and controlled motivation while a negative direct effect would be observed to autonomous motivation. Self-oriented perfectionism, by contrast, was expected to exhibit, respectively direct effects on autonomous motivation (positive) and amotivation (negative) but be unrelated to controlled motivation. The effects from autonomous motivation and amotivation on athlete burnout were expected to be, respectively, negative and positive with controlled motivation being unrelated to athlete burnout. If partial mediation was observed, we anticipated that direct effects from controlling coaching behavior variables to motivation variables would be positive, with the exception of autonomous motivation which would be negative. Also if partial mediation was observed, we anticipated that the direct effect from socially prescribed perfectionism to athlete burnout would be positive, while the direct effect from self-oriented perfectionism would be negative.

Methods

Participants

National Collegiate Athletic Association (NCAA) Division I swimmers (n = 501) responded to an email survey request to participate in the investigation that had been forwarded from their head coaches (n = 88). Fourteen of these participants completed only the demographic questions before discontinuing the survey. The 487 participants providing data for the analyses of this investigation were between the ages of 18 and 23 years old (M = 19.70, SD = 1.19) and competing in the Atlantic Coast Conference (n = 141), Big East Conference (n = 77), Big Ten Conference (n = 90), Big Twelve Conference (n =19), Conference USA (n = 6), Mid-American Conference (n = 79), Pacific Ten Conference (n = 20), and then Southeastern Conference (n = 48). Most were scholarship athletes (n = 364; 74.7%) and all had been swimming competitively for a considerable period of time (M = 11.64 years, SD = 3.27). As is typical in NCAA Division I swimming, the majority of the swimmers in this investigation were female (n_{female} = 352), although the percentage (i.e., 72%) did exceed the typical annual participation rates (i.e., ~58%) reported by Irick (2014). Most participants were Caucasian (n = 432; 88.7%) and very few participants identified with another ethnicity or race (i.e., Black, Asian, Hispanic, Indian, Native American, or Other). The overwhelming majority of participants were from the United States (n = 427, 87.7%) while the remainder identified nationalities from 27 other countries.

Measures

Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). The 15-item ABQ is the most widely used and well-validated measure of athlete burnout (Eklund, Smith, Raedeke, & Cresswell, 2012). For this investigation, the word "swimming" was substituted for "sport" in the original ABQ items. Participants responded to each item on a Likert-type scale ranging from *almost never* (1) to *almost always* (5). The three 5-item subscales include: (a) *reduced sense of accomplishment* (e.g., "I am not achieving much in swimming"), (b) *emotional/physical exhaustion* (e.g., "I feel overly tired from my swimming participation"), and (c) *sport devaluation* (e.g.' "The effort I spend in swimming would be better spent doing other things"). As is typically observed in research using the ABQ, the scale score reliability of responses observed in this study for the total scale (α = .92) and subscales (α coefficients of .85 for reduced accomplishment, .91 for exhaustion, and .87 for devaluation) were acceptable. Rigorous evaluation of ABQ data by Cresswell and Eklund (2006a) using multitrait-multimethod modeling has provided evidence of ABQ convergent validity relative to the matching subscales in the gold-standard Maslach Burnout Inventory-General Survey as well as discriminant validity between non-matching subscales and a measure of depression.

Behavioral Regulations in Sport Questionnaire (BRSQ; Lonsdale, Hodge, & Rose, 2008). The 24-item BRSQ measures competitive athletes' forms of motivation congruent with the SDT framework. For this investigation, "swimming" was substituted in items for "my sport" when applicable. Participants responded to each item using a Likert-type scale ranging from *not at all true* (1) to *very true* (7). The 4-item BRSQ subscales include: (a) *intrinsic motivation* (e.g., "I participate in swimming because I enjoy it"), (b) *integrated regulation* (e.g., "I participate in swimming because it's a part of who I am"), (c) *identified regulation* (e.g., "I participate in swimming because the benefits of swimming are important to me"), (d) *introjected regulation* (e.g., "I participate in swimming because I would feel ashamed if I quit"), and (e) *external regulation* (e.g., "I participate in swimming because I feel pressure from other people to swim") which can also be modeled, as occurs in this investigation, as higher-order factors assessing *autonomous motivation* (i.e., subscales a, b, and c; α = .91) and *controlled motivation* (i.e., subscales d and e; α = .90). A sixth subscale assesses *amotivation* (e.g. "I participate in swimming but I question why I continue").

The scale score reliability of responses observed in this study for the six BRSQ subscales (α ranging from .77 for identified regulation to α = .94 for intrinsic motivation) and

two higher order factors (i.e., α = .91, .90 respectively) was acceptable. Lonsdale et al. (2008) provided substantial evidence on psychometric adequacy of the BRSQ in their four-study report on the development of the instrument. They reported scale factorial and nomological validity relative to measures of flow and ABQ burnout and other extant measures of SDT motivational regulations, as well as relative to scale score reliability (α ranging from .93 to .79), and 1-week test-retest reliability (interclass correlation coefficients ranging from .73 for intrinsic motivation to .90 for integrated regulation).

Controlling Coaching Behaviors Scale (CCBS; Bartholomew et al., 2010). The 15-item CCBS is a multidimensional measure of athletes' perceptions of their coaches' controlling behaviors that is conceptually grounded in SDT. Swim teams often have several coaches (e.g., strength and conditioning, stroke, sprint/distance) so the term "head coach" was used to orient the athletes toward the behaviors of a specific coach for each of their teams. Participants responded to each item using a Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (7). Each behavior type was treated as a separate scale for analyses. The four CCBS subscales include: *controlling use of rewards* (4 items, e.g. "My head coach tries to motivate me by promising to reward me if I do well"), *negative conditional regard* (4 items, e.g. "My head coach pays me less attention if I have displeased him/her"), *intimidation* (4 items, e.g. "My head coach shouts at me in front of others to make me do certain things"), and *excessive personal control* (3 items, e.g. "My head coach expects my whole life to center on my sport participation"). Acceptable scale score reliability of responses for the subscales was observed in this study with α values ranging from .83 for controlling use of reward to .92 for negative conditional regard. Bartholomew et al. (2010) reported an excellent fit of the CCBS measurement model to cross-validation data (i.e., S-Bχ2 (84) = 120.94, $p < .05$, RCFI = .96, RNNFI = .95, SRMR = .06, and RRMSEA = .05), good composite reliability coefficients (i.e., ranging from .74 to .84), and factor intercorrelations (i.e.. r = .49 to .78) suggesting that unique facets of coaching controlling behavior are assessed by the subscales.

Multidimensional Perfectionism Scale (MPS-H; Hewitt & Flett, 1991). The version of the MPS-H used in this investigation had been previously adapted to the sport context by Appleton et al. (2009) in which participants respond to each item using a Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (7). In accordance with recommendations in the extant literature (e.g., Maïano et al., 2008; Smith, McCarthy, & Anderson, 2000), examination of results from Appleton et al.'s study was undertaken to reduce the full 30-item inventory to a short form set of the cleanest indicators (in terms of high factor loadings, low cross loadings, etc.) for operationalizing the constructs of *self-oriented perfectionism* (5 items, e.g., "One of my goals is to be perfect in everything I do.") and *socially prescribed perfectionism* (5 items, e.g., "The people around me expect me to succeed at everything I do") in our analyses.[1] Acceptable scale score reliability was observed for the subscales in the data obtained for this investigation (respectively α = .84, α = .76).

The items selected based upon data obtained from athletes using Appleton et al.'s (2009) adapted version of the scale parallel the 10 items previously identified by Cox, Enns, and Clara (2002) for these subscales using original inventory with three samples involving (a) clinically distressed outpatients, (b) undergraduate psychology students, and (c) medical students. All items selected in both instances were consistent with item placement in Hewitt and Flett's (1991) original long-version validation studies with four of five socially prescribed perfectionism items and three of five self-oriented perfectionism items being common in the independent efforts. One of the items selected in the Cox et al. solution but not selected for the present study had been modified for use with athletes by Appleton et al. The 10-item version employed in this report performed well in measurement model analyses as subsequently reported, and exhibited an interfactor correlation consistent with Hewitt and

Flett's validation of the longer version as well as that reported among undergraduate psychology students in Cox et al.'s validation of a comparable short version of the inventory.

Procedure

After obtaining approval from the university's Human Subjects Committee and NCAA compliance office, head swimming coaches (n = 88) responsible for approximately 3600 swimmers in the eight conferences identified earlier were contacted via email. The message contained a brief overview of the study, a direct link to the Qualtrics online survey, and a request to forward the email to their eligible and competitively active swimmers. Consistent with HSC approval requirements, coaches were free to decide whether their athletes would receive the link or not. The number of athletes receiving the link and the associated response rate are unknown as a consequence. Piloting of data acquisition procedures suggested that the survey took approximately 20 minutes to complete. The order in which the measures were presented to the athletes was randomized across, but not within, teams.

The athletes were given a three-week period prior to their conference championship meets at the end of the competitive season for *in-season* completion of the survey. Because multiple coaches mentioned that their athletes did not have time to complete the survey due to other obligations during that time period, an *out of season* group was formed in which athletes were given approximately three weeks to complete the survey after their conference championship meets. A small majority of the athletes responded to the survey while in-season ($n_{in\ season}$ = 272, 55.9%; $n_{out\ of\ season}$ = 213, 43.7%; 2 missing).[2]

Analyses

Data were first screened for outliers and response patterns in missingness that might threaten the interpretability of the analytic procedures described below. Analyses were subsequently conducted with Mplus 7.0 (Muthén & Muthén, 2012), based on the robust maximum likelihood (MLR) estimator. This estimator provides standard errors and fit indices that are robust to the Likert nature of the items and to possible violations of normality assumptions. MLR estimation was used in conjunction with full information maximum likelihood (Enders, 2010) to manage the small amount of missing data present at the item level (1.8% to 4.1%, *M* = 2.5%, *SD* = 0.5%).

Model fit assessment. Model fit was assessed using the robust chi-square test, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) with its 90% confidence interval; values greater than .90 and .95 for CFI and TLI are typically considered to be indicative of adequate and excellent model fit, while values smaller than .08 and .06 for the RMSEA are typically taken to support acceptable and good model fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004).

Preliminary measurement model analyses. An *a priori* confirmatory factor analytic (CFA) model was estimated to evaluate whether the measurement model provided a satisfactory representation of the data. The 10 latent variables used in the main structural modelling analyses (see Figure 1) were fully allowed to correlate with one another in this model. In this measurement model, the four controlling coaching behaviors, the two perfectionism dimensions, and the amotivation subscale were all were modelled as first-order factors where each item was only allowed to uniquely load on the factor it was assumed to measure. The autonomous and controlled motivation were modelled as higher order factors in in line with the SDT conceptual framework and previous research with this measure (e.g., Lonsdale et al., 2008; Lonsdale, Hodge, & Rose, 2009). Specifically, autonomous motivation and controlled motivation were each defined by their respective first-order factors as identified in the method section, which, in turn, were uniquely defined by their respective items. The correlations among the motivational regulation first-order factors were assumed to be fully explained by the higher-order factors. Finally, in line with analyses conducted by

Cresswell and Eklund (2005), athlete burnout was modelled as an overarching construct rather than as separate subscales by employing bifactor procedures. In this modelling, all 15 burnout items were allowed to simultaneously load on one global factor and on one (i.e., no cross-loadings allowed) of the three specific factors representing the ABQ dimensions. All global and specific factors in the bifactor model were specified as orthogonal, with the global factor reflecting the items' variances shared across dimensions (for additional information on bifactor modelling, see Morin, Tran, & Caci, 2015; Reise, 2012).[3]

Structural model analyses. Four *a priori* fully latent structural equation models were sequentially evaluated following Anderson and Gerbing's (1988) decision-tree framework as illustrated in Figure 1. First, the fully mediated theoretical model (M1; full black arrows in Figure 1) was estimated. A second model (M2) was estimated in which direct relations (full greyscale arrows in Figure 1) were added between the four coach behavior factors and the three motivation factors. In a third model (M3), direct relations (greyscale dashed arrows in Figure 1) were added between the two perfectionism factors and the global burnout factor. In a fourth model (M4), direct relations (black dashed arrows in Figure 1) were added between the four coach behavior factors and the global burnout factor. In all of these models, the four coach behavior factors were allowed to correlate with one another, the two perfectionism factors were allowed to correlate with one another, and the three motivation factors were allowed to correlate with one another. Finally, a fully saturated structural model, formally equivalent to the final CFA model, was estimated. This model serves as a standard for estimating the value of more parsimonious models. More parsimonious models were preferred if the decrease in fit for the more parsimonious model was less than .01 for the CFI or less than .015 for the RMSEA (Chen, 2007; Cheung & Rensvold, 2002). Chi-square differences tests were calculated while taking into account the scaling correction factors of the MLR estimator (Muthén & Muthén, 2012; Satorra & Bentler, 1999).[4]

Indirect effect analyses. To estimate the significance of mediated relationships (i.e., indirect effects), 95% bias-corrected bootstrap confidence intervals (CI) were constructed from 1000 bootstrap samples (MacKinnon, Lockwood, & Williams, 2004) as this currently represents the most effective way to identify mediated relationships given the asymmetry of their theoretical distributions (Cheung & Lau, 2008). If the CI did not include "zero", the mediated relationship was said to significantly differ from zero.

Results

Table 1 presents the goodness-of-fit indices for the various measurement and SEM solutions estimated in this study.[5]

Measurement model analyses. The *a priori* CFA measurement model provided an adequate level of fit to the data (CFI = .921; TLI = .915; RMSEA = .039). The detailed parameter estimates from this model are reported in the online supplemental materials (Table S3). In summary, parameter estimates show that all of the first-order or higher-order factors, as well as the global burnout factor, were well-defined by their items, as illustrated by high and significant factors loadings (varying from λ = .458 to .943, M = .737, SD = .123). As is typically observed in bifactor applications (e.g., Morin et al., 2013; Reise, 2012), the ABQ subscale-specific factors were not as well-defined as the other factors (λ = .009 to .653, M = .458, SD = .202). Nonetheless, this result fully supported our decision to model athlete burnout as an overarching factor rather than as three separate subscales. It indicates that the global burnout latent construct provided a reasonable summary of what was assessed by all ABQ items with a low level of specificity remaining to be modeled by the specific factors.

Examination of the 45 latent variable intercorrelations from this measurement model (see Table 2) revealed coefficients ranging from .849 (athlete burnout, amotivation) through -.806 (athlete burnout, autonomous motivation) with the median being r = .302 (negative conditional regard, controlled motivation). Only four coefficients of negligible magnitude

(i.e., -.043 to .069) were nonsignificant because of the available statistical power. The associations were generally in expected directions with: (a) autonomous motivation being negatively correlated with all constructs (r = -.727 to -.043) except for self-oriented perfectionism (r = .208), (b) controlled motivation and amotivation being negatively correlated with one another but both being positively associated with other constructs, albeit with weaker relations involving self-oriented perfectionism, (c) the various perceived coaching behaviors being positively related to the other constructs with the exception of autonomous motivation to which they were negatively associated, (d) both forms of perfectionism related positively to the other constructs, with the exception of a negative correlation between socially-prescribed perfectionism and autonomous motivation, while also exhibiting a moderate association with one another as observed in other studies (e.g., Hewitt & Flett, 1991), (e) athlete burnout being positively and significantly related to the other constructs, with the exception of a negative relationship with autonomous motivation. This correlation matrix did not suggest multicollinearity issues for the main analyses; a conclusion subsequently confirmed in detailed examinations of parameters estimates and model-implied correlations.

Finally, McDonald's (1970) model-based omega (ω) reliability coefficients are reported in Table S3 of the online supplemental materials to complement the Cronbach alpha coefficients reported in the method section. The ω coefficient provides a superior estimate of reliability in latent variable analyses because it takes into account the strength of association between items and constructs as well as items' uniquenesses. In summary, observed ω coefficients supported the reliability of the various first-order, higher-order, and global factors considered here (.762 to .940, M = .858, SD = .059), with slightly lower levels of scale score reliability associated with the specific burnout factors from the bifactor model (.620 to .839, M = .725, SD = .110).

Structural model analyses. The theoretical, fully mediated model (M1) provided a satisfactory level of fit to the data (see Table 1). Consistent with our theoretical expectations, M2 exhibited a slight improvement in model fit over M1 (ΔCFI = +.002; ΔTLI = +.002; ΔRMSEA = -.001) with some of the additional paths from coach behavior factors to motivation factors being significant. M2 was thus retained. Direct relations between perfectionism dimensions and burnout were then added to M2 to test M3. M3 exhibited a slight improvement in fit according to the ΔCFI (+.002) and ΔTLI (+.001) but none of the additional paths were significant. Consistent with Anderson and Gerbing's (1988) decision-tree framework, M3 was not retained for further consideration. Thus, the direct relations specified in M4 between the coaching latent variables and athlete burnout were added to M2. M4 (which also included the paths from the previously retained M2) also provided a slight improvement of fit (ΔCFI +.003, ΔTLI +.003), with one additional significant pathway in the model. M4 was thus retained as the final model. Importantly, although well-grounded in theory and far more parsimonious, the fit of this model was essentially equivalent to the entirely satisfactory fit of the fully saturated model (ΔCFI = +.004; ΔTLI = +.003; ΔRMSEA = -.001) in which all of the possible construct interrelationships were estimated.

The predictive structural model parameter results from M4 are reported in Table 3. Figure 2 provides an illustration of M4 without depiction of the measurement part of the model and only the significant structural paths included to provide clarity. Inspection of the parameters and patterns of association revealed that the significant pathways were all in anticipated directions. Perceptions of coach excessive personal control was the variable most widely and significantly associated with other variables in the model including athlete burnout, while perceived coach intimidation was unrelated to any other variables. The observed significant pathways in M4 also provided substantial support for our expectation that associations between athlete perceptions of controlling coach behaviors (i.e., controlling

use of rewards, excessive personal control, negative conditional regard) and athlete burnout would be mediated by the perfectionism and motivational variables. Importantly in making inferences about potential mediation, bootstrapped testing of indirect effects in M4 revealed that all indirect pathways were significant (see Table 4). Over and above these indirect effects, direct positive effects on athlete burnout were observed from perceptions of coaches' negative conditional regard and excessive personal control variables. The excessive personal control variable also had direct positive associations with levels of controlled motivation and amotivation, and direct negative associations with levels of autonomous motivation indicating the presence of a potential additional indirect mechanism underlying the relations between coaches' excessive personal control and levels of athlete burnout.

Finally, the percentage of variance explained in each endogenous variables by the predictive paths included in the model are provided in Table 3. Taken together, significant and meaningful variance (ranging from 6.4% for self-oriented perfectionism to 81.0% for the global athlete burnout latent variable; M = 35%) was explained in each of these variables by the predictors considered in this study.

Discussion

This study aimed to evaluate the SDT-grounded hypothesis that the effects of controlling coaching behaviors (i.e., controlling use of rewards, negative conditional regard, intimidation, and excessive personal control) on athlete burnout would be sequentially mediated through athlete perfectionism (i.e., socially prescribed, self-oriented) and motivational regulations (i.e., autonomous, controlled, amotivation) with increases in perceived controlling coaching behaviors ultimately associated with increased athlete burnout. The evaluation of the tenability of this complex hypothesis involved the sequential testing of a series of *a priori* specified SEM models, and tests of indirect effects, to determine whether inferences on full or partial mediation were potentially warranted.

The results of the analyses provided substantial but not complete support for our hypotheses. As depicted in Figure 2, significant pathways in expected directions were observed in the model analyses suggesting the mediation hypothesis embedded in the modeling testing sequence was tenable. Inferences regarding partial (rather than full) mediation were warranted as a result of the direct positive effects observed in the prediction of athlete burnout by coach negative conditional regard and excessive personal control as well as the effects of perceived exertion of excessive personal control on athlete burnout also being directly mediated through autonomous motivation and amotivation. Importantly, significant indirect effects were observed for all of the mediation pathways, and significant and meaningful proportions of variance were explained in all endogenous variables including approximately 81% of the variation in the global athlete burnout latent variable.

This pattern of findings on controlling coaching behaviors supports and extends earlier SDT-grounded studies of the mediated effects of the controlling coaching style on athlete burnout. Isoard-Gautheur et al. (2012), for example, reported the controlling coaching style to have effects mediated through athlete need for autonomy and motivation (i.e., intrinsic motivation, amotivation) across time on athlete burnout symptoms. Balanger et al. (2012) observed the controlling coaching style to have mediated effects on athlete burnout across time albeit through the motivation-related mediators of psychological need satisfaction and need thwarting. The more specific athlete perceptions of controlling coach behaviors assessed in the present study also positively and significantly predicted athlete burnout in our mediation model. With regard to the mediating variables considered in our final model, autonomous motivation and amotivation were observed to be significantly related (respectively, negatively and positively) to athlete burnout, as consistently reported in extant SDT-grounded investigations (Li et al., 2013). Controlled motivation has sometimes been reported to have mediating effects on athlete burnout (e.g., Isoard-Gautheur et al., 2012) but,

as is more typically observed (Li et al., 2013), that was not the case in the present study.

Our findings on athlete perfectionism also provided support for earlier studies examining perfectionism on athlete burnout. In the present investigation, the effects of both dimensions of perfectionism on athlete burnout were observed to be fully mediated by athlete autonomous motivation and amotivation. As has been reported previously, the more externally controlled dimension of socially prescribed perfectionism had positive indirect effects on athlete burnout while the more autonomously directed dimension of self-oriented perfectionism dimension had negative indirect effects (Appleton & Hill, 2012). Nonetheless, the presence of full mediation of perfectionism effects on athlete burnout observed in the present study differs from previous findings where direct effects had been reported as well (Appleton & Hill. 2012; Jowett et al., 2012). Specifically, Appleton and Hill reported both self-oriented and socially prescribed perfectionism to have significant direct effects on the burnout experienced by elite junior sport academy athletes in addition to observed significant amotivation and intrinsic motivation mediated effects. Using data from club, academy, and junior athletes, Jowett et al. also observed a combination of direct and indirect effects, albeit relative to dimensions of perfectionism (i.e., perfectionistic strivings, perfectionistic concerns) that differed from those measured in the present study. However, it remains unclear whether this discrepancy resulted from the NCAA swimmers being 3-4 years older on average and/or involved in somewhat different training and competition environments than junior level athletes in the United Kingdom, or from some other factor warranting consideration in future research.

Extant theorizing on the influence of coaches on athlete perfectionism (Dunn et al., 2006) and the coexistence of its dimensions within athletes (Hewitt & Flett, 1991) made unsurprising the observed positive associations with the controlling coaching behavior variables (i.e., coach negative conditional regard, excessive personal control, controlling use of rewards). We had, however, anticipated that the associations between perceptions of the various controlling coaching behaviors and self-oriented perfectionism would be smaller in magnitude than those observed with socially prescribed perfectionism because, as theorized by Hewitt and Flett (1991), the former involves the autonomously energized pursuit of standards of personal perfection whereas the latter involves social pressures to achieve perfection of the sort involved in controlling coaching behavior (Bartholomew et al., 2010). We observed, however, coefficients of comparable magnitude in all instances with the exception of negative conditional regard. Socially prescribed perfectionism was significantly predicted by negative conditional regard perceptions, but self-oriented perfectionism was not. Importantly, the Table 3 presentation of the standard errors also indicates that the two implicated coefficients (i.e., 0.218, 0.020) differed significantly from one another. The general pattern of association between most of controlling coaching behaviors and the perfectionism variables may be grounded in the shared variance of the perfectionism dimensions. The different pattern relative to coach negative conditional regard behaviors, however, may indicate these particular controlling coaching behaviors are exceptionally effective in signaling a belief that the only relevant standards of perfection are those established by the coach.

Bartholomew et al. (2009, 2010) presented an SDT grounded argument that ongoing coach intimidation may undermine self-determined motivation and perhaps subjective well-being. We had anticipated, for example, that both dimensions of athlete perfectionism, and particularly socially prescribed perfectionism because of the unambiguous social pressure involved, would be predicted by the coach intimidation behavior variable and that indirect effects would also be observed on athlete burnout. In the current investigation, however, the coach intimidation variable was not predictive of any of the mediating variables or athlete burnout. Nonetheless, it was reasonably strongly related (r = .62) to coaches' negative

conditional regard, another particularly manipulative controlling coaching behavior (Bartholomew et al., 2009, 2010), which exhibited both indirect and direct effects on athlete burnout. Perhaps, rather than being a neutral influence, the intimidation variable simply did not have sufficient remaining unique variance for significant associations to be observed in the analyses. Regardless, it would be entirely inappropriate to interpret this finding to mean that coach intimidation behavior can be regarded as benign.

This investigation has some considerable strengths including its theory-grounded nature, the large number of NCAA Division I swimmers involved at a very late stage in their competitive year, the effort to control for order effects in the presentation of measures to the athletes, and the use of a reasonably sophisticated analytic strategy allowing for detailed examination of the data. The insights afforded, however, are not without limitations. Most importantly, the causal inferences afforded by this investigation should be regarded as tenuous despite being essentially consistent with SDT because the analyses were conducted on cross-sectional data. Stronger causal inferences, therefore, await more rigorous testing with process-oriented data and data obtained in experimental design investigations.

Recent reports of analyses of panel data obtained in longitudinal studies (e.g., Martinent, Decret, Guillet-Descas, & Isoard-Gautheur, 2014; Nordin-Bates, Hill, Cumming, Aujila, & Reddings, 2014) provide emphasis to the cautionary point raised on the limitations of our analyses of cross-sectional data. Nordin-Bates et al., for example, observed indications of potential reciprocal causation over two-time points between adolescent dancers' perfectionism and their perceptions of the motivational climate in dance. This matter highlights that real-world causal processes are more complex than suggested in models, such as ours, specifying causal flow as unidirectional. Moreover, such findings also serve as a reminder of the potential viability of alternative models in analyses of cross-sectional data where temporality is not implicated in the testing of causal hypotheses. Nordin-Bates et al.'s results suggest the possibility of positioning the perfectionism variables as antecedents of athlete perceptions of controlling coaching behavior rather than as consequences. Furthermore, Martinent et al.'s results suggest that athlete burnout may be a better predictor of motivation over time than athlete motivation is of burnout. The sequencing of variables in our model was grounded in SDT contentions and relevant empirical findings, but other possibilities exist that would also be entirely consistent with SDT contentions when the array of potential reciprocal effects are considered. Future modeling of reciprocal effects across time of the constructs involved in the current investigation may be revealing, particularly over longer time frames in the ongoing process involved in the development of athlete burnout (Lonsdale et al., 2009; Isoard-Gautheur et al., 2012).

The analyses of this investigation were conducted on data that were entirely self-reported in nature. Studies involving a temporal element in data acquisition may also benefit by the inclusion of athlete and coach behavioral and/or observational data. Objective measures of coaching behavior (controlling or otherwise), for example, may serve to clarify the extent to which perfectionism, motivation, and states of well- or ill-being are shaped by this influential actor in the sport environment. As a related matter, the findings of this investigation provide support for earlier studies (e.g., Lonsdale, et al., 2009; Quested & Duda, 2011) suggesting a need for intervention studies designed to evaluate avenues for enhancing athlete well-being, and preventing or attenuating athlete burnout are also needed. It may be that interventions targeted at altering the motivational imperatives or climate created by coaches, or to shape athlete perfectionism tendencies toward being more self-oriented than socially prescribed, may have beneficial effects on the quality of athlete motivation and/or athlete well-being. Provision of training and competitive environments that are supportive of athlete basic psychological needs through such interventions with coaches may also prove

useful on a variety of accounts in addition to addressing concerns about athlete states of ill-being.

In summary, this study usefully extends knowledge on potential mediating antecedents of athlete burnout by examining athlete perceptions of controlling coaching behaviors and replicating and extending earlier findings on athlete perfectionism and motivational regulation in sport. These findings implicate controlling coaching behaviors as potentially contributing to athlete perfectionism, shaping athlete motivational regulations, and possibility increasing athlete burnout. The differential mediated effects of perfectionism on burnout, as reported previously, may provide indications of avenues for consideration in the development of coaching interventions relative to the nature of standards of excellence that athletes are encouraged to pursue. The implications for athlete states of ill- and well-being of controlling coaching behaviors warrants further investigation on a variety of accounts, and replication and extension of the findings reported in this investigation may prove revealing.

References

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411-423.

Appleton, P. R., & Hill, A. P. (2012). Perfectionism and athlete burnout in junior elite athletes: The mediating role of motivation regulations. *Journal of Clinical Sport Psychology 6*, 129-145.

Appleton, P. R., Hall, H. K., & Hill, A. P. (2009). Relations between multidimensional perfectionism and burnout in junior-elite male athletes. *Psychology of Sport and Exercise,10*, 457-465.

Balaguer, I., González, L., Fabra, P., Castillo, I., Mercé, J., & Duda, J. (2012). Coaches' interpersonal style, basic psychological needs and the well- and ill-being of young soccer players: A longitudinal analysis. *Journal of Sport Sciences, 30*, 1619-1629.

Bartholomew, K. J., Ntoumanis, N. & Thøgersen-Ntoumani, C. (2009). A review of controlling motivational strategies from a self-determination theory perspective: Implications for sports coaches. *International Review of Sport and Exercise Psychology, 2*, 215-233.

Bartholomew, K. J., Ntoumanis, N. & Thøgersen-Ntoumani, C. (2010). The controlling interpersonal style in a coaching context: Development and initial validation of a psychometric scale. *Journal of Sport & Exercise Psychology, 32*, 193-216.

Blanchard, C. M, Amiot, C. E., Perreault, S., Vallerand, R. J., & Provencher, P. (2009). Cohesiveness, coach's interpersonal style and psychological needs: Their effects on self-determination and athletes' subjective well-being. *Psychology of Sport and Exercise, 10*, 545-551.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464-504.

Cheung, G. W. (2008). Testing equivalence in the structure, means, and variances of higher-order constructs with structural equation modeling. *Organizational Research Methods, 11*, 593-613. doi: 10.1177/1094428106298973

Cheung, G. W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation modeling. *Organizational Research Methods, 11*, 296-325. doi: 10.1177/1094428107300343

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233-255.

Cox, B. J., Enns, M. W., & Clara, I. P. (2002). The multidimensional structure of perfectionism in clinically distressed and college student samples. *Psychological Assessment, 14*, 365–373.

Cresswell, S. L., & Eklund, R. C. (2005). Motivation and burnout among top amateur rugby players. *Medicine and Science in Sports and Exercise, 37*, 469-477. doi: 10.1249/01.MSS.0000155398.71387.C2

Cresswell, S.L. & Eklund, R.C. (2006a). The convergent and discriminant validity of burnout measures in sport: A multi-trait multi-method analysis. *Journal of Sport Sciences, 24*, 209-220.

Cresswell, S. L., & Eklund, R. C. (2006b). The nature of player burnout in rugby: Key characteristics and attributions. *Journal of Applied Sport Psychology, 18*, 219-239.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*, 109-134.

Eklund, R. C., Smith, A. L., Raedeke, T. D., & Cresswell, S. (2012). Burnout. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Measurement in Sport and Exercise Psychology* (pp. 359-366). Champaign, IL: Human Kinetics.

Irick, E. (2014). 1981-82 - 2013-14 NCAA sports sponsorship and participation rates report. Indianapolis, IN: National Collegiate Athletic Association.

Dunn, J. G., Dunn, J. C., & McDonald, K. (2012). Domain-specific perfectionism in intercollegiate athletes: Relationships with perceived competence and perceived importance in sport and school. *Psychology of Sport and Exercise, 13*, 747-755. doi: 10.1016/j.psychsport.2012.05.002

Dunn, J. G. H., Dunn, J. C., Gotwals, J. K., Vallance, J. K. H., Craft, J. M., & Syrotuik, D. G. (2006). Establishing construct validity evidence for the sport multidimensional perfectionism scale. *Psychology of Sport and Exercise, 7*, 57-79.

Eklund, R.C. & Cresswell, S.L. (2007). Burnout in sports. In G. Tenenbaum & R.C. Eklund (Eds.), *Handbook of Sport Psychology* (3rd ed.; pp. 621-641). Hoboken, NJ: Wiley.

Enders, C. K. (2010). *Applied missing data analysis*. New York, NY: Guildford Press.

Felton, L., & Jowett, S. (2012). "What do coaches do" and "how do they relate": Their effects on athletes' psychological needs and functioning. *Scandinavian Journal of Medicine & Science in Sports*, *23*(2), e130-e139. doi: 10.1111/sms.12029

Gould, D., Udry, E., Tuffey, S., & Loehr, J. E. (1996). Burnout in competitive junior tennis players: A quantitative psychological assessment. *The Sport Psychologist, 10*, 322-340.

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology, 60*, 456-470.

Hill, A. P. (2013). Perfectionism and burnout in junior soccer players: A test of the 2 x 2 model of dispositional perfectionism. *Journal of Sport & Exercise Psychology, 35*, 18-29.

Hu L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1-55.

Isoard-Gautheur, S., Guillet-Descas, E., & Lemyre, P.-N. (2012). A prospective study of the influence of percieved coaching style on burnout propensity in high level young athletes: Using a self-determination theory perspective. *The Sport Psychologist, 26*, 282-298.

Jowett, G.E., Hill, A.P., Hall, H.K., Curran, T. (2013). Perfectionism and junior athlete burnout: The mediating role of autonomous and controlled motivation. *Sport, Exercise, and Performance Psychology, 2*, 48-61.

Lemyre, P.-N., Hall, H. K., & Roberts, G. C. (2008). A social cognitive approach to burnout in elite athletes. *Scandinavian Journal of Medicine and Science in Sports, 18*, 221-234.

Li, C., Wang, C. K., Pyun, D. Y., & Kee, Y. H. (2013). Burnout and its relations with basic psychological needs and motivation among athletes: A sytematic review and meta-analysis. *Psychology of Sport and Exercise, 14*, 692-700.

Lonsdale, C., Hodge K., & Rose, E. (2009). Athlete burnout in elite sport: A self-determination perspective. *Journal of Sport Sciences, 27*, 785-795.

Lonsdale, C., Hodge, K., & Rose, E. A. (2008). The Behavioral Regulation in Sport Questionnaire (BRSQ): Instrument development and initial validity evidence. *Journal of Sport & Exercise Psychology, 30*, 323-355.

MacKinnon, D. P, Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research, 39*, 99-128.

Maïano, C., Morin, A.J.S., Ninot, G., Monthuy-Blanc, J., Stephan, Y., Florent, J.-F., & Vallée, P. (2008). A short and very short form of the physical self-inventory for adolescents: Development and factor validity. *Psychology of Sport & Exercise, 9*, 830-847.

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplenary Journal, 11*, 320-341.

Martinent, G., Decret, J. C., Guillet-Descas, E., & Isoard-Gautheur, S. (2014). A reciprocal effects model of the temporal ordering of motivation and burnout among youth table tennis players in intensive training settings. *Journal of Sports Sciences, 32*, 1648-58.

Maslach, C., Schaufeli, W.B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology, 52*, 397-422. DOI: 10.1146/annurev.psych.52.1.397

Matosic, D., Cox, A. E., & Amorose, A. J. (2014). Scholarship status, controlling coaching behavior, and intrinsic motivation in collegiate swimmers: A test of cognitive evaluation theory. *Sport, Exercise, and Performance Psychology, 3*, 1-12.

McDonald, R. P. (1970). The theoretical foundations of principal factor analysis, canonical factor anlaysis, and alpha factor analysis. *British Journal of Methematical and Statistical Psychology, 23*, 1-21. doi: 10.1111/j.2044-8317.1970.tb00432.x

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika 58*, 525-543.

Millsap, R. E. (2011). *Statistical approaches to measurement invariance*. New York, NY: Guildford Press.

Morin, A. J., Tran, A. & Caci, H. (2015). Factorial validity of the ADHD adult symptom rating scale in a french community sample: Results from the ChiP-ARD study. *Journal of Attention Disorders.* Advance online publication: Doi: 10.1177/1087054713488825

Muthén, L. K., & Muthén, B. O. (1988-2010). Mplus user's guide (6th ed.) Los Angelos, CA: Muthén & Muthén.

Nordin-Bates, S.M., Hill, A.P., Cumming, J., Aujla, I.J., & Redding, E. (2014). A longitudinal examination of the relationship between perfectionism and motivational climate in dance. *Journal of Sport & Exercise Psychology, 36*, 382-391.

Quested, E., & Duda, J. L. (2011). Antecedents of burnout among elite dancers: A longitudinal test of basic needs theory. *Psychology of Sport and Exercise, 12*, 159-167.

Raedeke, T. D. (2014). Burnout. In R. C. Eklund, & G. Tenenbaum (Eds.), *Encyclopedia of sport and exercise psychology* (pp. 94-98). Thousand Oaks, CA: Sage Publications, Inc.

Raedeke, T. D., & Smith, A. L. (2001). Development and preliminary validation of an athlete burnout measure. *Journal of Sport & Exercise Psychology, 23*, 281-306.

Reise, S. P. (2012). Invited paper: The rediscovery of bifactor measurement models. *Multivariate Behavioral Research, 47*, 667-696.

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67. doi:10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the faciliation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68-78. doi: 10.1037110003-066X.55.1.68

Satorra, A., & Bentler, P. M. (1999). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika, 66*, 507-514.

Smith, G., McCarthy, D., & Anderson, K. (2000). On the sins of short-form development. *Psychological Assessment, 12*, 102–111.

Vealey, R. S., Armstrong, L., Comar, W., & Greenleaf, C. A. (1998). Influence of perceived coaching behaviors on burnout and competitive anxiety in female college athletes. *Journal of Applied Sport Psychology, 10*, 297-318.

Endnotes

[1.] The selected items are provided in the supplementary online materials.

[2.] A series of multisample measurement and structural invariance analyses were conducted to consider potential group-based differences as a function of athletes completing the questionnaires in season or out of season. Those analyses are described in the online supplemental materials that accompany this article and the results are provided in Table S4 They confirmed the overwhelming similarity of the results according to completion of the questionnaires either in, or out of the competitive season. Only one predictive path significantly differed across subgroups ($p = .036$), showing that the relation between coaches' controlling use of rewards and self-oriented perfectionism was limited to the group of athletes who completed the questionnaire while being in-season ($\beta = 0.269$, S.E. = 0.078; $p \leq .01$), while the same relation proved non-significant for the out of season group ($\beta = 0.014$, S.E. = 0.082; $p > .05$). This suggests that controlling use of rewards may lead to higher perfectionism, but only during the competitive season.

[3] Preliminary analysis supported our decision to model athlete burnout as a global factor. Estimation of a more typical three-factor ABQ CFA model provided a suboptimal level of fit to the data ($\chi^2 = 396.318$; $df = 86$, $p \leq .05$; CFI = .914; TLI = .894; RMSEA = .087), whereas our *a priori* bifactor model provided a fully satisfactory level of fit to the data ($\chi^2 = 169.318$; $df = 74$, $p \leq .05$; CFI = .973; TLI = .962; RMSEA = .052). A global burnout factor could also have been modeled through a higher-order factor model; however, a higher-order factor model including only a single higher-order factor defined by three first-order factors is empirically indistinguishable from a first-order CFA model including only three factors (i.e., the three correlations between the first-order factors are simply replaced by three higher-order factor loadings). More precisely, the fit of this higher-order factor model was identical to the suboptimal fit of the first-order model which is not surprising given that higher-order factor models are known to rely on more stringent assumptions than bifactor models (e.g., Chen et al., 2007; Reise, 2012).

[4] Although the CFI associated regular ML estimation is monotonic with model complexity (i.e. cannot increase when constraints are included in the model), we rely on the robust MLR estimator where scaling corrections are used to adjust chi-square tests and resulting CFIs. These corrections may change across nested models, with the end result that CFIs can become non-monotonic. For this reason, increases in CFI when constraints are added to a model should simply be ignored and interpreted as supporting equivalent levels of fit.

[5] Although not of substantive relevance in these latent variable analyses, manifest variable means and standard deviations for the sample, and subsamples are provided in Table S2 of the online supplementary materials for interested readers.

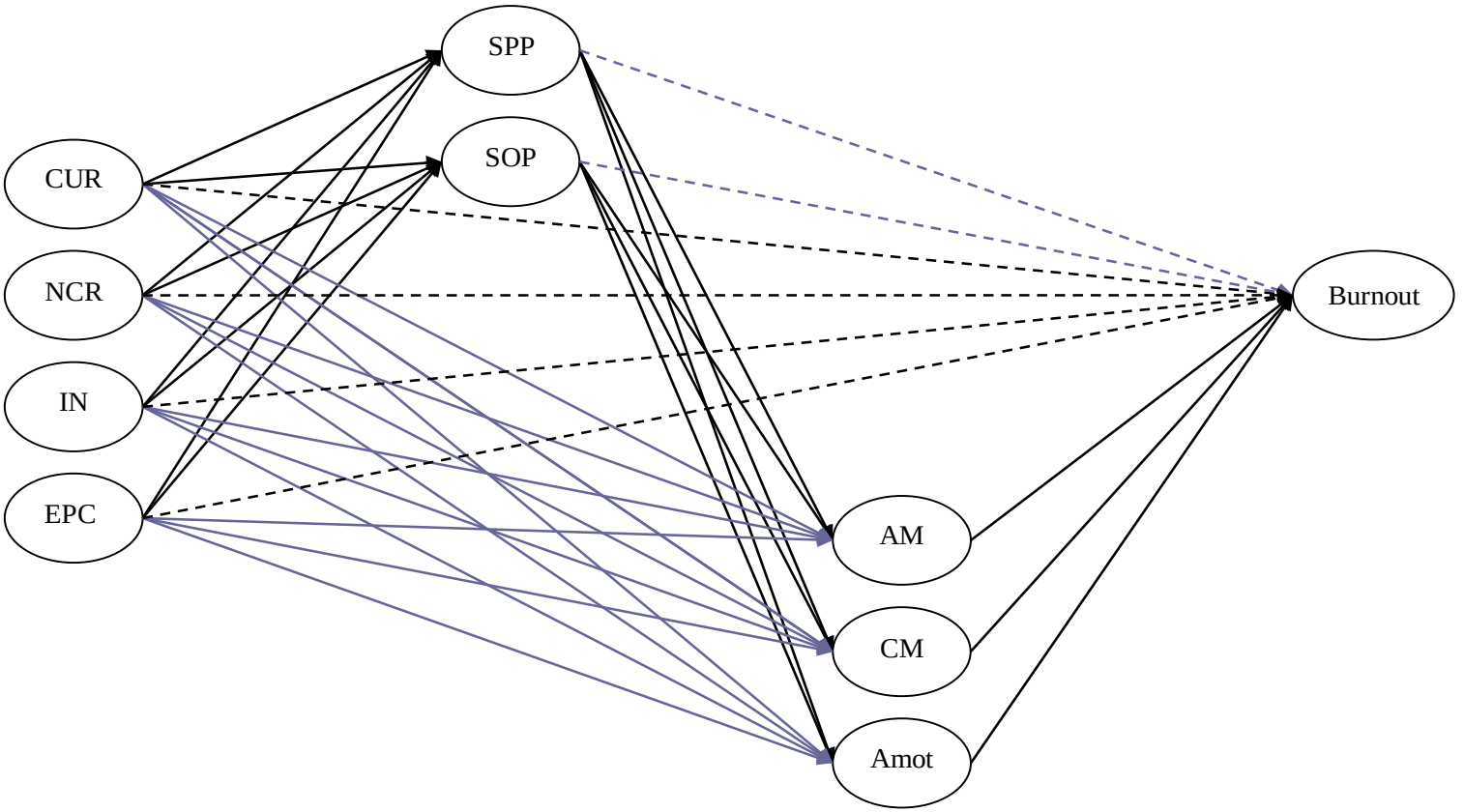

Figure 1. Theoretical Model to Guide the Predictive Models to be Estimated

Note. AM: Autonomous Motivation; CM: Controlled Motivation; Amot: Amotivation; CUR: Coaches' Controlling Use of Rewards; NCR: Coaches' Negative Conditional Regard; IN: Coaches' Intimidation; EPC: Coaches' Excessive Personal Control; SOP: Self-Oriented Perfectionism; SPP: Socially Prescribed Perfectionism; Full black arrows: Theoretical Model M1; Full grayscale arrows: Additional relations tested in Model M2; Dashed grayscale arrows: Additional relations tested in Model M3; Dashed black arrows: Additional relations tested in Model M4. This figure only includes the latent constructs of interest, without the full underlying measurement model to avoid cluttering an already complex model. Also not reported in these figures are the correlations that are freely estimated between the four coaching latent constructs, between the two perfectionism dimensions, and between the three motivation factors.

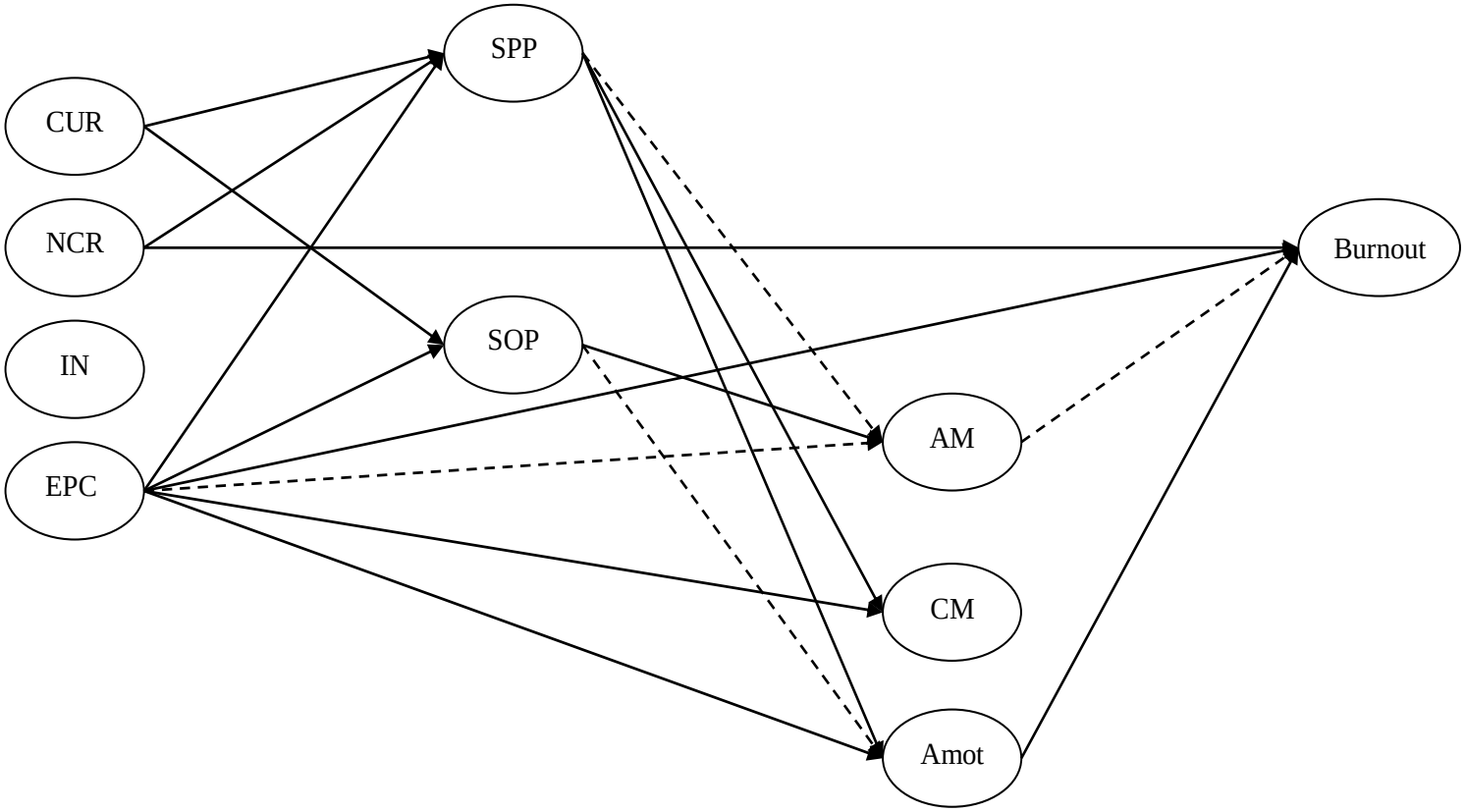

Figure 2. Synthesis of the Results from Model M4.

Note. AM: Autonomous Motivation; CM: Controlled Motivation; Amot: Amotivation; CUR: Coaches' Controlling Use of Rewards; NCR: Coaches' Negative Conditional Regard; IN: Coaches' Intimidation; EPC: Coaches' Excessive Personal Control; SOP: Self-Oriented Perfectionism; SPP: Socially Prescribed Perfectionism; Full black arrows: Significant positive relations; Dashed black arrows: Significant negative relations. See Table 2 for specific parameter estimates.

Table 1.
Goodness-of-fit indices for the CFA and SEM Models estimated in this study

Model	χ^2	df	CFI	TLI	RMSEA	90% CI	CM	$\Delta\chi^2$	Δdf	ΔCFI	ΔTLI	ΔRMSEA
CFA: A priori measurement model	3238.335*	1856	.921	.915	.039	.037-.041	---	---	---	---	---	---
M1:Fully mediated model	3447.544*	1904	.912	.907	.041	.039-.043	---	---	---	---	---	---
M2: Direct paths from coaching to motivation	3398.069*	1892	.914	.909	.040	.038-.043	M1	47.059*	12	+.002	+.002	-.001
M3: Direct paths from perfectionism to burnout	3374.119*	1890	.916	.910	.040	.038-.043	M2	17.407*	2	+.002	+.001	.000
M4: Direct paths from coaching to burnout	3342.495*	1888	.917	.912	.040	.038-.042	M2	90.438*	4	+.003	+.003	.000
Fully Saturated (CFA) model	3238.335*	1856	.921	.915	.039	.037-.041	M4	100.233*	32	+.004	+.003	-.001

Note. CFA: Confirmatory factor analyses; SEM: Structural equation modeling; χ^2 = Robust chi-square test of exact fit; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; CM: Comparison model; $\Delta\chi^2$ = robust chi-square difference test; Δ = change in specific index between the estimated model and the CM. * All χ^2 and $\Delta\chi^2$values are all significant ($p < .05$).

Table 2.
Standardized Factor Correlations from the A Priori Measurement Model

	AM	CM	Amot	CUR	NCR	IN	EPC	SPP	SOP
CM	-.478*								
Amot	-.727*	.810*							
CUR	-.043	.277*	.138*						
NCR	-.207*	.302*	.313*	.334*					
IN	-.181*	.319*	.297*	.311*	.624*				
EPC	-.299*	.429*	.421*	.297*	.574*	.592*			
SPP	-.236*	.642*	.461*	.278*	.411*	.362*	.380*		
SOP	.208*	.175*	.007	.179*	.118*	.069	.199*	.359*	
Burnout	-.806*	.634*	.849*	.202*	.427*	.374*	.493*	.387*	.018

Note. AM: Autonomous Motivation; CM: Controlled Motivation; Amot: Amotivation; CUR: Coaches' Controlling Use of Rewards; NCR: Coaches' Negative Conditional Regard; IN: Coaches' Intimidation; EPC: Coaches' Excessive Personal Control; SOP: Self-Oriented Perfectionism; SPP: Socially Prescribed Perfectionism. * $p < .05$.

Table 3.
Predictive Results from Model M4

Predictor	**Outcome**	**Unstandardized (Standard Error)**	**Standardized (Standard Error)**
Controlling Use of Rewards (coaching)	SOP	0.187 (0.080)*	0.146 (0.058)*
	SPP	0.175 (0.078)*	0.130 (0.058)*
	Autonomous Motivation	0.074 (0.084)	0.046 (0.053)
	Controlled Motivation	0.161 (0.101)	0.090 (0.056)
	Amotivation	-0.067 (0.099)	-0.035 (0.051)
	Burnout (Global)	0.048 (0.032)	0.060 (0.038)
Negative Conditional Regard (coaching)	SOP	0.012 (0.045)	0.020 (0.074)
	SPP	0.140 (0.052)**	0.218 (0.079)**
	Autonomous Motivation	-0.015 (0.057)	-0.020 (0.075)
	Controlled Motivation	-0.096 (0.065)	-0.113 (0.077)
	Amotivation	0.004 (0.065)	0.005 (0.070)
	Burnout (Global)	0.046 (0.019)*	0.120 (0.049)*
Intimidation (coaching)	SOP	-0.073 (0.052)	-0.117 (0.082)
	SPP	0.058 (0.054)	0.088 (0.080)
	Autonomous Motivation	0.059 (0.062)	0.076 (0.078)
	Controlled Motivation	0.000 (0.069)	0.000 (0.078)
	Amotivation	-0.023 (0.070)	-0.024 (0.073)
	Burnout (Global)	0.007 (0.019)	0.017 (0.049)
Excessive Personal Control (coaching)	SOP	0.120 (0.044)**	0.215 (0.078)**
	SPP	0.097 (0.045)*	0.165 (0.078)*
	Autonomous Motivation	-0.215 (0.046)**	-0.311 (0.065)**
	Controlled Motivation	0.200 (0.057)**	0.257 (0.072)**
	Amotivation	0.269 (0.055)**	0.319 (0.066)**
	Burnout (Global)	0.045 (0.014)*	0.128 (0.052)*
Self-Oriented Perfectionism (SOP)	Autonomous Motivation	0.441 (0.082)**	0.355 (0.060)**
	Controlled Motivation	-0.148 (0.094)	-0.106 (0.067)
	Amotivation	-0.300 (0.086)**	-0.197 (0.054)**
Socially-Prescribed Perfectionism (SPP)	Autonomous Motivation	-0.325 (0.086)**	-0.276 (0.067)**
	Controlled Motivation	0.799 (0.116)**	0.603 (0.066)**
	Amotivation	0.615 (0.114)**	0.427 (0.068)**
Autonomous Motivation	Burnout (Global)	-0.168 (0.038)**	-0.332 (0.070)**
Controlled Motivation	Burnout (Global)	-0.025 (0.041)	-0.056 (0.090)
Amotivation	Burnout (Global)	0.223 (0.049)**	0.539 (0.109)**
		R^2 (S.E.)	
Percentage of Variance Explained by the Model	SOP	0.064 (0.026)*	
	SPP	0.220 (0.044)**	
	Autonomous Motivation	0.218 (0.043)**	
	Controlled Motivation	0.469 (0.058)**	
	Amotivation	0.317 (.049)**	
	Burnout (Global)	0.810 (0.027)**	

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

Table 4.
Bootstrapped Tests of Significance for the Indirect Effects

Indirect Effect	Unstandardized (S.E.)	95% Bootstrapped CI	Standardized (S.E)
CUR→SPP→AM→Burnout	.010 (.005)	.002 to .025 *	.012 (.006)
CUR→SPP→Amot→Burnout	.024 (.014)	.004 to .063 *	.030 (.017)
CUR→SOP→AM→Burnout	-.014 (.007)	-.036 to -.003 *	-.017 (.009)
CUR→SOP→Amot →Burnout	-.013 (.007)	-.034 to -.003 *	-.016 (.008)
NCR→SPP→AM→Burnout	.008 (.004)	.002 to .018 *	.020 (.050)
NCR→SPP→Amot→Burnout	.019 (.008)	.007 to .041 *	.050 (.020)
EPC→SPP→AM→Burnout	.005 (.003)	.001 to .015 *	.015 (.009)
EPC→SPP→Amot→Burnout	.013 (.007)	.002 to .037 *	.038 (.021)
EPC→SOP→AM→Burnout	-.009 (.004)	-.024 to -.003 *	-.025 (.012)
EPC→SOP→Amot→Burnout	-.008 (.004)	-.024 to -.002 *	-.023 (.012)
EPC→AM→Burnout	.036 (.011)	.015 to .063 *	.103 (.030)
EPC→Amot→Burnout	.060 (.017)	.033 to .103 *	.172 (.048)
SPP→AM→Burnout	.055 (.003)	.024 to .102 *	.092 (.030)
SPP→Amot→Burnout	.137 (.039)	.073 to .257 *	.230 (.059)
SOP→AM→Burnout	-.074 (.021)	-.131 to -.036 *	-.118 (.033)
SOP→Amot→Burnout	-.067 (.023)	-.131 to -.030 *	-.106 (.035)
CUR→SPP→AM	-.057 (.030)	-.135 to -.008 *	-.036 (.019)
CUR→SOP→AM	.082 (.038)	.020 to .183 *	.052 (.023)
NCR→SPP→AM	-.045 (.019)	-.088 to -.015 *	-.060 (.025)
EPC→SPP→AM	-.031 (.016)	-.072 to -.005 *	-.045 (.024)
EPC→SOP→AM	.053 (.023)	.014 to .110 *	.076 (.032)
CUR→SPP→CM	.140 (.066)	.006 to .275 *	.078 (.036)
NCR→SPP→CM	.112 (.009)	.036 to .205 *	.132 (.050)
EPC→SPP→CM	.077 (.038)	.006 to .162 *	.099 (.048)
CUR→SPP→Amot	.108 (.052)	.016 to .218 *	.055 (.027)
CUR→SOP→Amot	-.056 (.029)	-.144 to -.013 *	-.029 (.014)
NCR→SPP→Amot	.086 (.033)	.027 to .152 *	.093 (.036)
EPC→SPP→Amot	.059 (.031)	.006 to .133 *	.070 (.036)
EPC→SOP→Amot	-.036 (.017)	-.086 to -.010 *	-.042 (.020)

Note. AM: Autonomous Motivation; CM: Controlled Motivation; Amot: Amotivation; CUR: Coaches' Controlling Use of Rewards; NCR: Coaches' Negative Conditional Regard; In: Coaches' Intimidation; EPC: Coaches' Excessive Personal Control; SOP: Self-Oriented Perfectionism; SPP: Socially Prescribed Perfectionism; CI: Confidence Interval. * $p < .05$.

Online supplements for

Problematic Coaching Behaviors and Athlete Burnout: Investigating the Mediational Role of Perfectionism and Motivation**.**

Table S1.

Multidimensional Perfectionism Subscale Items used to operationalize Self-Oriented Perfectionism and Socially Prescribed Perfectionism

Subscale Items
Self-Oriented Perfectionism
When I am working on something, I cannot relax until it is perfect.
One of my goals is to be perfect in everything I do.
I strive to be as perfect as I can be.
I demand nothing less than perfection of myself.
I am perfectionistic in setting goals.
Socially Prescribed Perfectionism
Anything that I do that is less than excellent will be seen as poor performance by those around me.
The people around me expect me to succeed at everything I do.
I feel that people are too demanding of me.
Although they may not show it, other people get very upset with me when I slip up.
My family expects me to be perfect.

Table S2.

Descriptive Statistics for Manifest Variables for the Total Sample, and Gender and Data Acquisition Time Point Subsamples

Measure	Total Sample (n = 487)		Female (n = 352)		Male (n = 134)		Inseason (n = 272)		Out-of-Season (n = 213)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Behaviorial Regulations in Sport Questionnaire (1 to 7 response format)										
Intrinsic Motivation (4 items)	5.33	1.33	5.29	1.29	5.45	1.43	5.24	1.41	5.45	1.22
Integrated Regulation (4 items)	5.41	1.13	5.43	1.10	5.38	1.21	5.39	1.18	5.44	1.08
Identified Regulation (4 items)	5.74	0.99	5.75	1.01	5.72	0.97	5.71	1.04	5.77	0.93
Introjected Regulation (4 items)	4.12	1.69	4.20	1.66	3.89	1.76	4.04	1.71	4.21	1.67
Extrinsic Regulation (4 items)	2.84	1.49	2.87	1.52	2.77	1.41	2.80	1.51	2.88	1.46
Amotivation (4 items)	3.01	1.54	3.10	1.56	2.80	1.48	3.01	1.53	3.04	1.55
Autonomous Motivation (12 items)	5.49	0.98	5.49	0.96	5.51	1.03	5.45	1.03	5.55	0.90
Controlled Controlled (8 items)	3.47	1.42	3.53	1.43	3.33	1.41	3.42	1.44	3.54	1.40
Athlete Burnout Scale (1 to 5 response format)										
Decreased Accomplishment (5 items)	2.49	0.80	2.52	0.82	2.42	0.76	2.39	0.78	2.62	0.83
Physical and Mental Exhaustion (5 items)	3.27	0.90	3.31	0.88	3.15	0.93	3.24	0.92	3.30	0.86
Sport Devaluation (5 items)	2.45	0.90	2.48	0.91	2.35	0.90	2.42	0.91	2.49	0.90
Global (15 items)	2.73	0.72	2.77	0.73	2.64	0.69	2.68	0.73	2.80	0.70
Controlling Coaching Behavior Scale (1 to 7 response format)										
Controlling Use of Rewards (4 items)	3.18	1.30	3.18	1.28	3.19	1.37	3.17	1.32	3.20	1.29
Negative Conditional Regard (4 items)	4.16	1.70	4.06	1.69	4.40	1.70	4.04	1.72	4.30	1.66
Intimidation (4 items)	2.53	1.47	2.43	1.41	2.77	1.58	2.33	1.42	2.77	1.50
Excessive Personal Control (3 items)	3.27	1.79	3.34	1.76	3.12	1.84	3.15	1.81	3.41	1.74
Multidimensional Perfectionism Scale (1 to 7 response format)										
Self-oriented Perfectionism (5 items)	4.53	1.15	4.52	1.16	4.56	1.14	4.56	1.15	4.47	1.16
Socially prescribed Perfectionism (5 items)	3.54	1.06	3.55	1.05	3.50	1.07	3.51	1.07	3.56	1.04

Note. Scores for each participant on each of the measures were calculated as item averages rather than as sums.

Table S3. *Standardized Parameter Estimates for the A Priori Measurement Model*

	Motivation							Perceived Coaching Behaviors					Perfectionism			Burnout				
	IM	InteR	IdR	IntroR	ExR	Amot	δ	CUR	NCR	IN	EPC	δ	SPP	SOP	δ	Burnout (G)	RSA (S)	EPE (S)	Dev (S)	δ
Item 1	.905*						.181*	.458*				.790*	.660*		.564*	.550*	.280*			.619*
Item 2	.918*						.158*	.760*				.423*	.578*		.666*	.604*	.468*			.417*
Item 3	.858*						.264*	.872*				.239*	.678*		.540*	.469*	.579*			.446*
Item 4	.887*						.213*	.899*				.191*	.541*		.708*	.543*	.554*			.398*
Item 5		.713*					.491*		.772*			.404*	.661*		.563*	.553*	.521*			.423*
Item 6		.833*					.307*		.840*			.294*		.624*	.611*	.458*		.618*		.408*
Item 7		.665*					.557*		.925*			.144*		.753*	.432*	.564*		.610*		.310*
Item 8		.683*					.534*		.890*			.207*		.666*	.556*	.671*		.481*		.319*
Item 9			.634*				.598*			.774*		.401*		.727*	.472*	.596*		.611*		.272*
Item 10			.626*				.608*			.749*		.438*		.768*	.410*	.697*		.520*		.244*
Item 11			.785*				.384*			.800*		.361*				.630*			.653*	.175*
Item 12			.659*				.566*			.809*		.346*				.740*			.305*	.358*
Item 13				.820*			.328*				.779*	.393*				.624*			.590*	.262*
Item 14				.829*			.312*				.923*	.148*				.712*			.009	.493*
Item 15				.860*			.260*				.881*	.223*				.814*			-.068	.332*
Item 16				.700*			.510*													
Item 17					.718*		.485*													
Item 18					.829*		.313*													
Item 19					.825*		.319*													
Item 20					.920*		.154*													
Item 21						.790*	.375*													
Item 22						.827*	.317*													
Item 23						.867*	.248*													
Item 24						.790*	.375*													
ω	.940	.816	.772	.880	.895	.891		.845	.918	.864	.897		.762	.835		.940	.715	.839	.620	
AM λ	.943*	.745*	.690*			$\omega = .840$														
CM λ				.725*	.828*	$\omega = .768$														
δ	.110*	.445*	.523*	.414*	.314*															

Note. IM: Intrinsic Motivation; InteR = Integrated Regulation; IdR = Identified Regulation; IntroR: Introjected Regulation; ExR = External Regulation; AM: Autonomous Motivation; CM: Controlled Motivation; Amot: Amotivation; CUR: Coaches' Controlling Use of Rewards; NCR: Coaches' Negative Conditional Regard; IN: Coaches' Intimidation; EPC: Coaches' Excessive Personal Control; SOP: Self-Oriented Perfectionism; SPP: Socially Prescribed Perfectionism; G: Global factor; S = Specific factors; RSA: Reduced Sense of Accomplishment; EMP: Emotional/Physical Exhaustion; Dev: Devaluation; λ: Standardized factor loading; δ: Standardized uniqueness (or disturbance for higher-order factors); ω = Scale score reliability. * $p < .05$.

Exploratory Multisample Analyses.

For exploratory purposes, analyses were extended to consider potential group-based differences as a function of athletes completing the questionnaires in season or out of season to assess whether the observed effects were limited to the competition season, or were lasting and tended to generalize outside of the competition season. An important assumption of such comparisons is that the constructs measured by the different indicators remain the same across groups (i.e. measurement invariance; Meredith, 1993; Millsap, 2011). We thus examined a series of sequentially performed measurement invariance tests based upon analytic recommendations for first-order factor models (Meredith, 1993; Millsap, 2011) and higher-order factor models (Cheung, 2008). First, for identification purposes, the invariance of the first-order factor model was estimated in the following sequence: (a) configural invariance (the same measurement model is estimated in all groups), (b) weak invariance (the factor loadings are constrained to be the same in all groups); (c) strong invariance (the factor loadings and items' intercepts are constrained to be the same in all groups); (d) strict invariance (the factor loadings, items' intercepts, and items' uniquenesses are constrained to be the same in all groups). We then extended these tests to tests of the invariance of the factor variances and covariance between the factors, as well as of the latent means of the factors. Second, the invariance of the higher-order structure was verified in a similar sequence, with the baseline model specified as invariant across groups according to the conclusions of steps (a) to (d) of the preceding sequence. Assuming the strict invariance of the first-order and second-order measurement model, we then re-estimated the final predictive model (M4) in both groups of participants. The significance of group-based differences in the relative strength of the predictive paths was tested using the multivariate delta method, implemented in Mplus with the model constraint function.

The results from the tests of measurement invariance are reported in Table S4 of the online supplemental materials. They support the complete measurement invariance (configural, loadings, intercepts, uniquenesses, variances-covariances, and latent means) of the CFA model across in-season and out of season groups of participants. This procedure confirmed the overwhelming similitude of the results estimated in participants according to completion of the questionnaire either in, or out of the competitive season. Only one predictive path exhibited significantly different coefficients across subgroups ($p = .036$), with coaches' controlling use of rewards being predictive of self-oriented perfectionism among the the group of athletes who completed the questionnaire while being in-season ($\beta = 0.269$, S.E. $= 0.078$; $p \leq .01$) but not among the out of season group ($\beta = 0.014$, S.E. $= 0.082$; $p > .05$). This suggests that controlling use of rewards may lead to higher self-oriented perfectionism, but only during the competitive season.

Table S4.

Results from the Tests of Measurement Invariance Conducted Across the In and Out of Season Groups

Model	χ^2	df	CFI	TLI	RMSEA	90% CI	CM	$\Delta\chi^2$	Δdf	ΔCFI	ΔTLI	ΔRMSEA
Measurement invariance of the first order measurement model without the higher order motivation constructs												
P1: Configural	5472.319*	3644	.902	.892	.045	.043-.048	---	---	---	---	---	---
P2: Weak	5534.358*	3707	.902	.894	.045	.043-.048	P1	68.852	63	.000	+.002	.000
P3: Strong	5601.248*	3755	.901	.894	.045	.043-.047	P2	66.753*	48	-.001	.000	.000
P4: Strict	5638.127*	3819	.903	.897	.044	.042-.047	P3	59.230	64	+.002	+.003	-.001
P5: Var.-Covar.	5741.970*	3937	.904	.901	.043	.041-.046	P4	106.568	118	+.001	+.004	-.001
P6: Latent Means	5780.359*	3953	.902	.900	.044	.041-.046	P5	39.140*	16	-.002	-.001	+.001
Measurement invariance of the higher-order motivation factors, starting from model P4 (strict)												
H1: Configural	5861.889*	3893	.895	.891	.046	.043-.048	---	---	---	---	---	---
H2: Weak	5864.293*	3896	.895	.891	.046	.043-.048	H1	2.626	3	.000	.000	.000
H3: Strong	5868.182*	3899	.895	.891	.046	.043-.048	H2	3.858	3	.000	.000	.000
H4: Strict	5875.915*	3904	.895	.891	.046	.043-.048	H3	7.704	5	.000	.000	.000
H5: Var.-Covar.	5940.666*	3973	.895	.893	.045	.043-.048	H4	65.610	69	.000	+.002	-.001
H6: Latent Means	5975.015*	3986	.894	.892	.045	.043-.048	H5	35.040	13	-.001	-.001	.000

Note. χ^2 = Robust chi-square test of exact fit; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; CM: Comparison model; $\Delta\chi^2$ = robust chi-square difference test; Δ = change in specific index between the estimated model and the CM. * $p < .05$.