THE ROLE OF INTERPERSONAL CONTROL AND NEED THWARTING IN THE PREDICTION OF ILL-BEING IN SPORT: A SELF-DETERMINATION THEORY APPROACH

By

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ABSTRACT

Utilizing self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002) as a framework, the current thesis aimed to explore the social conditions that satisfy versus thwart psychological needs and, in turn, impact upon psychological and physiological functioning and well/ill-being in the sport context. Although research guided by SDT has explored the conditions (i.e., autonomy support) and psychological processes (i.e., need satisfaction) that foster healthy development and effective functioning in athletes, very little research has considered the potential role of interpersonal control and psychological need thwarting in the development of athlete ill-being. To address these limitations, this thesis begins by outlining the development and initial validation of two new questionnaire measures: the Controlling Coach Behaviors Scale (Chapter 2) and the Psychological Need Thwarting Scale (Chapter 3). The new questionnaire measures were subsequently utilized in three studies, reported in Chapter 4. Across all three samples, need satisfaction was better predicted by autonomy-supportive behaviors, and need thwarting was better predicted by coach control. In turn, athletes' perceptions of need satisfaction predicted positive outcomes (i.e., vitality and positive affect) whereas need thwarting consistently better predicted maladaptive outcomes (i.e., disordered eating, burnout, depression, negative affect, physical symptoms, and perturbed physiological functioning). Such novel findings indicate that controlling interpersonal behaviors and psychological need thwarting represent important aspects of the SDT framework which must be further researched (both in sport and in other life domains) if the development of diminished functioning and ill-being is to be properly understood.

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I would like to dedicate this thesis to the loving memory of my Grandmother,
Beryl Mary Bartholomew

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LIST OF PAPERS

This thesis is comprised of the following three papers. Study design, data collection, statistical analysis and writing were conducted by Kimberley Bartholomew. Dr Nikos Ntoumanis advised on study design, data analysis and paper editing. Where listed, the secondary authors also advised on study design, data analysis and paper editing.

1. **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 and Exercise Psychology, 32,* 193-216.

2. **Bartholomew, K. J.,** Ntoumanis, N., Ryan, R. M., & Thøgersen-Ntoumani, C. (2011). Psychological need thwarting in the sport context: Assessing the darker side of athletic experience. *Journal of Sport and Exercise Psychology, 33,* 75-102.

3. **Bartholomew, K. J.,** Ntoumanis, N., Bosch, J. A., Ryan, R. M., & Thøgersen-Ntoumani, C. (in press). Self-determination theory and diminished human functioning: The role of interpersonal control and psychological need thwarting. *Personality and Social Psychology Bulletin.*

During the period of postgraduate study within the School of Sport and Exercise Sciences at the University of Birmingham, the following articles and conference abstracts were accepted for publication/presentation.

Publications

4. Thøgersen-Ntoumani, C., Ntoumanis, N., Cumming, J., **Bartholomew, K. J.,** & Pearce, G. (2011). Can self-esteem protect against the deleterious consequences of self-objectification for mood and body satisfaction in physically active female university students? *Journal of Sport and Exercise Psychology, 33,* 289-307.

5. **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.

Conference Presentations

6. **Bartholomew, K. J.,** Ntoumanis, N., & Thøgersen-Ntoumani, C. (2010). *Daily fluctuations in athlete well/ill-being: Psychological needs as experiential requirements and basic motives.* Paper presented at the British Psychological Society Division of Sport and Exercise Psychology Conference, London, December 2010. (Winner of the Student Oral Presentation Award).

7. Castillo, I., Fabra, P., Marcos, D., González, L., **Bartholomew, K. J.,** Fuentes, A., & Balaguer, I. (2010). *El Estilo Controlador del Entrenador: Análisis de las propiedades psicométricas (The controlling coaching style: Analysis of psychometric properties).* Paper presented at the VII Congreso Iberoamericano de Psicologia, Oviedo, July 2010.

8. **Bartholomew, K. J.,** Ntoumanis, N., & Thøgersen-Ntoumani, C. (2010). Self-determination theory and the prediction of ill-being in sport: The role of psychological need thwarting. *Journal of Sport and Exercise Psychology, 32,* S142-S143. Published abstract. (Paper presented at the North American Society for the Psychology of Sport and Physical Activity Conference, Tucson, June 2010).

9. Ntoumanis, N., **Bartholomew, K. J.,** & Thøgersen-Ntoumani, C. (2010). *Perceptions of coaching interpersonal style, psychological needs, and psychological well-being in competitive athletes.* Paper presented at the 4th International Self-Determination Theory Conference, Ghent, May 2010.

10. **Bartholomew, K. J.,** Ntoumanis, N., & Thøgersen-Ntoumani, C. (2009). *Developing a measure of sport coaches' controlling interpersonal style*. Paper presented for an invited symposium entitled 'Researching Self-Determination in Sport and Physical Activity' (chaired by Professor Edward Deci). International Society of Sport Psychology World Congress, Marrakech, June 2009.

11. **Bartholomew, K. J.,** Ntoumanis, N., & Thøgersen-Ntoumani, C. (2008). *Developing a measure of psychological need thwarting in the sport context*. Paper presented at the British Psychological Society Division of Sport and Exercise Psychology Inaugural Conference, London, December 2008. (Winner of the Student Oral Presentation Award).

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CHAPTER 1.

GENERAL INTRODUCTION

Parts of this chapter have been published in the

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"Maybe fourteen was too young to handle everything emotionally…

When I looked in my mirror I actually saw this distorted image: I was so ugly and so fat.

I just wanted to kill myself. I was depressed and sad and lonely and guilty."

(Jennifer Capriati, 2001)

The general consensus is that participation in competitive sport will lead to positive outcomes including increased psycho-social development and physical health (Fraser-Thomas, Côté, & Deaken, 2005). However, as highlighted in the case of one-time tennis prodigy Jennifer Capriati, such positive outcomes are not necessarily automatic (Theberge, 2008; Wankel & Mummery, 1990). For many young athletes, the extreme mental and physical demands often placed upon them in the sport context can lead to damaged self-esteem and affective disorders, such as anxiety and depression (Fraser-Thomas & Côté, 2009; Krane, Greenleaf, & Snow, 1997). Research has also shown that other serious problems, including body image concerns and disordered eating, occur more frequently amongst athletes compared to the general population (Sundgot-Borgen & Torstveit, 2004). Ultimately, the chronic stress associated with participation in competitive sport can lead to burnout and/or a complete withdrawal from sport (Gould, 1993; Schmidt & Stein, 1991). Thus, in order to promote healthy sport participation, it is important to understand the factors which contribute to the variability in psychological and physiological health-related outcomes in competitive sport settings. In order to explore this issue, the current thesis applies a motivational perspective to investigate the impact of the social environments manifested in sport on indices of athlete well/ill-being. Particular emphasis is placed on the darker side of sport participation as a greater understanding of the social-psychological stressors present in sport should enable appropriate interventions which support athletes to realize their athletic potential without compromising their health and well-being.

The Nature of Motivation in Sport

Motivation is typically referred to as the activation or energization of goal-oriented behavior and can thus be defined as the driving force behind all human action (Kleinginna & Kleinginna, 1981). In the context of sport, motivation has important influences on cognitive, affective, and behavioral outcomes such as persistence, learning, and performance, as well as athlete well/ill-being (Kowal & Fortier, 1999; Lemyre, Treasure, & Roberts, 2006; Pelletier, Fortier, Vallerand, & Brière, 2001). Without motivation, therefore, even the most gifted athlete is unlikely to realize his or her sport potential. Thus, the study of motivation as it pertains to athletes and the sport environment is clearly of paramount importance (Vallerand & Losier, 1999).

From a theoretical perspective, early explanations viewed motivation as a quantitative entity synonymous with the amount of energy or effort directed toward the targeted behavior (Ryan & Deci, 2000). Yet the factors which motivate one athlete in sport may vary substantially from those that motivate another (e.g., improvement and enjoyment versus winning and societal status). Early theories of motivation were thus limited in that they did not account for why the behavior was initiated or how it was regulated (Roberts, 1992). It was only later that theoretical frameworks (e.g., deCharms, 1968) began to acknowledge different *types* of motivation, originally proposing two separate forms: intrinsic and extrinsic. In essence, these two terms distinguished between behaviors that were engaged in because they were inherently interesting and enjoyable (i.e., intrinsic motivation) and behaviors that were carried out to obtain a separable outcome (i.e., extrinsic motivation). According to this latter conceptualization, the type (as opposed to the amount) of motivation driving the behavior is considered to be the primary determinant of cognitive, affective, and behavioral outcomes. Specifically, those athletes who report more intrinsic reasons for behavioral engagement are more likely to experience positive outcomes such as enhanced persistence, performance, and

well-being whilst those athletes who report more extrinsic motives are more likely to dropout or encounter negative outcomes such as anxiety and depression (e.g., Krane et al., 1997; Whitehead, 1995).

Such a differentiated approach to motivation is fully embraced by self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002), a broad framework for the study of motivation widely applied in the sport domain (Vallerand & Losier, 1999). However, in contrast to many other theoretical perspectives (e.g., deCharms, 1968), SDT does not characterize extrinsic motivation as non-autonomous or antithetical to intrinsic motivation. In fact, SDT argues that extrinsic motivation can vary considerably in its relative autonomy and thus can either reflect external control or true self-regulation (Ryan & Deci, 2000). Accordingly, it is possible for individuals to be autonomously extrinsically motivated.

In an attempt to explain the development and multifaceted nature of extrinsic motivation, Deci and Ryan (1985) proposed a taxonomy of types of regulation for extrinsic motivation. These regulations differ in the degree to which they have been internalized and integrated into an individual's sense of self. Thought of as a continuum, the concept of internalization describes how an individual's motivation for behavior can range from passive compliance to active personal commitment (Deci & Ryan, 2000).

At the left end of the continuum is amotivation. Amotivation represents a lack of motivation. As such, amotivated actions are passive and lack any intentional aim. The other five points on the continuum refer to classifications of motivated behavior. At the far right of the continuum is intrinsic motivation, the prototype of autonomous or self-determined behavior. Extrinsically motivated behaviors, which are characterized by four types of regulations, fall along the self-determination continuum between amotivation and intrinsic motivation (Ryan and Deci, 2002). External regulation represents the least autonomous form of extrinsic motivation and occurs when behaviors are performed to satisfy an external

demand or obtain an externally imposed reward contingency. A second type of extrinsic motivation is introjected regulation. Introjection describes a controlling type of internal regulation in which individuals feel pressure to engage in behaviors to avoid guilt and shame or to attain ego enhancements and feelings of worth. A more autonomous, or self-determined, form of extrinsic motivation is regulation through identification. In this case, individuals recognize the potential importance of the behavior and accept its regulation as their own. Finally, the most autonomous form of extrinsic motivation is integrated regulation. Integration occurs when identified regulations have been brought into congruence with other values endorsed by the individual and fully assimilated to the self (Ryan & Deci, 2000). Whilst integrated forms of motivation share many qualities with intrinsic motivation (e.g., they are often volitional and valued by the self), they remain extrinsic because behaviors are carried out for their presumed instrumental value with respect to some outcome that is separate from the behavior (Ryan & Deci, 2002).

Based on the assumption that humans are naturally inclined toward psychological growth, autonomous behavior, and a unified sense of self, SDT proposes that individuals will work to integrate within themselves the regulation of extrinsically motivated activities that are useful for effective functioning in the social environment but are not inherently interesting (Ryan & Deci, 2002). This process is particularly pertinent to the sport domain in which athletes are often tasked with repetitive training activities and are thus unlikely to be solely intrinsically motivated (e.g., Mallet & Hanrahan, 2004).

The Three Basic Psychological Needs

According to SDT, an understanding of human motivation (and subsequent psycho-social development and well/ill-being) requires a consideration of three innate psychological needs, namely those for autonomy, competence, and relatedness. Experiences of autonomy

(the degree to which individuals feel volitional and responsible for the initiation of their own behavior; deCharms, 1968) and competence (the degree to which individuals feel effective in their ongoing interactions with the social environment; Deci, 1975) need satisfaction are both necessary for the maintenance and enhancement of self-determination. In addition, SDT suggests that intrinsic motivational processes are most likely to take root where the need for relatedness (the degree to which individuals feel a secure sense of connectedness and belongingness; Baumeister & Leary, 1995) is supported. This is because when people feel insecure or rejected, they are more inhibited and defensive and less likely to experience interest or enjoyment in their activities (Deci & Ryan, 2000).

Therefore, autonomous behavioral engagement and positive cognitive, affective, and behavioral outcomes are expected when the three psychological needs are satisfied and individuals feel self-determined, efficacious, and connected to others in their social environment (Deci & Ryan, 2000). When the three psychological needs are thwarted, however, subsequent behaviors are likely to be controlled and diminished functioning and ill-being are hypothesized to ensue (Ryan & Deci, 2000). Thus, the concept of basic psychological needs provides a feasible and unifying framework for understanding how motivational processes are linked with different indices (both positive and negative) of psychological and physical health. The particular importance of psychological needs in relation to well/ill-being has been emphasized by the relatively recent formalization of basic psychological needs theory (BPNT; Deci & Ryan, 2000). As a sub-theory within the SDT framework,[1] BPNT details the dynamic relations between psychological needs and health and well/ill-being. Thus, the current thesis will draw specifically on BPNT with a view to

[1]SDT formally comprises five mini-theories (Ryan & Deci, 2002): organismic integration theory (which details the determinants and consequences of the separate forms of extrinsic motivation presented earlier); causality orientations theory (which describes individual differences in people's tendencies to orient toward environments and regulate their behavior); cognitive evaluation theory (which addresses the effects of social contexts, and factors such as rewards, on intrinsic motivation and interest); goal contents theory (which distinguishes between intrinsic and extrinsic goals and their impact upon motivation and wellness); and finally, basic psychological needs theory.

furthering our understanding of the psychological processes that may encourage versus diminish health-conducive sport participation.

The Conceptualization of Psychological Need Thwarting

The necessity of the basic needs to psychological growth and health is considered to be inherent to human nature and invariant regardless of context or culture (Chirkov, Ryan, Kim and Kaplan, 2003). In line with this assumption, a plethora of research guided by BPNT has established clear empirical links between the satisfaction of autonomy, competence, and relatedness needs and optimal psychological and physical well-being across various life domains (Deci & Ryan, 2000), including sport (e.g., Adie, Duda, & Ntoumanis, 2008; Gagné, Ryan, & Bargmann, 2003; Reinboth, Duda, & Ntoumanis, 2004).

However, beyond psychological growth and well-being, SDT recognizes that people can also display cognitive, affective, and behavioral patterns that represent non-optimal or darker sides of human existence. Such negative outcomes are hypothesized to occur when individuals perceive their psychological needs to be actively undermined (i.e., thwarted) in their immediate social environment (Deci & Ryan, 2000). Therefore, BPNT and, more specifically, its conceptualization of psychological need thwarting, should provide a framework through which to examine the psychological processes that link negative dimensions of the social environment to indices of athlete ill-being. However, there has been very little research on the direct consequences of psychological need thwarting (Vallerand, Pelletier, & Koestner, 2008). This is primarily due to the fact that previous research has generally, and somewhat misguidedly, equated low scores on existing measures of need satisfaction with the presence of psychological need thwarting.

Specifically, research conducted to date has explored negative relations between need satisfaction and indices of psychological and physical ill-being in athletes (e.g., Adie et al.,

2008; Hodge, Lonsdale, & Ng, 2008; Reinboth et al., 2004). Significant negative correlations have indicated that low need satisfaction is associated with compromised mental health in athletes. When such an approach is employed, however, low need satisfaction scores are often considered evidence of both a lack of need satisfaction and psychological need thwarting, without distinguishing between the two constructs. This raises questions as to whether low need satisfaction scores can actually be conceptually equated with need thwarting. The distinction between low levels of need satisfaction and psychological need thwarting will be further examined in Chapter 3, however one reason to question the aforementioned assumption is that low levels of need satisfaction do not always contribute directly to indices of ill-being (Gagné et al., 2003; Sheldon & Bettencourt, 2002; Quested & Duda, 2010). These findings suggest that low scores on measures of need satisfaction may not adequately tap the intensity of need frustration that Deci and Ryan describe as states of need thwarting (e.g., Deci & Ryan, 2000).

It is likely that assessments of both need satisfaction *and* need thwarting would more fully address the multiple impacts of sport participation on the psychological and physical well/ill-being of athletes. Utilizing such an approach, therefore, would reflect a more comprehensive examination of the psychological experiences of athletes in the sport environment and should allow researchers to provide better predictions regarding variability in health-related outcomes. In particular, compared to a measure of psychological need satisfaction, a measure which taps the negative experiential state of need thwarting directly should better predict diminished functioning and athlete ill-being.

The Social Environment

A central tenet of BPNT is that the social environment can support or thwart psychological need satisfaction and, as a result, contribute to well/ill-being, respectively (Deci

& Ryan, 2000). Whilst there are various social factors present in the sport context which may impact upon athletes' psychological needs, perhaps one of the most important is the influence of the coach (Horn, 2002; Vallerand & Losier, 1999). An increasing amount of research has shown that the social environments manifested in sport via different training programs and, in particular, the behaviors and interpersonal style of the coach, can play a major role in shaping the psychological experiences athletes derive from their sport participation (Reinboth et al., 2004; Smoll & Smith, 2002). As a result, the proposition that coach behaviors are associated with the health status (i.e., the degree of well/ill-being) of athletes is well-corroborated in the literature (Amorose, 2007; Duda & Balaguer, 2007).

In line with SDT, Vallerand and Losier (1999) suggested that a coach's behavior can primarily be viewed in terms of two interpersonal styles. The first of these is known as the autonomy-supportive style.[2] Coaches who support athletes' autonomy encourage self-initiated strivings and create conditions for athletes to experience a sense of volition, choice, and self-endorsement. The behaviors identified as being characteristic of an autonomy-supportive style include the provision of choice, rationale, and opportunities for initiative and independent work, taking the others' perspective into account and acknowledging their feelings, and providing feedback on competence that does not control or direct behavior (Deci, Eghrari, Patrick, & Leone, 1994; Mageau & Vallerand, 2003; Reeve & Jang, 2006). A wide variety of studies have demonstrated the advantages of autonomy-supportive contexts during teaching-related (e.g., Boggiano, Flink, Shields, Seelbach, & Barrett, 1993) and parental interactions (e.g., Grolnick, Deci, & Ryan, 1997). Research guided by SDT in the sport literature has also demonstrated that athletes tend to experience greater psychological need satisfaction (and

[2] An autonomy-supportive interpersonal style will only be beneficial for need satisfaction and subsequent motivation if it is accompanied by behaviors that provide structure and show involvement in athletes' welfare (Deci & Ryan, 1985; Mageau & Vallerand, 2003). Without coaches' instructions and structure, athletes lack the necessary information and experience to interact competently with their environment. In addition, without coaches' positive emotional involvement athletes cannot feel connected. However, the provision of structure and involvement must not be restrictive or intrusive (i.e., it must not be controlling).

more autonomously motivated actions) when coaches display more autonomy-supportive behaviors (Adie et al., 2008; Gagné et al., 2003). In addition, perceptions of autonomy support and subsequent psychological need satisfaction have been shown to predict positive outcomes such as athlete enjoyment, vitality, and positive affect (Adie et al., 2008; Alvarez, Balaguer, Castillo, & Duda, 2009; Gagné et al., 2003).

However, autonomy support is just one aspect of the social environment that can affect psychological needs. Those in a position of authority can also exhibit a controlling interpersonal style. For example, coaches can behave in a coercive, pressuring, and authoritarian way in order to impose a specific and preconceived way of thinking, feeling, and behaving upon their athletes (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Pelletier et al., 2001). Coach behaviors employed to pressure or control athletes have the potential to thwart athletes' feelings of autonomy, competence, and relatedness. This, in turn, undermines athletes' self-determined motivation and contributes to the development of controlled motives. As a consequence, athletes often comply but do not endorse the actions requested by their coach. When athletes feel pressured to behave in a certain way, a variety of negative consequences are expected to ensue which are to the detriment of the athletes' well-being. This can result in a vicious circle in which athletes feel compelled to respond in ways that potentially thwart their own psychological needs just to maintain a 'satisfactory' relationship with their coach (Mageau & Vallerand, 2003).

The Conceptualization of Interpersonal Control

Research conducted to date has primarily focused on autonomy-supportive interpersonal styles (Amorose & Anderson-Butcher, 2007; Gagné et al., 2003), assuming that the absence of autonomy-supportive coach behaviors could automatically be equated with the presence of controlling strategies. As a result, there has been no systematic psychometric

attempt to develop and validate a measure of the coaching behaviors associated with a controlling interpersonal style and empirical research on the use of controlling motivational strategies by coaches has remained scarce.

There are, however, a couple of notable exceptions. In line with BPNT, two studies have indicated that perceptions of coach control undermined athletes' psychological needs (Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009) and fostered external regulation (Pelletier et al., 2001). These studies also revealed significant, but relatively small, negative associations between athletes' perceptions of their coach's provision of autonomy support and control. Similar findings have also been reported in the parental literature (e.g., Silk, Morris, Kanaya, & Steinberg, 2003) and in physical education settings (e.g., Tessier, Sarrazin, & Ntoumanis, 2008). Such observations suggest that controlling behaviors may not be the exact opposite of autonomy-supportive behaviors and, therefore, it is possible that those in a position of authority engage in both controlling and autonomy-supportive behaviors simultaneously and to different extents. Thus, it is vital to identify and assess those behaviors associated specifically with a controlling interpersonal style. A taxonomy of six controlling strategies (drawn from an extensive review of the research conducted in the sport domain as well as the relevant parental and educational literatures) has recently been proposed (Bartholomew et al., 2009). Table 1.1 presents a summary of the identified controlling strategies alongside examples of their potential manifestation in the context of sports coaching. A more detailed overview of the extant research which supports each proposed strategy is also presented in the appendix.

Table 1.1: Coaches' Controlling Motivational Strategies

Controlling strategy	Explanation	Examples from the sport context	Supporting literature
Tangible rewards Task engagement Task completion Performance Competition	The use of tangible rewards designed to manipulate athlete behavior and promote desired/ expected behaviors.	A coach who promises to reward athletes if they engage in the training tasks he/she sets them. A coach who uses the fact that athletes' are on a scholarship as leverage to ensure they complete set training sessions. A coach who focuses on outcomes and promises to reward athletes only if they perform exceptionally well/beat other opponents.	Amorose and Horn (2000); Deci, Koestner and Ryan (1999); Deci and Ryan (1985); Houlfort, Koestner, Joussemet, Nantel-Vivier and Lekes (2002); Krane, Greenleaf and Snow (1997); Medic, Mack, Wilson and Starkes (2007); Reeve and Deci (1996); Ryan (1980); Vansteenkiste and Deci (2003).
Controlling feedback Instruction Criticism Praise	The use of instructional feedback which conveys expectations about athletes' behavior. The use of overly critical feedback which attempts to anger athletes in an effort to motivate them to perform better. The use of praise to reinforce expected/desired athlete behaviors.	A coach who uses feedback to direct future behavior, as opposed to providing information regarding present performance. A coach who picks up on all the negative aspects of his/her athletes' performances but does not say anything positive or offer suggestions for improvement. A coach who praises athletes in such a way that the latter learn to perform only those behaviors which are desired by the coach.	Amorose and Horn (2000); Black and Weiss (1992); Deci, Koestner and Ryan (1999); Henderlong and Lepper (2002); Hollembeak and Amorose (2005); Horn (1985); Kast and Connor (1988); Kohn (1993); Reeve and Jang (2006).

Table 1.1: (Continued)

Controlling strategy	Explanation	Examples from the sport context	Supporting literature
Excessive personal control Imposed values/opinions Controlling statements and vocalizations Surveillance Imposed goals Over-intrusive behaviors	The use of behaviors which are employed to impose opinions held by the coach upon his/her athletes, ignoring the athletes' own perspective. The use of constraining verbal expressions and pressuring locution employed to ensure that athletes follow the prescribed coach-centered agenda. The use of excessive monitoring and surveillance during training. The use of behaviors which are employed to impose goals, dictated by the coach, upon his/her athletes. Attempts to influence aspects of the athletes' lives which are not directly relevant to their sport participation.	A coach who views an opinion which differs from his/her own as personal criticism and who is unresponsive to his/her athletes' questions and ideas. A coach who interacts with athletes in an authoritative manner, commanding them to do things through the use of orders, directives, controlling questions and deadlines. A coach who places athletes under constant external pressure by excessively monitoring every aspect of their training session to ensure that every part is carried out as he/she believes it should be. A coach who independently decides on his/her athletes' goals without their input and then pressures athletes to achieve them. A coach who attempts to control what his/her athletes do outside of their sport (e.g., who the athlete is friends with).	Allen, Hauser, Eickholt, Bell and Conner (1994); Assor, Kaplan, Kanat-Maymon and Roth (2005); Barber (1996); Deci, Driver, Hotchkiss, Robbins and McDougal-Wilson (1993); Enzle and Anderson (1993); Flink, Boggiano and Barrett (1990); Fraser-Thomas and Côté (2009); Grolnick, Deci and Ryan (1997); Hollembeck and Amorose (2005); Kerr and Sattin (2000); Kyllo and Landers (1995); Lepper and Greene (1975); Reeve and Jang (2006); Ryan (1996); Smith, Ntoumanis and Duda (2007).

Table 1.1: (Continued)

Controlling strategy	Explanation	Examples from the sport context	Supporting literature
Intimidation behaviors Verbal abuse Yelling Physical punishment Personal attacks Humiliating/belittling	The use of power assertive techniques which force athletes to comply with coach expectations and demands.	A coach who says derogatory things to his/her athletes or engages in name-calling. A coach who shouts at athletes to intimidate them into doing the things that he/she wants. A coach who uses the threat of punishment (i.e. press-ups) to push athletes to work harder or keep athletes in line during training. A coach who emphasizes athletes' past mistakes or questions their loyalty and commitment to the team. A coach who embarrasses athletes' in front of their peers if they do not do certain things.	Baker, Côté and Hawes (2000); Barber (1996); Barber (2001); Côté, Yardley, Hay, Sedgwick and Baker (1999); D'Arripe-Longueville, Fournier and Dubois (1998); Duquin (1994); Feinstein (1989); Fraser-Thomas and Côté (2009).
Promoting ego-involvement Competition Public evaluation Normative comparisons Externally-referenced criteria for success	Employing strategies which lead athletes to view their self-worth as contingent upon demonstrating superiority against other athletes.	A coach who sets up training sessions to emphasize competition between his/her athletes. A coach who evaluates the performances of his/her athletes in front of their peers. A coach who makes explicit comparisons between his/her athletes. A coach who focuses solely on winning as a measure of success.	Ames (1992); Duda, Chi, Newton, Walling and Catley (1995); Krane, Greenleaf and Snow (1997); Nicholls (1989); Ntoumanis and Biddle (1999); Ryan (1982); Ryan and Deci (2002).

Table 1.1: (Continued)

Controlling strategy	Explanation	Examples from the sport context	Supporting literature
Conditional regard Positive regard Negative regard Negative affect-laden expressions	The provision of attention, affection and support when an athlete displays particular behaviors or attributes (positive regard), and the withdrawal of attention, affection and support when specified behaviors are not displayed (negative regard). The use of guilt-inducing statements which appeal to intrapsychic pressures and convey disappointment.	A coach who focuses more on athletes' when they are performing well and less when they are struggling. A coach who says things to make an athlete feel guilty (e.g. "you have really let me down") when the athlete does not perform well.	Assor, Roth and Deci (2004); Barber (1996); D'Arripe-Longueville, Fournier and Dubois (1998); Fraser-Thomas and Côté (2009); Hewitt and Flett (1991); Krane, Greenleaf and Snow (1997); Mageau and Vallerand (2003).

From an SDT standpoint, empirical evaluation of athletes' perceptions of their coaches' autonomy supportive *and* controlling behaviors is of value. Such an approach reflects a more comprehensive examination of the features of the social environment which may impact upon athletes' experiences of need satisfaction and need thwarting. Thus, research integrating both interpersonal styles may help to delineate the particular social conditions that facilitate versus forestall psychological and physical well/ill-being among athletes. In summary, the possibility of considering these different facets of the environment, which past research has suggested are related but distinct constructs (Blanchard et al., 2009; Pelletier et al., 2001; Tessier et al., 2008), may allow researchers to provide better predictions regarding variability in athletes' experiences and subsequent outcomes of interest.

The Conceptualization of Well/Ill-being

Well-being is a complex, multidimensional construct. Research on well-being has primarily been guided by two relatively distinct, yet overlapping, perspectives: the hedonic approach and the eudaimonic approach (Deci & Ryan, 2008). The hedonic approach essentially equates well-being with pleasure and happiness (e.g., Kahneman, Diener, & Schwarz, 1999). In contrast, the eudaimonic approach views well-being as more than just happiness and equates it with the actualization of human potential (e.g., Ryff & Singer, 1998). SDT principally embraces the eudaimonic conception, defining well-being as "optimal functioning and experience" and attempts to specify both what it means to actualize the self and the way in which this can be accomplished (Ryan & Deci, 2001, p.142).

Specifically, SDT theorizes that satisfaction of the autonomy, competence, and relatedness needs is essential for psychological growth and well-being and, therefore, the thwarting of one or more psychological need should have severe costs for mental health (Deci & Ryan, 2000). Thus, social factors which impact upon the three psychological needs (e.g.,

coaching behaviors), will, indirectly, increase or decrease athlete well/ill-being. This is because the satisfaction of psychological needs influences important organismic processes, such as intrinsic motivation and the internalization of extrinsic motivation, which are necessary for healthy functioning. Athletes exhibiting a high degree of well-being are fully functioning and experience personal growth in relation to their achievement endeavors (Ryan, Huta, & Deci, 2008). In line with its theoretical underpinnings, therefore, the present research aims to explore the social-psychological conditions and processes that facilitate versus forestall optimal functioning in athletes.

Research guided by SDT has typically supplemented measures of positive and negative affect with assessments of self-actualization, vitality, and mental health in an effort to assess well-being conceived of as healthy, congruent, and vital functioning (Ryan & Deci, 2002). Thus, although SDT posits that satisfaction of the basic psychological needs typically fosters positive affect as well as optimal functioning, it is important to differentiate between the two perspectives as conditions that foster happiness do not always also promote eudaimonic well-being (e.g., Nix, Ryan, Manly, & Deci, 1999).

Moreover, in line with the conceptualization of well-being endorsed by SDT, it is important to recognize that well-being and ill-being are not antipodal (Ryan & Deci, 2001). The absence of psychological or physical ill-health does not necessarily equate to optimal functioning, and vice versa. Thus, it is essential to examine indices of diminished functioning and ill-being (e.g., negative affect, depression, physical illness, burnout, and disordered eating) alongside indicators of wellness. The aforementioned assumption also indicates that the social-psychological conditions and processes that lead to healthy sport engagement may not be the same as those that underpin unhealthy sport participation. This highlights the importance of examining the potential antecedents of ill-being (i.e., control, need thwarting) alongside determinants of well-being (i.e., autonomy-support, need satisfaction).

Summary and Impetus for Research Program

A large body of evidence has suggested that autonomy-supportive social environments lead to high levels of need satisfaction, which, in turn, facilitate optimal functioning and well-being. This research has also indicated that low levels of autonomy support are associated with low levels of need satisfaction and that this can have a subsequent detrimental effect on health-related outcomes. However, due to the current conceptualization and measurement of interpersonal styles and psychological needs, research has not adequately investigated the potential role of controlling interpersonal behavior and need thwarting in the prediction of psychological and physical ill-being.

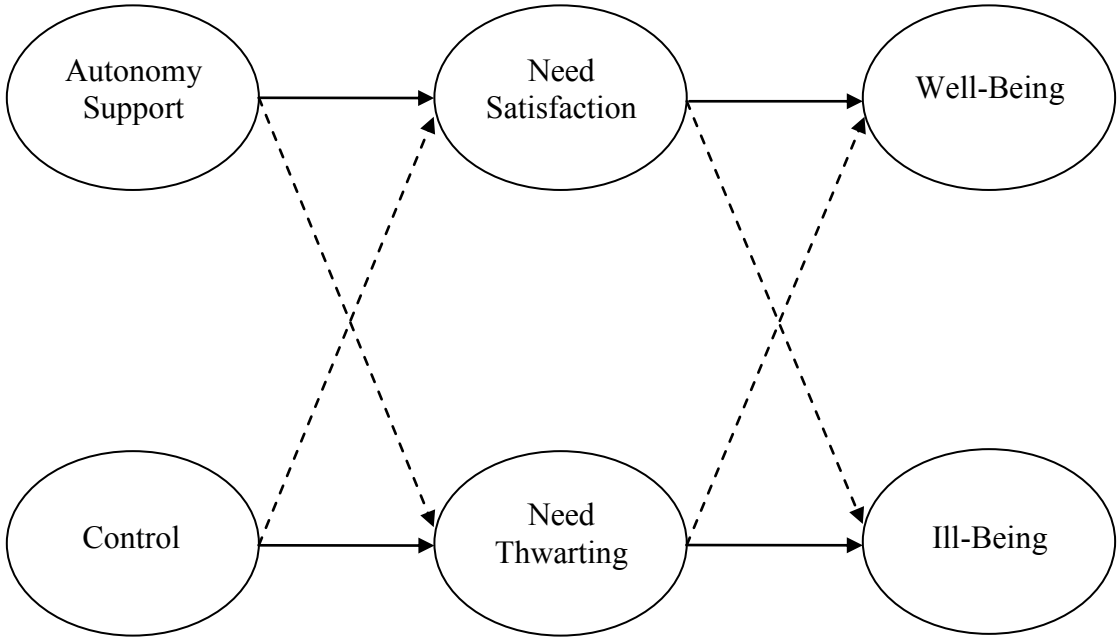

Figure 1.1: Hypothesized Relationships

Note: The hypothesized relationships between perceptions of autonomy-supportive and controlling social environments, psychological need satisfaction and need thwarting, and indices of well-being and ill-being, aligned with the tenets of the basic psychological needs theory (Deci & Ryan, 2000). Hypothesized positive and negative/non-significant relationships are represented by solid and dashed lines, respectively. Proposed positive pathways are expected to yield stronger predictions compared to cross-over pathways.

Thus, grounded within BPNT, the current research had two primary objectives. The first was to develop and validate two new SDT-based measures designed to tap these understudied

constructs; and the second was to explore whether assessing interpersonal control and need thwarting directly (as opposed to indirectly via low levels of autonomy-support and need satisfaction) would lead to better predictions regarding diminished psychological and physiological functioning. A greater, theoretically driven, insight into the mechanisms that underpin indices of maladaptive and compromised functioning, as well as optimal well-being, is important for the development, implementation, and testing of interventions which support athletes to realize their sport potential without hindering their health and well-being. With this in mind, the current thesis conducts a comprehensive examination of the conditions and processes implicated in BPNT, the central tenets of which are presented in Figure 1.1.

The present research begins by addressing the aforementioned measurement limitations. Chapter 2 outlines the development of the Controlling Coach Behaviors Scale, a multi-dimensional measure designed to tap a number of controlling motivational strategies salient in sport; and Chapter 3 describes the development of the Psychological Need Thwarting Scale, a separate measure designed to tap the experience of having one's autonomy, competence, and relatedness needs actively deprived. A number of indices deemed to represent good construct validity (see Messick, 1995) were examined through a series of studies presented in each chapter: four studies in Chapter 2 and three studies in Chapter 3.

There is, however, much debate regarding what indices constitute good construct validity. The general concept of validity can be defined as "the degree to which a test measures what it claims, or purports, to be measuring" (Brown, 1996, p. 231). Traditionally, validity has been subdivided into three categories: content, criterion-related, and construct validity. In essence, content validity includes any validity strategies that focus on the content of the items in the scale. The simplest form of content validity is face validity which refers to the extent to which a scale appears, on the surface, to measure what it is supposed to be measuring. As in the current thesis, it is best to establish face validity with the population you

wish to study (e.g., athletes). One cannot achieve other components of validity without first establishing face validity and, therefore, the development of appropriate items (e.g., via focus groups with the target population) is a vital first step in the scale development process. It is also important to consider guidelines for item wording at this stage in order to maximize the clarity, specificity, and shortness of the items (e.g., DeVellis, 1991).

Another way to establish content validity is via the use of an expert panel. In Chapters 2 and 3, experts in the field were asked to make judgements about the degree to which potential scale items matched the constructs being assessed. It is important that items are also reviewed by experts as, unlike the target population, they will be aware of nuances in the theoretical constructs under consideration. In addition, the ratings of item relevance provided by the experts can be used to compute the Content Validity Index (CVI) for each item. The CVI provides important quantitative data on the extent to which members of the expert panel perceive the item to tap the construct it has been designed to measure (Polit, Beck, & Owen, 2007). In summary, when a scale demonstrates good content validity, the items incorporated within the measure are clear and relevant to the target population and represent good indicators of the theoretical construct being operationalized.

Criterion-related validity is a way of assessing validity by comparing the results of the scale being developed with the findings of another pre-validated measure. Criterion-related validity of this sort is sometimes referred to as concurrent validity (because both tests are administered at about the same time). Another version of criterion-related validity is predictive validity, which is examined extensively in Chapter 4. Predictive validity is the degree of correlation between the scores on the scale under development and another measure that the test is designed to predict (Brown, 1996). Clearly, this is an important part of validity testing as the higher the predictive validity, the more useful the measure.

Other related aspects of validity testing include convergent and discriminant validity. Convergent validity refers to the degree to which the measure is similar to (converges on) other measures which should be similar from a theoretical perspective. In contrast, discriminant validity is designed to measure the extent to which a scale differs (diverges from) other scales designed to measure different constructs (DeVillis, 1991). Evidence of discriminant validity is obtained via the exploration of correlations between autonomy support and control in Chapter 2 and need satisfaction and need thwarting in Chapter 3.

Finally, construct validity has traditionally been defined as the experimental demonstration that a test is measuring the construct it claims to be measuring. However, all three types of validity (content, criterion-related, and construct validity) are now taken to represent different facets of a single unified form of construct validity (see Messick, 1995). In most cases, construct validity should be demonstrated from a number of perspectives. For example, another aspect of validity pertinent to the scale development process is factorial validity. Factorial validity is the degree to which the measure of a construct conforms to the theoretical definition of the construct (Hoyle & Smith, 1994). It is established by testing the fit of a theoretically based measurement model via exploratory or confirmatory factor analysis (EFA or CFA). The use of EFA, which is employed in Chapter 2, is often advocated as a precursor to CFA (which provides a more rigorous test of the factor structure) during the early stages of scale development in order to avoid misspecification of the number of factors (Kelloway, 1995). However, when there is a strong theoretical base for the hypothesized model, as in Chapter 3, the use of CFA is recommended (Williams, 1995). Testing the factorial structure of the items is an important part of the scale development process as the structure of the construct being measured must be understood before its meaning can be examined (Anderson & Gerbing, 1988). Thus, evidence of factorial validity is needed before

the construct validity of inferences from scores on the measure can be established (e.g., criterion-related validity).

In relation to the scale development process, therefore, the factorial validity of the items should be assessed (e.g., via EFA or CFA) after evidence is provided on the content validity of the items (e.g., via focus groups, expert panels, and CVIs) and before the criterion-related validity of the measure is explored (e.g., via correlation coefficients). In short, the construct validity of a new measure should be demonstrated through an accumulation of evidence provided during the scale development process. The more strategies used to demonstrate the validity of a new scale the more confidence one can have in the construct validity of the measure. As a result, a number of separate analyses were carried out in Chapters 2 and 3. Alongside demonstrating good construct validity, however, it is also important that measures are reliable. Raykov's composite reliability coefficient (RHO; Raykov, 1997) was used to assess the internal reliability of the scales employed in the current thesis. Several authors have demonstrated that Cronbach's alpha may over- or under-estimate scale reliability (e.g., Sijtsma, 2009; Huysamen, 2006). Underestimation is particularly common and, therefore, RHO is now preferred and may lead to higher estimates of true reliability (Raykov, 1997).

It is expected that valid and reliable measures of interpersonal control and psychological need thwarting will explain unique variance in negative outcomes associated with participation in competitive sport. To test this assumption, the new questionnaire measures were subsequently utilized in three studies, reported in Chapter 4, which explored the interrelations between athletes' perceptions of autonomy-supportive and controlling coaching behaviors, psychological need satisfaction and need thwarting, and optimal versus diminished functioning. The majority of research guided by BPNT in the physical activity domain has targeted indicators of psychological well-being (Gagné & Blanchard, 2007).

Therefore, in line with the proposition that well-being and ill-being are not polar opposites (Ryan & Deci, 2001), the BPNT framework was primarily employed in Chapter 4 to explore the social-psychological predictors of diminished functioning and ill-being. In particular, the utility of measuring interpersonal control and need thwarting independently of autonomy support and need satisfaction was examined. Studies 1 and 2 were cross-sectional in design. Study 1 focused primarily on the manifestation of disordered eating behaviors and depression and Study 2 examined the development of burnout symptoms and negative affect. In line with previous research, subjective vitality (Study 1) and positive affect (Study 2) were also included to gauge optimal functioning and well-being (Adie et al., 2008; Gagné et al., 2003).

Self-report measures have been the standard method of assessing psychological and physical well/ill-being in previous SDT-based research. As a consequence, very little is known regarding the extent to which the perceived satisfaction or thwarting of psychological needs holds implications for biological markers of health (or ill-health). Thus, another important aim of the current thesis was to explore the impact of psychological need thwarting on perturbed physiological functioning. In order to explore this issue, levels of salivary immunoglobulin A (S-IgA) were examined as a key immunological marker known to respond sensitively during acute psychological stress (Bosch, Ring, de Geus, Veerman, & Amerongen, 2002) in Study 2.

Exploring the psychological and physiological correlates of need thwarting (and need satisfaction) via cross-sectional investigations (Studies 1 and 2) represented an important first step in the present line of research. However, the dearth in longitudinal research examining social-environmental and motivational predictors of health among those engaged in sport has long been recognized in the SDT literature (Vallerand et al., 2008). In the realm of sport, for example, little is known regarding the degree to which perceptions of the social environment, psychological need satisfaction and need thwarting, and indicators of well/ill-being co-vary

over time. Thus, Study 3 extended the initial cross-sectional research by utilizing a diary study approach to explore whether daily variations in well/ill-being (positive and negative affect and physical symptoms) can be understood in terms of the degree to which the three psychological needs are satisfied or thwarted (via athletes' perceptions of coach behavior) during sports practice over a period of eight training days.

In line with SDT, perceptions of autonomy-supportive coach behaviors were expected to predict need satisfaction and controlling coach behaviors were hypothesized to predict need thwarting. Subsequently, optimal outcomes and well-being were expected to be more strongly predicted by need satisfaction whereas diminished functioning and ill-being were expected to be more strongly predicted by need thwarting.

CHAPTER 2.

THE CONTROLLING INTERPERSONAL STYLE IN A COACHING CONTEXT: DEVELOPMENT AND INITIAL VALIDATION OF A PSYCHOMETRIC SCALE

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Abstract

This paper outlines the development and initial validation of the controlling coach behaviors scale (CCBS), a multidimensional self-report measure designed to assess sports coaches' controlling interpersonal style from the perspective of self-determination theory (Ryan & Deci, 2002). Study 1 generated a pool of items, based on past literature and feedback from coaches, athletes, and academic experts. The factorial structure of the questionnaire was tested using exploratory and confirmatory factor analyses across Studies 2 and 3. The final CCBS model in Study 3 comprised 4 factors (controlling use of rewards, negative conditional regard, intimidation, and excessive personal control) and was cross-validated using a third independent sample in Study 4. The scale demonstrated good content and factorial validity, as well as internal consistency and invariance across gender and sport type. Suggestions for its use in research pertaining to the darker side of coaching and sport participation are discussed.

Keywords: self-determination theory, rewards, negative conditional regard, intimidation, personal control, scale development

Introduction

In the sport context, the behavior and interpersonal style of the coach can play a major role in shaping not only athletes' performance, but also the psychological experiences athletes derive from their sport participation (Vallerand & Losier, 1999). Research conducted in the coaching context has utilized instruments such as the Leadership for Sport Scale (LSS; Chelladurai & Saleh, 1980), the Coach Behaviors Assessment System (CBAS; Smith, Smoll, & Hunt, 1977), and the Coaching Behavior Scale for Sport (CBS-S; Côté, Yardley, Hay, Sedgwick, & Baker, 1999), to assess the impact of a variety of coaching behaviors (e.g., autocratic/democratic decision-making styles, personal rapport, social support, and feedback) upon outcomes such as motivation, enjoyment, and satisfaction (for a review, see Chelladurai & Reimer, 1998). This work has shown that the coaching behaviors used in youth sport have a significant influence upon the psychological experiences of young athletes (Smoll & Smith, 2002). However, Amorose and Horn (2000) have suggested that there may be other important coaching behaviors that also need to be examined. For example, previous research has shown that coaches' tendency to be autonomy-supportive or controlling can influence athlete motivation (see Mageau & Vallerand, 2003). Although there has been some research looking at autonomy-supportive coach behaviors, the empirical evidence concerning coaches' use of controlling behaviors is scarce. Therefore, the purpose of this paper is to present a scale that assesses sports coaches controlling interpersonal style from the perspective of self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002).

SDT and Interpersonal Styles

SDT suggests that a coach's behavior can be viewed in terms of two interpersonal styles: autonomy-supportive and controlling. Research in the sport and physical education literature, as well as in other life contexts, has primarily focused on (coaches') autonomy-

supportive behaviors (see Mageau & Vallerand, 2003). An autonomy-supportive style actively supports self-initiated strivings and creates conditions for athletes to experience a sense of volition, choice, and self-endorsement.

Research guided by SDT in the sport and physical education literature has demonstrated that autonomy-supportive coach behaviors (e.g., offering a rationale and acknowledging feelings) are related to more self-determined forms of motivation in athletes (Pelletier, Fortier, Vallerand, & Brière, 2001). To be self-determined means to act with a full sense of volition and choice (Ryan & Deci, 2002). Behaviors are fully endorsed by the athlete and engaged in because they are interesting (i.e., intrinsic motivation) or personally important (i.e., identified regulation). Research has consistently shown that athletes whose motivation is more self-determined tend to report positive outcomes such as enhanced persistence, effort, performance, vitality, self-esteem, and well-being (Ryan & Deci, 2002).

Specifically, SDT proposes that an autonomy-supportive interpersonal style will enhance athletes' self-determined motivation because it contributes to the satisfaction of their psychological needs. The theory (Deci & Ryan, 2000) identifies three innate psychological needs: autonomy (the degree to which individuals feel volitional and responsible for the initiation of their behavior), competence (the degree to which individuals feel able to achieve their goals and desired outcomes), and relatedness (the degree to which individuals feel connected to others in their social context). A number of studies conducted in the sport domain have supported the mediational effect of need satisfaction in the relationship between perceived autonomy-supportive coaching behaviors and athletes' self-determined motivation (e.g., Amorose & Anderson-Butcher, 2007).

In contrast, coaches exhibiting a controlling interpersonal style behave in a coercive, pressuring, and authoritarian way in order to impose a specific and preconceived way of thinking and behaving upon their athletes. As a consequence, the external pressures applied

by the coaches are perceived by their athletes to be the origin of their own behavior. Therefore, controlling coaching behaviors can induce a change in the athletes' perceived locus of causality from internal to external. The resultant loss of control undermines athletes' psychological needs and sense of self-determination, and contributes to controlled motivation (Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009; Deci & Ryan, 1985). The latter reflects motivation based upon coercive demands and reward contingencies (i.e., external regulation), or one's sense of guilt or obligation (i.e., introjected regulation). Such pressures force athletes into engaging in requested behaviors which are carried out but reflect a lack of personal endorsement.

Surprisingly, there has been very little SDT-based research on the use of controlling motivational strategies by coaches. A notable exception is a study by Pelletier et al. (2001) which assessed swimmers' perceptions of their coaches' autonomy-supportive as well as controlling interpersonal behaviors. In order to tap coaches' coercive (controlling) behaviors the researchers incorporated a four-item scale adapted from the client motivation for therapy scale (Pelletier, Tuson, & Haddad, 1997), which included items such as "My coach pressures me to do what he/she wants". In line with SDT, controlling coach behaviors predicted non-self-determined forms of regulation, particularly external regulation. Pelletier et al. (2001) also revealed a significant, but relatively small, negative association between the latent factors of swimmers' perceptions of their coach's provision of autonomy support and control (r = - 0.36), a finding which was presented as evidence that controlling behaviors are not the exact opposite of autonomy-supportive behaviors. A similar argument has been made in the parental literature (see Silk, Morris, Kanaya, & Steinberg, 2003), as well as in work investigating the interpersonal behaviors of physical education teachers (Tessier, Sarrazin, & Ntoumanis, 2008).

It follows that coaches may engage in both controlling and autonomy-supportive behaviors simultaneously and to different extents (for example, a coach may use conditional regard as a discipline strategy but may also provide a clear rationale for requested behaviors). This also means that the absence of autonomy-supportive behaviors (i.e., as indicated by low scores on an existing measure of autonomy support) cannot automatically be equated with the presence of controlling coach behaviors. The absence of autonomy support might, for instance, simply be indicative of a more neutral rather than directly controlling style. Such observations strengthen the need to understand exactly how controlling interpersonal behaviors are implicated in athletes' motivation and well-being and to identify those strategies which negatively impact upon the psychological experiences of young athletes.

SDT and Controlling Motivational Strategies

The use of controlling motivational strategies has been more extensively discussed in the parental and educational literatures. Therefore in order to identify controlling strategies that might also be employed by coaches in sports contexts, Bartholomew, Ntoumanis, and Thøgersen-Ntoumani (2009) reviewed the research conducted in each of these domains, as well as the relevant sport literature. The review yielded a large number of controlling behaviors. For the purposes of scale development, we chose those behaviors that were more distinct, likely to be exhibited in a variety of sport situations, and easily perceived by young athletes. Further, we aimed to present a measure that was not overly long and met stringent standards of adequate factorial structure.

Amongst the most prominent controlling strategies is the *controlling use of rewards*. The fact that extrinsic rewards can be used to control behavior has long been established in the psychological literature (Skinner, 1953). There is now also a considerable amount of evidence from a SDT-perspective, primarily from educational settings, to support the

undermining effect of rewards on intrinsic motivation. Deci, Koestner, and Ryan (1999) have argued that tangible rewards which are provided as an incentive for engaging with and completing a task (task-contingent rewards), or for reaching certain performance standards (performance-contingent rewards), can damage intrinsic motivation in the context of an interesting task, particularly when the rewards are expected. The undermining effect of rewards on intrinsic motivation has also been supported in the sport context (Amorose & Horn, 2000; Ryan, 1980; Vansteenkiste & Deci, 2003). In addition, the use of verbal rewards such as praise can also be controlling (Deci et al., 1999). This is because general praise which is non-contingent on performance (e.g. "Well done, you have done exactly what I told you") can be perceived as insincere and a contrived attempt to reinforce particular behaviors (for a review, see Henderlong & Lepper, 2002). Therefore, we suggest that controlling coaches may use extrinsic rewards and praise to induce engagement or persistence in certain behaviors and secure athlete compliance.

The vulnerability of the athlete to manipulative and abusive training methods increases when the value of the performance replaces the value of the individual. Pressurized sporting environments, in which the self-worth and reputation of the coach may equate to the performance of his or her athletes, can give rise to maladaptive coaching strategies. These include the use of shame, blame, and fear tactics which undermine the coach-athlete bond (Conroy & Coatsworth, 2007; Ryan, 1996). The use of conditional regard and intimidation are two controlling motivational strategies, identified in the parental literature, which employ such maladaptive tactics (see Barber, 1996).

Negative conditional regard refers to the withholding of love, attention, and affection by those in a position of authority when desired attributes or behaviors are not displayed by their subordinates (Assor, Roth, & Deci, 2004). In the parental literature, conditional regard has been identified as a socialization technique shown to promote introjected regulation

(Assor et al., 2004). Although children do enact requested behaviors, they do so to avoid feelings of guilt or shame. Qualitative research suggests that some coaches also use negative conditional regard, displaying complete indifference towards athletes after they have lost a competition, in an attempt to increase future effort and exhort higher performance (D'Arripe-Longueville, Fournier, & Dubois, 1998; Fraser-Thomas & Côté, 2009). Mageau and Vallerand (2003) proposed that because conditional regard makes a coach's attention and acceptance highly contingent upon his or her athletes emitting appropriate thoughts and behaviors, athletes may come to see their own thoughts and feelings as a threat to the emotional bond they share with their coach. Thus, athletes may relinquish their autonomy in order to maintain a satisfactory relationship with their coach.

Behaviors which are used to *intimidate* involve the display of power-assertive strategies which are designed to humiliate and belittle, such as verbal abuse and threats, yelling, and the threat or use of physical punishment. All of these strategies can be used to control behavior as they foster external regulation by creating pressure from outside to behave in certain ways in order to avoid external punishment (Ryan, 1982). Research carried out in the sport context suggests that coaches can engage in intimidating behaviors which have a negative impact upon the psychological experiences of athletes (D'Arripe-Longueville et al., 1998). For example, athletes who report feeling intimidated and fearful of their coach also report higher levels of cognitive and somatic sport anxiety (Baker, Côté, & Hawes, 2000).

In addition, Barber (2001) proposed that the use of *excessive personal control* by parents can compromise children's perceptions of autonomy and undermine their need for relatedness (Allen, Hauser, Eickholt, Bell, & O'Conner, 1994; Kerr & Sattin, 2000). Excessive personal control involves the use of intrusive monitoring (e.g., the extent to which parents know/control what their child is doing during his/her free time) and the imposition of strict limits (Barber, 1996; Kerr & Stattin, 2000). Evidence suggests that coaches can also

exert excessive personal control and engage in over-intrusive behaviors such as attempting to interfere in aspects of the athletes' lives which are not directly associated with their sport participation, for example by banning athletes from playing other sports or from staying out late (Fraser-Thomas & Côté, 2009). As such, athletes may experience extreme pressure from coaches to prioritize their sport involvement over other important aspects of their life, such as spending time with family and friends. In extreme cases the athletes' whole life is expected to revolve entirely around their sport participation (Scanlan, Stein, & Ravizza, 1991; Ryan, 1996).

Finally, the parental literature also indicates that parent-child interactions which *judge or devalue* interfere with the development of individuality. When parents consistently dismiss their children's own perspective and impose values and ideals upon them, the latter subsequently have difficulty recognizing their own uniqueness or self-worth and become unwilling to trust their own ideas for fear of damaging their relationship with their caregiver (Barber, 1996). Subsequently, children may comply with the advocated values and behaviors but this is primarily to reduce the possibility of value-related conflict, as well as feelings of rejection, anxiety or guilt associated with such conflict (Tangney & Dearing, 2002). Thus behavior is controlled (Ryan & Deci, 2002). It is likely that the same situation will occur when coaches dismiss their athletes' perspectives and judge and devalue them by treating them not as individuals with their own thoughts and feelings, but as objects that should be controlled to obtain certain outcomes (i.e., winning). In such circumstances, athletes may relinquish their autonomy and could come to depend upon their coach in a way that thwarts their own psychological needs.

Although existing questionnaire measures may contain items or subscales which have the potential to tap aspects of maladaptive coaching strategies (e.g., autocratic coach behaviors, such as not compromising on a point [LSS], punishment-oriented feedback

[CBAS], and the use of fear [CBS-S]), they are scattered and do not provide a comprehensive picture of a controlling interpersonal style. As far as we are aware, there has been no systematic psychometric attempt to develop and validate a measure of the controlling motivational strategies employed by coaches in the sport context (or other persons situated in a position of authority in other life contexts). In order to address this significant gap in the literature, the present paper outlines the development of a SDT-based multidimensional questionnaire designed to assess coaches' controlling interpersonal style by tapping the extent to which young athletes perceive their coach to engage in a variety of controlling behaviors during coach-athlete interactions. We hope that such a scale will facilitate research into the darker side of coaching and sports participation.

Present Research

A series of four studies were carried out in a youth sport context to develop and confirm the validity and reliability of the controlling coach behaviors scale (CCBS). The research focused on youth sport because approximately 33% of young athletes discontinue their involvement with competitive sport each year (Petlichkoff, 1996), some due to pressures imposed by an over-demanding (and/or disliked) coach (Butcher, Lindner, & Johns, 2002). Gould (2007) has also suggested that these negative factors have less impact upon the participation of older athletes. It is younger athletes who are more likely to report a range of negative psychological outcomes (e.g., damaged self-esteem, anxiety, and depression) as a result of the often extreme mental and physical demands placed upon them in the sport context (Brustad, 1988; Ommundsen & Vaglum, 1991). This makes youth sport an obvious setting in which to examine controlling motivational strategies.

Study 1

Study 1 aimed (a) to gather relevant views on coaching environments and gauge how applicable the controlling strategies identified in the literature review were to the sport context, and (b) to create and provide evidence for the content validity of a pool of items designed to tap sport coaches' controlling interpersonal behaviors.

Method

Participants

The sample (N = 23) comprised 6 British coaches and 17 British athletes. The coaches were drawn from three sports, athletics (n = 1), swimming (n = 3), and squash (n = 2). The athletes were 7 males and 10 females aged between 12 and 17 years old (M = 14.41; SD = 1.42). These athletes represented three sports, athletics (n = 5), swimming (n = 7) and dancing (n = 5), and were competing at regional (n = 6) or national (n = 11) level at the time of the study. Their competitive experience ranged from 3 to 10 years (M = 6.75; SD = 2.11) and they had spent between 6 months and 10 years (M = 3.41 years; SD = 3.55) working with their current coach. A panel of 9 academic experts in SDT-based research (who published in the sport, parental, and educational literatures) were also consulted to review the content validity of the items from a theoretical perspective.

Procedure

Ethical approval was obtained from the investigators' University ethics committee for each of the four studies reported in this paper. Study 1 consisted of six coach interviews and three athlete focus groups. After the interviews and focus groups, an online survey was also set up to obtain additional feedback (on the resultant items) from academic experts.

Each coach interview lasted approximately 60 min. A semi-structured interview schedule was used to facilitate general discussion relating to the positive and negative motivational strategies the coaches used themselves whilst coaching, as well as those they had seen or heard of being utilized by other coaches. The purpose of these interviews was to identify the most frequently used controlling coaching strategies. The athlete focus groups were all approximately 90 min in length. Athletes were provided with lay definitions of various controlling motivational strategies and asked, by considering their own sporting experiences, to comment upon the relevance of the identified behaviors during guided group discussion. Afterwards, an initial pool of 53 items (based upon a thorough review of the controlling motivational strategies identified in the literature, previous quantitative measures, and the personal experiences of the principal investigator) was presented to the athletes and, using a dichotomous scale (*applicable* versus *inapplicable*), they were instructed to assess the relevance of each item to the sport context. For the applicable items, athletes were also asked to rate their clarity using a 7-point scale (1 = *not at all clear;* 7 = *extremely clear*). The athletes' anonymous responses were then discussed at a group level and athletes were encouraged to suggest additional items or alternative wordings for items which were perceived to be problematic (i.e., items that were rated below five).

Subsequently an online questionnaire was set up and academic experts worldwide were recruited, via an invitational email, to review the pool of items established following the interviews and focus groups. The experts were provided with definitions of the controlling strategies and, using a 5-point scale (1 = *poor match;* 5 = *excellent match*), were asked to indicate the extent to which they perceived each of the items to tap the controlling motivational strategies we had assigned to them. They were also asked to make suggestions for alternative items or additional strategies.

Results and Discussion

The coaches and athletes interviewed in this study believed that all five of the controlling strategies we identified (i.e., the controlling use of rewards, negative conditional regard, intimidation, excessive personal control, and judging and devaluing) occurred frequently in the sport context. Although the interview process did not result in the identification of any new controlling motivational strategies, four new items were added to reflect additional interpersonal behaviors suggested by the coaches and athletes. The athletes also evaluated the relevance and clarity of each item. As a result, 16 items were deemed inapplicable to the sport context and were thus eliminated, and 11 items were rewritten in order to improve their clarity and broaden their applicability across sports. The resultant pool of 41 items was then examined by the academic experts. The ratings provided by the experts were used to calculate the Content Validity Index (CVI; Lynn, 1986) for each item and inform final decisions about whether to retain, eliminate, or revise the items. The CVI was calculated by dividing the number of experts who gave a rating of four, five, or six (i.e., rated the item as a good match, a very good match, or an excellent match to the identified controlling motivational strategy) by nine, the number of experts on the panel. A table containing the CVI for each item can be found in the appendix. Lynn (1986) suggested that when expert panels consist of six or more reviewers, CVIs in the vicinity of .80 are acceptable (see also Polit, Beck, & Owen, 2007). Twelve items displayed CVIs of .67 (6/9) or below and were thus deemed to be invalid. Of these items, eight were eliminated and four were revised in line with the suggestions made by the academic experts. All of the remaining items exhibited CVIs ranging from .78 (7/9) to 1.00 (9/9) and were thus retained. However the wording of nine items was slightly modified to ensure that the items clearly tapped overly controlling coach behaviors, as opposed to behaviors that could be elicited by coaches characterized as ‘caring’ (a concern raised by one of the expert reviewers). These modifications produced a reduced

pool of 33 items which tapped a variety of sports coaches' controlling interpersonal behaviors from a theoretical perspective, and were deemed to be clear and applicable to the sport context by athletes and coaches.

Study 2

The next step in the measurement development process was to administer a questionnaire containing the 33 items to a large sample in order to test the factorial composition of the items generated in Study 1 via exploratory factor analysis (EFA). The use of EFA is advocated during the early stages of scale development in order to avoid misspecification of the number of factors and to maximize the convergent and discriminant validity of the items constituting each factor (Gerbing & Hamilton, 1996; Hurley el al., 1997; Kelloway, 1995).

Method

Participants

The sample (N = 264) comprised 143 males and 115 females aged between 12 and 17 years old (M = 14.32; SD = 1.68); the remaining athletes did not report their gender. The athletes were involved in both individual sports (n = 220) such as athletics, swimming, rowing, and squash, and team sports (n = 44) such as football and cricket. They were competing at club (n = 55), county (n = 53), regional (n = 57), national (n = 79), or international (n = 20) level at the time of the study. The athletes' competitive experience ranged from 1 to 11 years (M = 4.92; SD = 2.60) and they had spent between 1 month and 8 years (M = 2.13 years; SD = 1.66) working with their current coach.

Measure and Procedure

At the beginning of the questionnaire, written instructions requested that the athletes should consider their general experiences with their current coach. They were told that each coach has a different coaching style and that no one style is necessarily better than another. The stem used in the questionnaire was "please indicate how much you agree or disagree with each statement" and, so that the new measure corresponded with existing measures of need satisfaction, the 33 items generated in Study 1 were assigned a 7-point scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Athletes were recruited via club coaches and sports events organizers. The purpose and nature of the study was explained and athlete, coach, and parental consent were obtained. The primary researcher personally supervised the questionnaire completion (which took place either after a normal training session or before an event/competition) for 65.6% of the athletes involved in this study. Standardized instructions were given by the same researcher and athletes were reassured that their responses would be confidential and anonymous (all coaches were asked to leave the area whilst athletes completed the questionnaire). Such confidentiality assurances have been shown to improve the response rate for sensitive data (Ransdell, 1996). For athletes who could only be reached by mail, the researcher sent enveloped questionnaire packs, including written instructions and consent forms, to a contact at the club (34.4% of athletes were reached this way). Athletes were then allowed to take the questionnaire away with them and return it to the contact person (in a sealed envelope) who posted the questionnaires back to the researcher.

Results and Discussion

An EFA was conducted on the 33 items to identify underlying dimensions of controlling coach behavior. Principal axis factor analyses were carried out with a direct oblimin rotation. An oblique rotation was used since it was hypothesized that the underlying dimensions of a controlling interpersonal style would be interrelated. Factor extraction was based on an eigenvalue value of > 1.0 and a confirmatory inspection of the scree plot. In terms of interpreting the extracted factors, item loadings of .30 and above were considered satisfactory (Kline, 1994). All items with primary factor loadings of < .30 and all items with high cross-loadings (i.e. secondary loadings > .30) were deleted.

Employing the aforementioned criteria in examining the pattern matrix, 17 items were removed following a sequence of factor analyses. The final EFA solution contained 16 items which loaded on to five factors and accounted for 43.68% of the item variance (see Table 2.1 for item means, standard deviations, factor loadings, factor correlations and internal consistency estimates).

Table 2.1: Item Means, Standard Deviations, Factor Loadings, Skewness and Kurtosis Values Following Exploratory Factor Analysis (Study 2)

CCBS Subscale and item	*M*	*SD*	F1	F2	F3	F4	F5	Skewness	Kurtosis
Controlling use of rewards									
My coach tries to motivate me by promising to reward me if I do well	3.32	1.76	*.34*	.03	.01	.10	.01	0.44	-0.64
The only reason my coach rewards/praises me is to make me train harder	3.28	1.67	*.38*	.14	.08	.10	.16	0.33	-0.71
My coach only uses rewards/praise so that I stay focused on tasks during training	3.17	1.48	*.72*	.04	.03	.24	.04	0.39	-0.36
Negative conditional regard									
My coach is less friendly with me if I don't make the effort to see things his/her way	3.74	1.70	.06	*.64*	.07	.08	.11	1.00	-0.77
My coach is less supportive of me when I am not training and competing well	3.30	1.83	.07	*.44*	.00	.16	.25	0.40	-0.86
My coach pays me less attention if I have displeased him/her	3.61	1.73	.09	*.60*	.07	.08	.21	0.18	-0.81
Intimidation									
My coach shouts at me in front of others to make me do certain things	2.50	1.84	.07	.09	*.56*	.03	.05	1.03	-0.11
My coach uses the threat of punishment to keep me in line during training	2.43	1.76	.07	.01	*.79*	.11	.03	1.08	0.06
My coach intimidates me into doing the things that he/she wants me to do	2.35	1.63	.08	.08	*.52*	.25	.07	1.07	0.25
Excessive personal control									
My coach expects me to put my sport before other important parts of my life	3.79	1.90	.03	.23	.05	*.39*	.08	0.07	-1.07
My coach tries to control what I do during my free time	2.19	1.53	.09	.09	.02	*.60*	.06	1.22	0.58
My coach tries to interfere in aspects of my life outside of my sport	2.27	1.56	.04	.04	.15	*.65*	.05	1.14	0.47
Judging and devaluing									
My coach evaluates me negatively if I perform badly	3.41	1.77	.03	.11	.06	.07	*.64*	0.29	-0.91
My coach is very judgmental if I am not competing well	3.26	1.73	.12	.07	.07	.03	*.68*	0.46	-0.53
My coach is overly critical of me when he/she provides me with feedback	2.95	1.51	.12	.12	.04	.10	*.60*	0.61	-0.09
My coach undervalues my contribution to the team	2.50	1.55	.16	.05	.13	.07	*.39*	1.05	0.58

Factor correlations and internal consistency	1	2	3	4	5
1. Controlling use of rewards	.53				
2. Negative conditional regard	.14	.70			
3. Intimidation	.31	.36	.69		
4. Excessive personal control	.16	.31	.28	.64	
5. Judging and devaluing	.25	.46	.44	.46	.74

Note: F1 = Controlling use of Rewards, F2 = Negative conditional regard, F3 = Intimidation, F4 = Excessive personal control, F5 = Judging and devaluing. Numbers in italics indicate primary loadings. Composite reliability coefficients are presented on the diagonal of the factor correlation matrix.

Analysis of item content suggested that the extracted items could be represented by five dimensions. Factor 1, the *Controlling use of Rewards*, consisted of three items that reflected coaches' use of extrinsic rewards and praise to induce athlete engagement or persistence in certain behaviors. Factor 2, the use of *Negative Conditional Regard*, consisted of three items that reflected cases where coaches withhold attention and support from athletes who do not display desired attributes and behaviors. Factor 3 was labeled *Intimidation* and consisted of three items which reflected the strategies coaches may use to intimidate their athletes into emitting requested behaviors. Factor 4, the use of *Excessive Personal Control*, consisted of three items which reflected coaches' over-intrusive behaviors. Finally, Factor 5, *Judging and Devaluing*, consisted of four items reflecting the behaviors coaches may engage in which actively undermine athletes' feelings of self-worth. The factor correlations were small to moderate and ranged from $r = .14$ to $r = .46$ (see Table 2.1).

Once we had determined the underlying dimensions of controlling coach behavior, we carried out item analysis in order to assess the homogeneity of the items representing each factor (DeVellis, 1991). To assess the internal reliability of each factor we used the following criteria: (a) an inter-item correlation between $r = .20$ and $r = .70$, and (b) a minimum corrected item-total correlation of $r = .30$ (Kidder & Judd, 1986). Item analysis identified one of the reward items as particularly problematic ("My coach tries to motivate me by promising to reward me if I do well"). Due to documented shortcomings (see Sijtsma, 2009; Huysamen, 2006) associated with Cronbach's alpha (Cronbach, 1951), Raykov's composite reliability coefficient (RHO; Raykov, 1997) was employed to assess the internal reliability of each factor. Despite the remaining items satisfying criteria (a) and (b), the controlling use of rewards and excessive personal control factors displayed low internal reliability (RHO = .53 & .64, respectively). The composite reliability coefficient for the intimidation factor was also relatively low (RHO = .69).

Despite the low estimates of internal reliability, the extracted factors appeared to represent salient controlling motivational strategies identified in the literature and considered to be important by athletes, coaches, and SDT experts in Study 1. Conceptually, therefore, the five factors appeared sound and thus we believed that it would be premature to delete any of the extracted factors at such an early stage of psychometric testing. Therefore, in order to increase the internal reliability estimates, the decision was made to rephrase some of the existing items and write additional items so that the factor structure of the questionnaire could be tested again in Study 3, using an independent sample. We included three additional items which we hoped would better tap the controlling use of rewards by coaches and added one additional item to each of the other three-item factors. Thus, we ended up with a 22-item questionnaire consisting of 16 existing items and 6 new items.

Study 3

The purpose of Study 3 was to use confirmatory factor analysis (CFA) to cross-validate the findings of the EFA and further refine the structure of the scale if necessary. Study 3 also examined whether the resultant CCBS scores were invariant across gender and sport type (team and individual) and explored the relationship between controlling and autonomy-supportive coach behaviors.

Method

Participants

The sample (N = 303) comprised 169 males and 122 females aged between 12 and 17 years old (M = 14.79; SD = 1.60); 12 athletes did not report their gender. The athletes represented individual (n = 177) and teams sports (n = 126) similar to those sampled in

Study 2. They were competing at club (n = 72), county (n = 50), regional (n = 31), national (n = 102), or international (n = 34) level at the time of the study. The remaining athletes did not report their competition level. Competitive experience ranged from 1 to 13 years (M = 5.23; SD = 2.91), and the athletes had spent between 1 month and 11 years (M = 2.27 years; SD = 1.83) working with their current coach.

Measures and Procedure

The CCBS, as described in Study 2, was administered. The scale consisted of 22 items representing the five factors of the Controlling use of Rewards, Negative Conditional Regard, Intimidation, Excessive Personal Control, and Judging and Devaluing. Athletes' perceptions of their coach's autonomy-supportive behaviors were also measured in the current study using six items taken from the Health-Care Climate Questionnaire (HCCQ; Williams, Grow, Freeman, Ryan, & Deci, 1996) and modified for their use in sport (e.g., "I feel that my coach provides me with choices and options"). The modified scale has demonstrated good psychometric properties in samples of adolescent athletes (e.g., Reinboth, Duda, & Ntoumanis, 2004). Participant recruitment and data collection procedures remained the same as previously outlined in Study 2. Of the sampled athletes, 53.1% completed the questionnaire supervised and 46.9% were reached by mail.

Data Analysis

To cross-validate the findings of the EFA, the 22 items were analyzed via CFA using EQS 6.1 (Bentler & Wu, 2002). CFA is considered a robust test of factorial validity (Kline, 1994). No cross-loadings of items were allowed, all latent factors were inter-correlated, and one item from each factor was fixed to 1.0 for purposes of identification and latent variable scaling. The adequacy of the model to the data was evaluated using multiple fit indices, such

as the chi-square statistic, the comparative fit index (CFI; Bentler, 1990), the Bentler-Bonett non-normed fit index (NNFI; Bentler & Bonett, 1980), the standardized root mean residual (SRMR; Hu & Bentler, 1998), and the root mean square error of approximation (RMSEA; Steiger, 1990). Although values indicative of acceptable model fit remain controversial (Markland, 2007; Marsh, Hau, & Wen, 2004), it is typically accepted that an excellent fit between the hypothesized model and the data are indicated by values of around .95 and above for the NNFI and CFI, and SRMR and RMSEA values of .08 and .06 or less, respectively (Hu & Bentler, 1999). In addition, standardized factor loadings, standardized residuals, and modification indices were analyzed to screen for model misspecification. Items with standardized factor loadings below .40 or a large standardized residual (>|2.00|) were considered for deletion. Discriminant validity was also investigated through inspection of the factor correlations, and the tenability of a hierarchical model and an alternative one-factor model were tested. Further data analysis also calculated scale descriptives and internal reliability estimates. The resultant CCBS scores were then tested to ascertain whether they would be invariant across gender and sport type (team/individual). Finally, the correlations between athletes' perceptions of their coach's controlling and autonomy-supportive behaviors were obtained.

Results and Discussion

Distribution of the CCBS Items

The univariate skewness values of the CCBS items ranged from .49 to 1.51 and the univariate kurtosis values ranged from -.95 to 1.51, suggesting that all items were within acceptable ranges (e.g., Chou & Bentler, 1995; Kline, 1998; West, Finch, & Curran, 1995). However, examination of Mardia's normalized coefficients of multivariate kurtosis indicated that the data departed from multivariate normality, (e.g., for the five-factor model the coefficient was 36.88). Subsequently, and in line with the recommendations of Chou, Bentler, and Satorra (1991), all CFAs were conducted using the robust maximum likelihood (ML) estimation procedure. A robust χ^2 statistic called the Satorra-Bentler scaled statistic (S-Bχ^2; Satorra & Bentler, 1994) and robust parameter standard errors (Bentler & Dijkstra, 1985) are produced using this method to correct for non-normality in large samples (200-500 cases; West, Finch, & Curran, 1995).

CFA Analysis

Results of the CFA suggested a relatively good fit to the data, but indicated room for improvement: S-Bχ^2 (179) = 330.65, $p < .001$, RCFI = .93, RNNFI = .92, SRMR = .06, RRMSEA = .05. Large modification indices suggested that the residuals associated with two items (one tapping the controlling use of rewards and another tapping excessive personal control) correlated with those of other items. In addition, a second reward item exhibited a low standardized factor loading. Excluding these three items improved the fit of the model to the data: S-Bχ^2 (142) = 229.12, $p < .001$, RCFI = .96, RNNFI = .95, SRMR = .05, RRMSEA = .05. However, an inspection of the factor correlations revealed that the judging and

devaluing factor correlated highly with three of the other four factors (conditional regard r = .88, intimidation r = .82, excessive personal control r = .72).

As a result of the high correlations, the decision was made to remove the judging and devaluing factor and subsequently test a four-factor model, comprising of the Controlling use of Rewards, Negative Conditional Regard, Intimidation, and Excessive Personal Control.[3] The final 15-item four-factor model also produced an excellent fit to the data: S-Bχ^2 (84) = 144.38, $p < .001$, RCFI = .96, RNNFI = .95, SRMR = .05, RRMSEA = .05. The model included three 4-item factors (Controlling use of Rewards, Negative Conditional Regard, and Intimidation) and one 3-item factor (Excessive Personal Control). All factor correlations remained significant but below .70, and all four factors demonstrated adequate internal consistency with composite reliability coefficients ranging from .74 to .85. Table 2.2 displays item means, standard deviations, standardized factor loadings, and residuals for this solution, as well as factor correlations and internal consistency estimates. In addition to the composite reliability coefficient, inter-item correlations and minimum corrected item-total correlations were used to assess internal reliability. All of the items included in the final CFA solution met the aforementioned criteria outlined by Kidder and Judd (1986).

[3] As suggested by a second anonymous reviewer, it may be useful for future research to re-evaluate the decision made in the current paper to remove the judging and devaluing factor from the CCBS due to high interfactor correlations (the items for this factor can be found in Table 2.1). At the request of the reviewer, a second hierarchical model was tested which also included the judging and devaluing factor. This five first-order factor hierarchical model also produced a good fit to the data (S-Bχ^2 (148) = 244.76, $p < .001$, RCFI = .95, RNNFI = .94, SRMR = .05, RRMSEA = .05), indicating the need for future research on this issue.

Table 2.2: Item Means, Standard Deviations, Factor Loadings, Residuals, Skewness and Kurtosis Values Following Confirmatory Factor Analysis (Study 3)

CCBS subscale and item	*M*	*SD*	Loading	Residual	Skewness	Kurtosis
Controlling use of rewards						
My coach tries to motivate me by promising to reward me if I do well	2.46	1.63	.59	.81	1.08	0.36
My coach only rewards/praises me to make me train harder	3.02	1.67	.48	.88	0.60	-0.44
My coach only uses rewards/praise so that I stay focused on tasks during training	2.43	1.47	.84	.55	0.88	-0.03
My coach only uses rewards/praise so that I complete all the tasks he/she sets in training	2.42	1.43	.80	.60	0.89	0.09
Negative conditional regard						
My coach is less friendly with me if I don't make the effort to see things his/her way	3.17	1.90	.64	.77	0.49	-0.95
My coach is less supportive of me when I am not training and competing well	2.68	1.71	.77	.64	0.86	-0.19
My coach pays me less attention if I have displeased him/her	2.76	1.77	.87	.49	0.81	-0.41
My coach is less accepting of me if I have disappointed him/her	2.57	1.59	.84	.54	0.96	0.18
Intimidation						
My coach shouts at me in front of others to make me do certain things	2.23	1.71	.71	.70	1.40	0.99
My coach *threatens to punish me* to keep me in line during training	2.05	1.44	.49	.87	1.36	0.93
My coach intimidates me into doing the things that he/she wants me to do	1.90	1.35	.66	.75	1.51	1.42
My coach embarrasses me in front of others if I do not do the things he/she wants me to do	2.12	1.53	.83	.55	1.39	1.12
Excessive personal control						
My coach expects my whole life to centre on my sport participation	2.48	1.65	.74	.67	1.05	0.20
My coach tries to control what I do during my free time	1.95	1.38	.77	.64	1.50	1.51
My coach tries to interfere in aspects of my life outside of my sport	1.98	1.36	.81	.59	1.45	1.35

Factor correlations and internal consistency	1	2	3	4
1. Controlling use of rewards	.74			
2. Negative conditional regard	.55	.85		
3. Intimidation	.58	.67	.76	
4. Excessive personal control	.39	.60	.59	.79

Note: All factor loadings are statistically significant ($p < .05$). Words in italics represent new items/rephrased items from Study 2. Composite reliability coefficients are presented on the diagonal of the factor correlation matrix.

In addition, a hierarchical model was tested in which the four first-order latent factors were represented by one higher order latent factor. The fit of the hierarchical measurement model was similar to that of the first-order model: S-Bχ^2 (86) = 147.50, $p < .001$, RCFI = .96, RNNFI = .95, SRMR = .06, RRMSEA = .05, and demonstrated good internal reliability (RHO = .92). The implications of this finding will be discussed later. A one-factor model was also tested and this produced a very poor fit to the data: S-Bχ^2 (90) = 461.27, $p < .001$, RCFI = .76, RNNFI = .71, SRMR = .92, RRMSEA = .11, indicating that a controlling interpersonal style is a multidimensional construct represented by a number of separate, but related, controlling coaching strategies.

Invariance Testing

A sequential model testing approach was employed via multisample CFA to examine whether the CCBS displayed invariance across gender and sport type (team/individual). In relation to gender, a baseline model was established and then two increasingly constrained models were specified to examine the equality of measurement (i.e., factor loadings) and structural parameters (i.e., factor covariances) across male and female samples (see Byrne, 2006). The procedure was then repeated to test for invariance across athletes involved in team and individual sports. The decision was made not to test for the equality of the factor variances as Byrne suggests that these parameters are typically of little interest: "from a construct-validity perspective, we test only for the invariance of the factor covariances" (Byrne, 2006, p. 242). The relative goodness of fit between increasingly constrained models was analyzed via the S-Bχ^2 difference test (Satorra & Bentler, 2001) using the "sbdiff" software (Crawford, 2007). However as the χ^2 statistic is influenced by sample size, the recommendations of Cheung and Rensvold (2002) were also adopted and a change in CFI of $\leq .01$ was considered indicative of model invariance.

Table 2.3 displays the goodness of fit indices for all multigroup models tested during the invariance analysis. Although the change in S-Bχ^2 was significant when the factor covariances were also constrained to be equal across male and female samples, the change in CFI was < .01, thus supporting the scale's factorial invariance across gender. A nonsignificant ΔS-Bχ^2 and a change in CFI of < .01 during both stages of the second analysis, suggested that the factor loadings and factor covariances were also invariant across sport type. These analyses provide initial support for the factorial invariance of the CCBS measurement model. Multisample CFA procedures also revealed that the final CCBS model was invariant across the two data collection methods, suggesting that athletes responded in a similar fashion independent of whether they completed the questionnaire supervised or unsupervised (see Table 2.3).

Correlation Analysis

Athletes' perceptions of their coaches' autonomy-supportive behaviors (RHO = .89, *M* = 5.28, *SD* = 1.18) were correlated with the four CCBS subscales and an overall score of controlling behavior. The results revealed small to moderate negative correlations (controlling use of rewards *r* = -.18, negative conditional regard *r* = -.50, intimidation *r* = -.38, excessive personal control *r* = -.36, overall CCBS score *r* = -.46).

Table 2.3: Fit Indices for Invariance Analysis (Study 3)

Model	S-B χ^2	*d.f.*	*p*	RCFI	RNNFI	SRMR	RRMSEA	ΔS-Bχ^2	Δ *d.f.*	*p*	ΔRCFI
Gender											
1. Unconstrained	248.25	168	.000	.942	.927	.078	.056				
2. Constrained factor loadings	257.94	179	.000	.943	.933	.082	.055	8.14	11	.701	.001
3. Constrained factor covariances	273.66	185	.000	.936	.927	.099	.058	15.15	6	.019	.007
Sport type											
1. Unconstrained	248.46	168	.000	.941	.926	.073	.056				
2. Constrained factor loadings	259.03	179	.000	.941	.931	.078	.055	9.12	11	.611	.000
3. Constrained factor covariances	269.61	185	.000	.938	.929	.091	.055	10.79	6	.095	.003
Data collection method											
1. Unconstrained	240.49	168	.000	.948	.935	.070	.054				
2. Constrained factor loadings	258.97	179	.000	.943	.933	.081	.054	18.95	11	.062	.005
3. Constrained factor covariances	269.37	185	.000	.940	.931	.097	.055	10.35	6	.111	.003

Note: S-Bχ^2 = Satorra-Bentler scaled chi-square statistic, RCFI = robust comparative fit index, RNNFI = robust non-normed fit index, SRMR = standardized root mean residual, RRMSEA = robust root mean square error of approximation. ΔS-B χ^2 = Satorra-Bentler scaled chi-square difference, Δ *d.f.* = difference in degrees of freedom, ΔRCFI = change in RCFI, when the fit of the more constrained model is compared to that of the previous less constrained model (Cheung & Rensvold, 2002).

Study 4

The purpose of Study 4 was to use another independent sample to cross-validate the four-factor model supported in Study 3 via CFA.

Method

Participants

The sample (N = 189) comprised 50 males and 139 females aged between 12 and 17 years old (M = 14.64; SD = 1.74). The athletes were involved in both individual (n = 117) and team sports (n = 72) similar to the sports sampled in the previous studies. The athletes were competing at club (n = 41), county (n = 73), regional (n = 25), national (n = 38), or international (n = 12) level at the time of the study. Competitive experience ranged from 1 to 11 years (M = 4.57; SD = 2.14). The athletes had spent between 1 month and 10 years (M = 2.22 years; SD = 2.00) working with their current coach.

Measures and Procedure

The CCBS, as designed in Study 3, was administered. The way in which the participants were recruited and the data collection procedure remained the same as those outlined in the previous studies. Athletes completed the questionnaire supervised (71.9%) or were reached by mail (28.1%).

Table 2.4: Item Means, Standard Deviations, Factor Loadings, Residuals, Skewness and Kurtosis Values Following Confirmatory Factor Analysis (Study 4)

CCBS subscale and item	*M*	*SD*	Loading	Residual	Skewness	Kurtosis
Controlling use of rewards						
My coach tries to motivate me by promising to reward me if I do well	2.88	1.68	.41	.91	0.75	-0.34
My coach only rewards/praises me to make me train harder	2.61	1.61	.76	.65	0.89	-0.05
My coach only uses rewards/praise so that I stay focused on tasks during training	3.37	1.71	.49	.87	0.43	-0.63
My coach only uses rewards/praise so that I complete all the tasks he/she sets in training	2.47	1.60	.89	.46	1.00	0.05
Negative conditional regard						
My coach is less friendly with me if I don't make the effort to see things his/her way	3.35	1.70	.61	.79	0.44	-0.74
My coach is less supportive of me when I am not training and competing well	3.22	1.66	.65	.76	0.40	-0.94
My coach pays me less attention if I have displeased him/her	3.18	1.70	.82	.57	0.50	-0.71
My coach is less accepting of me if I have disappointed him/her	2.78	1.69	.89	.46	0.80	-0.37
Intimidation						
My coach shouts at me in front of others to make me do certain things	2.55	1.62	.62	.79	1.01	0.19
My coach threatens to punish me to keep me in line during training	1.89	1.41	.72	.70	1.83	2.90
My coach intimidates me into doing the things that he/she wants me to do	2.28	1.59	.71	.70	1.27	0.93
My coach embarrasses me in front of others if I do not do the things he/she wants me to do	2.20	1.74	.82	.57	1.36	0.60
Excessive personal control						
My coach expects my whole life to centre on my sport participation	2.74	1.76	.83	.57	0.84	-0.33
My coach tries to control what I do during my free time	2.22	1.52	.77	.64	1.25	0.85
My coach tries to interfere in aspects of my life outside of my sport	2.15	1.69	.87	.50	1.48	1.08

Factor correlations and internal consistency	1	2	3	4
1. Controlling use of rewards	.74			
2. Negative conditional regard	.61	.84		
3. Intimidation	.70	.78	.81	
4. Excessive personal control	.49	.66	.67	.84

Note: All factor loadings are statistically significant ($p < .05$). Composite reliability coefficients are presented on the diagonal of the factor correlation matrix.

Results and Discussion

The 15-item four-factor solution was analyzed via CFA using EQS 6.1 (Bentler & Wu, 2002). The model displayed an excellent fit to the data: S-Bχ^2 (84) = 120.94, $p < .05$, RCFI = .96, RNNFI = .95, SRMR = .06, and RRMSEA = .05, confirming the validity of the factorial model. All four subscales demonstrated good internal consistency with composite reliability coefficients ranging from .74 to .84. Table 2.4 displays item means, standard deviations, standardized factor loadings, and residuals for this solution, as well as factor correlations and internal consistency estimates. The hierarchical measurement model had a fit that was equivalent to that of the first-order model: S-Bχ^2 (86) = 122.10, $p < .05$, RCFI = .96, RNNFI = .95, SRMR = .06, RRMSEA = .05, and demonstrated good internal reliability (RHO = .93). These findings provide further support for the factor structure of the CCBS.

General Discussion

The purpose of the present research was to develop and psychometrically evaluate a questionnaire measure designed to assess sports coaches' controlling interpersonal style from the perspective of SDT. A systematic series of studies provided substantial support for the validity and reliability of the scores derived from the new measure. The questionnaire taps four separate controlling motivational strategies salient in the context of sport: the controlling use of rewards, negative conditional regard, intimidation, and excessive personal control. The four dimensions of controlling behavior are aligned well with the SDT literature and the results of qualitative studies conducted in the sport context (D'Arripe-Longueville et al., 1998; Fraser-Thomas & Côté, 2009; Scanlan et al., 1991). Collectively, the findings from the present research suggest that the CCBS has the potential to be at the heart of research investigating interpersonal control in the coaching context, currently an understudied but theoretically important component of SDT.

We believe that all four of the identified controlling strategies involve judging and devaluing athletes by treating them not as individuals with their own thoughts and feelings, but as objects that should be controlled in order to obtain certain outcomes such as winning. It is not surprising, therefore, that the judging and devaluing aspect of coaches' controlling behavior did not demonstrate sufficient discriminant validity in the five-factor CCBS model (in the sense that it was highly correlated with the other factors). It is likely that the judging and devaluing subscale captured aspects of controlling behavior that were already implicit in the other subscales. For example, an athlete who finds his or her coach to be 'less supportive when they are not training and competing well' (an item from the conditional regard scale) is also likely to perceive his/her coach to be 'very judgmental if they are not competing well' (an item from the judging and devaluing subscale). Thus, the judging and devaluing subscale was removed from the questionnaire.

The resultant four factor model displayed an excellent fit to the data and further analysis supported the internal consistency of the four subscales. Study 3 also provided initial support for the factorial invariance of the CCBS by suggesting that the factor loadings and factor covariances remained unchanged across both gender and sport type (team/individual). Future work should continue to test the validity of the CCBS by assessing whether its factorial structure is also invariant across age and competitive experience levels. Further research is also needed to test the temporal stability of the CCBS.

A hierarchical model was also tested in which the four first-order factors were represented by one higher order factor. The fit of the hierarchical measurement model was similar to that of the first-order model in both Studies 3 and 4. Marsh (1987) suggested that if the fit of the hierarchical model is comparable to the fit of the first-order model, the former should be preferred because it is more parsimonious. Such a model would be useful for researchers who are interested in an overall measure of a controlling environment (for

example, when such a measure is used in complex structural equation modeling). However, if researchers are interested in examining whether specific aspects of the controlling interpersonal context predict specific outcomes, we suggest using the four-factor model to examine the impact of each facet of controlling coach behavior separately. Such research could be used to examine the utility of a differentiated conception of controlling behavior by ascertaining whether the separate behaviors have different effects on psychological, behavioral, and social outcomes.

The relatively low item mean scores obtained across Studies 2, 3 and 4 suggest that the majority of athletes participating in this research did not perceive their coaches to be overly controlling. However, frequency analyses revealed that athletes employed the entire response range for all items across all three studies. One potential reason for the relatively low item mean values could stem from the difficulties which arise when one tries to access athletes who have controlling coaches. Controlling coaches are likely to be very protective not only of their athletes, but also of their own coaching philosophy and the training environments they create. Ethically, coach consent had to be obtained during this research, thus controlling coaches had the opportunity to opt their athletes out of the studies. Nonetheless, it is important to note that the low item mean scores should not be used to draw inferences with regard to the factorial structure of the questionnaire, for which assessment should primarily focus on the fit indices.

As we expected, coaches' provision of autonomy support was only moderately correlated with the CCBS. Thus, although athletes' perceptions of both autonomy-supportive and controlling coach behaviors are helpful in understanding the psychological experiences of young athletes, we believe that when ill-being and other maladaptive outcomes are the focus of an investigation, controlling coaching strategies will predict a larger amount of variance than autonomy-supportive strategies. This is because controlling strategies have the capacity

to thwart athletes' feelings of autonomy, competence, and relatedness and, in turn, contribute to the development of controlled motivation and ill-being (Deci & Ryan, 2000).

For example, coaches who use rewards and praise to secure athlete compliance can foster external perceptions of control and undermine athletes' feelings of autonomy (Amorose & Horn, 2000). Further, low perceived competence can ensue when rewards and praise are used inappropriately and given non-contingently on performance (Hollembeak & Amorose, 2005). Under such circumstances, these extrinsic incentives may be perceived as an insincere and contrived attempt to control behavior (Henderlong & Lepper, 2002), and could, therefore, also have a negative impact upon the need for relatedness.

Similarly, the use of excessive personal control imposes an external pressure upon athletes to prioritize their sport involvement over other aspects of their lives. Feelings of autonomy will be undermined if such commitment is elicited and maintained as a result of external monitoring and pressure, as opposed to free will (Deci & Ryan, 2000). Findings from the parental literature also suggest that coaches who attempt to control and restrict their athletes' behavior outside of their sport participation may also undermine competence and relatedness needs (e.g., Kerr & Stattin, 2000). In the coaching context, the use of overly intrusive behaviors may be perceived to convey a lack of trust in the athletes and their ability to self-regulate their own behavior in order to optimize their athletic performance. This may lead to feelings of resentment toward the coach, especially if athletes are prevented from engaging in desired activities (such as spending time with friends).

The parental literature indicates that motivational strategies which attempt to control athlete behavior by overtly manipulating or exploiting the coach-athlete relationship (i.e. intimidation and negative conditional regard) will also damage feelings of relatedness (e.g., Assor et al., 2004). Athletes who are subjected to behaviors designed to intimidate (i.e., yelled at and embarrassed) or repeatedly exposed to negative conditional regard (i.e., ignored when

they are not performing well) may be left feeling humiliated and questioning their own self-worth (e.g., Barber, 2001). Therefore, as well as thwarting relatedness needs, the use of intimidation and conditional regard can also undermine athletes' perceptions of their own competence. These manipulative behaviors leave athletes' with little choice but to relinquish their autonomy and comply with advocated behaviors in order to maintain a satisfactory relationship with their coach and avoid conflict.

Therefore the stake of not emitting requested behaviors in controlling environments could become so high that athletes can no longer choose to behave otherwise (Mageau & Vallerand, 2003). This undermines the athletes' psychological needs and leads to controlled motivation and a variety of negative affective, cognitive, and behavioral consequences (Deci & Ryan, 2000). However, the CCBS is yet to be fully empirically tested with other SDT variables and future research, in particular longitudinal studies, are needed to understand exactly how controlling interpersonal behaviors, as assessed by the CCBS, are implicated in athletes' motivation and well-being. For example, studies could examine the role of such behaviors in predicting symptoms of overtraining, burnout, and disordered eating.

In summary, the purpose of the current research was to evaluate the construct validity and reliability of scores derived from the CCBS scale, a self-report measure designed specifically to assess athletes' perceptions of controlling coach behaviors from the perspective of SDT. Overall the findings have provided substantial support for the new questionnaire measure. The unique contribution of this research is the creation of a multidimensional instrument designed to measure an understudied aspect of SDT in the sport context, a domain in which issues of motivation and psychological well-being are important considerations. We hope that the CCBS will facilitate research into the darker side of coaching and help coaches self-reflect on the motivational strategies they employ.

CHAPTER 3.

PSYCHOLOGICAL NEED THWARTING IN THE SPORT CONTEXT: ASSESSING THE DARKER SIDE OF ATHLETIC EXPERIENCE

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Abstract

Research in self-determination theory (Ryan & Deci, 2002) has shown that satisfaction of autonomy, competence, and relatedness needs in sport contexts is associated with enhanced engagement, performance, and well-being. This paper outlines the initial development of a multidimensional measure designed to assess psychological need thwarting, an under-studied area of conceptual and practical importance. Study 1 generated a pool of items designed to tap the negative experiential state which occurs when athletes' perceive their needs for autonomy, competence, and relatedness to be actively undermined. Study 2 tested the factorial structure of the questionnaire using confirmatory factor analysis. The supported model comprised 3 factors which represented the hypothesized interrelated dimensions of need thwarting. The model was refined and cross-validated using an independent sample in Study 3. Overall, the psychological need thwarting scale (PNTS) demonstrated good content, factorial, and predictive validity, as well as internal consistency and invariance across gender, sport type, competitive level, and competitive experience. The conceptualization of psychological need thwarting is discussed and suggestions are made regarding the use of the PNTS in research pertaining to the darker side of sport participation.

Keywords: self-determination theory, autonomy, competence, relatedness, scale development

Introduction

There is a large body of evidence to suggest that athletes derive many psychological and physiological benefits from their sport participation (Fraser-Thomas, Côté, & Deaken, 2005; Reinboth, Duda, & Ntoumanis, 2004). However, negative experiences in the sport environment are not uncommon (Scanlan, Stein, & Ravizza, 1991; Theberge, 2008). The extreme mental and physical demands often placed upon athletes can have a detrimental effect upon athlete engagement, performance, and well-being, contributing to negative outcomes such as overtraining and burnout (Gould, 1993), disordered eating (Sundgot-Borgen & Torstveit, 2004), damaged self-esteem, and affective disorders such as anxiety and depression (Fraser-Thomas & Côté, 2009; Krane, Greenleaf, & Snow, 1997). Therefore, it is important to understand how social-contextual factors shape both the positive and negative experiences of athletes in sporting environments (Smoll & Smith, 2002). Based upon the framework of self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002), the aim of the current paper is to facilitate research into the darker side of sport participation by presenting a scale that assesses athletes' perceptions of psychological need thwarting.

SDT and Basic Psychological Needs

One integral component of SDT is the concept of psychological needs. Basic psychological needs theory (BPNT; Deci & Ryan, 2000), one of five mini-theories within SDT, proposes that people function and develop most effectively as a consequence of social environmental supports for their basic psychological needs. According to BPNT, humans have three innate and developmentally persistent psychological needs, namely those for autonomy, competence, and relatedness. Autonomy refers to the degree to which individuals feel volitional and responsible for their own behavior and, therefore, represents a need for an inner endorsement of one's actions (Ryan, 1995). The need for competence concerns the

degree to which individuals feel effective in their ongoing interactions with the social environment and experience opportunities in which to express their capabilities (Ryan & Deci, 2002). Finally, the need for relatedness is defined as the extent to which individuals feel a secure sense of belongingness and connectedness to others in their social environment (Baumeister & Leary, 1995; Ryan, 1995). Satisfaction of these psychological needs is assumed to directly enhance psychological and physical well-being in various life domains (Baard, Deci, & Ryan, 2004; Reeve & Jang, 2006; Ryan, Patrick, Deci, & Williams, 2008). Research conducted in the sport context has also confirmed the utility of examining optimal well-being from a need-fulfillment perspective (Adie, Duda, & Ntoumanis, 2008; Gagné, Ryan, & Bargmann, 2003; Reinboth et al., 2004).

However, "SDT has historically dealt not only with growth and well-being, but equally with the undermining, alienating, and pathogenic effects of need thwarting…" (Ryan & Deci, 2000, p. 319). Deci and Ryan (2000) proposed that the deprivation of any need will lead to alternative, and often defensive or self-protective, psychological accommodations which can have severe costs for health and well-being (e.g., low vitality and high levels of emotional and physical exhaustion; Adie et al., 2008). Such psychological accommodations include the development of controlling regulatory styles, compensatory motives or need substitutes, and rigid behavior patterns that may, over time, lead to further thwarting of need satisfaction (Ryan, Deci, Grolnick, & La Guardia, 2006). Controlling regulatory styles represent non-optimal (i.e., non-self-determined) forms of motivation, such as external regulation (e.g., behaviors motivated by coercive demands and reward contingencies) and introjected regulation (e.g., behaviors motivated by one's sense of guilt, obligation or perceived threats to one's ego). Compensatory motives are need substitutes that do not really satisfy the thwarted basic need but provide some collateral satisfaction (Deci, 1980). For example, if the need for relatedness is thwarted during childhood, one may compensate by

attempting to gain approval or a sense of worth by pursuing image-oriented outcomes, such as accumulating money or material possessions (e.g., Kasser, Ryan, Zax, & Sameroff, 1995). The third intertwined component of the response to need thwarting, the development of rigid behavior patterns, helps protect individuals from the inner hurt that results from psychological need thwarting but also tends to prevent individuals from dealing with their inner experiences (Deci & Ryan, 2000). For example, eating disorders represent one instance of rigid behavior which results from the thwarting of autonomy and competence needs (Bruch, 1973; Pelletier, Dion, & Lévesque, 2004; Strauss & Ryan, 1987).

In summary, need thwarting is hypothesized to lead to patterns of regulations, goals, behaviors, and affect that do not represent the optimal development and well-being that would be expected when the psychological needs are satisfied (Deci & Ryan, 2000; Ryan et al., 2006). Such adaptations, regardless of whether individuals claim to value them, will have significant negative consequences for health and well-being (e.g., low levels of vitality and high levels of emotional and physical exhaustion). Therefore, BPNT and, more specifically, its conceptualization of psychological need thwarting, should provide a conceptual framework through which to examine the mechanism which links dimensions of the social environment to negative indices of athlete well-being. However, little research has focused on the direct consequences of psychological need thwarting (Vallerand, Pelletier, & Koestner, 2008), primarily due to the way in which this construct has been operationalized and subsequently measured.

Psychological Need Thwarting

Research conducted to date has examined negative relations between need satisfaction and various maladaptive outcomes and has thus provided indirect evidence to support the hypothesized detrimental effects of need thwarting on health and well-being (e.g., Adie et al.,

2008; Jang, Reeve, Ryan, & Kim, 2009). For example, significant negative correlations have indicated that low levels of need satisfaction relate to higher levels of ill-being (e.g., burnout, Hodge, Lonsdale, & Ng, 2008; self-reported physical symptoms, Reinboth et al., 2004). In this approach, however, low need satisfaction scores are inadvertently considered evidence of both a lack of need satisfaction and psychological need thwarting, without distinguishing between the two constructs. In this paper we question whether low need satisfaction scores can be conceptually equated with need thwarting. Specifically, we propose that low scores on measures of psychological need satisfaction do not adequately tap the intensity of need frustration that Deci and Ryan (2000) describe as states of need thwarting. For instance, a low score on a need satisfaction scale may not necessarily indicate that an athlete feels as if his or her needs are being thwarted during their interactions with the sport environment; it may merely suggest that the athlete feels dissatisfied with the extent to which his or her needs are currently being met. As such, a female athlete could feel incompetent in her sport purely because she doesn't have the necessary skills to perform well (despite the best efforts of her coach); however another female athlete might feel incompetent because her coach is severely demeaning and critical of her. The first situation is a case of low need satisfaction (or need dissatisfaction) whereas the latter is a case of need thwarting. Similarly, a male athlete could feel lonely in his sport because he cannot meaningfully associate with his teammates or because he is actively rejected by them. We argue that need thwarting is evident only in the latter case in which loneliness results from active exclusion by others.

According to the Oxford English Dictionary, 'to be dissatisfied' means to feel that something is not as good as it should be (i.e., it is a feeling). Contrastingly, 'to thwart' means to stop something from happening (i.e., it is a prevention). Therefore, similarly to need satisfaction, need thwarting is an experience, a 'feeling-state'. For instance, one feels oppressed, inadequate, or rejected when one's psychological needs are thwarted. However,

conceptualizations and assessment tools must also reflect this focus on the perceived undermining effect of significant others. Thus, need thwarting does not simply reflect the perception that need satisfaction is low, but moreover the perception that need satisfactions are being obstructed or actively frustrated within a given context.

An additional problem with using existing measures of need satisfaction to tap need thwarting is one of item relevance. The three psychological needs are currently measured in terms of positive psychological experiences only. For example, the need for relatedness is assessed in terms of positive aspects of social relationships (e.g., feelings of support, acceptance, and understanding) and does not capture negative aspects of social relationships in a broader sense (e.g., feelings such as rejection, jealousy, or conflict), which are likely to occur when the need for relatedness is actively thwarted. As such, one would expect perceived support for relatedness to better predict positive affect as opposed to negative affect (McDonough & Crocker, 2007; Ryan & Deci, 2001). Similar findings have also been reported in the youth sport context. For example, Gagné et al. (2003) found that whilst daily need satisfaction during practice led to increased positive affect, it was unrelated to the extent to which gymnasts experienced feelings of negative affect. In addition, Quested and Duda (2010) found that satisfaction of the three psychological needs was unrelated to emotional and physical exhaustion in a sample of young dancers. Thus, it is not surprising that current research has suggested that the psychological needs are often more pertinent in understanding the presence of well-being, as opposed to the absence of ill-being (e.g., Adie et al., 2008; McDonough & Crocker, 2007; Sheldon & Bettencourt, 2002). Such findings highlight the potential disadvantages of measuring need thwarting indirectly via low levels of need satisfaction.

It is thus of theoretical and empirical interest to explore how a more direct assessment of need thwarting can contribute to the prediction of psychological well/ill-being. Of

additional interest is the possibility that alongside perceived need satisfaction, athletes can also experience the active thwarting of needs within the same environment. That is, need satisfaction and need thwarting can sometimes co-occur. Within observations of coaching and physical training environments, we often see mixed patterns of positive and negative events (Smoll & Smith, 2002) that may, over time, have the potential to facilitate feelings of both need satisfaction and need thwarting in athletes. In line with BPNT, we thus suggest that a measure that taps the experience of having one's needs actively countered may yield better predictions concerning negative outcomes associated with sport participation, compared to existing measures of psychological need satisfaction, an issue that no doubt could be extended to other domains.

Present Research

To date there has been no systematic attempt to develop and validate a measure of psychological need thwarting. To address this gap in the literature, we outline the development of a SDT-based multidimensional questionnaire designed to tap the negative experiential state which occurs when athletes' perceive their psychological needs to be actively undermined in the sport environment. A series of three studies were carried out in a youth sport context to develop and provide initial evidence for the validity and reliability of the psychological need thwarting scale (PNTS). Study 1 sought to generate and provide evidence for the content validity of a pool of items designed to tap psychological need thwarting. Study 2 tested the factorial structure of the questionnaire and examined whether the resultant PNTS scores were invariant across gender, sport type, competitive level, and competitive experience. Finally, Study 3 cross-validated the PNTS model with an independent sample and provided preliminary evidence for the predictive validity of the measure. Youth sport settings were an apt place to explore these issues as previous research has indicated that

younger athletes can be highly susceptible to the demands and excessive pressures often placed on them by coaches and significant others in the sport environment (Fraser-Thomas & Côté, 2009; Gould, 2007; Krane et al., 1997; Ommundsen & Vaglum, 1991). Further, SDT-based research has also indicated that when young athletes experience low levels of need satisfaction they are prone to experience negative outcomes such as burnout (Perreault, Gaudreau, Lapointe & Lacroix, 2007), physical illness (Reinboth et al., 2004), and negative affect (Quested & Duda, 2010).

Study 1

Study 1 utilized qualitative and quantitative feedback from coaches, athletes, and academic experts to develop and provide evidence for the content validity of a pool of items designed to tap psychological need thwarting in the sport context (an important component of construct validity; see Messick, 1995).

Method

Participants

The sample (N = 23) comprised 6 British coaches and 17 British athletes. The coaches were drawn from three sports, athletics (n = 1), swimming (n = 3), and squash (n = 2). The athletes were 7 males and 10 females aged between 12 and 17 years old (M = 14.41; SD = 1.42). These athletes represented three sports, athletics (n = 5), swimming (n = 7), and dancing (n = 5), and were competing at regional (n = 6) or national (n = 11) level at the time of the study. Their competitive experience ranged from 3 to 10 years (M = 6.75; SD = 2.11). A panel of 9 academic experts in SDT-based research was also consulted to review the content validity of the developed items from a theoretical perspective.

Procedure

Ethical approval was obtained from the principal investigator's University ethics committee for each of the three studies reported in this paper which were conducted in accordance with APA guidelines. Study 1 consisted of six coach interviews and three athlete focus groups (one focus group was conducted within each sport). The coaches and athletes were recruited via sports clubs administrators. The purpose and nature of the study was explained and coach and athlete consent were provided prior to participation. In addition, coach and parental consent were also obtained before athletes participated in the focus groups. Based upon the operational definitions of the three basic psychological needs, a review of the relevant SDT literature, and the personal experiences of the principal investigator (an experienced athlete who competed at national level as a junior), an initial pool of sport-relevant need thwarting items was developed. Guidelines for item wording were closely followed to maximize the clarity, specificity, and shortness of the items (e.g., DeVellis, 1991). The aim was to develop a number of potential items which could be discussed with coaches and athletes during the interviews and focus groups.

Each coach interview lasted approximately 60 min. A semi-structured interview schedule was used to facilitate general discussion relating to the sport environment and its potential impact upon young athletes' feelings of autonomy, competence, and relatedness. The purpose of these interviews was to identify need thwarting situations which occurred in the sport environment. The athlete focus groups were all approximately 90 min in length. Athletes were provided with lay definitions of the three psychological needs[4] and asked, by considering their own sporting experiences, to discuss situations in their sport in which their feelings of autonomy, competence, and relatedness were actively thwarted or undermined by

[4] The need satisfaction definitions used in the athlete focus groups were as follows: Autonomy; "the need to feel in charge of your own behavior and that you are offered choices/have a say in the decisions made regarding your sport participation", Competence; "the need to feel really good/skilled at your sport", Relatedness; "the need to feel close to and accepted by those around you in your sport".

others. All interviews and focus groups were recorded and the data were transcribed verbatim. Subsequently, a content analysis was carried out based on the definition of need thwarting in order to explore athletes' experiences of psychological need thwarting (i.e., the way in which athletes' perceived their needs to be thwarted and how this made them feel).

In addition, the athlete focus groups were used to collect quantitative data concerning the pool of 21 items developed prior to the interviews and focus groups. The items were presented to the athletes and, using a dichotomous scale (*applicable versus inapplicable*), they were instructed to assess the relevance of each item to the sport context. Items deemed inapplicable by 75% or more of the athletes involved in the focus group were eliminated. For the applicable items, athletes were also asked to rate their clarity using a 7-point scale (*1 = not at all clear; 7 = extremely clear*). The athletes' anonymous responses were then discussed at a group level and athletes were encouraged to suggest additional items or alternative wordings for items perceived to be problematic (i.e., items rated below five on clarity).

Subsequently, an online questionnaire was set up and nine academic experts worldwide were recruited, via an invitational email, to review the pool of items derived from the interviews and focus groups. The experts were provided with a definition of need thwarting ("the negative experiential state which occurs when athletes perceive their psychological needs for autonomy, competence, and relatedness to be actively undermined via interactions with significant others") and, using a 5-point scale (*1 = poor match; 5 = excellent match*), were asked to indicate the extent to which they perceived the items to tap the active thwarting of each of the psychological needs. The ratings provided by the experts were used to calculate the Content Validity Index (CVI; Lynn, 1986) for each item and inform final decisions about whether to retain, eliminate, or revise the items. The experts were also asked to make suggestions for improving these items and to propose alternative items.

Results and Discussion

The coaches and athletes interviewed in this study believed that the sport context was a domain which could empower young people and facilitate feelings of autonomy, competence, and relatedness. However, they also recognized that the sport context could be a highly pressurized environment in which an athlete's psychological needs could easily be thwarted in the pursuit of performance-related goals. For example, athletes suggested that the sport environment could, at times, leave them feeling controlled (e.g., dictatorial coaches), over-challenged and incompetent (e.g., imposed goals/expectations), and even rejected (e.g., conflict/jealousy between athletes). Based upon the ratings and comments provided by the coaches and athletes, two items were deleted and four items were rewritten to improve their clarity and broaden their applicability across sports. The resultant pool of 19 items was then examined by the expert researchers. The CVI was calculated by dividing the number of experts who gave a rating of three, four, or five (i.e., rated the item as a good match, a very good match, or an excellent match to the need construct) by nine, the number of experts on the panel. A table containing the CVI for each item can be found in the appendix. Lynn (1986) suggested that when expert panels consisted of six or more reviewers, CVIs in the vicinity of .80 were acceptable (see also Polit, Beck, & Owen, 2007). One item displayed a CVI of .56 (5/9) and was thus deleted. All of the remaining items exhibited CVIs ranging from .78 (7/9) to 1.00 (9/9) and were retained. However, based upon the expert reviewers' qualitative feedback, very minor modifications were made to the wording of six items in order to further emphasize the active thwarting of the psychological needs by significant others in the sport environment. The final pool of 18 items was deemed to be clear and applicable to the sport environment by athletes, coaches, and SDT researchers.

Study 2

The next step in the measurement development process was to administer a questionnaire containing the 18 items to a large sample in order to test the factorial structure of the items generated in Study 1 via confirmatory factor analysis (CFA). The use of CFA is advocated when there is a strong theoretical base for the hypothesized model (Williams, 1995), as in the current research. In line with SDT, a three-factor model was hypothesized. Study 2 also examined two additional components of construct validity (i.e., generalizability and discriminant validity; see Messick, 1995). Generalizability was assessed by examining whether the resultant PNTS scores were invariant across gender, sport type, competitive level, and competitive experience. Subsequently, the relations between athletes' perceptions of psychological need thwarting and need satisfaction were explored via correlations and exploratory factor analysis (EFA) to test for discriminant validity. Relatively small negative correlations were expected between corresponding need satisfaction and need thwarting subscales; the latter were also hypothesized to form independent factors in individual EFA analyses.

Method

Participants

The sample (N = 354) comprised 197 males and 144 females aged between 12 and 17 years old (M = 14.72; SD = 1.61); 13 athletes did not report their gender. The athletes represented individual (n = 208) and teams sports (n = 146) such as athletics, squash, swimming, rowing, rugby, football, netball, and basketball. They were competing at club (n = 87), county (n = 61), regional (n = 35), national (n = 121), or international (n = 36) level at the time of the study. The remaining athletes (n = 14) did not report their competition level. Competitive experience ranged from 1 to 13 years (M = 5.23; SD = 2.91).

Measures

Psychological need thwarting. At the beginning of the questionnaire, written instructions requested that athletes consider their general experiences in the sport context and indicate how much they agreed or disagreed with each statement. The stem used in the questionnaire was "In my sport…". To ensure that the response scale of the new measure corresponded with the response scale of existing measures used to assess need satisfaction in sport (McAuley, Duncan, & Tammen, 1989; Richer & Vallerand, 1998; Standage, Duda, & Ntoumanis, 2003), the 18 items (5 autonomy, 7 competence, 6 relatedness) created in Study 1 were assigned a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Psychological need satisfaction. Three previously validated questionnaires were used to assess the degree to which athletes experienced satisfaction of the three psychological needs. To assess satisfaction of the need for autonomy, five items collated by Standage et al. (2003) were used. An example item is "I have some choice in what I want to do in my sport". Satisfaction of the need for competence was assessed using five items from the competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley et al., 1989). An example item is "I think I am pretty good at my sport". Finally, satisfaction of the need for relatedness was assessed using the 5-item acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998). A sample item is "when participating in my sport I feel supported". Responses for all three measures were provided on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The subscales have demonstrated satisfactory levels of internal reliability in previous research conducted in the sport domain (e.g., Reinboth et al., 2004; Standage et al., 2003; Standage, Duda, & Ntoumanis, 2005).

Procedure

Athletes were recruited via club coaches and sports events organizers. The purpose and nature of the study was explained and athlete, coach, and parental consent were obtained. The primary researcher personally supervised the questionnaire completion for 63.3% of the athletes involved in the current study. For athletes who could only be reached by mail (due to practical constraints such as distance), the researcher sent enveloped questionnaire packs, including written instructions and consent forms, to a contact at the club (36.7% of athletes were reached this way). Athletes were then allowed to take the questionnaire pack away with them and return it to the contact person (in a sealed envelope) who mailed the completed consent forms and questionnaires back to the researcher.

Data Analysis

The 18 items from Study 1 were analyzed via CFA using EQS 6.1 (Bentler & Wu, 2002). No cross-loadings of items were allowed, all latent factors were inter-correlated, and one item from each factor was fixed to 1.0 for purposes of identification and latent variable scaling. Standardized factor loadings, standardized residuals, and modification indices were analyzed to screen for model misspecification. In line with previous work (e.g., Gaudreau & Blondin, 2002; Sebire, Standage, & Vansteenkiste, 2008), items with standardized factor loadings below .40 or a large standardized residual (>|2.00|) were removed. Furthermore, items were deleted if a large modification index suggested that the item could load on a non-intended factor or that its residual could correlate with the residuals of other items. Descriptive statistics and internal reliability estimates were also calculated. Raykov's composite reliability coefficient (RHO; Raykov, 1997) was employed to assess the internal reliability of each scale. The resultant PNTS scores were then analyzed to test for invariance across gender, sport type, competitive level, and competitive experience. Finally, in order to

explore how need thwarting is related to need satisfaction, the correlations between athletes' perceptions of psychological need thwarting and need satisfaction were obtained and the PNTS and need satisfaction items were analyzed via EFA.

Results and Discussion

Distribution of the Need Thwarting Items

The univariate skewness and kurtosis values for items comprising the final solution in Study 2 are presented in Table 3.1. An examination of Mardia's normalized coefficient of multivariate kurtosis indicated that the data departed from multivariate normality (e.g., for the final three-factor model the coefficient was 28.99). Subsequently, and in line with the recommendations of Chou, Bentler, and Satorra (1991), all CFAs were conducted using the robust maximum likelihood (ML) estimation procedure. A robust χ^2 statistic called the Satorra-Bentler scaled statistic (S-Bχ^2; Satorra & Bentler, 1994) and robust parameter standard errors (Bentler & Dijkstra, 1985) are produced using this method to correct for non-normality in large samples (200-500 cases; West, Finch, & Curran, 1995).

The adequacy of the model to the data was evaluated using multiple fit indices, such as the robust chi-square statistic, the robust comparative fit index (CFI; Bentler, 1990), the robust Bentler-Bonett non-normed fit index (NNFI; Bentler & Bonett, 1980), the standardized root mean residual (SRMR; Hu & Bentler, 1998), and the robust root mean square error of approximation (RMSEA; Steiger, 1990). Although values indicative of acceptable model fit remain controversial (Markland, 2007; Marsh, Hau, & Wen, 2004), it is typically accepted that CFI and NNFI values exceeding .90 and .95 are indicative of acceptable and excellent fit, respectively (Hu & Bentler, 1999). RMSEA values of less than .08 suggest an excellent fit, whereas values exceeding .10 are undesirable (Browne & Cudeck, 1993). Finally, values approximating .08 for the SRMR are typically considered satisfactory (Hu & Bentler, 1999).

Table 3.1: Item Means, Standard Deviations, Factor Loadings, Residuals, Skewness and Kurtosis Values Following Confirmatory Factor Analysis (Study 2)

Subscale and item	*M*	*SD*	Loading	Residual	Skewness	Kurtosis
In my Sport….						
Autonomy						
I feel prevented from making choices with regard to the way I train	3.14	1.66	.57	.83	0.55	-0.46
I feel pushed to behave in certain ways	3.07	1.79	.57	.82	0.55	-0.69
I feel obliged to follow training decisions made for me	3.70	1.85	.59	.81	0.18	-1.00
I feel under pressure to agree with the training regime I am provided	2.76	1.56	.61	.80	0.57	-0.52
Competence						
There are occasions where I feel incompetent because others impose unrealistic expectations upon me	2.27	1.43	.71	.71	1.09	0.38
There are times when I am told things that make me feel incompetent	2.23	1.38	.77	.64	1.12	0.78
There are situations where I am made to feel inadequate	2.21	1.43	.81	.59	1.17	0.79
I feel inadequate because I am not given opportunities to fulfill my potential	2.11	1.42	.49	.87	1.26	0.66
Relatedness						
I feel I am rejected by those around me	1.64	1.27	.63	.78	2.58	6.58
I feel others can be dismissive of me	2.11	1.37	.75	.66	1.41	1.67
I feel other people dislike me	1.99	1.42	.67	.75	1.67	2.32
I feel some of the athletes around me are envious when I achieve success	2.96	1.87	.50	.87	0.61	-0.84

Factor correlations and internal consistency	1	2	3
1. Autonomy	.67		
2. Competence	.59	.79	
3. Relatedness	.52	.85	.71

Note: All factor loadings and factor correlations are statistically significant ($p < .05$). Raykov's composite reliability coefficients are presented on the diagonal of the factor correlation matrix. All items were scored on a 7-point scale; athletes employed the entire response range for all items.

CFA Analysis

Results of the initial CFA indicated room for improvement: S-Bχ^2 (132) = 386.64, $p < .001$, RCFI = .84, RNNFI = .82, SRMR = .07, RRMSEA = .07 (90% CI = 0.07 - 0.08). Large modification indices suggested that the residuals of a number of items correlated with those of other items. Three of these items (two competence items and one relatedness item) were also associated with standardized residuals > |2.00|. Further, the modification indices indicated that one of the aforementioned competence items and one autonomy item cross-loaded onto a non-intended factor. Excluding these four items improved the fit of the model to the data: S-Bχ^2 (74) = 161.09, $p < .001$, RCFI = .91, RNNFI = .90, SRMR = .06, RRMSEA = .06 (90% CI = 0.05 - 0.07). However, further examination of the modification indices and standardized residuals identified two additional items (one competence item and one relatedness item) as problematic. These items were thus removed and the model was tested again. The final model demonstrated an excellent fit to the data: S-Bχ^2 (51) = 87.92, $p < .001$, RCFI = .96, RNNFI = .95, SRMR = .05, RRMSEA = .05 (90% CI = 0.03 - 0.06), and included three 4-item factors, representing the thwarting of the autonomy, competence, and relatedness needs. All deleted items are available from the first author upon request. Table 3.1 displays item means, standard deviations, standardized factor loadings, and residuals for this solution, as well as internal consistency estimates and factor correlations. Raykov's composite reliability coefficient was just below .70 for the autonomy subscale (RHO = .67). In addition, the factor correlation between the competence and relatedness subscales was large (.85), although it should be clarified that this correlation is not attenuated for measurement error.[5]

[5] Due to the large factor correlations, the tenability of three alternative two-factor models was tested in Study 2 and Study 3. In each model, two of the subscales were combined to form one factor and then paired with the remaining subscale. In both studies, the hypothesized three-factor model demonstrated a superior fit to the data in comparison to each of the competing two-factor models. A one-factor model also exhibited a very poor fit in both data sets. Table 3.2 provides the fit indices for all alternative models tested in Studies 2 and 3. These additional analyses support the discriminant validity of the three factors.

Table 3.2: Fit Indices for Alternative Factor Models (Studies 2 & 3)

Model	S-B χ^2	*d.f.*	RCFI	RNNFI	SRMR	RRMSEA (90% CI)
Study 2						
F1 = Autonomy/Competence F2 = Relatedness	161.31**	53	.88	.85	.07	.08 (0.06 - 0.09)
F1 = Autonomy/Relatedness F2 = Competence	165.65**	53	.87	.84	.07	.08 (0.07 - 0.09)
F1 = Competence/Relatedness F2 = Autonomy	110.25**	53	.94	.92	.05	.06 (0.04 - 0.07)
F1 = Autonomy/Competence/Relatedness	185.39**	54	.85	.82	.07	.08 (0.07 – 0.10)
Study 3						
F1 = Autonomy/Competence F2 = Relatedness	165.49**	53	.91	.88	.07	.09 (0.07 - 0.10)
F1 = Autonomy/Relatedness F2 = Competence	217.61**	53	.86	.83	.08	.10 (0.09 - 0.12)
F1 = Competence/Relatedness F2 = Autonomy	149.51**	53	.92	.90	.07	.08 (0.06 - 0.09)
F1 = Autonomy/Competence/Relatedness	224.96**	54	.96	.83	.08	.11 (0.09 – 0.12)

** $p < 0.01$.

Note: S-Bχ^2 = Satorra-Bentler scaled chi-square statistic, RCFI = robust comparative fit index, RNNFI = robust non-normed fit index, SRMR = standardized root mean residual, RRMSEA = robust root mean square error of approximation, 90% CI = 90% confidence interval for the RRMSEA point estimate.

Thus, in an effort to improve the internal reliability of the autonomy subscale and decrease the size of the large inter-factor correlation, three items were rephrased prior to Study 3 (see final CFA solution in Study 3).

Invariance Testing

A sequential model testing approach was employed via multisample CFA to examine whether the PNTS displayed invariance across gender, sport type (team or individual), competitive level (club, county, and regional or above) and competitive experience (low or high based on a median split). In relation to gender, a baseline model was established and then two increasingly constrained models were specified to examine the equality of measurement (i.e., factor loadings) and structural parameters (i.e., factor variances & factor covariances) across male and female samples (see Byrne, 2006). The procedure was then repeated to test for invariance across athletes involved in team and individual sports and athletes of high and low competitive levels and competitive experience. The relative goodness of fit between increasingly constrained models was analyzed via the S-Bχ^2 difference test (Satorra & Bentler, 2001) using the "sbdiff" software (Crawford, 2007; Crawford & Henry, 2003). However, because the χ^2 statistic is influenced by sample size, the recommendations of Cheung and Rensvold (2002) were also adopted and a change in CFI of $\leq .01$ was considered indicative of model invariance.

Table 3.3 displays the goodness of fit indices for all multigroup models tested during the invariance analysis. Although changes in the S-Bχ^2 statistic were significant when the factor loadings were constrained across gender and across sport type, the change in the CFI values was less than or equal to .01 in both analyses, supporting the equality of the factor loadings across the separate gender and sport type groups.

Table 3.3: Fit Indices for Invariance Analysis (Study 2)

Model	S-B χ^2	*d.f.*	RCFI	RNNFI	SRMR	RRMSEA (90% CI)	ΔS-Bχ^2	Δ *d.f.*	ΔRCFI
Gender									
1. Unconstrained	151.30**	102	.946	.930	.059	.054 (0.03 - 0.07)			
2. Constrained factor loadings	171.70**	111	.934	.921	.084	.057 (0.04 - 0.07)	20.40*	9	.012
3. Constrained factor variances/covariances	180.21**	117	.931	.922	.096	.057 (0.04 – 0.07)	8.46	6	.003
Sport type									
1. Unconstrained	154.16**	102	.944	.928	.059	.054 (0.04 - 0.07)			
2. Constrained factor loadings	172.10**	111	.935	.923	.074	.056 (0.04 - 0.07)	17.85*	9	.009
3. Constrained factor variances/covariances	180.12**	117	.933	.924	.094	.056 (0.04 – 0.07)	8.08	6	.002
Competitive level									
1. Unconstrained	130.51**	102	.967	.957	.056	.041 (0.01 - 0.06)			
2. Constrained factor loadings	141.07**	111	.965	.958	.068	.040 (0.01 - 0.06)	10.57	9	.002
3. Constrained factor variances/covariances	144.13**	117	.968	.964	.071	.037 (0.01 – 0.06)	2.90	6	.003
Competitive experience									
1. Unconstrained	140.79**	102	.952	.937	.058	.049 (0.03 - 0.07)			
2. Constrained factor loadings	155.75**	111	.944	.934	.076	.050 (0.03 - 0.07)	14.96	9	.008
3. Constrained factor variances/covariances	164.56**	117	.941	.933	.081	.050 (0.03 – 0.07)	8.81	6	.003

* $p < 0.05$. ** $p < 0.01$.

Note: S-Bχ^2 = Satorra-Bentler scaled chi-square statistic, RCFI = robust comparative fit index, RNNFI = robust non-normed fit index, SRMR = standardized root mean residual, RRMSEA = robust root mean square error of approximation 90% CI = 90% confidence interval for the RRMSEA point estimate. ΔS-B χ^2 = Satorra-Bentler scaled chi-square difference, Δ *d.f.* = difference in degrees of freedom, ΔRCFI = change in RCFI, when the fit of the more constrained model is compared to that of the previous less constrained model (Cheung & Rensvold, 2002).

Nonsignificant changes in the S-Bχ^2 statistic and differences in the CFI values of less than .01, suggested that the factor variances and covariances were also equal across gender and sport type. Non-significant changes in the S-Bχ^2 statistic and differences in the CFI values of less than .01 between increasingly constrained models revealed that the three-factor model was also invariant across competitive level and competitive experience.[6] These findings provide substantial support for the factorial invariance of the PNTS measurement model.

Correlation and EFA Analyses

The three need satisfaction subscales exhibited satisfactory levels of internal reliability in the current study (autonomy RHO = .79; competence RHO = .85; relatedness RHO = .75). As hypothesized, small negative Pearson's correlations were observed between the corresponding need thwarting and need satisfaction subscales (autonomy r = -.27, competence r = -.21, relatedness r = -.26), indicating that, empirically, need thwarting and need satisfaction may not be antipodal (see Table 3.4 for descriptive statistics and the complete correlation matrix). Further, the results of three separate EFA analyses showed that, within each need, need thwarting and need satisfaction represented distinct factors. Principal axis factor analyses were carried out with a direct oblimin rotation and factor extraction was based on the criterion of an eigenvalue value greater than 1.0. Two factors were extracted in each EFA analysis. With the exception of one need satisfaction item, all items had primary loadings above .40. Over all three needs, the need thwarting items had primary factor loadings ranging from .48 to .82 (mean loading = .63) and secondary loadings ranging from .01 to .17 (mean loading = .05).

[6] Non-significant changes in the S-Bχ^2 statistic and differences in the CFI values of less than .01 between increasingly constrained models revealed that the model was also invariant across the two data collection methods. This suggests that athletes responded to the PNTS items in a similar fashion independent of whether they completed the questionnaire supervised or unsupervised.

Table 3.4: Descriptive Statistics and Correlations among the Need Thwarting and Need Satisfaction Subscales (Study 2)

Variable	*M*	*SD*	Skewness	Kurtosis	1	2	3	4	5
1. Need thwarting - Autonomy	3.17	1.22	.18	-.39					
2. Need thwarting - Competence	2.24	1.19	1.08	.62	.40**				
3. Need thwarting - Relatedness	2.18	1.09	1.24	1.45	.38**	.65**			
4. Need satisfaction - Autonomy	5.62	0.90	-.88	1.47	-.27**	-.20**	-.13**		
5. Need satisfaction - Competence	5.69	0.92	-1.28	2.43	-.09*	-.21**	-.01	.45**	
6. Need satisfaction - Relatedness	5.84	0.78	-1.31	4.80	-.21**	-.24**	-.26**	.62**	.48**

* $p < 0.05$. ** $p < 0.01$.

Similarly, the need satisfaction items had primary loadings ranging from .31 to .92 (mean loading = .65) and secondary loadings ranging from .00 to .09 (mean loading = .04). In concert, these findings support the discriminant validity of the need thwarting scale and indicate that need thwarting and need satisfaction should be viewed as independent constructs. Therefore, it would appear that athletes can perceive need thwarting as potentially co-occurring and perhaps interacting with need satisfaction.

Study 3

The purpose of Study 3 was to use an independent sample to cross-validate the three-factor model supported in Study 2 and further refine the scale if necessary. Study 3 also aimed to provide preliminary evidence for the predictive validity of the PNTS (i.e., criterion relevance; see Messick, 1995). It was hypothesized that need thwarting would predict additional variance, over and above that accounted for by need satisfaction, of well/ill-being outcome variables. Further, in the same set of analyses, the scores derived from the PNTS were expected to more strongly predict an index of ill-being (emotional and physical exhaustion) when compared to the scores obtained from established measures of need satisfaction. The opposite relationships were hypothesized in relation to an index of well-being (subjective vitality). In addition, Study 3 also examined the interactive effects of perceived need thwarting and need satisfaction on the outcome variables as these independent dimensions could potentially co-occur in the same sport context. Hierarchical regression analyses were employed to test these hypotheses at the individual need level. Subsequently, structural equation modeling (SEM) was utilized to test a model incorporating all three psychological needs.

Method

Participants

The sample (N = 289) comprised 79 males and 210 females aged between 12 and 17 years old (M = 14.54; SD = 1.70). The athletes were involved in both individual (n = 158) and team sports (n = 131), similar to the sports sampled in the previous study. The athletes were competing at club (n = 41), county (n = 132), regional (n = 41), national (n = 57), or international (n = 18) level at the time of the study. Competitive experience ranged from 1 to 11 years (M = 4.57; SD = 2.14).

Measures

Psychological needs. Psychological need thwarting was measured using the PNTS, as designed in Study 2. Similarly, psychological need satisfaction was measured using the same scales outlined in the previous study. Each of the need satisfaction subscales demonstrated satisfactory internal reliability in the current study (autonomy RHO = .84; competence RHO = .88; relatedness RHO = .84).

Well/ill-being outcomes. A five-item version of the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997) was employed to measure athletes' feelings of positive energy. Subjective vitality has been referred to as a primary component of psychological well-being (Ryan & Deci, 2001). An example item is, "I feel alive and full of vitality". Responses were provided on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The scale demonstrated good internal reliability in the current study (RHO = .91) and in previous research conducted in the sport domain (e.g., Gagné et al., 2003; Reinboth et al., 2004). The five item emotional and physical exhaustion subscale of the Athlete Burnout Questionnaire (Raedeke & Smith, 2001) was employed as an indicator of ill-being. An example item is,

"I am exhausted by the mental and physical demands of my sport". Responses were provided on a 5-point scale ranging from 1 (almost never) to 5 (almost always). In line with previous research conducted in the sport domain (e.g., Lemyre, Roberts, & Stray-Gundersen, 2007; Raedeke & Smith, 2001), the subscale exhibited satisfactory levels of internal reliability in the current study (RHO = .88).

Procedure

The way in which the participants were recruited and the data collection procedure remained the same as those outlined in the previous study. Athletes completed the questionnaire supervised (71.9%) or were reached by mail (28.1%).

Results and Discussion

The 12-item three-factor solution from Study 2 was analyzed via CFA using EQS 6.1 (Bentler & Wu, 2002). Examination of Mardia's normalized coefficient (33.74) indicated that the data departed from multivariate normality. Subsequently, the robust maximum likelihood (ML) estimation procedure was utilized. The model displayed a good fit to the data (S-Bχ^2 (51) = 107.78, $p < .001$, RCFI = .95, RNNFI = .94, SRMR = .06, and RRMSEA = .06 (90% CI = 0.05 - 0.08) and all three subscales demonstrated good internal consistency with composite reliability coefficients ranging from .77 to .82. However, the correlation between the competence and relatedness subscales remained high (.83). Further, the correlation between the competence and autonomy subscales increased from that observed in Study 2 (.79).[5] Table 3.5 displays item means, standard deviations, standardized factor loadings, and residuals for the final solution, as well as internal consistency estimates and factor correlations.

Table 3.5: Item Means, Standard Deviations, Factor Loadings, Residuals, Skewness and Kurtosis Values Following Confirmatory Factor Analysis (Study 3)

Subscale and item	*M*	*SD*	Loading	Residual	Skewness	Kurtosis
In my Sport….						
Autonomy						
I feel prevented from making choices with regard to the way I train	3.15	1.65	.61	.80	0.57	-0.39
I feel pushed to behave in certain ways	3.31	1.90	.69	.72	0.36	-1.03
I feel *forced* to follow training decisions made for me	3.01	1.67	.82	.58	0.53	-0.70
I feel under pressure to agree with the training regime I am provided	2.75	1.59	.75	.66	0.64	-0.50
Competence						
Situations occur in which I am made to feel incapable	2.39	1.43	.77	.64	0.96	0.05
There are times when I am told things that make me feel incompetent	2.29	1.50	.75	.66	1.21	0.80
There are situations where I am made to feel inadequate	2.70	1.70	.71	.70	0.84	-0.28
I feel inadequate because I am not given opportunities to fulfill my potential	2.12	1.41	.70	.71	1.25	0.81
Relatedness						
I feel I am rejected by those around me	1.78	1.26	.68	.73	1.97	3.77
I feel others can be dismissive of me	2.29	1.46	.86	.51	1.05	0.25
I feel other people dislike me	2.17	1.52	.68	.73	1.47	1.54
I feel *other people* are envious when I achieve success	2.56	1.78	.53	.85	0.97	-0.18

Factor correlations and internal consistency	1	2	3
1. Autonomy	.80		
2. Competence	.79	.82	
3. Relatedness	.55	.83	.77

Note: All factor loadings and factor correlations are statistically significant ($p < .05$). Raykov's composite reliability coefficients are presented on the diagonal of the factor correlation matrix. Words in italics represent modified items from Study 2. All items were scored on a 7-point scale; athletes employed the entire response range for all items.

Predictive Validity

Table 3.6 displays the descriptive statistics and correlations among the variables used in the regression and SEM analyses.

Table 3.6: Descriptive Statistics and Correlations among Variables (Study 3)

Variable	Range	*M*	*SD*	1	2	3
1. Need satisfaction	1-7	5.52	0.86			
2. Need thwarting	1-7	2.54	1.06	-.39**		
3. Subjective vitality	1-7	5.22	1.25	.47**	-.35**	
4. Emotional and physical exhaustion	1-5	2.13	0.93	-.31**	.46**	-.47**

** $p < 0.01$.

A total of six hierarchical regression analyses were performed to examine the incremental effect of the need thwarting subscales and the potentially interactive effects of need thwarting and need satisfaction on exhaustion and vitality. Specifically, for each of the three needs, two hierarchical regressions were carried out using exhaustion and then vitality as the dependent variable. The need satisfaction and need thwarting subscales were standardized, as recommended by Aiken and West (1991), prior to being entered into the equation. Need satisfaction was entered in the first step, need thwarting was entered in the second step, and the interaction term for corresponding need satisfaction and need thwarting subscales was added in the third step.

As shown in Table 3.7 and indicated by the ΔR^2 values, need thwarting made a significant contribution to the prediction of exhaustion and vitality over and above the significant contribution of need satisfaction in all cases. Notably, across all three psychological needs, need thwarting was a stronger predictor of exhaustion and need satisfaction was a stronger predictor of vitality.

Table 3.7: Individual Need Satisfaction and Need Thwarting Subscales Predicting Vitality and Exhaustion (Study 3)

	1. Autonomy: Vitality		2. Autonomy: Exhaustion		3. Competence: Vitality		4. Competence: Exhaustion		5. Relatedness: Vitality		6. Relatedness: Exhaustion	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.18**		.12**		.15**		.06**		.16**		.05**	
Need satisfaction		.42**		-.34**		.39**		-.25**		.40**		-.22**
Step 2	.03**		.16**		.03**		.10**		.02**		.05**	
Need satisfaction		.36**		-.17**		.33**		-.15*		.35**		-.14*
Need thwarting		-.17**		.43**		-.19**		.33**		-.16**		.25**
Step 3	.00		.01*		.02*		.02**		.00		.01	
Need satisfaction		.37**		-.15**		.35**		-.17**		.35**		-.15**
Need thwarting		-.17**		.43**		-.21**		.35**		-.16**		.26**
Interaction		-.04		-.10*		-.14*		.15**		.01		.09

* $p < 0.05$. ** $p < 0.01$.

Further, three of six interaction terms were significant. First, with regard to exhaustion, there were significant interactions involving the corresponding autonomy and competence subscales. For autonomy, at high levels of need thwarting, increased need satisfaction levels were associated with lower levels of exhaustion ($b = -.22$; $p < .05$), while at low levels of need thwarting, need satisfaction did not predict exhaustion ($b = -.06$; $p > .05$). With regard to competence, at high levels of need thwarting, need satisfaction did not predict exhaustion ($b = -.05$; $p > .05$), while at low levels of need thwarting, increased need satisfaction scores were associated with lower exhaustion scores ($b = -.26$; $p < .05$). Across both needs, exhaustion was most prevalent when athletes experienced high levels of need thwarting and low levels of need satisfaction. In relation to vitality, a significant interaction effect was observed between the corresponding competence subscales. At both low ($b = .56$; $p < .05$) and high ($b = .30$; $p < .05$) levels of need thwarting, increased levels of need satisfaction was associated with higher levels of vitality. As expected, vitality was greatest when need thwarting was low and need satisfaction was high. Each interaction plot can be found in the appendix.

Subsequently, all three psychological needs were included in the hypothesized SEM which was examined using a two-step approach (Anderson & Gerbing, 1988). A second-order factorial structure, in which the three first-order latent factors were represented by one higher order latent factor, was hypothesized for both the need thwarting and need satisfaction measurement models in order to create a more parsimonious SEM (see Figure 3.1). As such, one first-order factor loading was fixed to 1.0 on the second-order factor for purposes of identification and latent variable scaling. A hierarchical need thwarting model could not be tested prior to Study 3 because such a model can only be used if the scale is utilized alongside other variables in a SEM. This is because from a statistical perspective, it is not possible to discriminate between a hierarchical model and a first-order model with three factors as the

degrees of freedom in both models are identical. The use of the two models in future research is discussed in the General Discussion.

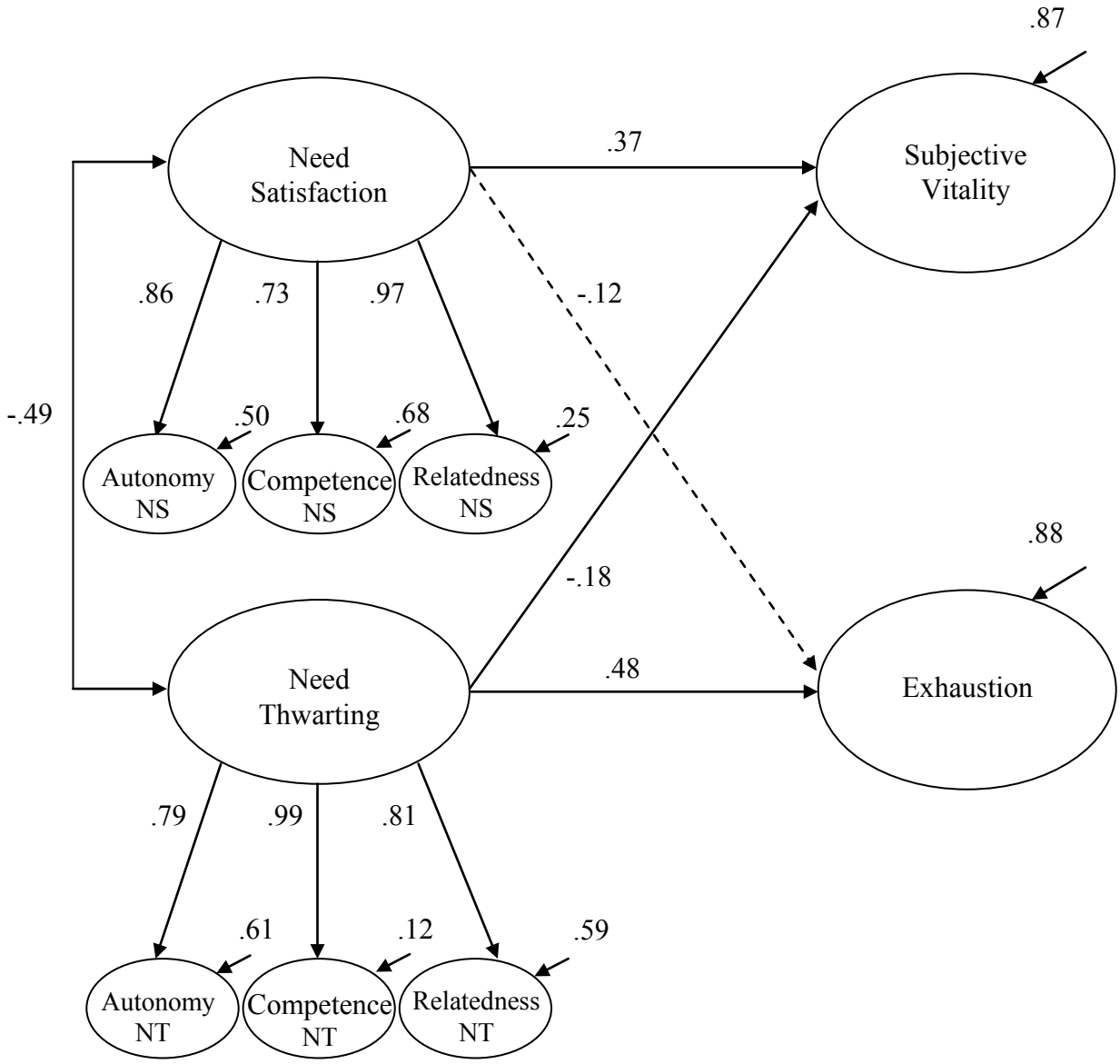

Figure 3.1: Latent Variable Modeling Predicting Subjective Vitality and Exhaustion (Study 3)

Note: Revised second-order factor model of need satisfaction, need thwarting, subjective vitality and emotional and physical exhaustion. All paths are significant, with the exception of the need satisfaction-exhaustion path. Item indicators are not presented for presentation simplicity purposes.

Although the initial measurement model demonstrated a reasonable fit to the data: S-Bχ^2 (601) = 1015.90, $p < .001$, RCFI = .91, RNNFI = .90, SRMR = .06, RRMSEA = .05 (90% CI = 0.04 - 0.05), an examination of the modification indices, standardized residuals, and

standardized factor loadings, suggested the elimination of five items (three need satisfaction items, one vitality item, and one exhaustion item).[7] None of the PNTS items were identified as problematic. The five items were removed one at a time and the model fit was reevaluated. This procedure is considered a justifiable process in measurement evaluation as it preserves the general structure of the hypothesized factor model, but only with the best available indicators (Hoffmann, 1995). The final measurement model demonstrated a good fit to the data: S-Bχ^2 (436) = 661.32, $p < .001$, RCFI = .94, RNNFI = .93, SRMR = .06, RRMSEA = .04 (90% CI = 0.04 - 0.05), and the removal of these items did not compromise the internal reliability of the scales (all scales exhibited composite reliability coefficients of .87 and above). After the measurement model was evaluated and modified, the fit of the structural model was tested and the concurrent relationships between the latent variables were examined. The hypothesized model demonstrated a good fit to the data: S-Bχ^2 (451) = 712.48, $p < .001$, RCFI = .93, RNNFI = .93, SRMR = .07, RRMSEA = .05 (90% CI = 0.04 - 0.05). However, the path from need satisfaction to exhaustion was not significant. As expected and illustrated in Figure 3.1, vitality was better predicted by need satisfaction than need thwarting. Exhaustion was predicted by need thwarting only. These findings support the predictive validity of the PNTS and highlight the limitations associated with using measures of need satisfaction to investigate ill-being.

[7]From the need satisfaction scale, three items were removed (one autonomy item, i.e., "I can decide which activities I want to practice in my sport"; one competence item, i.e., "After training at my sport for a while I feel pretty competent"; and one relatedness item, i.e., "When participating in my sport I feel safe"). The item "I nearly always feel alert and awake" was removed from the vitality scale. Finally, one item was removed from the exhaustion subscale (i.e., "I feel so tired from my training that I have trouble finding energy to do other things").

General Discussion

Based upon the framework of BPNT, the purpose of the present research was to further develop the concept of need thwarting and to psychometrically evaluate a measure designed to assess psychological need thwarting in the sport context. A systematic series of studies provided initial support for the reliability and validity of the scores derived from the new measure. Collectively, the findings from this research suggest that the PNTS could be utilized to supplement and extend research investigating psychological needs in the sport context. Although much discussed within theoretical overviews (e.g., Deci & Ryan, 2000; Ryan et al., 2006; Vallerand et al., 2008), currently psychological need thwarting remains a relatively understudied component of SDT. Sport offers an important application of this construct because it is a domain characterized by both support and encouragement and pressure and critique. It is thus a domain where both need support and need thwarts could be salient. Nonetheless, need thwarting measures could also be developed in other life contexts, given the lack of such measures in the extant SDT literature.

The results of Studies 2 and 3 revealed that the factor structure of the PNTS reflected the three-factor model proposed by SDT. Analyses also supported the internal consistency of the autonomy, competence, and relatedness subscales. As a further examination of the factor structure, three alternative two-factor CFA models were tested in Studies 2 and 3. Comparisons with the competing models provided additional support for the hypothesized three-factor model. Further, a one-factor model exhibited a very poor fit to the data in both CFA studies. These analyses suggest that the need thwarting subscales represent correlated, but distinct constructs. This pattern is consistent with prior research on need satisfaction, in which high correlations are frequently observed between the three needs (Deci & Ryan, 2000; Ryan, Bernstein, & Brown, 2010). One potential reason for this could be that all three psychological needs are often impacted by common antecedents. For example, in the same

way that autonomy-supportive behaviors involve valuing and demonstrating confidence in the other person (and thus not only contribute to feelings of autonomy need satisfaction but also relatedness and competence; Deci & Ryan, 2000), excessively controlling behaviors can thwart all three needs as they not only undermine feelings of autonomy but also often devalue and convey a lack of trust in the athlete and/or his or her ability (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010).

Additional analyses were conducted in Study 2 to examine the extent to which the scores derived from the PNTS were invariant across gender, sport type, competitive level, and competitive experience. Establishing invariance is important in order to ensure that future group-based comparisons are meaningful (Hoyle & Smith, 1994). The results supported the factorial invariance of the PNTS by suggesting that the factor loadings, factor variances, and factor covariances are equivalent across gender, sport type and competitive level and experience. The decision was made to carry out the invariance testing in Study 2, where the gender split was relatively equal, because model fit indices can be misleading when subsamples differ markedly in size (Vandenberg & Lance, 2000), as was the case in Study 3. Future research is needed to confirm the invariance of the scale across age and should also test the temporal stability (time invariance) of the PNTS.

A second-order need thwarting model, in which the three first-order factors were represented by one higher order factor, was also utilized in Study 3. Such a model would be particularly useful for researchers who are interested in obtaining an overall measure of need thwarting (e.g., when such a measure is used in complex SEM) and is justifiable from a theoretical perspective as previous research has suggested that the three psychological needs tend to function in unison in natural settings (e.g., Baard et al., 2004; Gagné et al., 2003). On the other hand, if researchers are interested in examining whether the thwarting of specific needs predict specific outcomes, we would recommend the use of the three-factor model in

order to examine the impact of each need separately. For instance, future research utilizing the three-factor model could explore whether it is necessary for all three needs to be thwarted in order for ill-being to occur, or whether the thwarting of one need is more strongly linked to particular negative outcomes.

As expected, small negative correlations were observed between athletes' perceptions of psychological need thwarting and psychological need satisfaction. These small correlations and the results of the EFA analyses in Study 2 support the discriminant validity of the need thwarting scale and suggest that perceived need satisfaction and perceived need thwarting are independent constructs. As such, low scores on measures of need satisfaction do not represent need thwarting and, therefore, the traditional bipolar approach (i.e., need satisfaction – need dissatisfaction) cannot adequately investigate the hypothesized detrimental effects of need thwarting on health and well-being. Such a conclusion is in line with previous research in which low levels of need satisfaction have not reliably predicted athlete ill-being (e.g., Gagné et al., 2003; Quested & Duda, 2010).

In Study 3 we presented evidence to support the incremental predictive validity of the three need thwarting subscales over and above need satisfaction, as well as a SEM which included all three needs. These analyses demonstrated the value of considering need thwarting—in every case need thwarting accounted for additional variance above and beyond that due to need satisfaction scores. As expected, the assessment of need thwarting added especially to the prediction of negative outcomes. Further, in the SEM analysis, exhaustion was predicted by need thwarting only. In line with BPNT, we suggest that this is because the thwarting of psychological needs can lead to defensive psychological accommodations (e.g., the development of controlling regulatory styles, compensatory motives or need substitutes, and rigid behavior patterns) which have severe costs for health and well-being (Deci & Ryan, 2000; Ryan et al., 2006). In concert, these findings indicate that the manifestation of ill-being

in sport may be more related to the presence of psychological need thwarting than to the absence of psychological need satisfaction. The finding that need satisfaction and need thwarting differently predict positive and negative mental health outcomes provides further impetus to disentangling these constructs in future SDT-based research.

Given their potential independence, it is plausible that need thwarting and need satisfaction can be perceived to co-occur within the same sport context. Accordingly we tested for interactions between corresponding need thwarting and need satisfaction subscales. Three of six interactions were significant, albeit with relatively small effect sizes relative to the main effects. One indicated that higher autonomy need satisfaction can help buffer the effects of need thwarting in fostering exhaustion. A second interaction suggested that high competence need thwarting can diminish the salutatory impact of satisfaction on exhaustion. A third interaction suggested that vitality is most catalyzed when competence need satisfaction is high and need thwarting low. Thus, these interactions generally indicated that buffering effects can occur between need satisfaction and thwarting constructs, and are suggestive of the need for further study of these opposing, yet sometimes co-occurring, dynamics within sport settings.

In Study 3 we modeled the overall relations between both the need satisfaction and thwarting constructs and positive and negative outcomes. Results indicated that when ill-being and other maladaptive outcomes are the focus of investigation, need thwarting can predict a larger amount of variance relative to measures of need satisfaction. The current research findings thus highlight the importance of future work investigating the distinct consequences of psychological need thwarting. For example, research should continue to investigate the role that the thwarting of one or more psychological needs play in predicting other burnout symptoms and various maladaptive outcomes associated with competitive sport, such as low or contingent self-esteem, anxiety and depression, disordered eating, and self-

handicapping. Future research could also examine the direct effects of psychological need thwarting on the development of defensive psychological accommodations assumed to have severe costs for mental health and well-being (e.g., controlling regulatory styles, need substitutes, extrinsic goals, and rigid behavior patterns such as disordered eating and obsessive compulsive behaviors; Deci & Ryan, 2000). A greater understanding of psychological need thwarting in sport could aid the development of appropriate interventions which aim to reduce the prevalence of athlete ill-being.

In summary, the purpose of the current research was to evaluate the construct validity and reliability of scores derived from the PNTS, a self-report measure designed to assess athletes' perceptions of psychological need thwarting based upon the framework of SDT. Overall, the findings have provided substantial support for the new questionnaire measure and have emphasized the importance of measuring need thwarting, an understudied aspect of SDT with important ramifications for psychological well-being. We hope that the PNTS will facilitate research into the darker side of sports participation.

CHAPTER 4.

SELF-DETERMINATION THEORY AND DIMINISHED FUNCTIONING: THE ROLE OF INTERPERSONAL CONTROL AND PSYCHOLOGICAL NEED THWARTING

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Abstract

Drawing from self-determination theory (Ryan & Deci, 2002), three studies explored the social-environmental conditions that satisfy versus thwart psychological needs and, in turn, impact psychological functioning and well/ill-being. In cross-sectional Studies 1 and 2, structural equation modeling analyses supported latent factor models in which need satisfaction was predicted by athletes' perceptions of autonomy support and need thwarting was better predicted by coach control. Athletes' perceptions of need satisfaction predicted positive outcomes associated with sport participation (vitality and positive affect) whereas need thwarting more consistently predicted maladaptive outcomes (disordered eating, burnout, depression, negative affect, and physical symptoms). In addition, athletes' perceptions of psychological need thwarting were significantly associated with perturbed physiological arousal (elevated levels of secretory immunoglobulin A) prior to training. The final study involved the completion of a diary and supported the relations observed in the cross-sectional studies at a daily level. These findings have important implications for the operationalization and measurement of interpersonal styles and psychological needs.

Keywords: self-determination theory, autonomy support, control, psychological needs, burnout, disordered eating, psychological well/ill-being

Introduction

Self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2002) is a perspective on human motivation and personality that focuses on the social-environmental conditions that enhance versus diminish self-motivation and healthy psychological adjustment. Specifically, social environments can either facilitate the growth and integration propensities with which the human psyche is endowed, or can thwart these processes resulting in behaviors and inner experiences that represent the darker sides of human existence (Ryan & Deci, 2000). Substantial research guided by SDT has explored the conditions and processes that foster healthy development and effective functioning in humans. Comparatively less research has considered the development and amelioration of ill-being and psychopathology (Pyszczynski, Greenberg, & Solomon, 2000; Ryan & Deci, 2000). Based upon recent conceptual and measurement advances in the SDT literature, the primary aim of the present research was to examine the impact of controlling and autonomy-supportive contextual factors on both experiences of need satisfaction and need thwarting and explore the differential effect of the latter variables on well/ill-being outcomes. This endeavor should provide unique empirical evidence to test the propositions of SDT in relation to both the brighter and darker sides of human functioning.

Basic Psychological Needs and Well/Ill-Being

Basic psychological needs theory (BPNT; Deci & Ryan, 2000), a sub-theory within SDT, proposes that people function and develop most effectively as a consequence of social-environmental supports for their autonomy, competence, and relatedness needs. The need for autonomy refers to the degree to which individuals feel volitional and responsible for their own behavior. The need for competence concerns the degree to which individuals feel effective in their ongoing interactions with the social environment and experience

opportunities in which to express their capabilities. Finally, the need for relatedness is defined as the extent to which individuals feel a secure sense of belongingness and connectedness to others in their social environment (Ryan & Deci, 2002).

Previous research (conducted in domains as diverse as sport, education, work, parenting, healthcare, and psychotherapy) has established a clear empirical link between psychological need satisfaction (or lack thereof) and well-being, both at a general and daily level (Gagné, Ryan, & Bargmann, 2003; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Ryan, Bernstein, & Brown, 2010; Ryan & Deci, 2000). However, SDT recognizes that beyond psychological growth and well-being, people can display cognitive, affective, and behavioral patterns that represent the non-optimal or darker sides of human existence (Deci & Ryan, 2000). To explain the causes of such diminished functioning, Deci and Ryan proposed that the thwarting of basic psychological needs can lead to defensive or self-protective accommodations (e.g., the development of controlling regulatory styles, compensatory motives or need substitutes, and rigid behavior patterns) which have significant negative consequences for health and well-being (Niemiec, Ryan, & Deci, 2009; Ryan, Deci, Grolnick, & La Guardia, 2006). The concept of psychological need thwarting therefore, is the mechanism that links negative dimensions of the social environment to indices of compromised functioning and ill-being. However, current research has yet to simultaneously and explicitly explore experiences of both psychological need satisfaction and need thwarting within a given context, while also assessing their differential outcomes.

The Conceptualization of Psychological Need Thwarting

Previous SDT-based research has investigated negative relations between need satisfaction and various maladaptive outcomes and has thus provided indirect evidence to support the hypothesized detrimental effects of need thwarting on health and well-being (e.g.,

Hodge, Lonsdale, & Ng, 2008; Pelletier, Dion, & Lévesque, 2004; Reinboth, Duda, & Ntoumanis, 2004). Although these studies have indicated that low need satisfaction is associated with ill-being, this finding has not always being replicated in the literature (e.g., Adie, Duda, & Ntoumanis, 2008; Gagné et al., 2003; Quested & Duda, 2010). Bartholomew, Ntoumanis, Ryan, and Thøgersen-Ntoumani (2011) suggested that this may be due to the fact that previous research has not explicitly assessed need thwarting in relation to negative outcomes. Specifically, Bartholomew et al. posited that low scores on measures of psychological need satisfaction may simply reflect need dissatisfaction and not adequately tap the active nature and intensity of need frustration that Deci and Ryan (2000) described as states of need thwarting (e.g., "I do not feel related" versus "I feel I am rejected"). Although there have been recent attempts to measure the negative side of psychological needs (e.g., Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010), such attempts do not explicitly distinguish between need dissatisfaction and need thwarting.

Compared to feelings of dissatisfaction, therefore, the negative experiential state of need thwarting (i.e., the feelings which arise when individuals perceive their psychological needs to be actively undermined by others) is far more likely to lead to negative outcomes and ill-being, as has been discussed in the theory with regards to specific life domains (e.g., Grolnick, 2003; Kasser, Ryan, Zax, & Sameroff, 1995). In line with such theorizing, Bartholomew et al. (2011) validated a measure designed to tap psychological need thwarting in the sport context. The authors demonstrated that compared to need satisfaction, need thwarting better predicted feelings of exhaustion. Contrastingly, need satisfaction was a stronger predictor of vitality. These findings provided preliminary support for the utility of measuring need thwarting alongside need satisfaction and indicated that need thwarting may be a better predictor of diminished functioning and ill-being. The current research aims to further explore this important theoretical distinction and expand on the initial work of

Bartholomew et al. by examining the effects of psychological need thwarting (independently of need satisfaction) on a number of maladaptive affective, behavioral, and physiological outcomes. Examining whether need thwarting has meaningful and independent empirical consequences beyond more traditional measures of need satisfaction can provide new and stronger testing for SDT's account of the darker sides of human existence.

Basic Psychological Needs and Social Environments

It is also important to explore the social-environmental conditions that may sustain or frustrate athletes' psychological needs. Research suggests that interactions with significant others play an important role in either supporting or thwarting psychological needs (Vallerand, Pelletier, & Koestner, 2008). One key contextual factor is autonomy support. An autonomy-supportive environment fosters self-initiated strivings and creates conditions for individuals to experience a sense of personal autonomy (Grolnick, Ryan, & Deci, 1991), competence, and relatedness (Baard, Deci, & Ryan, 2004).

Beyond examining merely support or its absence, however, it is important to acknowledge that individuals in a position of authority can also behave in a coercive, pressuring, and authoritarian way to impose a specific and preconceived way of thinking, feeling, and behaving upon others (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010; Silk, Morris, Kanaya, & Steinberg, 2003). For example, in 2007, a very public confrontation between a Ukrainian coach and his daughter rocked the World Swimming Championships. The 38-year-old coach pushed and hit the teenage backstroke star after she failed to qualify for the 50m final. A number of studies have documented the detrimental effect of controlling behaviors on the need for autonomy (Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009) and autonomous self-regulation (Assor, Roth & Deci, 2004; Pelletier, Fortier, Vallerand, & Brière, 2001). However, when examined in relation to need related outcomes,

typically measures of satisfaction rather than thwarting have been used. Utilizing an approach which includes assessments of both autonomy support and control as well as need satisfaction and need thwarting reflects a more comprehensive examination of the psychological experiences of individuals in different social environments and can potentially provide a better understanding of the motivational factors that result in variability in health-related outcomes.

Present Research

The primary goal of this research was to test a model in which perceived controlling behaviors were hypothesized to predict feelings of psychological need thwarting which, in turn, were expected to lead to patterns of behavior and affect associated with diminished functioning and ill-being. Contrastingly, in the same model, perceptions of autonomy support were hypothesized to predict need satisfaction which, in line with previous research, was expected to facilitate optimal psychological well-being. Three studies were carried out in the sport context in order to test the hypothesized model using a multi-method approach. Sport offers an important application of the constructs outlined in the introduction because it is an environment where both need supports and need thwarts could be salient. Whilst many coach behaviors can have a positive influence on athletes' psychological needs and well-being, maladaptive coaching behaviors and strategies are not altogether uncommon (Fraser-Thomas & Côté, 2009).

Study 1 examined the concurrent relationships between athletes' perceptions of autonomy-supportive and controlling coaching behaviors, psychological need satisfaction and need thwarting, vitality, depression, and disordered eating. Study 2 replicated the findings of Study 1 with an independent sample and additional outcomes associated with sport participation, namely positive affect, negative affect, and burnout symptoms. Further, in order

to assess the impact of psychological need thwarting on biological functioning, Study 2 also included secretory immunoglobulin A (S-IgA), an immunological marker known to increase sensitively during acute psychological stress (Bosch, Ring, de Geus, Veerman, & Amerongen, 2002). Finally, we conducted a longitudinal test of the hypothesized relations in Study 3 using a diary methodology over eight training days.

In line with SDT, we hypothesized that perceptions of autonomy-supportive behaviors would primarily predict need satisfaction (Hypothesis 1) and perceptions of controlling coach behaviors would primarily predict need thwarting (H2). Subsequently, optimal outcomes and well-being were expected to be more strongly predicted by need satisfaction (H3) whereas diminished functioning and ill-being were expected to be more strongly predicted by need thwarting (H4).

Study 1

Study 1 focused primarily on the prediction of abnormal and harmful eating behaviors which are often used in a misguided attempt to lose weight (Hausenblas & Carron, 1999). The sport context is an apt place to explore these issues as sport participation has been associated with an increased incidence of eating disorders and/or subclinical eating problems (Sundgot-Borgen, 1993). For example, athletes involved in sports that focus on aesthetics, emphasize leanness, and/or have weight requirements, have been identified as being particularly at risk (Petrie & Greenleaf, 2007).

From an SDT perspective, eating disorders and the struggle for body control represent rigid or self-defeating behaviors which result from the thwarting of autonomy, competence, and relatedness needs (Pelletier et al., 2004; Thøgersen-Ntoumani, Ntoumanis, & Nikitaras, 2010). Specifically, not eating (or engaging in other disordered eating behaviors) represents one domain in which individuals can regain some control over their own behaviors and

outcomes and thus feel autonomous and competent (Pelletier et al., 2004; Strauss & Ryan, 1987). When the need for relatedness is thwarted, individuals may also attempt to gain social approval by meeting standards of ideal physique (Thøgersen-Ntoumani et al., 2010).

In addition to disordered eating behaviors, we also examined two affective indicators of psychological well/ill-being (i.e., vitality and depression). Although sport participation is frequently associated with positive outcomes including increased vitality (Adie et al., 2008; Gagné et al., 2003), the mental and physical demands often placed upon athletes in the sport environment can also lead to negative affect, such as depression (Fraser-Thomas & Côté, 2009). It is thus important to examine how social-psychological factors shape both the positive and negative emotional experiences of athletes in sporting environments.

Method

Participants

The sample consisted of 303 female athletes aged between 16 and 25 years old (M = 19.74; SD = 2.19). On the basis of self-reported height and weight, athletes had an average body mass index (BMI) of 20.98 kg/m² (SD = 2.34). Athletes were involved in aesthetic sports such as gymnastics and figure skating (n = 212), or weight-related sports such as light-weight rowing and long-distance running (n = 91). These athletes competed at club (n = 51), county (n = 88) regional (n = 57), national (n = 82), or international (n = 19) level; 6 athletes did not report their competition level. On average, athletes had 4.14 years experience with their current coach (SD = 4.18).

Procedure

All three studies reported in this paper were conducted following institutional ethical approval and in accordance with APA guidelines. Athletes were recruited via club coaches and sports events organizers and athlete, coach, and parental consent (for those athletes under 18) were obtained. The questionnaires administered in Studies 1 and 2 were completed in the sport context under the supervision of the primary researcher. All coaches were asked to leave the immediate area.

Measures

Autonomy-supportive behaviors. Athletes' perceptions of their coach's autonomy-supportive behaviors were assessed using six items taken from the Health-Care Climate Questionnaire (HCCQ; Williams, Grow, Freeman, Ryan, & Deci, 1996) and modified for their use in sport (e.g., "I feel that my coach provides me with choices and options").

Controlling behaviors. Athletes' perceptions of their coach's controlling behaviors were assessed using the 15-item Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010), a multi-dimensional measure designed to tap four controlling motivational strategies salient in sport: the controlling use of rewards (e.g., "My coach only uses rewards/praise so that I complete all the tasks he/she sets during training"), negative conditional regard (e.g., "My coach is less friendly with me if I don't make the effort to see things his/her way"), intimidation (e.g., "My coach intimidates me into doing the things that he/she wants me to do"), and excessive personal control (e.g., "My coach tries to interfere in aspects of my life outside of my sport").

Need satisfaction. To assess satisfaction of the need for autonomy, five items collated by Standage, Duda, and Ntoumanis (2003) were used (e.g., "I have some choice in what I want to do in my sport"). Satisfaction of the need for competence was assessed using five

items (e.g., “I think I am pretty good at my sport”) from the competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). Finally, satisfaction of the need for relatedness was assessed using the 5-item acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998). A sample item is “when participating in my sport I feel supported”.

Need thwarting. Need thwarting was assessed using the 12-item Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011). The stem used in the questionnaire was “In my sport…” and athletes rated statements such as “I feel forced to follow training decisions made for me”, “I feel I am rejected by those around me”, “There are times when I am told things that make me feel incompetent”.

Disordered eating. Disordered eating was assessed using the Questionnaire for Eating Disorder Diagnoses (Q-EDD; Mintz, O’Halloran, Mulholland, & Schneider, 1997). The Q-EDD is a 50-item self-report questionnaire that operationalizes *DSM-IV* criteria for eating disorders (American Psychiatric Association, 1994). Based on their responses, participants are placed into one of two major diagnostic categories: eating-disordered (*DSM-IV* diagnosis) or non-eating-disordered (no *DSM-IV* diagnosis). The non-eating-disordered category comprises two subcategories: symptomatic (some eating disorder symptoms but no *DSM-IV* diagnosis) and asymptomatic (no eating disorder symptoms). Mintz et al. (1997) reported test-retest reliability kappa values ranging from .64 to .94, and an accuracy rate of 98% between the Q-EDD and clinician diagnosis of eating disorder categories.

Vitality. A five-item version of the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997) was employed to measure athletes’ feelings of positive energy (e.g., “I feel alive and full of vitality”).

Depression. Depression was measured using the 7-item depression subscale of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995). A sample item is “I

can't seem to experience any positive feeling at all". Table 4.1 presents the response scale and internal reliability estimate for each of the measures utilized in the current study.

Data Analysis

Data were analyzed via structural equation modeling using EQS 6.1 (Bentler & Wu, 2002). For models containing categorical variables (such as the disordered eating variable in the current study), the least squares estimation method is recommended (Lei, 2009). For such models, EQS uses an analytical approach developed by Lee, Poon, and Bentler (1995). A robust χ^2 statistic (S-Bχ^2; Satorra & Bentler, 1994) and robust parameter standard errors (Bentler & Dijkstra, 1985) were produced to correct for non-normality in large samples (200-500 cases; West, Finch, & Curran, 1995).

The degree of model fit was evaluated using multiple fit indices, such as the robust chi-square statistic, the robust comparative fit index (CFI), the standardized root mean residual (SRMR), and the robust root mean square error of approximation (RMSEA). Although values indicative of acceptable model fit remain controversial (Marsh, Hau, & Wen, 2004), it is typically accepted that CFI values exceeding .90 and .95 are indicative of acceptable and excellent fit, respectively, and RMSEA and SRMR values of .08 or less are satisfactory (Hu & Bentler, 1999).

Results and Discussion

Table 4.1 presents descriptive statistics and intercorrelations among all of the measures used in the study. Raykov's composite reliability coefficient (RHO; Raykov, 1997) was employed to assess the internal reliability of each scale. Based on their Q-EDD scores, athletes were placed into one of three diagnostic categories: eating disordered (n = 31), symptomatic (n = 47), and asymptomatic (n = 225). The eating disordered and symptomatic groups were then

collapsed and a binary categorical variable was used (i.e., eating disordered/symptomatic [*n* = 78]; asymptomatic [*n* = 225]).

Aside from disordered eating, all constructs were tested as latent variables. To increase the stability of the parameter estimates and improve the ratio of sample size to estimated parameters (Bagozzi & Edwards, 1998), construct specific parcels were created for the autonomy support, vitality, and depression scales. Each parcel represented unweighted average scores created by pairing stronger loading items with weaker loading items from the same scale (Little, Cunningham, Shahar, & Widaman, 2002). In line with previous SDT-based research (e.g., Baard et al., 2004), the three need satisfaction subscales were used as indictors of a general need satisfaction latent variable. Similarly, need thwarting was modeled as a latent factor indexed by the three subscales of the PNTS. Finally, the composite scores derived from the four subscales of the CCBS were used as indicators of a controlling coach behavior latent variable.

Table 4.1. Descriptive Statistics, Internal Reliabilities, and Pearson Correlations for Variables (Study 1)

Variable	Range	*M*	*SD*	RHO	1	2	3	4	5	6
1. Coach autonomy support	1-7	5.10	1.20	.93						
2. Coach control	1-7	2.48	1.31	.97	-.43**					
3. Need satisfaction	1-7	5.31	0.87	.94	.56**	-.38**				
4. Need thwarting	1-7	2.83	1.29	.95	-.51**	.70**	-.49**			
5. Disordered eating	-	-	-	-	-.09	.28**	-.13*	.19**		
6. Vitality	1-7	4.92	1.19	.92	.40**	-.20**	.40**	-.31**	-.09	
7. Depression	0-3	0.41	0.48	.87	-.37**	.41**	-.34**	.45**	.19**	-.50**

* $p < 0.05$. ** $p < 0.01$.

The structural model demonstrated a good fit to the data: S-Bχ^2 (177) = 434.76, $p <$ .001, RCFI = .94, SRMR = .05, RRMSEA = .07 (90% CI = 0.06 - 0.08). The standardized path coefficients are presented in Figure 4.1. As illustrated in Figure 4.1, need satisfaction was predicted by perceptions of autonomy-supportive behaviors and need thwarting was better predicted by perceived coach control (supporting H1 & H2). Vitality was predicted by need satisfaction only and depression and disordered eating were predicted by need thwarting only (supporting H3 & H4). Regression paths between control and need satisfaction, need satisfaction and disordered eating, need satisfaction and depression, and need thwarting and vitality were not significant.

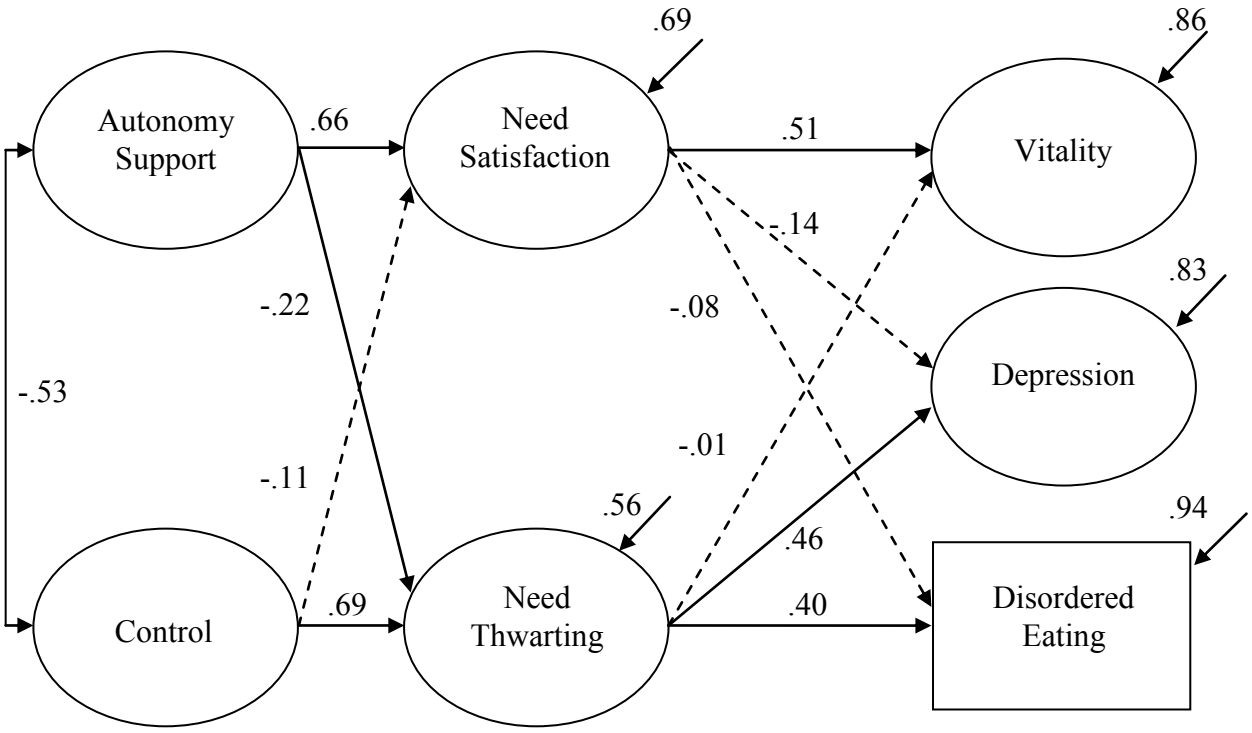


Figure 4.1: Latent Variable Modeling Predicting Vitality, Depression, and Disordered Eating (Study 1)

Note: Dotted lines represent non-significant parameters. Disordered eating was an observed categorical variable. Item indicators are not presented for presentation simplicity purposes. Correlations between disturbance terms were: need satisfaction-need thwarting = -.43, vitality-depression = -.43.

In summary, the current findings supported an extended SDT-based model of optimal and diminished human functioning in the sport domain. Specifically, autonomy supportive coach behaviors primarily predicted athletes' feelings of need satisfaction which, in turn, predicted well-being (i.e., vitality). In contrast coach control was related to perceptions of need thwarting which were subsequently associated with behaviors (i.e., disordered eating) and affect (i.e., depression) which are assumed to represent the darker sides of human existence (Ryan & Deci, 2000). The results thus highlight the importance of measuring athletes' perceptions of interpersonal control and feelings of need thwarting directly when investigating psychological ill-being. However, to strengthen our arguments we carried out a second study to examine whether these findings could be replicated with an independent sample (broadened to include both male and female athletes and a diverse range of sports) and different forms of psychological well/ill-being.

Study 2

Study 2 focused primarily on the manifestation of burnout symptoms. Burnout is a psychophysiological response to chronic situational stress, characterized by an enduring experience of emotional and physical exhaustion, sport devaluation, and reduced accomplishment (Raedeke & Smith, 2001). Recent SDT-based research has investigated burnout from a need satisfaction perspective, indicating that low levels of need satisfaction are associated with higher levels of burnout symptoms (Hodge et al., 2008; Perreault, Gaudreau, Lapointe, & Lacroix, 2007). However, we suggest that the negative experiential state of burnout may be more prevalent among athletes who not only experience low levels of need satisfaction, but also perceive their basic needs to be chronically frustrated by controlling sport environments. Therefore, the exploration of interpersonal control and psychological need thwarting within the context of athlete burnout should also prove

profitable. In addition, positive and negative affect were measured in this study as indicators of psychological well/ill-being.

The current study also aimed to further prior research by including a marker of psychobiolological functioning. S-IgA is an immunological protein that is secreted at the mucosa; the soft tissues that line the respiratory and gastro-intestinal tracts. Its main purpose is to protect against the invasion of infectious agents (e.g., viruses, bacteria). The levels of this protein are responsive to stress and can be measured in saliva, which conveniently provides psychologists and psychophysiologists with an accessible, non-invasive marker of immune function. Stressors have a well-known bi-directional effect on immune parameters, whereby protracted stressors suppress immune functions and acute stressors enhance immune system activity (Segerstrom & Miller, 2004). S-IgA is a typical example, chronic stress has been shown to have a modest lowering effect on this immunological marker whereas acute stressors, with the exception of stressors involving physical pain, have consistently been found to increase salivary S-IgA levels (Bosch et al., 2002).

Method

Participants

The sample (N = 294) comprised 80 males and 214 females aged between 12 and 17 years old (M = 14.51; SD = 1.51). The athletes were involved in both individual sports such as athletics and swimming (n = 169), and team sports such as football and rugby (n = 125). All other athlete demographics were relatively similar to those in Study 1. Saliva samples were collected from a sub-sample of athletes (N = 120; 28 males and 92 females) competing at regional level and above.

Procedure

The self-report data were collected following the procedure outlined in Study 1. Saliva samples were collected in the sport environment immediately prior to a standard training session, using the spitting method as described by Navazesh (1993). Athletes were asked to void their mouth by swallowing and then allow saliva to accumulate in the floor of their mouth without stimulation of saliva secretion by means of facial movements. The athletes were then asked to spit out into a pre-weighted, ice-chilled polypropylene cup every 60 seconds. Saliva was collected over a period of four minutes. Secretion was determined by weighting the cups and subtracting their pre-weighted values. After collection, saliva was homogenized by vigorous shaking using a vortex and clarified by centrifugations (14,000 x g, 10 min) to eliminate buccal cells and oral micro-organisms. The clear supernatant was then divided into 500µl aliquots and stored at -80°C until use. Samples were assayed for S-IgA level using an ELISA method described by Bosch et al. (2001).

Measures

Coach behaviors and psychological needs. These constructs were assessed using the questionnaire measures outlined in Study 1.

Burnout symptoms. Burnout symptoms were assessed using the 15-item Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) which contains three subscales measuring emotional and physical exhaustion (e.g., "I am exhausted by the mental and physical demands of my sport"), reduced accomplishment (e.g., "I am not achieving much in my sport"), and sport devaluation (e.g., "I have negative feelings toward my sport"). Athletes were asked to rate the extent to which they had experienced each thought/feeling over the past month.

Positive and negative affect. Positive (e.g., "happy") and negative affect (e.g., "frustrated") were measured using the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen 1988). Athletes were asked to rate the extent to which they had experienced each emotion over the past month. The response scale and internal reliability estimate for each of the measures utilized in the current study are presented in Table 4.2.

Results and Discussion

Table 4.2 presents descriptive statistics and intercorrelations among all of the measures employed in the current study. Construct-specific parcels were created for the autonomy support and PANAS scales. All other latent factors were indexed by the composite scores derived from the subscales of each measure. The structural model demonstrated an acceptable fit to the data: (S-Bχ^2 (285) = 554.54, $p < .001$, RCFI = .92, SRMR = .06, RRMSEA = .06 (90% CI = 0.05 - 0.06). The standardized path coefficients are presented in Figure 4.2. The hypothesized model was supported. Perceived autonomy-supportive coach behaviors were more strongly associated with psychological need satisfaction which, in turn, predicted positive affect (supporting H1 & H3). Contrastingly, perceptions of coach control were linked to psychological need thwarting only, which in turn, was a better predictor of burnout and negative affect when compared to need satisfaction (supporting H2 & H4). The regression paths between coach control and need satisfaction, and need thwarting and positive affect were not significant.

Table 4.2. Descriptive Statistics, Internal Reliabilities, and Pearson Correlations for Variables (Study 2)

Variable	Range	*M*	*SD*	RHO	1	2	3	4	5	6	7
1. Coach autonomy support	1-7	5.38	1.20	.91							
2. Coach control	1-7	2.27	1.16	.95	-.37**						
3. Need satisfaction	1-7	5.51	0.84	.93	.62**	-.30**					
4. Need thwarting	1-7	2.54	1.06	.91	-.43**	.50**	-.40**				
5. Burnout symptoms	1-5	2.03	0.66	.92	-.41**	.32**	-.46**	.56**			
6. Positive affect	1-7	3.88	0.66	.86	.48**	-.19**	.46**	-.31**	-.44**		
7. Negative affect	1-7	1.97	0.72	.85	-.22**	.20**	-.34**	.37**	.51**	-25**	
8. S-IgA	-	2.07	0.23	-	-.08	.02	-.08	.20*	.03	-.06	.03

* $p < 0.05$. ** $p < 0.01$.

Note: The correlations between S-IgA and the other variables were obtained from a sub-sample of athletes ($N = 120$).

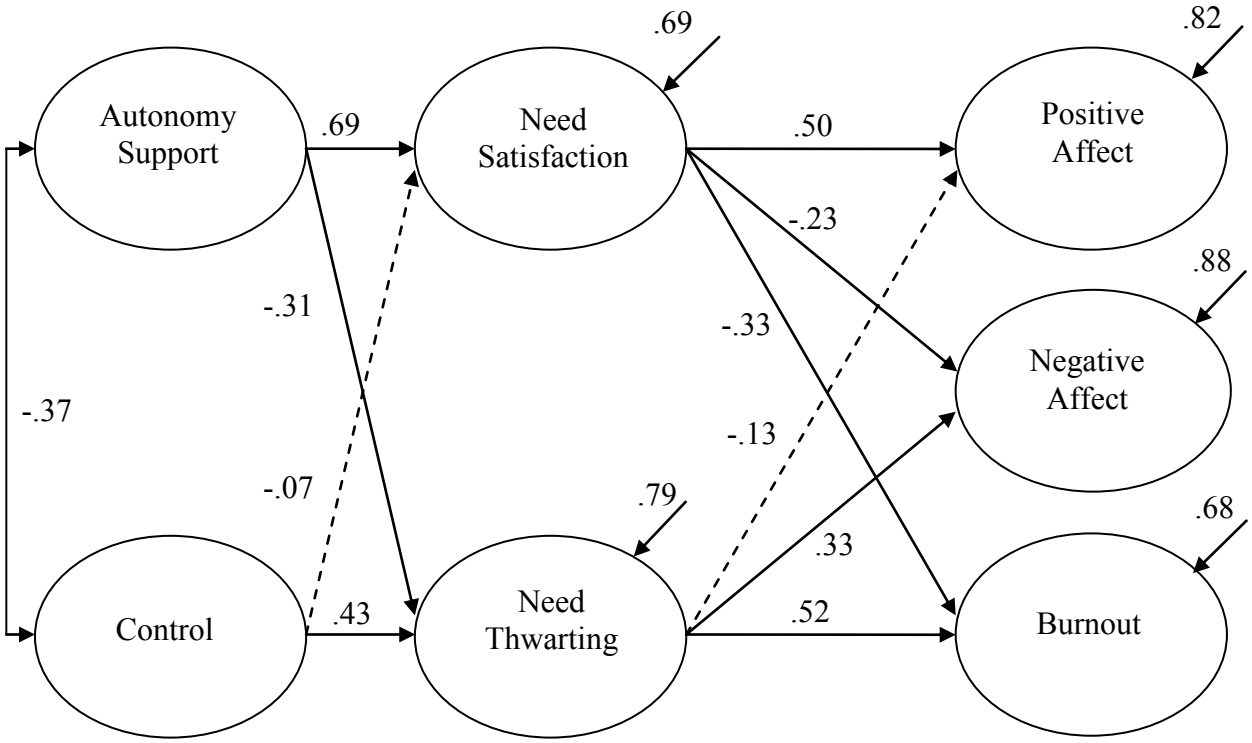


Figure 4.2: Latent Variable Modeling Predicting Positive Affect, Negative Affect and Burnout Symptoms (Study 2)

Note: Dotted lines represent non-significant parameters. Item indicators are not presented for presentation simplicity purposes. Correlations between disturbance terms were: need satisfaction-need thwarting = -.20, positive affect-burnout = -.30, negative affect-burnout = .46.

Model comparisons reinforced the assertion that need thwarting is a better predictor of negative outcomes compared to need satisfaction. In the first model, the pathway between need satisfaction and burnout symptoms and the pathway between need thwarting and burnout symptoms were constrained to be equal. In the second model, the pathways from need satisfaction and need thwarting to negative affect were constrained to be equal. The fit of the original model to the data was significantly better than the fit of the two additional models (burnout: $\Delta\chi^2$ (1) = 166.40, $p < .001$; negative affect: $\Delta\chi^2$ (1) = 113.91, $p < .001$), indicating that the equality constraints were not plausible.

S-IgA Analysis

The decision was made to collect samples from athletes competing at regional levels and above as these athletes are likely to train more frequently and may, therefore, be at increased risk of repeated biological deregulations and associated health problems. In addition, given their investment, they may also be more willing to endure social environments that result in feelings of need thwarting.

The S-IgA data were $\log^{10}$-transformed to restore normality. Correlation analysis revealed that S-IgA showed a significant positive correlation with need thwarting (see Table 4.2). This finding is indicative of enhanced physiological arousal (i.e., acute stress; Bosch et al., 2002) in anticipation of the imminent training session. Note that the other dependent variables had a larger temporal resolution (e.g., the PANAS items were used to indicate affect over the past month) and did not capture acute changes in mood.

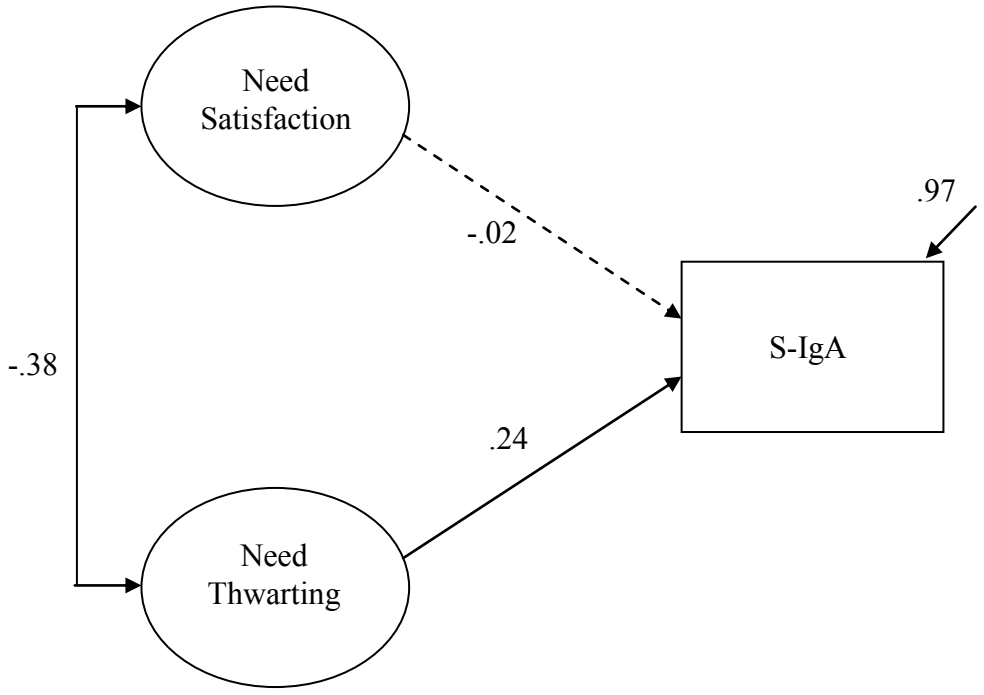


Figure 4.3: Latent Variable Modeling Predicting Levels of S-IgA (Study 2)

Note: Dotted lines represent non-significant parameters. S-IgA was an observed variable. Item indicators for the two need factors are not presented for presentation simplicity purposes.

Subsequently, the S-IgA data were entered as an observed variable in the SEM analysis (alongside need satisfaction and need thwarting latent factors). The structural model demonstrated a good fit to the data: S-Bχ^2 (12) = 16.80, $p > .05$, RCFI = .98, SRMR = .03, RRMSEA = .06 (0.00 - 0.08). The standardized path coefficients are presented in Figure 4.3. Perceived psychological need thwarting significantly predicted higher levels of S-IgA measured before a standard training session. The path between need satisfaction and S-IgA was not significant. These findings suggest that athletes who generally perceived their needs to be actively thwarted in their sport environment experienced elevated levels of physiological arousal before training. In contrast, athletes who generally experienced high levels of need satisfaction during training did not show evidence of physiological arousal before their session. Taken in concert, the findings from the current study suggest that need thwarting not only predicts self-reported negative affect and burnout symptoms, but is also associated with elevated immunological activation indicative of physiological arousal.

Overall, cross-sectional Studies 1 and 2 have provided considerable support for an extended model of optimal and diminished human functioning. However, the use of between-person analyses is limited in that it cannot account for within-person variability. For example, it is likely that an athlete's ongoing experience of participating in competitive sport will vary from day to day or from training session to training session. In addition, within-person analyses rule out potential between-person (individual difference) confounds. Thus, further support for the utility of considering interpersonal control and need thwarting in the prediction of ill-being was sought in Study 3 via the use of a diary study approach which allowed us to explore whether the social-psychological processes outlined in the hypothesized model can also be observed at the within-person level.

Study 3

As well as controlling for between-person variability, diary studies have the advantage of being able to capture the dynamics of events or psychological states that may be missed when general/global self-report measures are used (Bolger, Davis, & Rafaeli, 2003). As responses are provided daily, distortions inherent in asking individuals to recall and summarize many experiences varying in recency and memorability (i.e., a documented short-coming of aggregated self-reports) are avoided. In Study 3, athletes were asked to report on their levels of positive affect, negative affect, and physical symptoms before each training session. Somatic symptoms are frequently employed as indicators of ill-being in SDT-based research (Reinboth et al., 2004; Reis et al., 2000: Ryan et al., 2010) and were included in the current study to further explore the proposed link between psychological needs and self-reported physical health. After each training session, athletes rated the extent to which they perceived their coach to engage in autonomy-supportive and/or controlling behaviors and the degree to which their needs for autonomy, competence, and relatedness had been satisfied and/or thwarted. Athletes also rated their well/ill-being again after training. It was hypothesized that perceptions of autonomy supportive coach behaviors would relate to higher levels of need satisfaction during training (Model 1) and that perceptions of controlling behaviors would predict higher levels of perceived need thwarting (Model 2). Subsequently, experiences of need satisfaction/need thwarting during training were expected to predict changes in well/ill-being from before to after each training session. Specifically, need satisfaction during training was expected to facilitate positive affect from before to after training (Model 3) and need thwarting was hypothesized to lead to higher levels of negative affect (Model 4) and physical symptoms (Model 5) from before to after training.

Method

Participants

The sample (N = 61) comprised 24 males and 37 females aged between 15 and 25 years old (M = 19.31; SD = 2.94). Athlete demographics were relatively similar to those in Studies 1 and 2. On average, athletes trained for 12.68 hours a week (SD = 4.01).

Procedure

Before and after training over a two week period comprising eight training days, athletes provided responses to a short questionnaire installed on Sony Ericsson v640 mobile phones. The questionnaire took 3-4 minutes to complete. The athletes were signaled 30 minutes before and 30 minutes after each training session (to allow for early starts and late finishes in training sessions). All athletes responded within 30 minutes from being signaled and thus all data points (976 in total) were included in the subsequent analyses. The benefits of electronic methods of data collection (as opposed to paper diaries) include the use of signalling and the provision of time-stamps. These features can be used to measure compliance and control for retrospective memory biases.

Measures

Coach behaviors. The stem used in the questionnaire was "During training today my coach…" and athletes completed two items ("Listened to how I would like to do things" and "Tried to understand how I saw things before suggesting a new way of doing things") and four items ("Only used rewards/praise so that I would complete all the tasks he/she set", "Paid me less attention because I had displeased him/her", "Shouted at me in front of others in order to make me do certain things", "Tried to interfere in aspects of my life outside of my sport")

taken from the scales used in Studies 1 and 2. Items with the strongest loadings on CFAs were chosen (see appendix). Both measures demonstrated good internal reliability (averaged across the eight days) in the current study (coach autonomy support: RHO = .85; coach control: RHO = .81).

Psychological needs. The stem used in the questionnaire was "During training today" and athletes responded to three need satisfaction items ("I could decide what activities I wanted to practice", "I felt that I was pretty good at my sport", and "I felt listened to") and three need thwarting items ("I felt forced to follow training decisions made for me", "I was told things that made me feel incompetent", "I felt that other people were dismissive of me") taken from the scales used in Studies 1 and 2. Again, items with the strongest loadings on CFAs were chosen (see appendix). The reliability for each measure averaged across the eight days was as follows: need satisfaction RHO = .68; need thwarting RHO = .71.

Psychological well-being/ill-being. Five adjectives selected by Diener and Emmons (1984) and commonly used in diary studies were employed to represent positive affect ("happy" and "joyful") and negative affect ("frustrated", "angry/hostile" and "worried/anxious"). The adjective "energized", taken from the Psychological Vitality Scale (Ryan & Frederick, 1997), was also used alongside the other positive affect items in order to tap subjective vitality, a primary component of psychological well-being. To measure physical symptoms, two items ("Headache" and "Stomach-ache/pain") from the Physical Symptom Checklist (Emmons, 1991) were utilized. The stem used for all well/ill-being measures was "Please indicate how you are feeling at this moment…". The reliability for each measure, before (A) and after training (B), averaged across the eight days was as follows: positive affect (A) RHO = .82, (B) RHO =.67; negative affect (A) RHO = .73, (B) RHO = .75; physical symptoms (A) RHO = .72, (B) RHO = .72.

Data Analysis

Multilevel modeling (MLM: Raudenbush & Bryk, 2002) was used to test the exploratory questions outlined in the introduction. MLM is suitable for the hierarchical nature of diary data, in which lower level units (daily experiences) are nested within a higher level unit (persons). Specifically, multilevel designs allow research questions to be investigated at different levels of analysis simultaneously by separating the within-person and between-person effects (Bolger et al., 2003). To enhance the interpretability of the model intercept parameters and in line with the recommendations made by Raudenbush and Bryk (2002), all day-level variables were centered around the athletes' individual means and all person-level variables were centered around the sample mean. All variable scores were also converted into z scores.

Results and Discussion

Predicting daily need satisfaction and need thwarting

Day-level need satisfaction (Model 1) and need thwarting (Model 2) were predicted by daily autonomy-support and coach control which were set random at the between-person level. The aggregates for autonomy support and coach control for each athlete were also included in the equation (see Raudenbush & Bryk, 2002). Pre-training levels of need satisfaction and need thwarting were not assessed. Gender and age were controlled for in each model. The results of these analyses are reported in Table 4.3.

Table 4.3. Predicting Daily Need Satisfaction/Need Thwarting from Day- and Person-Level Variables (Study 3)

	Need satisfaction (Model 1)		Need thwarting (Model 2)	
	β	*t*	β	*t*
Day-level variables				
Intercept	-.10	1.20	-.03	0.40
Coach autonomy support	.35	5.13**	-.22	5.12**
Coach control	-.16	2.18*	.33	4.30**
Error	.32	13.13**	.20	13.53**
Person-level variables				
Intercept	.21	4.66**	.19	4.87**
Mean coach autonomy-support	.67	6.93**	-.20	2.22*
Mean coach control	-.09	1.02	.65	7.56**
Gender	.25	1.88	.08	0.64
Age	-.04	1.64	.01	0.24

* $p < 0.05$. ** $p < 0.01$.

As hypothesized, daily autonomy support was the stronger predictor of daily need satisfaction (supporting H1). Thus, athletes who experienced their coach as more autonomy-supportive during training experienced higher levels of need satisfaction on that day. Athletes' daily perception of their sport coaches' controlling behaviors was also a significant negative predictor of need satisfaction, but to a lesser extent. At the between-person level, athletes who generally experienced higher levels of autonomy support in the sport environment reported higher levels of average daily need satisfaction across all training days. However, general perceptions of interpersonal control did not relate significantly to average need satisfaction.

Contrastingly, coach control was the stronger predictor of daily need thwarting (supporting H2). Thus, those athletes who perceived their coach to engage in controlling behaviors during training also reported higher levels of need frustration on that day. Perceptions of autonomy support during training were also negatively associated with feelings of need thwarting, but to a lesser extent. A similar pattern was observed at the between-person

level, with athletes who generally experienced higher levels of interpersonal control or autonomy support also experiencing higher or lower levels, respectively, of average need thwarting. Coach control was the strongest predictor of need thwarting at the between-person level. Gender and age were not significant predictors in either of the models.

Predicting daily positive affect, negative affect, and physical symptoms

Day-level positive affect after training (Model 3) was predicted by daily need satisfaction, need thwarting, and positive affect before training which were set random at the between-person level. The aggregates for need satisfaction and need thwarting for each athlete were also included in the equation. Pre-training levels of each well/ill-being outcome were entered into each equation to control for initial levels when predicting post-training well/ill-being. Negative affect (Model 4) and physical symptoms (Model 5) were modeled in exactly the same way. Gender and age were also controlled for in each model. The results of these analyses are reported in Table 4.4.

Need satisfaction during training (but not need thwarting) was significantly associated with daily changes in positive affect from before to after training (supporting H3). Thus, higher levels of need satisfaction during training predicted increased levels of positive affect post-training (whilst controlling for positive affect before training). In contrast, changes in negative affect and physical symptoms were not predicted by daily (or mean) need satisfaction. Perceptions of psychological need thwarting did, however, predict changes in negative affect and physical symptoms from before to after training (supporting H4). Specifically, after controlling for initial levels, athletes experienced more post-training negative affect and physical symptoms on the days in which they reported higher levels of perceived need thwarting during training.

Table 4.4. Predicting Daily Well/Ill-Being from Day- and Person-Level Variables (Study 3)

	Positive affect (Model 3)		Negative affect (Model 4)		Physical symptoms (Model 5)	
Variable	β	*t*	β	*t*	β	*t*
Day-level variables						
Intercept	.02	0.15	.01	0.08	.06	0.48
Need satisfaction	.22	3.04**	-.10	1.81	-.02	0.49
Need thwarting	-.13	1.95	.17	2.18*	.14	2.21*
Outcome before training	.12	2.65**	.16	3.09**	.18	3.30**
Error	.34	13.00**	.27	12.62**	.36	18.74**
Person-level variables						
Intercept	.52	5.12**	.44	5.13**	.46	5.20**
Mean need satisfaction	.29	1.72	.13	0.81	.28	1.68
Mean need thwarting	.04	0.27	.56	3.75**	.50	3.32**
Gender	-.05	0.23	.02	0.11	-.14	0.75
Age	.04	1.06	.01	0.16	.01	0.33

* $p < 0.05$. ** $p < 0.01$.

In addition, athletes who generally experienced higher levels of need thwarting in the sport environment also experienced higher average levels of negative affect and physical symptoms. Gender and age differences were not significant in any of the well/ill-being models.[8]

The current findings indicate that the processes operating at the daily level are the same as those evidenced at the general level of analysis in Studies 1 and 2, providing further support for the hypothesized model and allowing strong inferences to be made regarding the utility of assessing interpersonal control and need thwarting in the prediction of diminished functioning and ill-being.

General Discussion

Although research has provided substantial support for the hypothesized links between autonomy support, need satisfaction, and psychological health and well-being (Adie et al., 2008; Baard et al., 2004), the links between interpersonal control, psychological need thwarting, and ill-being have been less frequently studied within the SDT framework (Bartholomew et al., 2010; Vallerand et al., 2008). This is primarily due to the way in which interpersonal styles and psychological needs have been operationalized and measured in research conducted to date. Grounded specifically within BPNT (Deci & Ryan, 2000), the current research tested an extended model of optimal and diminished human functioning outside of the lab and in a life domain valued by many individuals across the world (i.e., sport). Our results supported the hypothesized model across three studies using varied

[8]At the request of an anonymous reviewer, the data from Studies 2 and 3 were analyzed to explore the impact of gender on the variables examined. In Study 2, no significant gender mean differences or significant gender x predictor interactions (i.e., gender x coach autonomy-support, gender x coach control, gender x need satisfaction, gender x need thwarting) were found. In Study 3, three significant interactions were observed at the within-person level. With regard to need satisfaction, there was a significant interaction involving gender and coach control ($\beta = -.41$; $p < 0.01$). Further, in relation to positive and negative affect, significant interactions were observed between gender and need satisfaction ($\beta = .22$; $p < 0.05$; $\beta = -.24$; $p < 0.05$, respectively).

measures and methods and demonstrated the value of directly assessing perceptions of controlling interpersonal environments and feelings of psychological need thwarting in the prediction of ill-being. The present research is also the first to examine outcomes associated with both satisfaction and thwarting of needs simultaneously and in relation to both supportive and controlling inputs within the same context. The differentiated sets of findings obtained have important theoretical and practical implications for sport and other life domains.

Beyond Autonomy Support and Psychological Need Satisfaction

The importance of exploring the social-environmental conditions that sustain *and* frustrate athletes' psychological needs was demonstrated clearly across all three studies reported in the current paper. In line with previous research (Bartholomew et al., 2010; Pelletier et al., 2001; Silk et al., 2003), relatively modest correlations were observed between athletes perceptions of their coaches' provision of autonomy support and control. Such findings indicate that the support of autonomy and the control of behavior are not always opposite sides of the same coin (Pelletier et al., 2001) and may at times even co-occur (Bartholomew et al., 2011). As such, individuals in a position of authority may use a variety of autonomy-supportive and controlling behaviors simultaneously and to a different extent. For example, a sports coach, parent, teacher, employer, or health-care professional, may use conditional regard to promote desired attributes and behaviors but may also provide a clear rationale for requested actions (Bartholomew et al., 2010). Thus, considering these different facets of the social environment, which past research has suggested are related but distinct constructs (Blanchard et al., 2009; Pelletier et al., 2001; Silk et al., 2003), should allow better understanding of the variability in psychological experiences of individuals in multiple life

domains. It is, therefore, vital that future SDT-based research continues to rate autonomy-supportive and controlling behaviors independently.

The current research is also one of the first to empirically distinguish between low levels of need satisfaction and need thwarting and thus directly assess the impact of need thwarting on diminished functioning and ill-being. In line with the propositions made by Bartholomew et al. (2011), our findings support the notion that psychological need thwarting is not equivocal to low levels of need satisfaction. Thus, we would suggest that need satisfaction and need thwarting are best viewed as independent constructs which not only have separate antecedents, but also predict different outcomes. As hypothesized, cross-sectional and diary evidence from three independent samples suggested that the manifestation of ill-being in sport (i.e., disordered eating, burnout, depression, negative affect, symptomatology, and perturbed physiological functioning) is more related to the presence of need thwarting than to the absence of need satisfaction. Such findings provide new empirical support for the role of need thwarting in SDT's theoretical account of the darker sides of human existence and should allow researchers to provide better predictions regarding variability in negative psychological and physiological health-related outcomes in various life domains.

Social Contexts, Psychological Needs, and Optimal/Diminished Functioning

To the best of our knowledge, the current paper is the first to explore disordered eating in competitive sport from a SDT perspective. Disordered eating was predicted by athletes' perceptions of psychological need thwarting in Study 1. Thus, it would appear that the struggle for body control can represent a compensatory process prompted by frustrations in perceived autonomy, competence, and relatedness needs. Over one-quarter of the female athletes involved in Study 1 were identified on the basis of their Q-EDD scores as either

symptomatic or as having a clinical eating disorder (25.7%). Although combining symptomatic and eating disordered groups has produced similar prevalence rates in previous research (e.g., Greenleaf, Petrie, Carter, & Reel, 2009), the occurrence of eating disorders (10.8%) was high in the current sample (Johnson, Powers, & Dick, 1999). The majority of athletes categorized as eating disordered were classified as having subthreshold bulimia or a binge-eating disorder. According to the *DSM-IV*, binge eating often follows periods of strict dieting or fasting. Therefore this issue may have been particularly salient in the present sample due to the fact that athletes frequently experience weight-related pressures such as weigh-ins and revealing athletic attire. These are events and circumstances that could encourage periods of dietary restraint and thus increase the potential for subsequent binge eating (Greenleaf et al., 2009).

Study 2 replicated the hypothesized model of optimal and diminished functioning in the context of burnout using a mixed sample of male and female athletes drawn from a diverse range of sports. Competitive athletes, especially young athletes who participate in high level sport, can experience considerable stress as a result of their sport participation (Smoll & Smith, 2002). If this stress is maintained at a high level for an extended period, athletes may become 'burned out' and lose their desire to continue in sport. The findings from Study 2 supported previous SDT-based research in which low levels of need satisfaction have significantly contributed to the manifestation of burnout symptoms (Hodge et al., 2008; Perreault et al., 2007). In line with our fourth hypothesis, however, the experiential state of burnout was more related to the active thwarting of psychological needs than to a perceived lack of need satisfaction. As such, including a measure of need thwarting in future SDT-based research should help to explain additional variance in such an outcome.

Study 2 also explored the relation between perceptions of need thwarting and an immunological marker responsive to psychological stress (S-IgA). Our aim was to extend

knowledge regarding the extent to which the psychological needs hold implications for psychobiological functioning. The results indicated that athletes who perceived their needs to be actively thwarted in the sport environment were more likely to show enhanced physiological arousal, possibly reflective of anticipatory apprehension, immediately prior to training. These findings support SDT as a relevant framework within which to advance our understanding of the motivational factors that may regulate psychophysiological stress responses. The inclusion of such biomarkers in future longitudinal SDT-based research may, therefore, be particularly informative regarding the potential immunological mechanisms through which social-psychological processes lead to variability in health-related outcomes. Future research could also provide additional support for the construct of need thwarting by exploring the distinct biological consequences of perceived need thwarting and need satisfaction. In line with the conceptualization of well-being endorsed by SDT, recent psychobiological research has found that biomarkers of well-being and ill-being are primarily 'distinct' (i.e., well-being and ill-being have different biological signatures) as opposed to 'mirrored' (i.e., well-being and ill-being correlate similarly with biomarkers but show opposite directional signs; Ryff et al., 2006). Based on the theoretical hypotheses underlying the current research we would, therefore, expect perceptions of need satisfaction to predict biological correlates of well-being and perceptions of need thwarting to predict biological correlates of ill-being. Such findings would provide strong support for assessing need thwarting independently of need satisfaction.

Studies 1 and 2 also indicated that general perceptions of need satisfaction and need thwarting were associated with affective outcomes in athletes. Need satisfaction facilitated feelings of positive affect and vitality and need thwarting led to feelings of negative affect and depression. Study 3 aimed to examine these relations in more detail by exploring changes in daily levels of positive and negative affect and physical symptoms from before to after

training using a diary methodology. Instead of conceptualizing well/ill-being as a relatively stable characteristic, diary research acknowledges that athletes will experience good training days (in which they feel more energetic and confident) and bad training days (in which they feel tired and insecure). Thus, as well as enabling us to control for between-person (individual difference) confounds, the diary technique afforded the possibility of exploring the social-psychological processes that may underlie within-person variability in reported well/ill-being over time (Bolger et al., 2003). Further, although the role of the social context as an antecedent of psychological needs and subsequent well/ill-being is a central feature of SDT (Ryan & Deci, 2002), within-person variability in perceptions of *controlling* social environments created by significant others has largely been neglected in previous diary studies. Consequently it has not been possible to ascertain whether variability in daily perceptions of control corresponds systematically with daily fluctuations in need thwarting and subsequent ill-being.

The findings from Study 3 indicated that daily experiences of need satisfaction and need thwarting predict daily fluctuations in well/ill-being in accordance with the pattern observed at the general level in Studies 1 and 2. The fact that we observed the same social-psychological processes at the between and within-person levels allows strong inferences to be made regarding the utility of considering interpersonal control and need thwarting in the prediction of diminished functioning and ill-being. These findings also built on the growing body of studies which have investigated daily variations in mood and subjective well/ill-being from a need fulfillment perspective (Gagné et al., 2003; Reis et al., 2000; Ryan et al., 2010). Previous SDT-based research has identified that the nature of social experiences (e.g., doing fun things, hanging out with others, feeling self-conscious) is associated with the degree of need satisfaction and well-being afforded each day (Reis et al., 2000), however it is also important to target the specific behaviors, employed by authority figures, that facilitate versus

forestall need satisfaction or thwarting each day among those engaged in the setting in question (Bartholomew et al., 2011; Quested & Duda, 2010).

From an applied perspective, a greater insight into the social-psychological mechanisms that may underpin indices of maladaptive and compromised functioning, as well as optimal well-being, is important for the implementation of interventions which support athletes to realize their sport potential without hindering their health and well-being. In particular, the current findings emphasized the importance of training coaches not only to engage in more autonomy-supportive behaviors, but also to be less controlling. Such implications can be generalized to SDT-based interventions in other life domains, particularly education, work, parenting, and health-care.

Limitations and Future Directions

Cross-sectional designs do not allow for an examination of reciprocal effects between variables. Deci and Ryan (2000) proposed that psychological accommodations such as the development of rigid eating patterns may, over time, lead to further thwarting of need satisfaction (Ryan et al., 2006). It is therefore important for future research to explore the manifestation of disordered eating behaviors and burnout symptoms, examined in Studies 1 and 2, from a longitudinal perspective in order to account for variations in the variables under consideration and explore reciprocal mechanisms over time. In addition, experimental work on need thwarting would also complement the current studies.

Overall, the present research provides a new empirical approach to understanding diminished human functioning and ill-being and opens up novel research possibilities. An obvious line of research would be to explore the individual contributions of each of the three needs in the etiology of diminished functioning and ill-being. Deci and Ryan (2000)

suggested that specific patterns of thwarted need satisfaction may be key psychological contributors to many mental disorders and their behavioral manifestations.

Future research could also examine compensatory processes driven by thwarted psychological needs at different levels of motivation (Vallerand, 2000). For example, Sheldon and Gunz (2009) recently demonstrated that unmet psychological needs can increase corresponding desires to seek need fulfillment experiences (see Moller, Deci, & Elliot, 2010, for similar findings). Such findings suggest that athletes experiencing high levels of need frustration in the sport environment might also be motivated to increase their feelings of autonomy, competence, and relatedness. Nonetheless this may not be possible in overly controlling sport environments. In such circumstances, athletes may seek compensatory need fulfillment experiences in other contexts to restore or maintain their global motivation (Vallerand, 2000). It would, therefore, be interesting to explore the circumstances under which athletes who experience need thwarting attempt to seek need fulfillment experiences within their sport, in other life contexts, or by turning to need substitutes and other less optimal ways of functioning.

In sum, controlling interpersonal behaviors and psychological need thwarting represent important and still understudied aspects of social environments. Our findings suggest that both psychological need supports and thwarts simultaneously bear on athletes' functioning, and that explicit assessments of both can more fully address the multiple impacts of sport participation on wellness and ill-being. These results also highlight the potential contributions of explicitly assessing interpersonal control and need thwarting in other social contexts, such as education, work, parenting, health-care, psychotherapy, and personal relationships.

CHAPTER 5.

GENERAL DISCUSSION

Grounded within BPNT (Deci & Ryan, 2000), the current thesis comprised a series of studies which aimed to develop and test an extended model of optimal and diminished human functioning in sport, a life domain valued by many individuals across the world. The program of research was designed primarily to provide unique empirical evidence to test the propositions of SDT in relation to both the darker and brighter sides of human existence. From an applied perspective, a greater, theoretically driven, insight into the mechanisms that underpin indices of maladaptive and compromised functioning, as well as optimal well-being, is important in order to support athletes realize their sport potential without hindering their psychological and physical health.

Although a plethora of research has provided support for the hypothesized links between autonomy support, need satisfaction, and psychological health and well-being (Adie, Duda, & Ntoumanis, 2008; Gagné, Ryan, & Bargmann, 2003), the links between interpersonal control, psychological need thwarting, and ill-being have been less frequently studied within the SDT framework (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010; Vallerand, Pelletier, & Koestner, 2008). This is primarily due to the way in which interpersonal styles and psychological needs have been operationalized and measured in research conducted to date. The current thesis aimed to address these measurement limitations via the development and validation of two new psychometric scales: the Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010; Chapter 2) and the Psychological Need Thwarting Scale (PNTS; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Chapter 3).

Subsequently, the findings from three further studies supported the application of a model which incorporated assessments of athletes' perceptions of coach control and psychological need thwarting, alongside traditional measures of autonomy support and need satisfaction, in the prediction of multiple indices of athlete well/ill-being (Chapter 4). In

particular, these findings supported the value of considering perceptions of controlling interpersonal environments and feelings of psychological need thwarting in the prediction of athlete ill-being.

Collectively, the results provided direct support for the propositions made by BPNT in that optimal or compromised functioning depended upon the extent to which the three psychological needs were perceived to be satisfied or thwarted in the sport environment (Deci & Ryan, 2000). The present research is, however, the first to examine outcomes associated with both the satisfaction and thwarting of needs simultaneously and in relation to both supportive and controlling inputs within the same domain. The differentiated sets of findings obtained in the three final studies have significant theoretical, measurement, and applied implications for sport (and potentially other life domains). In this final chapter, the thesis findings will be discussed in relation to these important advances and suggestions will be presented for future research.

The Social Environment: Beyond Autonomy-Support

A key tenet of BPNT is that significant others (e.g., coaches) play a central role in determining the quality of experience afforded to individuals in the setting in question via the nature of the social environment they create (Ryan & Deci, 2007). Specifically, a coach's behavior can primarily be viewed in terms of two interpersonal styles: autonomy-supportive and controlling. Research conducted to date has primarily focused on coaches' autonomy-supportive behaviors and the extent to which athletes experience psychological need satisfaction (see Mageau & Vallerand, 2003). This thesis found consistent support for the BPNT-based hypothesis that perceptions of autonomy-supportive social environments predict the degree of need satisfaction experienced by athletes in the sport context.

Beyond merely examining autonomy support, however, the findings from this thesis also highlighted the importance of exploring the social-environmental conditions that frustrate athletes' psychological needs. To date, controlling coach behaviors have largely been neglected in work examining social-environmental predictors of the three psychological needs. In addition, when interpersonal control has been examined in relation to need related outcomes, typically measures of satisfaction rather than thwarting have been used. The CCBS (Bartholomew et al., 2010; Chapter 2) was designed explicitly to assess sports coaches' controlling interpersonal styles from the perspective of SDT. Four separate controlling motivational strategies salient in the context of sport were identified in the development and initial validation of the measure: the controlling use of rewards, negative conditional regard, intimidation, and excessive personal control. The scale demonstrated good content and factorial validity, as well as internal consistency and invariance across gender and sport type. However, further research is needed to test the temporal stability (test-retest reliability) of the CCBS and its invariance across competitive level and experience. Subsequently, the predictive validity of the measure in relation to multiple indices of ill-being was supported at the between-person and within-person levels in Chapter 4.

Similarly to the majority of research grounded in SDT, the first two studies outlined in Chapter 4 focused on predictors of between-person variability in need satisfaction and need thwarting. In other words, these studies tapped athlete's "general" perceptions of the degree of autonomy support or control afforded in their training context. The third study extended this work and demonstrated that situational perceptions of autonomy support and control impact upon need satisfaction and need thwarting with immediate effect. Specifically, Study 3 found that the athletes' perceptions of the interpersonal environment during training were relevant to the degree of need satisfaction or need thwarting that the athletes reported immediately after each session. The focus on within-person variability in perceptions of controlling social

environments created by significant others represents a particularly unique aspect of this research and extends previous SDT-based diary research which has largely neglected this important aspect of the social environment.

The findings from all three studies indicated that controlling strategies thwarted athletes' feelings of autonomy, competence, and relatedness. In turn, perceptions of need thwarting were associated with the development of psychological and physiological ill-being (Deci & Ryan, 2000). Thus, although controlling strategies can sometimes appear to be adaptive in that they evoke desired behaviors and performance outcomes in the short term, the current research suggests that such techniques may ultimately thwart athletes' psychological needs and lead to diminished functioning.

At this juncture, it is important to distinguish between the use of control and the provision of structure and involvement (Deci & Ryan, 1985; Mageau & Vallerand, 2003). Structure refers to the provision and quality of information regarding expectations as well as the provision of timely and useful feedback (Reeve, 2002). Involvement can be defined as the extent to which a coach takes an active interest in and commits time, attention, and care towards the athlete (Mageau & Vallerand, 2003; Gagné et al., 2003). Without instructions and involvement from their coaches, athletes may lack the necessary information and experience to interact competently with their environment. As long as the provision of structure and involvement is not restrictive or intrusive (i.e., it must not be controlling; Amorose, 2007) these contextual factors facilitate need satisfaction. The controlling strategies identified in the CCBS clearly go beyond providing structure and positive emotional involvement and attempt to manipulate athlete behavior and thus thwart psychological needs with detrimental consequences for athlete well-being.

Alongside psychological needs and optimal/diminished functioning, it is also important to explore the construct of interpersonal control in relation to the wider SDT

framework. Over the long term, continued exposure to controlling coach behaviors should not only thwart athletes' psychological needs, but also contribute to the development of controlled motives (or amotivation). The current research is therefore limited in that this proposition was not tested. Recent research using a version of the CCBS translated into Spanish, however, has indicated that young football player's perceptions of their coaches' controlling behaviors are associated with amotivation and external and introjected regulation and unrelated to identified regulation and intrinsic motivation (Castillo et al., 2010). Thus, the controlling strategies identified in the CCBS are expected to have strong undermining effects, perhaps even for athletes who have initially high levels of self-determination. This hypothesis should be empirically tested in future longitudinal research. Although studies should explore the moderating role of athlete resilience, we would suggest that most individuals subjected to this kind of pressurized environment are likely to experience negative feelings that reflect their needs being actively undermined by their coach.

Castillo et al. (2010) also presented psychometric evidence which supported the factorial validity and internal reliability of the translated scale. It is important that cross-cultural research continues to explore the nature and use of controlling coaching strategies in sport. Due to the fact that the needs are hypothesized to be universal, the relations between the psychological needs and well/ill-being should apply across cultures (Ryan & Deci, 2000). However, the means through which the psychological needs are satisfied or thwarted may vary as a function of culture. Thus, in an extreme case, it is possible for the same behavior to be need satisfying for one group and need thwarting for another (Ryan & Deci 2002). This suggests that there may be cultural differences in the way in which coach behaviors impact upon athletes psychological needs. For example, recent research has shown that dominant-submissive (i.e., controlling) interactions between coaches and athletes actually increased the extent to which Chinese athletes experienced relationship satisfaction (Xin Yang & Jowett,

2010). To date, the CCBS has been translated and validated in Spanish, French, Greek, Norwegian, Mandarin, and Flemish and findings from these studies are eagerly anticipated.

An overall measure of the controlling environment was used in each of the three studies reported in the Chapter 4. This is because the primary focus of the current thesis was on nomological relationships among higher order constructs (i.e., control and need thwarting; relationships between specific sub-components of the two constructs should be the focus of future work). As such, further research is needed to assess the utility of a differentiated conception of controlling interpersonal behavior by exploring whether the separate controlling strategies have individual effects on the three psychological needs, subsequent motivation, and psychological and physical ill-being. It is likely that some maladaptive coach behaviors may be more damaging to the motivation and well-being of athletes than others. For example, the use of intimidation behaviors is expected to have a severe negative effect on the well-being of those individuals subjected to them (Baker, Côté, & Hawes, 2000; Barber, 1996). Similarly, negative conditional regard has been associated with introjected regulation and many serious forms of psychological ill-being in the parental literature (Hewitt & Flett, 1991). Thus, controlling motivational strategies which attempt to control athlete behavior by overtly manipulating or exploiting the coach-athlete relationship (through intimidation and negative conditional regard) may produce the most damaging effects upon athlete motivation and well-being, when compared to strategies such as the use of tangible rewards or controlling praise.

In contrast to the other facets of controlling behavior incorporated within the CCBS, the controlling use of rewards is an approach-oriented strategy in the sense that rewards and praise induce hopes for increased recognition, attention, and self-aggrandizement. Thus, future research exploring reward and praise may be of particular importance because the current findings indicated that approach-oriented, and apparently more benign control, can also be problematic. Recent research by Roth, Assor, Niemiec, Ryan, and Deci (2009)

supported this proposition. Compared to more avoidance-orientated means of control, the use of positive conditional regard – a strategy in which parents motivate children to comply by providing more regard (affection, recognition, and attention) when children behave in accordance with parental expectations – was associated with fragile and unstable self-esteem, which drove children to over-strive and compulsively invest effort in the enactment of parental valued behaviors (i.e., introjected motivation aimed at attaining positive regard). In contrast, Roth et al. suggested that the use of more punitive means of control (i.e., avoidance-orientated strategies such as negative conditional regard and intimidation) are more likely to be associated with amotivation and depression (Roth et al., 2009). Thus, the distinction between the various components of controlling coaching and their differential impacts upon psychological needs, motivation, and well-being is an interesting avenue for future research.

In line with previous research (Pelletier, Fortier, Vallerand, & Brière, 2001; Silk, Morris, Kanaya, & Steinberg, 2003; Tessier, Sarrazin, & Ntoumanis, 2008), the findings from this thesis indicate that the support of autonomy and the control of behavior are not two sides of the same coin. As such, coaches may use a variety of autonomy-supportive and controlling behaviors simultaneously and to a different extent. Thus, an absence of autonomy support does not necessarily equate to high levels of control (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009) and coaches can also use neutral strategies (Tessier et al., 2008). Incorporating perceptions of controlling coach behaviors alongside autonomy support, therefore, reflects a more comprehensive examination of the diverse features of the social environment which impact upon athletes' experiences of need satisfaction and need thwarting. In summary, considering these different facets of the social environment, which past research has suggested are related but distinct constructs (Pelletier et al., 2001; Silk et al., 2003), should allow better understanding of the variability in psychological experiences of individuals in sport, and in other life domains.

The Three Basic Psychological Needs: Beyond Need Satisfaction

The role of psychological need satisfaction/thwarting in the 'social environment – well/ill-being' dialectic is the focus of BPNT (Ryan & Deci, 2000). To qualify as a need, therefore, a motivating force must have a direct relation to well/ill-being (Ryan & Deci 2002). The proposition that psychological needs, when satisfied, promote athlete well-being was fully supported in the current research, both at the between-person and within-person level (Chapter 4). However, the current thesis aimed to extend previous research conducted in the sport domain by explicitly assessing need thwarting in relation to ill-being outcomes. The findings presented in Chapters 3 and 4 demonstrated that need thwarting has meaningful and independent empirical consequences beyond more traditional measures of need satisfaction. Such findings should allow researchers to provide better predictions regarding variability in the negative psychological and physiological health-related outcomes experienced by athletes in sport and provide new empirical support for the role of need thwarting in SDT's theoretical account of the darker sides of human existence.

A number of limitations relating to the way in which need thwarting had been conceptualized and measured in previous questionnaire-based research were highlighted during the development of the PNTS (Bartholomew et al., 2010; Chapter 3). These included the positive conceptualization of the three psychological needs and subsequent failure of assessment tools to take into account the active nature and intensity of need frustration that characterize states of need thwarting (Deci & Ryan, 2000). Specifically, need thwarting does not simply reflect the perception that need satisfaction is low, but moreover the perception that need satisfaction is being obstructed or actively frustrated within a given context. In addition, need thwarting items must capture the intensity of the negative experiential state which occurs when an individual's psychological needs are actively frustrated (i.e., one feels oppressed, inadequate, and rejected).

As a result of the measurement limitations outlined above, previous research exploring negative relations between need satisfaction and maladaptive outcomes has only provided indirect evidence to support the detrimental effects of need thwarting on athlete health and well-being (e.g., Lonsdale, Hodge, & Ng, 2008; Reinboth, Duda, & Ntoumanis, 2004). In addition, because previous research has not distinguished between low levels of need satisfaction and need thwarting, the hypothesized relations between the psychological needs and indices of ill-being have not always been supported in the literature (Adie et al., 2008; Gagné et al., 2003; Quested & Duda, 2010). That is, the psychological needs do not always relate significantly (and negatively) to indicators of ill-being (e.g., negative affect: Gagné et al., 2003; McDonough & Crocker, 2007; and burnout symptoms: Quested & Duda, 2010). Thus, the current research aimed to provide direct support for the propositions outlined by BPNT in relation to the darker side of sport participation by examining the relationship between explicit measures of need thwarting and diminished functioning and ill-being.

The PNTS is a multidimensional measure designed to tap the negative experiential state which occurs when athletes' perceive their psychological needs for autonomy, competence, and relatedness to be actively undermined in the sport environment. Similarly to the CCBS, future research is required to test the temporal stability of the scale. Overall, however, the scale demonstrated good content, factorial, and predictive validity, as well as internal consistency and invariance across gender, sport type, competitive level, and competitive experience. The development of a valid and reliable need thwarting measure was the first step in the exploration of this relatively understudied but theoretically important construct.

The data presented in this thesis provided consistent support for the assessment of need thwarting independently of need satisfaction. In Chapter 3, small negative correlations were observed between athletes' perceptions of need thwarting and need satisfaction

indicating that, empirically, need thwarting and need satisfaction may not be antipodal. Further, the results of three separate EFA analyses showed that, within each need, need thwarting and need satisfaction represented distinct factors. These findings suggest that perceived need satisfaction and perceived need thwarting are independent constructs. There are, however, problems inherent with the use of factor analysis in this regard. For example, when a set of items that are indicators of opposite poles of a single underlying bipolar dimension are submitted to factor analysis, two factors generally appear instead of one factor: one factor including the positive items and one factor including the negative items (González-Romá, Schaufeli, Bakker, & Lloret, 2006; Lloret & González-Romá, 2000). This is because data gathered by means of balanced Likert-type scales composed of positive and negative items do not fit the linear factor analysis model (Van Schuur & Kiers, 1994). An interesting avenue for future research, therefore, would be to conduct Item Response Theory (IRT) analyses (which do not assume linear relationships) to further examine whether or not need satisfaction and need thwarting are scalable on a single continuum (Edelen & Reeve, 2007).

In line with BPNT, Chapter 3 presented preliminary evidence to suggest that the PNTS yielded better predictions concerning negative outcomes associated with sport participation (i.e., emotional and physical exhaustion) compared to existing measures of psychological need satisfaction. The regression analyses clearly demonstrated the value of considering perceptions of need thwarting. Within each need, need thwarting accounted for additional variance above and beyond that due to need satisfaction scores. Further, in the subsequent SEM analysis, emotional and physical exhaustion was predicted by need thwarting only. These initial findings were further supported in Chapter 4. Cross-sectional and diary evidence from three independent samples suggested that the manifestations of ill-being in sport (i.e., disordered eating, burnout, depression, negative affect, symptomatology, and perturbed physiological functioning) were more related to the presence of need thwarting than to the

absence of need satisfaction. The finding that these dimensions differently predicted mental health outcomes supplies further impetus for disentangling these constructs in future SDT-based research. In particular, future experimental work on need thwarting would complement the current studies.

As well as examining outcomes associated with both the satisfaction and thwarting of needs simultaneously, the three studies conducted in Chapter 4 examined both supportive and controlling inputs within the same domain. Need satisfaction was predicted by athletes' perceptions of coach autonomy-support and need thwarting was better predicted by coach control. These findings further supported the notion that need satisfaction and need thwarting are best viewed as independent constructs which not only predict different outcomes, but have separate antecedents. This provides unique empirical evidence to support the processes outlined by BPNT in relation to the darker and brighter sides of human functioning.

Given their potential independence, it is plausible that alongside perceived need satisfaction, athletes can also experience the active thwarting of needs within the same environment. For instance, research suggests that coaches can simultaneously engage in behaviors that support and forestall athletes' feelings of autonomy, competence, and relatedness (Pelletier et al., 2001). In line with observational research on coaching environments (Smoll & Smith, 2002), the findings presented in Chapter 3 suggested that perceptions of autonomy and competence need satisfaction and need thwarting could sometimes co-occur. The interactions observed in Chapter 3 generally indicated that buffering effects can be observed between corresponding need satisfaction and need thwarting constructs. For example, the deleterious effects of need thwarting on well-being may be moderated via athletes' perceptions of need satisfaction. Although similar interactions were not examined in Chapter 4, future research should further explore these opposing, yet sometimes co-occurring, dynamics within the sport context.

In order to explore nomological relationships, an overall measure of need thwarting was used in each of the studies reported in Chapter 4. It would, however, be interesting to explore whether it is necessary for all three needs to be thwarted in order for ill-being to occur. Thus, another line of research would be to explore the individual contributions of each of the three needs in the etiology of diminished functioning and ill-being. Deci and Ryan (2000) suggested that specific patterns of thwarted need satisfaction may be key psychological contributors to many mental disorders and their behavioral manifestations. Future studies may, therefore, wish to employ the three-factor PNTS model, supported in Chapter 3, to investigate whether the thwarting of one need is more strongly linked to particular negative outcomes. Although the three psychological needs tend to be highly correlated and function in unison in natural settings (e.g., Baard, Deci, & Ryan, 2004; Gagné et al., 2003), previous research has observed differences in the extent to which the three psychological needs account for levels of psychological well/ill-being (e.g., Adie et al., 2008; McDonough & Crocker, 2007). In research undertaken with athletes, competence has been shown to be the most salient need in predicting targeted motivational and well/ill-being outcomes (e.g., Reinboth et al., 2004). Such findings suggest that the functional significance of the situation can influence the relative impact of each need upon cognitive, behavioral, and affective outcomes (Deci & Ryan, 1985). Clearly, the demonstration of competence is important in competitive sport and thus, the thwarting of this particular need may make a key contribution to athlete ill-being.

It is also important for future research to explore need thwarting in relation to the wider SDT framework. For example, future research should examine the direct effects of psychological need thwarting on the development of the three defensive psychological accommodations assumed to have severe costs for mental health and well-being: the development of controlling regulatory styles, compensatory motives, and rigid behavior

patterns (Deci & Ryan, 2000). Of particular theoretical importance is the exploration of need thwarting in relation to motivation (i.e., controlling regulatory styles). Need thwarting is hypothesized to have an undermining effect on self-determination and promote controlled forms of motivation such as external and introjected regulation. However, this assumption was not tested in the current thesis.

Compensatory motives are need substitutes (e.g., extrinsic goals) that do not really satisfy the thwarted need but provide some collateral satisfaction (Deci, 1980). Future research is needed to explore the impact of need thwarting on the development of extrinsic goals in sport. Initial support for the role of need thwarting in the development of rigid behavior patterns (i.e., disordered eating) was provided in Chapter 4. Although rigid behavior patterns help protect individuals from the inner hurt that results from psychological need thwarting, they also tend to prevent individuals from dealing with their inner feelings and experiencing subsequent need satisfaction (Deci & Ryan, 2000). It would be interesting, therefore, for future research to extend this preliminary work by examining need thwarting and rigid eating patterns from a longitudinal perspective in order to explore whether psychological accommodations lead to further thwarting of need satisfaction over time.

Recent research has also suggested that unmet psychological needs can increase corresponding desires to seek need fulfillment experiences (Moller, Deci, & Elliot, 2010; Sheldon & Gunz, 2009). Such findings suggest that athletes experiencing high levels of need frustration in the sport environment may be motivated to increase their feelings of autonomy, competence, and relatedness in sport and/or in other life contexts (Vallerand, 2000). However, it is unlikely that individuals will always respond in such a positive fashion to need thwarting. It may be that when individuals are thwarted, they are just undermined and alienated (as opposed to spurred into action) and, therefore, turn to less optimal ways of functioning. It would be interesting for future research to explore the circumstances under which athletes

who experience need thwarting attempt to seek need fulfillment experiences within their sport, in other life contexts, or by turning to need substitutes and other less optimal ways of functioning. The dynamics of subsequent motivation after need thwarting are clearly complex, rather than straightforward, and demand future research attention.

Finally, although the means through which needs are satisfied or thwarted may vary as a function of culture, as mentioned previously, the underlying processes via which the psychological needs promote or forestall health and well-being are theorized to be the same across all groups (Ryan & Deci, 2002). Accordingly, future research is needed to explore the construct of need thwarting from a cross-cultural perspective. Recent research incorporating a Spanish version of the PNTS has provided initial cross-cultural evidence to support the role of need thwarting in athlete ill-being by demonstrating that the thwarting of each psychological need (as assessed using a translated version of the PNTS) was significantly related to emotional and physical exhaustion in a sample of young Spanish football players (Balaguer et al., 2010). A number of additional findings also supported the factorial validity and internal reliability of the Spanish PNTS. Similarly to the CCBS, the PNTS has been validated in several languages for use in sport (or adapted to be used in other life domains) and further findings relating to the process of need thwarting from a cross-cultural perspective are anticipated.

In summary, the findings of this thesis support the notion that psychological need thwarting is not equivalent to low levels of need satisfaction. Need satisfaction and need thwarting are, therefore, best viewed as independent constructs. As expected, the assessment of need thwarting added significantly to the prediction of diminished functioning and ill-being. Thus, the current research provided new support for the assumptions made by BPNT in that both perceptions of psychological need satisfaction and need thwarting simultaneously

impacted upon athletes' functioning and explicit assessments of both more fully addressed the multiple impacts of sport participation on wellness and ill-being.

Athlete Well/Ill-being: A Function of the Social Environment and Psychological Needs

Although sport participation is generally associated with positive outcomes including increased psycho-social development and physical health (Fraser-Thomas, Côté, & Deaken, 2005), there is evidence to suggest that athletes may be 'at risk' of ill-being and particular psychological and physical problems (Gould, 1993; Theberge, 2008; Sundgot-Borgen & Torstveit, 2004). SDT principally embraces the eudaimonic conception of well-being and examines the processes that underlie healthy, congruent, and vital functioning (Ryan, Huta, & Deci, 2008). In line with the conceptualization of well-being endorsed by SDT, it is also important to recognize that well-being and ill-being are not antipodal (Ryan & Deci, 2001). Thus, the absence of psychological or physical ill-health does not necessarily equate to optimal functioning, and vice versa. Therefore, a range of outcomes were targeted in the current thesis to capture the processes and experiences associated with optimal (i.e., vitality and positive affect) and, in particular, diminished functioning (negative affect, disordered eating, burnout, physical symptoms, and perturbed physiological arousal).

The descriptive statistics reported in this thesis indicated that in general, athletes experienced low levels of depression and negative affect and moderate burnout symptoms (mean scores on the burnout measure were just under the midpoint). However, over one-quarter of the female athletes involved in the first study reported in Chapter 4 were identified as either displaying symptoms of disordered eating or as having a clinical eating disorder. This is in line with research suggesting that sport participation is associated with an increased incidence of subclinical eating problems and/or eating disorders (Sundgot-Borgen, 1993). In addition, whilst, on average, athletes experienced high levels of vitality, the mean for positive

affect was only marginally above the scale's midpoint. Collectively, these findings support the proposition that healthful sport participation is not automatic (Wankel & Mummery, 1990). Thus, in order to promote adaptive sport participation, it is important to understand the factors which contribute to the variability in health-related outcomes.

The descriptive statistics reported in Chapter 4 indicated that, on average, athletes reported high levels of autonomy support and need satisfaction. This suggests that many coaches exhibited adaptive behaviors that facilitated the satisfaction of their athletes' psychological needs. In addition, relatively low mean scores suggested that most athletes did not perceive their coaches to be overly controlling or experience high levels of need thwarting in the sport context. This is seemingly good news for those interested in supporting athlete welfare and promoting positive experiences in sport. However, this picture must be interpreted with caution. Firstly, in all studies, there was evidence of variability in each of the targeted variables. This indicates that some athletes did have negative experiences in the sport context, report high levels of need thwarting, and/or experience psychological and physical ill-being. Secondly, it is important to acknowledge that the coaches' agreement to participate in this research may have reflected an existing interest in creating adaptive coaching environments. Controlling coaches are more likely to be protective not only of their athletes, but also of their own coaching philosophy and the training environments they create. Therefore, the thesis data may have been more variable and we may have observed higher mean levels of control, need thwarting, and athlete ill-being, if consent could have been obtained from a more representative sample of coaches in the UK.

In line with previous research, the findings from the current thesis confirmed the utility of examining optimal athlete well-being from a need-fulfillment perspective (Adie et al., 2008; Gagné et al., 2003; Reinboth et al., 2004). For example, vitality and positive affect were employed to gauge optimal functioning and emotional well-being in the three studies

reported in Chapter 4. At the between-person level, need satisfaction positively predicted athletes' typical feelings of vitality and experiences of positive affect (Studies 1 and 2, respectively). However, SDT also postulates that need satisfaction should predict enduring signs of effective functioning and psychological health (Deci & Ryan, 2000). The diary technique afforded the possibility of exploring the social-psychological processes that underlie within-person variability in reported well-being over time (Bolger, Davis, & Rafaeli, 2003). Via the application of this method (Study 3), daily experiences of need satisfaction during training were shown to predict athletes' daily experiences of positive affect. This adds weight to the BPNT postulate with regard to the psychological mechanisms important for sustained well-being. The social-psychological processes underlying well-being, however, were not the primary focus of the present research.

If the needs for autonomy, competence, and relatedness are thwarted, ill-being and compromised functioning are expected to ensue (Deci & Ryan, 2000). However, the conditions and processes that lead to the manifestation of ill-being have received less attention in the SDT literature. Overall, the findings from the current thesis support the notion that perceptions of interpersonal control and subsequent need thwarting contribute to the manifestation of compromised functioning and ill-being. Multiple indices of ill-being were targeted in Chapter 4 including disordered eating, which was predicted by athletes' perceptions of psychological need thwarting only (Study 1). Thus, it would appear that the struggle for body control can represent a compensatory process prompted by frustrations in perceived autonomy, competence, and relatedness needs. Similarly, the experiential state of burnout was more related to the active thwarting of psychological needs than to a perceived lack of need satisfaction (Study 2). These studies also indicated that general perceptions of need thwarting were associated with between-person variability in depression and negative affect. Study 3 aimed to examine the emotional impact of need thwarting in more detail by

exploring changes in daily levels of negative affect from before to after training using the diary methodology. Physical symptoms were also measured in order to explore the proposed link between psychological needs and self-reported physical health. Perceptions of psychological need thwarting during training predicted changes in negative affect and physical symptoms from before to after training. Specifically, after controlling for pre-training levels, athletes experienced more post-training negative affect and physical symptoms on the days in which they reported higher levels of perceived need thwarting during training. The fact that the same processes were observed at the between and within-person levels provides strong support for the utility of considering interpersonal control and need thwarting in the prediction of diminished functioning and ill-being.

This thesis also aimed to further extend prior research by including a biological marker responsive to psychological stress. Secretory immunoglobulin A (S-IgA) is an immunological protein. Its main purpose is to protect against the invasion of infectious agents (e.g., viruses, bacteria). Acute psychological stressors, with the exception of stressors involving physical pain, have consistently been found to increase S-IgA levels (Bosch, Ring, de Geus, Veerman, & Amerongen, 2002). Aligned with the predictions of BPNT, the findings from Study 3 indicated that athletes who generally experienced need thwarting in the sport environment were more susceptible to biological and psychological deregulation. Specifically, the results indicated that athletes who perceived their needs to be actively thwarted in the sport environment were more likely to show enhanced physiological arousal (i.e., elevated levels of S-IgA) immediately prior to training, possibly reflective of anticipatory apprehension.

These findings make a novel and important contribution to the literature and support SDT as a relevant framework within which to advance our understanding of the motivational factors that may contribute towards psychophysiological stress responses. The study of

biological mechanisms is underexplored within SDT, and could easily be expanded to include other markers of immunological functioning known to be associated with stress, such as the hormone Cortisol. Repeated exposure to situations perceived as excessively stressful may have long term physical (Burns, 2006) and psychological (Raedeke & Smith, 2004) health implications. Thus, the inclusion of biomarkers (e.g., S-IgA, Cortisol) in future longitudinal SDT-based research should be particularly informative regarding the potential immunological pathways by which social-psychological processes lead to variability in health (and ill-health).

It would also be interesting for future research to explore the interdependencies between interpersonal control, need thwarting, state emotional responses, and indices of immunological functioning. In the current research, positive and negative affect were measured at a global level only and thus did not correlate significantly with S-IgA (indicative of physiological arousal and acute stress immediately prior to training). Moreover, it may also be that state-level indicators of need thwarting produce even stronger associations with biological markers responsive to acute stress. Biological stress responses (i.e., elevated salivary Cortisol levels) have also been associated with exposure to controlling interpersonal behaviors during a learning activity in the educational setting (Reeve & Tseng, 2010).

Future research could also provide further support for the construct of need thwarting by exploring the distinct biological consequences of need satisfaction and need thwarting. In line with the conceptualization of well-being endorsed by SDT, recent biological research has suggested that the biomarkers of well-being and ill-being are primarily 'distinct' (i.e., well-being and ill-being have different biological signatures; Ryff et al., 2006). Based on the theoretical hypotheses underlying the current thesis, perceptions of need satisfaction should predict biological correlates of well-being and perceptions of need thwarting should predict biological correlates of ill-being. Such an approach highlights the benefits that could be accrued from a multi-disciplinary approach to the study of the social-psychological predictors

of ill-being and would provide new and stronger support for assessing need thwarting independently of need satisfaction.

Practical Implications

Grounded within BPNT, this thesis was undertaken with the intention of addressing the darker side of sport participation and the negative health-related implications of interpersonal control and psychological need thwarting. Aside from the desire to make a significant theoretical and empirical contribution to the SDT literature, this research was motivated by a personal aspiration to contribute towards the advancement of training environments which help athletes realize their sport potential without compromising their health and well-being. The practical implications stemming from this thesis are thus aligned with the conceptual foundation upon which the studies were based.

Overall, the findings supported the propositions made by BPNT and indicated that the social environment in which training is carried out has an important influence on athlete well/ill-being. In particular, the different instructional environments manifested in sport via the interpersonal style of the coach clearly play a pivotal role in supporting or thwarting athletes' psychological needs and shaping subsequent health-related outcomes. The fact that the differing interpersonal behaviors employed by coaches can have such a profound effect upon the psychological and physical health of athletes has significant applied ramifications. In relation to the brighter side of sport participation, the findings corroborated previous research (Adie et al., 2008; Gagné et al., 2003; Reinboth et al., 2004) and indicated that autonomy-supportive training environments supported athletes' psychological needs and helped them experience vitality and sustained positive emotions. Research in exercise and educational settings has indicated that it is possible to train instructors and teachers to be more autonomy-supportive (Edmunds, Ntoumanis, & Duda, 2008; Reeve, 1998; Tessier, Sarrazin, &

Ntoumanis, 2010). Evidence-based interventions such as these provide authority figures with the skills to be more autonomy-supportive and help promote positive outcomes and well-being for individuals within the setting in question.

Beyond training individuals to be more autonomy-supportive, however, coaches must also be equipped with the skills to identify and avoid the use of controlling interpersonal behaviors (e.g., Tessier et al., 2008). The current thesis identified four/five maladaptive motivational strategies associated with a controlling interpersonal style in sport: the controlling use of rewards, negative conditional regard, intimidation, excessive personal control, and behaviors which judge or devalue the athlete. These strategies were well aligned with the SDT literature and perceived to occur frequently in the sport domain (Chapter 2). Subsequent findings indicated that controlling training environments thwarted athletes' psychological needs and were associated with negative feelings and maladaptive behavioral outcomes (Chapter 4).

It is, therefore, important to understand why coaches engage in strategies that have the potential to be psychologically damaging for their athletes in the first place. Research undertaken in educational settings indicates that there are several factors which influence the extent to which a teacher adopts a controlling interpersonal style. To organize these multiple influences into a coherent framework, it is important to distinguish between "pressures from above" (e.g., administrators), "pressures from below" (e.g., students), and "pressure from within" (e.g., teachers own values and personality depositions; Pelletier, Seguin-Levesque, & Legault, 2002; Reeve, 2009). When teachers are themselves pressured to produce particular student outcomes (e.g., high grades, good behavior) they are more likely to teach in a controlling fashion (Flink, Boggiano, & Barrett, 1990). Similarly, when teaches perceive their students to be disruptive or low in motivation and engagement they tend to react by adjusting their behavior toward a more controlling style (Sarrazin, Tessier, Pelletier, Trouilloud, &

Chanal, 2006). In addition, research suggests that some teachers are motivationally or dispositionally orientated toward a controlling style (Pelletier et al., 2002). When teachers enter the classroom with controlled motivation of their own and harbor controlling orientations within their personality (e.g., are highly authoritarian or conservative) they are more likely to adopt a controlling style toward students (Cai, Reeve, & Robinson, 2002).

Research conducted in the sport and physical education literature has also identified a number of demands on coaches which include pressures from above (e.g., external evaluations of athlete performance, time constraints, and a lack of assistance and guidelines from sport organizations), pressures from below (e.g., perceived athlete motivation), and pressures from within (e.g., coach personality; Allen & Shaw, 2009; Stebbings, Taylor, & Spray, in press; Taylor, Ntoumanis, & Standage, 2008). In addition, recent research in sport has pointed to the importance of coaching contexts that facilitate coaches' psychological need satisfaction and well-being. For example, Stebbings et al. (in press) found that competence and autonomy need satisfaction predicted coaches' levels of psychological well-being (as indexed by positive affect and subjective vitality) which, in turn, negatively predicted their perceived controlling behaviors towards athletes. Thus, it is likely that coaches will adopt more positive coaching behaviors when their own needs are satisfied and more controlling behaviors when their own needs are thwarted. An exploration of the pressures that thwart psychological needs and result in a greater reliance on maladaptive coaching strategies is clearly warranted. It would, therefore, be interesting to explore how an explicit measure of coaches' experiences of need thwarting relates to their use of controlling behaviors. Moreover, athletes' perceptions of coach behavior would complement coaches' self-reports, especially as athletes' perceptions of the social environment are most pertinent in predicting athlete consequences (Deci & Ryan, 1987).

Given the pressure that some coaches are under to produce results, their adoption of more controlling behaviors towards their athletes is understandable. However, it is clear that both coaches and athletes function better when coaches support athletes' autonomy (Deci, La Guardia, Moller, Scheiner, & Ryan, 2006; Gagné et al., 2003; Stebbings et al., in press). Thus, coaches must try to become less controlling (i.e., avoid controlling sentiment, controlling language, and controlling behaviors; Mageau & Vallerand, 2003; Reeve, 2009). Identifying the factors which promote the adoption of controlling behaviors is important so that this awareness can allow coaches to become more mindful of the forces that take them away from supporting athletes' autonomy. Similarly, a greater understanding of the detrimental impact of controlling coaching strategies should help coaches become more aware of the inimical effect their behavior can have on athletes. Therefore, as coaches become more mindful of the causes and consequences of their controlling behaviors they should gain a greater capacity to self-reflect upon the motivational strategies they employ and this should facilitate the adoption of more adaptive coaching behaviors (e.g., Reeve, 2009).

Drawing from the educational literature, it is apparent that coaches must volitionally endorse the practice of an autonomy-supportive style (i.e., they must *want* to support their athletes autonomy). They must, therefore, deeply appreciate the benefits of such action and create conditions that enable the practice of an autonomy-supportive style to take root (i.e., take the athletes' perspective, welcome athletes' thoughts, feelings, and behaviors, and support athletes' capacity for autonomous self-regulation). The next task in trying to become more autonomy-supportive is to become aware of, develop, and ultimately refine the interpersonal behaviors that actualize an autonomy-supportive style (Reeve, 2009). However, autonomy support is not just a list of skills or behaviors and identifying exactly *how* to help coaches adopt a more autonomy-supportive approach, regardless of the situational demands, remains a challenge for sport psychologists.

Limitations and Future Directions

A number of limitations and ideas for future research have been discussed throughout this chapter and will be summarized in this penultimate section. The primary limitation of the current research is its focus on BPNT, which can be viewed as somewhat narrow. The constructs of interpersonal control and psychological need thwarting still need to be incorporated within the wider SDT framework. In this regard, it is important that future research assesses athlete motivation alongside interpersonal control and need thwarting. Specifically, chronic exposure to controlling interpersonal environments and experiences of need thwarting should lead to controlled motives/amotivation (as well as other psychological accommodations including need substitutes and the development of rigid behavior patterns). It would also be interesting to explore the moderating role of athlete resilience and subsequent motivation after need thwarting (i.e., do thwarted needs motivate subsequent desires for need fulfillment experiences or do individuals just turn to less optimal ways of functioning?).

Thus, longitudinal research examining the dynamic interplay between motivational constructs (i.e., autonomy-support, control, need satisfaction, need thwarting, and motivational regulations) would clearly be of great value. The findings presented in the current thesis suggest that perceptions of need satisfaction and need thwarting can co-exist. Thus, more research is needed to explore the dynamic interplay between these opposing yet co-occurring experiences. It could be that athletes who experience high levels of need thwarting and high levels of need satisfaction in the sport environment are less vulnerable than athletes who experience high levels of need thwarting and low levels of need satisfaction. In addition, at the momentary level, it may be possible for athletes to simultaneously experience the satisfaction of one need and the thwarting of another need. The exploration of these dynamics in relation to motivation and well/ill-being outcome variables (e.g., via diary studies) could be particularly informative. Research could also explore interactions between

perceptions of coach autonomy-support and control and assess their subsequent impact on experiences of need satisfaction and need thwarting. For example, the use of controlling strategies may not be as detrimental to experiences of autonomy, competence, and relatedness if they are used alongside more autonomy-supportive behaviors. These motivational dynamics should also be explored from a cross-cultural perspective (e.g., the nature, use, and impact of controlling coaching strategies on psychological needs, motivation, and well/ill-being in authoritarian cultures such as China). In addition, research exploring the individual contributions of the separate controlling strategies identified in the CCBS, and the individual role of each thwarted need, in the etiology of diminished functioning and ill-being should also prove profitable.

Despite including an objective immunological marker in Chapter 4, the current thesis relied heavily on self-report measures. Whilst Deci and Ryan (1984) have suggested that it is the subjective perception and interpretation of social-environmental factors which influence ones affective state and behavior, objective measures of the sport environment (e.g., coach behavioral observations) and athlete well/ill-being (e.g., biological stress markers) should be employed alongside subjective assessments in future work. In this regard, research should continue to explore psychophysiological stress responses and immunological functioning within the SDT framework.

The current thesis focused primarily on health-related outcomes and well/ill-being. Another important avenue for future research, therefore, is the exploration of interpersonal control and need thwarting in relation to additional outcomes associated with sport participation including athletic performance and other aspects of psycho-social development.

Finally, it is also important that the practical implications stemming from these findings [i.e., coaches must be equipped with the skills to (a) identify and avoid the use of controlling interpersonal behaviors and (b) adopt more autonomy-supportive strategies] are

put into practice. Thus, interventions which help coaches foster quality motivation and athlete enjoyment are needed to ensure that athletes are able to realize their potential without compromising their health and well-being.

Summary and Conclusion

Throughout this final chapter, the most pertinent findings from the thesis have been presented and discussed. Collectively, the findings supported a new empirical approach to understanding diminished functioning and ill-being in sport. Firstly, exploring the social-environmental conditions that sustain and frustrate athletes' psychological needs reflected a more comprehensive examination of the social environment (compared to traditional approaches) and clearly demonstrated the importance of measuring autonomy-supportive and controlling behaviors independently. Secondly, the current research was the first to empirically distinguish between low levels of need satisfaction and need thwarting. The two independent need constructs not only had separate antecedents, but also predicted different outcomes and even co-occurred in the same setting. Finally, the manifestation of ill-being in sport was consistently more related to the presence of need thwarting than to the absence of need satisfaction. This highlights the importance of incorporating direct assessments of need thwarting when diminished psychological and physiological functioning is the focus of an investigation.

Taken in their totality, these findings provide new empirical support for the role of interpersonal control and need thwarting in SDT's theoretical account of the darker sides of human existence and should allow researchers to provide better predictions regarding variability in negative psychological and physiological health-related outcomes. The ongoing application of the SDT framework as an approach to understanding compromised functioning, as well as optimal well-being, will be important in addressing both the darker and brighter

sides of sport participation and helping athletes realize their sport potential without compromising their health and well-being. Controlling interpersonal behaviors and psychological need thwarting must be further researched if the development of diminished functioning and ill-being is to be properly understood and prevented. Clearly, this issue is not only relevant to the sport domain and, therefore, the conceptual and measurement implications of the current findings should also be studied in other social contexts including education, work, parenting, health-care, psychotherapy, and personal relationships.

REFERENCES

Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction and the optimal functioning of adult male and female sport participants: A test of basic needs theory. *Motivation and Emotion, 32,* 189-199.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, London: Sage.

Allen, J. B., & Shaw, S. (2009). Women coaches' perceptions of their sport organizations' social environment: Supporting coaches' psychological needs? *The Sport Psychologist, 23*, 346-366.

Allen, J. P., Hauser, S. T., Eickholt, C., Bell, K. L., & O'Conner, T. G. (1994). Autonomy and relatedness in family interactions as predictors of expressions of negative adolescent affect. *Journal of Research on Adolescence, 4,* 535-552.

Alvarez, M. S., Balaguer, I., Castillo, I., & Duda, J. L. (2009). Coach autonomy support and quality of sport engagement in young soccer players. *Spanish Journal of Psychology, 12*, 138-148.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.

Ames, C. (1992). Achievement goals and adaptive motivational patterns: The role of the environment. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 161–176). Champaign, IL: Human Kinetics.

Amorose, A. J. (2007). Coaching effectiveness. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 209-227). Leeds: Human Kinetics.

Amorose, A. J., & Anderson-Butcher, D. (2007). Autonomy-supportive coaching and self-determined motivation in high school and college athletes: A test of self-determination theory. *Psychology of Sport and Exercise, 8,* 654-670.

Amorose, A. J., & Horn, T. S. (2000). Intrinsic motivation: Relationships with collegiate athletes' gender, scholarship status, and perceptions of their coaches' behavior. *Journal of Sport and Exercise Psychology, 22,* 63-84.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 3,* 411-423.

Assor, A., & Kaplan, H. (2001). Mapping the domain of autonomy support: Five important ways to enhance or undermine student's experience of autonomy in learning. In A. Efklides, J. Kuhl, & R. M. Sorrentino (Eds.), *Trends and prospects in motivation research* (pp. 101-120). Dordrecht: Kluwer.

Assor, A., Kaplan, H., Kanat-Maymon, Y., & Roth, G. (2005). Directly controlling teacher behaviors as predictors of poor motivation and engagement in girls and boys: The role of anger and anxiety. *Learning and Instruction, 15,* 397-413.

Assor, A., Roth, G., & Deci, E. L. (2004). The emotional costs of parents' conditional regard: A self-determination theory analysis. *Journal of Personality, 72,* 47-88.

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology, 34,* 2045-2068.

Bagozzi, R. P., & Edwards, J. R. (1998). A general approach for representing constructs in organizational research. *Organizational Research Methods, 1,* 45–87.

Baker, J., Côté, J., & Hawes, R. (2000). The relationship between coaching behaviors and sport anxiety in athletes. *Journal of Science and Medicine in Sport, 3,* 110-119.

Balaguer, I., Castillo, I., Mercé, J., Ródenas, L. T., Rodríguez, A., García-Merita, M., & Ntoumanis, N. (2010). *Escala de Frustración de las Necesidades Psicológicas, en el contexto deportivo: Análisis de las propiedades psicométricas.* A paper presented at the VII Congreso Iberoamericano de Psicologia. Oviedo, Spain.

Barber, B. K. (1996). Parental psychological control: revisiting a neglected construct. *Child Development, 67*, 3296-3319.

Barber, B. K. (2001). *Intrusive parenting: How psychological control affects children and adolescents.* Washington, DC: American Psychological Association.

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 and Exercise Psychology, 32,* 193-216.

Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., & Thøgersen-Ntoumani, C. (2011). Psychological need thwarting in the sport context: Assessing the darker side of athletic experience. *Journal of Sport and Exercise Psychology, 33,* 75-102.

Baumeister, R., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117,* 497-529.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 238-246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88,* 588-606.

Bentler, P. M., & Dijkstra, T. (1985). Efficient estimation via linearization in structural models. In P. R. Krishnaiah (Ed.), *Multivariate analysis: VI* (pp. 9-42). Amsterdam: North-Holland.

Bentler, P. M., & Wu, E. J. C. (2002). EQS 6 for Windows: User's guide. Encino, CA: Multivariate Software.

Black, J. S., & Weiss, M. R. (1992). The relationship among perceived coaching behaviors, perceptions of ability, and motivation in competitive age-group swimmers. *Journal of Sport and Exercise Psychology, 14,* 309-325.

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.

Boggiano, A. K., Flink, C., Shields, A., Seelbach, A., & Barrett, M. (1993). Use of techniques promoting students' self-determination: Effects on students' analytic problem-solving skills. *Motivation and Emotion, 17,* 319-336.

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54,* 579–616.

Bosch, J. A., de Geus, E. J., Kelder, A., Veerman, E. C., Hoogstraten, J., & Amerongen, A. V. (2001). Differential effects of active versus passive coping on secretory immunity. *Psychophysiology, 38*, 836-846.

Bosch, J, A., Ring, C., de Geus, E. J., Veerman, E. C., & Amerongen, A. V. (2002). Stress and secretory immunity. *International Review of Neurobiology, 52,* 213-253.

Brown, J. D. (1996). *Testing in language programs.* New Jersey: Prentice Hall Regents.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.

Bruch, H. (1973). *Eating disorders.* New York: Basic Books.

Brustad, R. J. (1988). Affective outcomes in competitive youth sport: The influence of intra-personal and socialization factors. *Journal of Sport and Exercise Psychology, 10,* 307-321.

Burns, V. E. (2006). Psychological stress and immune function. In M. Gleeson (Ed.), *Immune function in sport and exercise* (pp. 221-245). London: Elsevier.

Butcher, J., Lindner, K. J., & Johns, D. P. (2002). Withdrawal from competitive youth sport: A retrospective ten-year study. *Journal of Sport Behavior, 25,* 145-163.

Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming.* London: Lawrence Erlbaum.

Cai, Y., Reeve, J., & Robinson, D. T. (2002). Home schooling and teaching style: Comparing the motivating styles of home school and public school teachers. *Journal of Educational Psychology, 94*, 372–380.

Cameron, J., & Pierce, W. D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research, 64,* 363-423.

Castillo, I., Fabra, P., Marcos, D., González, L., Bartholomew, K. J., Fuentes, A., & Balaguer, I. (2010). *El Estilo Controlador del Entrenador: Análisis de las propiedades psicométricas.* A paper presented at the VII Congreso Iberoamericano de Psicologia. Oviedo, Spain.

Chelladurai, P., & Reimer, H. A. (1998). Measurement of leadership in sport. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 227-256). Morgantown, WV: FIT.

Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. *Journal of Sport Psychology, 2*, 34-35.

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

Chirkov, V. I., Ryan, R. M., Kim, Y., & Kaplan, U. (2003). Differentiating autonomy from individualism and independence: A self-determination theory perspective on

internalization of cultural orientations and well-being. *Journal of Personality and Social Psychology*, 84, 97-110.

Chou, C. P., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling* (pp. 37–55). Thousand Oaks, CA: Sage.

Chou, C. P., Bentler, P. M., & Satorra, A. (1991). Scaled test statistics and robust standard errors for nonnormal data in covariance structure analysis. *British Journal of Mathematical and Statistical Psychology, 44,* 347-357.

Conroy, D. E., & Coatsworth, J. D. (2007). Coaching behaviors associated with changes in fear of failure: Changes in self-talk and need satisfaction as potential mechanisms. *Journal of Personality, 75,* 383-419.

Côté, J., Yardely, J., Hay, J., Sedgwick, W., & Baker, J. (1999). An exploratory examination of the coaching behavior scale for sport. *Avante, 5*, 82-92.

Crawford, J. R. (2007). Sbdiff.exe [computer software]. Retrieved May 6, 2009, from http://www.abdn.ac.uk/psy086/dept/sbdiff.htm.

Crawford, J. R., & Henry, J. D. (2003). The depression anxiety stress scales: Normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology, 42,* 111-131.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

D'Arripe-Longueville, F., Fournier, J. F., & Dubois, A. (1998). The perceived effectiveness of interactions between expert French judo coaches and elite female athletes. *The Sport Psychologist, 12*, 317-332.

DeCharms, R. (1968). *Personal causation: The internal affective determinants of behavior*. New York: Academic Press.

Deci, E. L. (1975). *Intrinsic motivation.* New York: Plenum.

Deci, E. L. (1980). *The psychology of self-determination.* Lexington, MA: Heath.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

Deci, E. L., & Ryan, R. M. (2008). Hedonia, eudaimonia, and well-being: An introduction. *Journal of Happiness Studies, 9*, 1-11.

Deci, E. L., Driver, R. E., Hotchkiss, L., Robbins, R. J., & McDougal-Wilson, I. (1993). The relation of mothers' controlling vocalizations to children's intrinsic motivation. *Journal of Experimental Child Psychology, 55,* 151-162

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62,* 119–142.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*, 627-668.

Deci, E. L., La Guardia, J. G., Moller, A. C., Scheiner, M. J., & Ryan, R. M. (2006). On the benefits of giving as well as receiving autonomy support: Mutuality in close friendships. *Personality and Social Psychology Bulletin, 32*, 313–327.

DeVellis, R. F. (1991). *Scale development: Theory and application.* London: Sage.

Diener, E., & Emmons, R. A. (1984). The independence of positive and negative affect. *Journal of Personality and Social Psychology, 47,* 1105-1117.

Duda, J. L., & Balaguer, I. (2007). The coach-created motivational climate. In S. Jowett & D. Lavalee (Eds.), *Social psychology of sport* (pp. 117-130). Champaign, IL: Human Kinetics.

Duda, J. L., Chi, L., Newton, M. L., Walling, M. D., & Catley, D. (1995). Task and ego orientation and intrinsic motivation in sport. *International Journal of Sport Psychology, 26*, 40-63.

Duquin, M. (1994). The body snatchers and Dr. Frankenstein revisited: Social construction and deconstruction of bodies and sport. *Journal of Sport and Social Issues, 18,* 268-261.

Edelen, M. O., & Reeve, B. B. (2007). Applying item response theory (IRT) modeling to questionnaire development, evaluation, and refinement, *Quality of Life Research, 16,* 5-18.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2008). Testing a self-determination theorybased teaching style intervention in the exercise domain. *European Journal of Social Psychology, 38*, 375-388.

Emmons, R. A. (1991). Personal strivings, daily life events, and psychological and physical well-being. *Journal of Personality, 59,* 453-472.

Enzle, M. E., & Anderson, S. C. (1993). Surveillant intentions and intrinsic motivation. *Journal of Personality and Social Psychology, 64,* 257-266.

Feinstein, J. (1989). *A season on the brink: A year with Bob Knight and the Indiana Hoosiers.* New York, N.Y: Libri.

Flink, C., Boggiano, A. K., & Barrett, M. (1990). Controlling teaching strategies: Undermining children's self-determination and performance. *Journal of Personality and Social Psychology*, *59*, 916-924.

Fraser-Thomas, J., & Côté, J. (2009). Understanding adolescents' positive and negative developmental experiences in sport. *The Sport Psychologist, 23,* 3-23.

Fraser-Thomas, J., Côté, J., & Deaken, J. (2005). Youth sport programs: An avenue to foster positive youth development. *Physical Education and Sport Pedagogy, 10,* 19-40.

Gagné, M., & Blanchard, C. (2007). Self-determination theory and well-being in athletes. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 243-254). Champaign, IL: Human Kinetics.

Gagné, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology*, *15*, 372-390.

Gaudreau, P., & Blondin, J-P. (2002). Development of a questionnaire for the assessment of coping strategies employed by athletes in competitive sport settings. *Psychology of Sport and Exercise, 3,* 1 -34.

Gerbing, D. W., & Hamiliton, J. G. (1996). Viability of exploratory factor analysis as a precursor to confirmatory factor analysis. *Structural Equation Modeling, 3,* 62-72.

González-Romá, V., Schaufeli, W. B., Bakker, A. B., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior, 68,* 165-174.

Gould, D. (1993). Intensive sport participation and the prepubescent athletes: Competitive stress and burnout. In B. R. Cahill & A. J. Pearl (Eds.), *Intensive participation in children's sport* (pp. 19-38). Champaign, IL: Human Kinetics.

Gould, D. (2007). Understanding attrition in children's sport. In D. Smith & M. Bar-Eli (Eds.), *Essential readings in sport and exercise psychology* (pp. 401-411). Champaign, IL: Human Kinetics.

Greenleaf, C., Petrie, T. A., Carter, J. & Reel, J. J. (2009). Female Collegiate Athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health, 57,* 489-495.

Grolnick, W. S. (2003). *The psychology of parental control: How well-meant parenting backfires*. Mahwah, NJ: Erlbaum.

Grolnick, W. S., Deci, E. L., & Ryan, R. M. (1997). Internalization within the family: the self-determination theory perspective. In J. E Grusec & L. Kuezynski (Eds.), *Parenting and children's internalization of values: A handbook of contemporary theory* (pp. 135-161). New York: Wiley.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 38,* 508-517.

Hausenblas, H. A., & Carron, A. V. (1999). Eating disorder indices and athletes: An integration. *Journal of Sport and Exercise Psychology, 12,* 427-433

Henderlong, J., & Lepper, M. R. (2002). The effects of praise on children's intrinsic motivation: A review and synthesis. *Psychological Bulletin, 128,* 774-795.

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.

Hodge, K., Lonsdale, C., & Ng, J. Y. Y. (2008). Burnout in elite rugby: Relationships with basic psychological needs fulfillment. *Journal of Sports Sciences, 26,* 835-844.

Hoffmann, R. (1995). Establishing factor validity using variable reduction in confirmatory factor analysis. *Educational and Psychological Measurement, 55,* 572-582.

Hollembeak, J., & Amorose, A. J. (2005). Perceived coaching behaviors and college athletes' intrinsic motivation: A test of self-determination theory. *Journal of Applied Sport Psychology, 17*, 20-36.

Horn, T. S. (1985). Coaches' feedback and changes in children's perceptions of their physical competence. *Journal of Educational Psychology, 77,* 174-186.

Horn, T. S. (2002). Coaching effectiveness in the sport domain. In T. S. Horn (Ed.), *Advances in sport psychology* (pp. 309-354). Champaign, IL: Human Kinetics.

Houlfort, N., Koestner, R., Joussemet, M., Nantel-Vivier, A., & Lekes, N. (2002). The impact of performance-contingent rewards on perceived autonomy and competence. *Motivation and Emotion, 26,* 279-295.

Hoyle, R. H., & Smith, G, T. (1994). Formulating clinical research hypotheses as structural equation models: A conceptual overview. *Journal of Consulting and Clinical Psychology, 62,* 429-440.

Hu, L. T., & Bentler, P. M. (1988). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*, 424-453.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55.

Hurley, A. E., Scandura, T. A., Schriesheim, C. A., Brannick, M. T., Seers, A., Vandenberg, R. J., & Williams, L. J. (1997). Exploratory and confirmatory factor analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior, 18,* 667-683.

Huysamen, G. K. (2006). Coefficient alpha: unnecessarily ambiguous, unduly ubiquitous. *South-African Journal of Industrial Psychology, 32,* 34-40.

Jang, H., Reeve, J., Ryan, R. M., & Kim, A. (2009). Can self-determination theory explain what underlies the productive, satisfying learning experiences of collectivistically oriented Korean students? *Journal of Educational Psychology*, *101*, 644-661.

Johnson, C., Powers, P. S., & Dick. R. (1999). Athletes and eating disorders: The National Collegiate Athletic Association study. *International Journal of Eating Disorders, 26,* 179-188.

Kahneman, D., Diener, E., & Schwarz, N. (1999). *Well-being: The foundations of hedonic Psychology.* New York: Russell Sage Foundation.

Kasser, T., Ryan, R. M., Zax, M., & Sameroff, A. J. (1995). The relations of maternal and social environments to late adolescents' materialistic and prosocial values. *Developmental Psychology, 31,* 907-914.

Kasser, T., Ryan, R. M., Zax, M., & Sameroff, A. J. (1995). The relations of maternal and social environments to late adolescents' materialistic and prosocial values. *Developmental Psychology, 31,* 907-914.

Kast, A., & Connor, K. (1988). Sex and age differences in response to informational and controlling feedback. *Personality and Social Psychology Bulletin, 14,* 514-523.

Kelloway, K. E. (1995). Structural equation modelling in perspective. *Journal of Organizational Behavior, 16,* 215-224.

Kerr, M., & Stattin, H. (2000). What parents know, how they know it, and several forms of adolescent adjustment: Further support for a reinterpretation of monitoring. *Developmental Psychology, 3,* 366-380.

Kidder, L. H., & Judd, C. M. (1986). *Research methods in social relations* (5th ed.). New York: Holt, Rinehart and Winston.

Kleinginna, P., & Kleinginna A. (1981). A categorized list of motivation definitions with suggestions for a consensual definition. *Motivation and Emotion, 5*, 263-291.

Kline, R. B. (1994). *An easy guide to factor analysis*. London: Routledge.

Kline, R. B. (1998). *Principles and practice of structural equation modeling.* New York: Guilford Press.

Kohn, A. (1993). *Punished by rewards: The trouble with gold stars, incentive plans, A's, praise, and other bribes.* New York: Houghton Mifflin.

Kowal, J., & Fortier, M. S. (1999) Motivational determinants of flow: Contributions from self-determination theory. *Journal of Social Psychology, 139,* 355-368.

Krane, V., Greenleaf, C. A., & Snow, J. (1997). Reaching for gold and the price of glory: A motivational case study of an elite gymnast. *The Sport Psychologist, 11,* 53-71.

Kyllo, L. B., & Landers, D. M. (1995). Goal setting in sport and exercise: A research synthesis to resolve the controversy. *Journal of Sport and Exercise Psychology, 17,* 117-137.

Lee, M. J., Whitehead, J., & Balchin, N. (2000). The measurement of values in youth sport: Development of the Youth Sport Values Questionnaire. *Journal of Sport and Exercise Psychology, 22*, 307-326.

Lee, S. Y., Poon, W. Y., & Bentler, P. M. (1995). A two-stage estimation of structural equation models with continuous and polytomous variables. *British Journal of Mathematical and Statistical Psychology, 48,* 339-358.

Lei, P. W. (2009). Evaluating estimation methods for ordinal data in structural equation modeling. *Quality and Quantity, 43,* 495-507.

Lemyre, P. N., Treasure, D. C., & Roberts, G. C. (2006). Influence of variability in motivation and affect on elite athlete burnout. *Journal of Sport and Exercise Psychology, 28,* 32-48.

Lemyre, P., Roberts, G. C., & Stray-Gundersen, J. (2007). Motivation, overtraining, and burnout: Can self-determined motivation predict overtraining and burnout in elite athletes? *European Journal of Sport Science, 7,* 115-126.

Lepper, M. R., & Greene, D. (1975). Turning play into work: Effects of adult surveillance and extrinsic rewards on children's intrinsic motivation. *Journal of Personality and Social Psychology, 31,* 479-486.

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9,* 151-173.

LLoret, S., & González-Romá, V. (2000). Measurement of bipolar constructs with Likert-type scales: Why do unipolar factors emerge? *Psicothema, 12,* 471-479.

Lovibond, S. H. & Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales*. (2nd. Ed.) Sydney: Psychology Foundation.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research, 35,* 382-385.

MacLean, J., & Hamm, S. (2008). Values and sport participation: Comparing participant groups, age, and gender. *Journal of Sport Behavior, 31,* 352-367.

Mageau, G. A., & Vallerand, R. J. (2003). The coach-athlete relationship: a motivational model. *Journal of Sports Sciences, 21*, 883-904.

Mallett, C., & Hanrahan, S. J. (2004). Elite athletes: Why does the "fire" burn so brightly? *Psychology of Sport and Exercise, 5,* 183-200.

Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*, 851-858.

Marsh, H. W. (1987). The hierarchical structure of self-concept and the application of hierarchical confirmatory factor analysis. *Journal of Educational Measurements, 24,* 17-39.

Marsh, H. W., Hau, K., & 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, 11,* 320-341.

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the intrinsic motivation inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 68,* 20-32.

McDonough, M. H., & Crocker, P. R. E. (2007). Testing self-determined motivation as a mediator of the relationship between psychological needs and affective and behavioral outcomes. *Journal of Sport and Exercise Psychology, 29,* 645-663.

Medic, N., Mack, D. E., Wilson, P. M., & Starkes, J. L. (2007). The effects of athletic scholarship of motivation in sport. *Journal of Sport Behavior*, *30*, 292-306.

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist, 50,* 741-749.

Mintz, L. B., O'Halloran, M. S., Mulholland, A. M., & Schneider, P. A. (1997). Questionnaire for eating disorder diagnoses: Reliability and validity of operationalizing *DSM-IV* criteria into a self-report format. *Journal of Counselling Psychology, 44,* 63-79.

Moller, A. C., Deci, E. L., & Elliot, A. J. (2010). Person-level relatedness and the incremental value of relating. *Personality and Social Psychology Bulletin, 36*, 754-767.

Mouratadis, M., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008). The motivating role of positive feedback in sport and physical education: Evidence for a motivational model. *Journal of Sport and Exercise Psychology*, *30*, 240-268.

Navazesh, M. (1993). Methods for collecting saliva. *Annals of the New York Academy of Sciences, 694,* 72–77.

Nicholls, J. G. (1989). *The competitive ethos and democratic education.* Cambridge, MA: Harvard University Press.

Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality, 43,* 291-306.

Nix, G., Ryan, R. M., Manly, J. B., & Deci, E. L. (1999). Revitalization through self-regulation: the effects of autonomous versus controlled motivation on happiness and vitality. *Journal of Experimental Social Psychology, 35,* 266–84.

Ntoumanis, N., & Biddle, S. J. H. (1999). A review of motivational climate in physical activity. *Journal of Sport Sciences, 17,* 643-665.

Ommundsen, Y., & Vaglum, P. (1991). Soccer competition anxiety and enjoyment in young boy players: The influence of perceived competence and significant others' emotional involvement. *International Journal of Sport Psychology, 22,* 35-39.

Pelletier, L. G., Dion, S., & Lévesque, C. (2004). Can self-determination help protect women against sociocultural influences about body image and reduce their risk of experiencing bulimic symptoms? *Journal of Social and Clinical Psychology, 23,* 61-88.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion, 25,* 279-306.

Pelletier, L. G., Seguin-Levesque, C., & Legault, L. (2002). Pressure from above and pressure from below as determinants of teachers' motivation and teaching behaviors. *Journal of Educational Psychology, 94*, 186–196

Pelletier, L. G., Tuson, K. M., & Haddad, N. K. (1997). The client motivation for therapy scale (CMOTS): A measures of intrinsic motivation, forms of extrinsic motivation, and amotivation for therapy. *Journal of Personality Assessments, 68,* 414-435.

Perreault, S., Gaudreau, P., Lapointe, M-C., & Lacroix, C. (2007). Does it take three to tango? Psychological need satisfaction and athlete burnout. *International Journal of Sport Psychology, 38,* 437-450.

Petlichkoff, L. (1996). The dropout dilemma in youth sport. In O. Bar-Or (ed.), *The child and adolescent athlete.* Champaign, IL: Human Kinetics.

Petrie, T. A., & Greenleaf, C. A. (2007). Eating disorders in sport: From theory to research to intervention. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (pp. 352-378). Hoboken, NJ: John Wiley and Sons.

Polit, E. F., Beck, T. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing and Health, 30,* 459-467.

Pyszczynski, T., Greenberg, J., & Solomon, S. (2000). Why do we need what we need? A terror management perspective on the roots of human social motivation. *Psychological Inquiry*, *8*, 1–20.

Quested, E., & Duda, J. L. (2010). Exploring the social-environmental determinants of well- and ill-being in dancers: A test of basic needs theory. *Journal of Sport and Exercise Psychology, 32,* 39-60.

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

Ransdell, L. B. (1996). Maximizing response rate in questionnaire research. *American Journal of Health Behavior, 2,* 50-56.

Raudenbush, S. W., Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Newbury Park, CA: Sage.

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement, 21,* 173-184.

Reeve, J. (1998). Autonomy support as an interpersonal motivating style: Is it teachable? *Contemporary Educational Psychology, 23*, 312-330.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (Vol. 2, pp. 183-204). Rochester: University of Rochester Press.

Reeve, J. (2009). Why teachers adopt a controlling motivation style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44,* 159-175.

Reeve, J., & Deci, E. L. (1996). Elements within the competitive situation that affect intrinsic motivation. *Personality and Social Psychology Bulletin, 22,* 24-33.

Reeve, J., & Jang, H. (2006). What teachers say and do to support student's autonomy during a learning activity. *Journal of Educational Psychology, 98,* 209-218.

Reeve, J., & Tseng., C. (2010). Cortisol reactivity to a teacher's motivating style: The biology of being controlled versus supporting autonomy. *Motivation and Emotion, 35,* 63-74.

Reinboth, M., Duda, J. L., Ntoumanis, N. (2004). Dimensions of coaching behavior, need satisfaction, and the psychological and physical welfare of young athletes. *Motivation and Emotion, 28,* 297-313.

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin, 4,* 419-435.

Richer, S., & Vallerand, R. J. (1998). Construction and validation of the perceived relatedness scale. *Revue Européene de Psychologie Appliquée, 48,* 129-137.

Roberts, G. C. (1992). *Motivation in sport and exercise.* Champaign, IL: Human Kinetics.

Rogers, C. (1963). The actualizing tendency in relation to "motives" and to consciousness. In M. R. Jones (Ed), *Nebraska symposium on motivation*, (pp. 1-24). Lincoln: University of Nebraska Press.

Roth, G., Assor, A., Niemiec, C.P., Ryan, R.M., & Deci, E.L. (2009). The emotional and academic consequences of parental conditional regard: Comparing conditional positive regard, conditional negative regard, and autonomy support as parenting practices. *Developmental Psychology, 45*, 1119-1142.

Ryan, E. D. (1980). Attribution, intrinsic motivation, and athletics: A replication and extension. In C. H. Nadeau, W. R. Halliwell, K. M. Newell, & G. C. Roberts (Eds.), *Psychology of motor behavior and sport* (pp. 19–26). Champaign, IL: Human Kinetics Publishers.

Ryan, J. (1996). *Little girls in pretty boxes: The making and breaking of elite gymnasts and figure skaters.* London: The Women's Press.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43,* 450–461.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63,* 397-427.

Ryan, R. M., & Deci, E. (2007). Active human nature: Self-determination theory and the promotion, and maintenance of sport, exercise and health. In M. S. Hagger & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in sport and exercise* (pp. 1-22). Champaign, IL: Human Kinetics.

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

Ryan, R. M., & Deci, E. L. (2000). The darker and brighter sides of human existence: Basic psychological needs as a unifying concept. *Psychological Inquiry, 11,* 319-338.

Ryan, R. M., & Deci, E. L. (2000). When rewards compete with nature: The undermining of intrinsic motivation and self-regulation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 13-54). New York: Academic Press.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology, 53,* 141-166.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3-33). Rochester, NY: University of Rochester Press.

Ryan, R. M., & Frederick, C. M. (1997). On energy, personality and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65,* 529-565.

Ryan, R. M., Bernstein, J. H., & Brown, K. W. (2010). Weekends, work, and wellbeing: Psychological need satisfactions and day of the week effects on mood, vitality, and physical symptoms. *Journal of Social and Clinical Psychology, 29,* 95-122.

Ryan, R. M., Deci, E. L., Grolnick, W. S., & La Guardia, J. G. (2006). The significance of autonomy and autonomy support in psychological development and psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Theory and method* 2nd ed., (pp. 795-849). New Jersey: John Wiley and Sons.

Ryan, R. M., Huta, V., & Deci, E. L. (2008). Living well: A self-determination theory perspective on eudaimonia. *Journal of Happiness Studies, 9*, 139-170.

Ryan, R. M., Patrick, H., Deci, E. L., & Williams, G. C. (2008). Facilitating health behaviour change and its maintenance: Interventions based on self-determination theory. *The European Health Psychologist, 10*, 2-5.

Ryff, C. D., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9,* 1-28.

Ryff, C. D., Dienberg-Love, G., Urry, H. L., Muller, D., Rosenkranz, M. A., Friedman, E. M., Davidson, R. J. & Singer, B. (2006). Psychological well-being and ill-being: Do they have distinct or mirrored biological correlates? *Psychotherapy and Psychosomatics, 75,* 85-95.

Sarrazin, P. G., Tessier, D. P., Pelletier, L. G., Trouilloud, D. O., & Chanal, J. P. (2006). The effects of teachers' expectations about students' motivation on teachers' autonomy-

supportive and controlling behaviors. *International Journal of Sport and Exercise Psychology, 4*, 283–301.

Satorra, A., & Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye & C. C. Clogg (Eds), *Latent variables analysis: Applications for developmental research* (pp. 399-419). Thousand Oaks, CA: Sage.

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika, 66,* 507-514.

Scanlan, T. K., Stein, G. L., & Ravizza, K. (1991). An in-depth study of former elite figure skaters: III. Sources of stress. *Journal of Sport and Exercise Psychology, 13,* 103-120.

Schmidt, G. W., & Stein, G. L. (1991). Sport commitment: A model integrating enjoyment, dropout, and burnout. *Journal of Sport and Exercise Psychology, 8,* 254-265.

Sebire, S. J., Standage, M., & Vansteenkiste, M. (2008). Development and validation of the goal content for exercise questionnaire. *Journal of Sport and Exercise Psychology, 30,* 353-377.

Segerstrom, S. C., & Miller, G. E. (2004). Psychological Stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin, 130,* 601-630.

Sheldon, K. M., & Bettencourt, B. A. (2002). Psychological need-satisfaction and subjective well-being within social groups. *British Journal of Social Psychology, 41,* 25-38.

Sheldon, K. M., & Gunz, A. (2009). Psychological needs as basic motives, not just experiential requirements. *Journal of Personality, 77,* 1467-1492

Sijtsma, K. (2009). On the use, the misuse, and the very limited usefulness of Cronbach's alpha. *Psychometrika, 74,* 107-120.

Silk, J, S., Morris, A. S., Kanaya, T., & Steinberg, L. (2003). Psychological control and autonomy granting: Opposite ends of a continuum or distinct constructs? *Journal of Research on Adolescence, 13,* 113-128.

Skinner, B. F. (1953). *Science and human behavior* New York: Macmillan.

Smith, A. L., Ntoumanis, N., & Duda, J. L. (2007). Goal striving, goal attainment, and well-being: An adaptation of the Self-Concordance Model in sport. *Journal of Sport and Exercise Psychology, 29*, 763-782.

Smith, R. E., Smoll, F. L., & Hunt, B. (1977). A system for the behavioral assessment of athletic coaches. *The Research Quarterly, 48,* 401-407.

Smoll, F. L., & Smith, R. E. (2002). Coaching behavior research and intervention in youth sports. In F. L. Smoll & R. E. Smith (Eds.), *Children and youth in sport: A biopsychosocial perspective* (2nd ed., pp. 211-233). Dubuque, IA: Kendall/Hunt.

Smoll, F. L., & Smith, R. E. (2002). Coaching behavior research and intervention in youth sports. In F. L. Smoll & R. E. Smith (Eds.), *Children and youth in sport: A biopsychosocial perspective* (2nd ed., pp. 211-133). Dubuque, IA: Kendall/Hunt.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology, 95,* 97–110.

Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *The British Psychological Society, 75,* 411-433.

Stebbings, J., Taylor, I. M., & Spray, C. M. (in press). Antecedents of perceived coach autonomy supportive and controlling behaviors: Coach psychological need satisfaction and well-being. *Journal of Sport and Exercise Psychology.*

Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research, 25,* 173-180.

Strauss, J., & Ryan, R. M. (1987). Autonomy disturbances in subtypes of anorexia nervosa. *Journal of Abnormal Psychology, 96*, 254-258.

Sundgot-Borgen, J. (1993). Prevalence of eating disorders in elite female athletes. *International Journal of Sport Nutrition, 3,* 29-40.

Tangney, J. P., & Dearing, R. L. (2002). *Shame and guilt.* New York: The Guilford Press.

Taylor, I. M., Ntoumanis, N., & Standage, M. (2008). A self-determination theory approach to understanding the antecedents of teachers' motivational strategies in physical education. *Journal of Sport and Exercise Psychology, 30*, 75-94.

Tessier, D., Sarrazin, P., & Ntoumanis, N. (2008). The effects of an experimental programme to support students' autonomy on the overt behaviors of physical education teachers. *European Journal of Psychology of Education, 23,* 239-253.

Tessier, D., Sarrazin, P., & Ntoumanis, N. (2010). The effects of a programme intended to support students' needs on the overt behaviours of teachers, and students' self-determined motivation and engagement in physical education. *Contemporary Educational Psychology, 35,* 242-253.

Theberge, N. (2008). "Just a normal bad part of what I do": Elite athletes' accounts of the relationship between health and sport. *Sociology of Sport Journal, 25,* 206-222.

Thøgersen-Ntoumani, C., & Ntoumains, N., & Nikitaras, N. (2010). Unhealthy weight control behaviours in adolescent girls: A process model based on self-determination theory. *Psychology and Health, 25,* 535-550.

Vallerand, R. J. (2000). Deci and Ryan's self-determination theory: A view from the hierarchical model of intrinsic and extrinsic motivation. *Psychological Inquiry, 11,* 312–318.

Vallerand, R. J., & Losier, G. F. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of Applied Sport Psychology, 11*, 142–169.

Vallerand, R. J., Pelletier, L. G., & Koestner, R. (2008). Reflections on self-determination theory. *Canadian Psychology, 49,* 257-262.

Van den Broeck, A., Vansteenkiste, M., De Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, relatedness and competence at work: Construction and initial validation of the work-related basic need satisfaction scale. *Journal of Occupational and Organisational Psychology, 83,* 981-1002.

Van Schuur, W. H., & Kiers, H. A. L. (1994). Why factor analysis is often the wrong model for analysing bipolar concepts and what model to use instead. *Applied Psychological Measurement, 18,* 97-110.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organisational research. *Organisational Research Methods, 3,* 4-70.

Vansteenkiste, M., & Deci, E. L. (2003). Competitively contingent rewards and intrinsic motivation: Can losers remain motivated. *Motivation and Emotion, 27,* 273-299.

Wankel, L. M., & Mummery, W. K. (1990). The psychological and social benefits of sport and physical activity. *Journal of Leisure Research, 22*, 167-182

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063-1070.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 56-75). Newbury Park, CA: Sage.

Whitehead, J. (1995). Multiple achievement orientations and participation in youth sport: A cultural and developmental perspective. *International Journal of Sport Psychology, 26,* 431-452.

Williams, G. C., Grow, V, M., Freeman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70,* 115-126.

Williams, L. J. (1995). Covariance structure modeling in organizational research: Problems with the method versus applications of the method. *Journal of Organizational Behavior, 16,* 225-234

Xin Chung, S., & Jowett, S. (2010). *The development and validation of dominant-submissive interpersonal transactions scales between coaches and athletes.* A paper presented at the BPS Division of Sport and Exercise Psychology Conference. London, UK.

APPENDICIES

A Taxonomy of Six Controlling Coaching Strategies

(Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009)

(1) Tangible Rewards

Tangible rewards, such as gold stars, money, and medals, are all extrinsic reinforcements that can be used to induce participation or persistence in some sort of behavior. Deci and Ryan (1985) have shown that extrinsic rewards often have a detrimental effect on intrinsic motivation. Whilst some authors disagree with this argument (see, for example, Cameron & Pierce, 1994), there is much evidence, primarily from educational settings, to support this negative effect under certain conditions. Deci, Koestner, and Ryan (1999) have argued specifically that tangible rewards damage intrinsic motivation in the context of an interesting task, especially when rewards are expected, and when they are provided as an incentive for *engaging with and completing a task* (task-contingent rewards), or for *reaching certain performance standards* (performance-contingent rewards). Competitively-contingent rewards, which are given for *beating opponents* during direct competition, have also been shown to undermine intrinsically motivated behavior (Vansteenkiste & Deci, 2003). Such incentives are often associated with feelings of pressure to perform a task and performance-contingent rewards, in particular, have been linked with anxiety about one's performance (Houlfort, Koestner, Joussemet, Nantel-Vivier, & Lekes, 2002).

Ryan (1980) found that collegiate football players who were rewarded with athletic scholarships were subsequently less intrinsically motivated to play football because they perceived the scholarships to be extrinsically controlling (for similar findings, see Medic, Mack, Wilson, & Starkes, 2007). Interestingly, however, athletic scholarships in college wrestlers and female athletes (who receive such support less frequently) were perceived as an

affirmation of their athletic competence and increased their subsequent intrinsic motivation. Ryan (1980) suggested that the undermining effect of the scholarships on the intrinsic motivation of football players could have resulted from coaches using the scholarship as leverage to control the players' behavior. This hypothesis was confirmed in a more recent study by Amorose and Horn (2000) who found that changes in feelings of intrinsic motivation were primarily attributable to coaching behaviors, rather than whether athletes were on a scholarship or not. Specifically, athletes who perceived their coaches to predominantly display autocratic and controlling behaviors demonstrated less intrinsic motivation. These findings indicate that it may not be the reward per se that undermines intrinsic motivation, but the way in which it is presented and used by the coach, that is, whether it is presented in an informational (autonomy-supportive) or a controlling (autonomy-thwarting) fashion. Research suggests that rewards which are delivered in a controlling and pressuring interpersonal context will undermine intrinsic motivation (Reeve & Deci, 1996; Vansteenkiste & Deci, 2003).

Controlling coaches emphasize a specific way of thinking and behaving and may offer extrinsic incentives and rewards to secure athlete compliance (Mageau & Vallerand, 2003). Although this use of rewards may appear to be an effective way of controlling athlete behavior, for the majority of athletes sport provides its own inherent rewards, such as personal achievement, fun, and enjoyment (Lee, Whitehead, & Balchin, 2003; MacLean & Hamm, 2008), which are undermined when contingent rewards come into play (Ryan & Deci, 2000). Coaches who place a great emphasis on rewards will focus their athletes on extrinsic reasons for their sport participation, undermining the intrinsic satisfaction which initially brought athletes into the sport. Krane, Greenleaf, and Snow (1997) highlighted this undermining effect in a case study of an elite female gymnast who was awarded stars by her coach for exceptional performance. The gymnast learnt to place great importance on the significance of

these extrinsic rewards, to the extent that the rewards themselves became the primary motivation for her sport involvement.

To help reduce athletes' perceptions of rewards as controlling, coaches who use rewards should administer them in an informational and autonomy-supportive way, focusing on increasing feelings of autonomy and competence by rewarding effort, personal improvement, and behaviors which are under the athletes' control.

(2) Controlling Feedback

Findings from the coaching literature indicate that the type of feedback young athletes perceive their coaches to give them is critical to the development of their perceptions of competence, autonomy, and intrinsic motivation (Hollembeak & Amorose, 2005; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008). Feedback contains an informational element regarding competence, however it can also have a controlling aspect which conveys expectations and desires about an individual's behavior in an effort to incite the person into re-emitting or changing the behavior. When the informational element is not salient and the controlling aspect is, the individual will be under pressure to act in a specific manner (Mageau & Vallerand, 2003). As such, controlling feedback promotes interpersonal control and external reasons for task engagement, undermining feelings of autonomy. For example, early experimental studies using positive but controlling locutions (e.g., "Keep it up. I would like you to do even better in the next game"; Kast & Connor, 1988), demonstrated that the experimenters' expectations and desires about the participants' behavior were perceived as a form of control which undermined autonomy and intrinsic motivation.

Pressuring feedback can manifest itself not only in terms of *instruction*, but also in terms of *criticism* and *positive reinforcement (praise)*. In terms of the former, research conducted in the sport setting has employed the Coaching Feedback Questionnaire (CFQ;

Amorose & Horn, 2000), a questionnaire version of the Coach Behaviors Assessment System (CBAS; Smith, Smoll, & Hunt, 1977), to assess athletes' perceptions regarding the type of feedback their coaches give them in response to their performance successes and failures. This work supports the negative impact of critical feedback on intrinsic motivation. For example, Amorose and Horn (2000) found that a high frequency of criticisms (punishment-oriented feedback) was negatively related to female athletes' intrinsic motivation. Further, although not embedded within an SDT-perspective, Black and Weiss' (1992) study found that coaches' criticism not only had a negative impact upon perceived motivation and competence, but also on perceived success, enjoyment, and effort in a sample of 15-18-year-old swimmers.

Whilst research has shown that praise can be perceived as positive and affirming competence, it can also be viewed as negative and controlling (Deci et al., 1999; Reeve & Jang, 2006). For example, Hollembeak and Amorose (2005) reported a negative relationship between positive feedback (praise) and perceived competence. Previous evidence also suggests that praise may result in low perceived competence when it is given non-contingently and inappropriately (Horn, 1985). Thus, in a controlling context, general praise which is non-contingent on performance may undermine feelings of competence, autonomy, and intrinsic motivation as it can be perceived as insincere and a contrived attempt to reinforce particular behaviors (Henderlong & Lepper, 2002; Kohn, 1993). Further, even when praise is not purposefully controlling, athletes may learn to select only those behaviors that have been previously praised by their coach in an attempt to please them. Deci et al. (1999) suggested that by responding in this way, individuals can thwart their own need for autonomy and thus undermine intrinsic motivation.

(3) Excessive Personal Control

Barber (1996) proposed that excessive personal control can inhibit or intrude upon the psychological and emotional development of children. Achieving a sense of autonomy whilst maintaining a positive relationship with parents has been identified as a critical task in adolescence. In fact, research suggests that several forms of negative affect may be linked to the thwarting of the autonomy and relatedness needs during parent-child interactions (Allen, Hauser, Eickholt, Bell, & Conner, 1994). Rather than allowing children to autonomously express their own opinions and individuality, controlling parents may *impose their own values* upon them. This may result in children conforming to parental values which are not fully congruent with their own in order to avoid value-related conflicts and feelings of rejection, anxiety, and guilt (Grolnick, Deci, & Ryan, 1997). Controlling parents will also interact in a way which emphasizes interpersonal control. For example, mothers' *constraining verbal expressions and pressuring language* have been negatively related to children's intrinsic motivation (Deci, Driver, Hotchkiss, Robbins, & McDougal-Wilson, 1993). Similar findings have also been reported in the educational setting in which controlling teachers also tend to stress personal control, prevent children from expressing opinions which differ from their own, and use controlling vocalizations (Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Reeve & Jang 2006). Not letting children work at their own pace, monopolizing the conversation, using orders, directives, and commands, asking controlling questions, and using deadline statements are also behaviors associated with an excessively teacher-centered agenda and have been shown to undermine pupils' intrinsic motivation and predict negative feelings during learning, such as low self-esteem, anger, and anxiety (e.g., Assor & Kaplan 2001; Assor et al., 2005; Boggiano, Flink, Shields, Seelbach and Barrett, 1993; Flink, Boggiano, & Barrett, 1990).

High levels of success in sport require high levels of commitment from both the athlete and the coach. On some occasions, the coach's commitment could transform into excessive personal control. When coaches equate the performance of their athletes with their own self-worth and reputation, they are likely to create pressurized, coach-centered training environments. In such an environment, athletes would be forced to comply with the training regime dictated by their coach and pushed to their physical limits in order to produce winning performances. A coach who perceives his or her athletes merely as objects that should be controlled to obtain certain outcomes will make little, if any effort at all, to appreciate the athletes' perspective. Instead, in a fashion similar to that of controlling parents, he or she is likely to impose his or her own values and invalidate or discount the athletes' own feelings and opinions. Anecdotal reports suggest that controlling coaches do employ these strategies to pressure athletes towards coach-prioritized behaviors and goals. For example, Kristie Phillips, an ex-American gymnastics champion, talked of her coach's unrelenting demands conveyed only via commands and orders during training (Ryan, 1996). In such instances, athletes feel they have to suppress their own feelings and opinions and relinquish their autonomy in order to maintain connectedness with their coach.

Research utilizing the Leadership for Sport Scale (LSS; Chelladurai & Saleh, 1980) has found that these kind of autocratic behaviors negatively predict feelings of autonomy, relatedness, and subsequent intrinsic motivation in adolescent athletes (Hollembeck & Amorose, 2005). This is not surprising as, for example, authoritarian coaches assert their authority and distance themselves emotionally from their athletes, leaving little room for feelings of connectedness. Another dimension of coach behavior assessed by the LSS, training and instruction, was also found by Hollembeck and Amorose (2005) to have a significant negative effect on feelings of autonomy. The authors suggested that when coaches employ a great deal of instructional behavior, they may leave little room for athlete input.

Although the role of a coach clearly involves directing athlete behavior, when directions are consistently communicated in an overly controlling way (through the use of demands, orders, and pressuring language), they undermine athletes' psychological needs. The athlete may learn to follow orders but he or she will not be able to appreciate and internalize the value or importance which underlie a prescribed activity.

Coaches who create coach-centered training environments and demand strict compliance to their training decisions are likely to monitor their athletes closely as they complete set sessions. *Surveillance* is defined as the constant monitoring of a subordinate's behavior by someone in a position of authority (Lepper & Greene, 1975). Research from the educational literature has shown that the use of surveillance reduces pupils' intrinsic motivation in the classroom environment (Lepper & Greene, 1975). These authors proposed that in such situations the pupils perceive themselves as engaging in an activity because of the external pressure produced by the excessive surveillance. Research further suggests that this undermining effect is particularly apparent when surveillance is accompanied by an explicitly stated controlling intention to evaluate performance (Enzle & Anderson, 1993). A relatively recent study from the parental literature, Kerr and Sattin (2000), has also highlighted the damaging effects of intrusive monitoring upon children's perceptions of personal control and subsequent self-esteem and levels of depression. Although athletes' performances need to be constantly evaluated, these findings suggest that the use of excessive surveillance in coaching may have an adverse impact on athletes' intrinsic motivation and well-being.

Controlling coaches are also likely to *impose predetermined goals* on their athletes. Such coaches often have a very controlling 'you do as I say and you will achieve this' mentality. In the sport literature, research has demonstrated that as long as the athlete is committed to a goal and has the ability to achieve it, goal setting is an effective performance enhancement technique (Kyllo & Landers, 1995). However, when coaches pressure athletes

towards obtaining imposed and predetermined goals, the athletes may come to perceive themselves as pursuing the goals for extrinsic reasons and, thus, perceive an external locus of causality with respect to their goal strivings. Goals which are pursued for controlled motives have been shown to be unrelated to effort and goal attainment, and to be negatively related to athlete well-being (Smith, Ntoumanis, & Duda, 2007). To be effective, goals should be jointly set by the athlete and the coach and should be perceived by both as challenging, yet realistic to the athlete's current performance level. Under circumstances in which coaches have to set goals for their athletes, for example when athletes are very inexperienced, this must be done in an autonomy-supportive way. Involving athletes in the goal-setting process and providing a rationale for the set goals will facilitate their feelings of goal ownership.

Qualitative and anecdotal evidence also suggests that coaches can become over-possessive, over-protective, or engage in *over-intrusive behaviors* (e.g., Scanlan, Stein, & Ravizza, 1991). For example, some coaches may isolate their athletes from others, telling them that they must not speak to other athletes and coaches as they are competitors or enemies (Krane et al., 1997). In extreme circumstances, the athlete's life is expected to revolve entirely around his or her sport. For example, Ryan (1996) reported that the Romanian coach Karolyi wielded total control over every aspect of his gymnasts' lives. They lived in dormitories at his gym, trained eight hours a day, fit in a few hours of school and ate only what food he provided them. This is unlikely to be a healthy situation, particularly when an athlete is not performing well. Athletes competing at lower levels may also experience excessive pressure from their coaches who sometimes expect them to priorities their sport involvement over other important aspects of their life, such as spending time with friends (Fraser-Thomas & Côté, 2009).

(4) Intimidation Behaviors

Behaviors which are used to intimidate others involve the display of power-assertive strategies such as *verbal abuse* and *yelling*, the use and threat of *physical punishment*, and the launch of *personal attacks* on the individual which are designed to *humiliate* and *belittle*. All of these strategies can be used to control behavior as they foster external regulation by creating pressure from outside to behave in certain ways to avoid external punishment (Ryan, 1982). Behaviors obtained via these compliance techniques are problematic in the sense that they occur in the absence of any internalization of the underlying values of the activity. The use of such strategies is also likely to have a direct effect on the well-being of those subjected to them. For example, in the parental literature yelling, verbal threats, and physical punishment have all been found to produce negative consequences such as depression, low self-esteem, and social withdrawal (Barber, 2001). Further, personal attacks designed to question the worth, place, contribution, and loyalty of other family members undermine feelings of relatedness and have been shown to be a strong predictor of loneliness (Barber, 1996).

Qualitative research carried out in the sport context suggests that coaches do engage in such power-assertive behaviors (D'Arripe-Longueville, Fournier, & Dubois, 1998; Fraser-Thomas & Côté 2009). Côté, Yardley, Hay, Sedgwick and Baker (1999) also suggested that coaches use psychological strategies such as intimidation, fear, and/or yelling at their players to exhort them to higher performance. As a result, these authors included a subscale reflecting these behaviors (coaches' negative personal rapport) in the development of the Coaching Behavior Scale for Sport (CBS-S; Côté et al., 1999). Empirical studies utilizing the CBS-S have provided some evidence regarding the negative impact of coaches' intimidation behaviors on athletes' psychological experiences. For example, athletes who report feeling

intimidated and fearful of their coach also report higher levels of sport anxiety (Baker, Côté, & Hawes, 2000).

The use of intimidation behaviors to exhort successful performance is clearly exemplified by American basketball coach Bob Knight. Knight's fundamental approach to motivation was to use fear. He believed that if his players were afraid of getting yelled at and feared him more than the opposition, they would play better. Knight was even once arrested for physical assault after head-butting a player (Feinstein, 1989). Intimidation behaviors may not be rare in the sport context as they are often considered necessary to enforce discipline or to build character (Duquin, 1994). However, as discussed earlier, evidence from the coaching literature suggests that that the negative words and actions of coaches can profoundly affect the long-term emotional health of their athletes (Baker et al., 2000).

(5) Promoting Ego-Involvement

Ego-involvement has been extensively researched in the achievement goal theory literature and is also discussed in the self-determination theory literature. This concept refers to evaluating one's own competence and performance by reference to others, rather than in relation to self-referenced criteria (Nicholls, 1989). When ego-involved, self-esteem is constantly threatened and behavior is motivated by the desire to protect or enhance levels of self-esteem. This is because when ego-involved, individuals view their self-worth as contingent upon their performance. As such, ego-involvement encourages introjected regulation in which behaviors are performed to attain ego enhancement and feelings of worth (Ryan & Deci, 2002). Thus, individuals are controlled in that they perform an activity to prove to themselves that they are good at it and therefore worthy individuals (Ryan, 1982). As a result ego-involved individuals put more pressure on themselves in competitive situations

because their performance is a measure, perhaps the only measure, of their self-esteem (Nicholls, 1989).

Coaches who create ego-involving environments *stress competition*, *public evaluation*, *normative comparisons,* and make *externally-referenced criteria for success* salient (Ames, 1992). Numerous studies in the sport and physical education literature have supported the negative effect of an ego-involving climate on intrinsic motivation (Duda, Chi, Newton, Walling, & Catley, 1995; Ntoumanis & Biddle, 1999). Further, Krane et al. (1997) have suggested that the ego-involving coach climate experienced by the elite female gymnast in their case study significantly contributed to the development of her contingent self-esteem, disordered eating, and depression.

(6) Conditional Regard

Conditional regard refers to the provision of love, attention, and affection by those in a position of authority when desired attributes or behaviors are displayed by their subordinates (*positive regard*), and the withholding of love, attention and affection when these attributes and behaviors are absent (*negative regard*; Assor, Roth, & Deci, 2004). In the parental literature, conditional regard has been shown to promote contingent self-esteem, thwart personal growth, and damage psychological functioning and general well-being (Assor et al., 2004; Barber, 1996; Hewitt & Flett, 1991). For example, Assor et al. (2004) reported that parental use of conditional regard led to children's introjected regulation which mediated the enactment of desired behaviors. However, conditional regard and introjected regulation were also associated with fluctuations in the children's self-esteem, shame and guilt after failure, poor coping skills, feelings of perceived parental disapproval, and feelings of resentment towards parents.

There has been no empirical research on the use of conditional regard in the context of sport. However, qualitative research suggests that some coaches do indeed use negative conditional regard, displaying complete indifference towards athletes after they have lost a competition, apparently in an attempt to increase future effort and exhort higher performance (D'Arripe-Longueville, Fournier, & Dubois, 1998; Fraser-Thomas & Côté 2009). Coaches may also use *negative affect-laden expressions* (e.g., "you have really let me down"), and other guilt-inducing statements, to express their disappointment and withdraw their affection when athletes have not engaged in desired behaviors. An illustration of this can be found in the case study by Krane et al. (1997) in which the interviewed gymnast described how her coach often used negative affect-laden statements in order to evoke feelings of shame if the gymnasts ate something that the coach did not approve of.

Mageau and Vallerand (2003) suggested that because conditional regard makes a coach's attention and acceptance highly contingent upon his or her athletes emitting appropriate thoughts and behaviors, the athletes may come to see their own thoughts and feelings as a threat to the emotional bond they have with their coach. Thus, athletes may suppress their own opinions and relinquish their autonomy in order to maintain a satisfactory relationship with their coach. Ultimately, the repeated experience of conditional regard is likely to produce high-levels of contingent self-worth as athletes learn that they are less worthy as a person if they fail, or do not perform the behaviors desired by their coach.

Questionnaire Items Used in Chapter 2

Study 1

Initial Pool of 53 CCBS Items

Please indicate the extent to which you find each statement clear in terms of its meaning and wording.

	Not at all Clear			**Neutral**			**Extremely Clear**
From past experience, I have learnt to expect rewards from my coach when I have done well.	1	2	3	4	5	6	7
My coach tells me that he/she will reward me when I complete all of the tasks he/she sets in training.	1	2	3	4	5	6	7
My coach will motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
I believe that my coach rewards/praises me to make me train harder.	1	2	3	4	5	6	7
My coach uses rewards to help me stay focused on tasks during training.	1	2	3	4	5	6	7
My coach will often tell me what do without asking what I think, or how I feel about it.	1	2	3	4	5	6	7
I feel under pressure from my coach to agree with the way he/she thinks or feels about things.	1	2	3	4	5	6	7
I feel under pressure to behave in certain ways when I am with my coach.	1	2	3	4	5	6	7
I sometimes feel as though I have to put my own feelings to one side and do as my coach asks.	1	2	3	4	5	6	7
My coach tries hard to change the way I think and feel about things.	1	2	3	4	5	6	7
When I train I feel as though I am under constant surveillance by my coach.	1	2	3	4	5	6	7
My coach monitors my performance in ways that make me feel pressured.	1	2	3	4	5	6	7
My coach expects my involvement in sport to be the main priority in my life.	1	2	3	4	5	6	7
My coach likes to be aware of all my activities, not just my sporting ones.	1	2	3	4	5	6	7
My coach tries to control what I do/what I don't do in my free time.	1	2	3	4	5	6	7
My coach will design my training sessions without discussing alternative sessions with me.	1	2	3	4	5	6	7
My coach will plan my training and competition schedule for the season without consulting me.	1	2	3	4	5	6	7
My coach designs my training session and I feel like I have to do what he/she tells me.	1	2	3	4	5	6	7
My coach does not allow me to use my own initiative when training.	1	2	3	4	5	6	7
When goal setting, I feel as though my coach imposes goals on me.	1	2	3	4	5	6	7
My coach rarely explains why we are doing certain things in a particular session.	1	2	3	4	5	6	7
My coach is overly critical of me when he/she provides me with feedback.	1	2	3	4	5	6	7

Sometimes I feel as if my coach is putting me down when he/she is providing me with feedback.	1	2	3	4	5	6	7
My coach will criticise me if I do not endorse his/her opinions.	1	2	3	4	5	6	7
My coach likes to provide me with time deadlines for tasks.	1	2	3	4	5	6	7
My coach says things that make me feel guilty when I perform badly.	1	2	3	4	5	6	7
My coach tells me that I have/should/ought to do things.	1	2	3	4	5	6	7
My coach evaluates me negatively if I perform badly.	1	2	3	4	5	6	7
My coach can be very judgemental if I am not competing well.	1	2	3	4	5	6	7
My coach tells me I am not a valuable member of the team.	1	2	3	4	5	6	7
The way I think and feel about some things is often overlooked.	1	2	3	4	5	6	7
My coach rarely seems to understand or appreciate my feelings.	1	2	3	4	5	6	7
My coach does not think that my opinions are as important as his/her own.	1	2	3	4	5	6	7
My coach does not value my feeling and opinions.	1	2	3	4	5	6	7
My coach often interrupts me when we are talking.	1	2	3	4	5	6	7
My coach is unresponsive to my questions and ideas.	1	2	3	4	5	6	7
If I question my coach he/she questions my loyalty.	1	2	3	4	5	6	7
My coach is friendlier with me if I make the effort to see things his/her way.	1	2	3	4	5	6	7
My coach's opinion of me is dependent upon my performance.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach will pay me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach will avoid looking at me if I have disappointed him/her.	1	2	3	4	5	6	7
If I hurt my coach's feelings he/she will be distant with me until I please him/her again.	1	2	3	4	5	6	7
The extent to which my coach accepts me is dependent upon my performance in my sport.	1	2	3	4	5	6	7
I sometimes feel as if I am not living up to my coach's expectations.	1	2	3	4	5	6	7
My coach will use the threat of punishment to make sure I live up to his/her expectations.	1	2	3	4	5	6	7
My coach makes comparisons between myself and others in my sport based upon my ability and performance.	1	2	3	4	5	6	7
My coach will bring up mistakes I have made in the past in order to shame me.	1	2	3	4	5	6	7
My coach's feelings towards me change from day to day.	1	2	3	4	5	6	7
If I have disappointed my coach he/she will act as though he/she does not care about me.	1	2	3	4	5	6	7
My coach tends to treat me in ways that make me feel isolated.	1	2	3	4	5	6	7
Conversation with my coach is normally one way, he/she talks and I listen.	1	2	3	4	5	6	7
My coach does not give me time to work things out for myself before providing me with the answer.	1	2	3	4	5	6	7

Study 2

Revised Pool of 33 CCBS Items

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
If I want to receive rewards/praise from my coach, then I have to perform exceptionally well.	1	2	3	4	5	6	7
My coach is less friendly with me if I don't make the effort to see things his/her way.	1	2	3	4	5	6	7
When I train I feel as though I am under constant surveillance by my coach.	1	2	3	4	5	6	7
My coach pressures me to agree with the way he/she thinks about aspects of my training.	1	2	3	4	5	6	7
My coach evaluates me negatively if I perform badly.	1	2	3	4	5	6	7
If I want to receive rewards/praise from my coach, then I have to complete all the tasks he/she sets in training.	1	2	3	4	5	6	7
My coach does not think that my opinions are as important as his/her own.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach does not value my feelings and opinions.	1	2	3	4	5	6	7
My coach expects me to put my sport before other important parts of my life.	1	2	3	4	5	6	7
My coach tells me what to do without asking what I think, or how I feel about it.	1	2	3	4	5	6	7
My coach is very judgemental if I am not competing well.	1	2	3	4	5	6	7
My coach tries to motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
My coach pays me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach tries to control what I do during my free time.	1	2	3	4	5	6	7
My coach never explains why we have to do certain things during training.	1	2	3	4	5	6	7
My coach is overly critical of me when he/she provides me with feedback.	1	2	3	4	5	6	7
The only reason my coach rewards/praises me is to make me train harder.	1	2	3	4	5	6	7
My coach makes it clear that things must be done his/her way.	1	2	3	4	5	6	7

My coach avoids looking at me if I have disappointed him/her.	1	2	3	4	5	6	7
My coach tries to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7
My coach does not allow me to use my own initiative when training.	1	2	3	4	5	6	7
My coach puts me down when he/she is providing me with feedback.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I stay focused on tasks during training.	1	2	3	4	5	6	7
My coach shouts at me in front of others to make me do certain things.	1	2	3	4	5	6	7
If I hurt my coach's feelings he/she will be distant with me.	1	2	3	4	5	6	7
When goal setting, I feel as though my coach imposes set goals on me.	1	2	3	4	5	6	7
My coach undervalues my contribution to the team.	1	2	3	4	5	6	7
My coach uses the threat of punishment to keep me inline during training.	1	2	3	4	5	6	7
My coach completely ignores me if I have annoyed him/her.	1	2	3	4	5	6	7
My coach is inflexible when he/she gives me time deadlines.	1	2	3	4	5	6	7
The way I think and feel about some things are overlooked.	1	2	3	4	5	6	7
My coach intimidates me into doing the things that he/she wants me to do.	1	2	3	4	5	6	7

Study 3

Revised Pool of 22 CCBS Items

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
The only reason my coach rewards/praises me is to make me train harder.	1	2	3	4	5	6	7
My coach is less friendly with me if I don't make the effort to see things his/her way.	1	2	3	4	5	6	7
My coach expects me to put my sport before other important parts of my life.	1	2	3	4	5	6	7
My coach undervalues my contribution to the team	1	2	3	4	5	6	7
My coach shouts at me in front of others to make me do certain things.	1	2	3	4	5	6	7
My coach evaluates me negatively if I perform badly.	1	2	3	4	5	6	7
My coach only rewards/praises me so that I perform the behaviours he/she wants me to.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach tries to control what I do during my free time.	1	2	3	4	5	6	7
My coach uses the threat of punishment to keep me inline during training.	1	2	3	4	5	6	7
My coach is very judgemental if I am not competing well.	1	2	3	4	5	6	7
My coach tries to motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
My coach pays me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach only rewards/praises me when I perform exceptionally well.	1	2	3	4	5	6	7
My coach intimidates me into doing the things that he/she wants me to do.	1	2	3	4	5	6	7
My coach is overly critical of me when he/she provides me with feedback.	1	2	3	4	5	6	7
My coach tries to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I complete all the tasks he/she sets during training.	1	2	3	4	5	6	7
My coach is less accepting of me if I have disappointed him/her.	1	2	3	4	5	6	7
My coach embarrasses me in front of others if I do not do the things he/she wants me to do.	1	2	3	4	5	6	7
My coach expects my whole life to centre on my sport participation.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I stay focused on tasks during training.	1	2	3	4	5	6	7

Health Care Climate Questionnaire (HCCQ; Williams et al., 1996)

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that my coach provides me with choices and options.	1	2	3	4	5	6	7
My coach conveys confidence in my ability to do well at my sport.	1	2	3	4	5	6	7
I feel understood by my coach.	1	2	3	4	5	6	7
My coach encourages me to ask questions.	1	2	3	4	5	6	7
My coach listens to how I would like to do things.	1	2	3	4	5	6	7
My coach tries to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Study 4

Final 15 CCBS Items

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
My coach is less friendly with me if I don't make the effort to see things his/her way.	1	2	3	4	5	6	7
My coach shouts at me in front of others to make me do certain things.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I stay focused on tasks during training.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach tries to control what I do during my free time.	1	2	3	4	5	6	7
My coach threatens to punish me to keep me in line during training.	1	2	3	4	5	6	7
My coach tries to motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
My coach pays me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach intimidates me into doing the things that he/she wants me to do.	1	2	3	4	5	6	7
My coach tries to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I complete all the tasks he/she sets during training.	1	2	3	4	5	6	7
My coach is less accepting of me if I have disappointed him/her.	1	2	3	4	5	6	7
My coach embarrasses me in front of others if I do not do the things he/she wants me to do.	1	2	3	4	5	6	7
My coach only uses rewards/praise to make me train harder.	1	2	3	4	5	6	7
My coach expects my whole life to centre on my sport participation.	1	2	3	4	5	6	7

Questionnaire Items Used in Chapter 3

Study 1

Initial Pool of 21 PNTS Items

Please indicate the extent to which you find each statement clear in terms of its meaning and wording.

In my Sport...	**Not at all Clear**			**Neutral**			**Extremely Clear**
I feel like I am prevented from making choices with regards to the way I train.	1	2	3	4	5	6	7
I feel pushed by others to behave in certain ways.	1	2	3	4	5	6	7
I feel restricted by training decisions made for me by others.	1	2	3	4	5	6	7
I feel under pressure to endorse the training regime I am provided.	1	2	3	4	5	6	7
I feel as if my involvement is dictated by others.	1	2	3	4	5	6	7
I am restricted from changing the things that I don't enjoy.	1	2	3	4	5	6	7
I receive feedback in a way that makes me feel incompetent.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to develop my skills.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to fulfil my potential.	1	2	3	4	5	6	7
I feel incompetent when I am compared to athletes who are better than me.	1	2	3	4	5	6	7
I feel incompetent when I am pressured to do things I have not practiced.	1	2	3	4	5	6	7
I feel useless when I am pushed to do things that are beyond my current capabilities.	1	2	3	4	5	6	7
Interactions with others can leave me feeling incompetent.	1	2	3	4	5	6	7
I am often in conflict with those around me.	1	2	3	4	5	6	7
I feel rejected by those around me.	1	2	3	4	5	6	7
I feel isolated by others.	1	2	3	4	5	6	7
I feel alienated when around other members of my training group.	1	2	3	4	5	6	7
I feel as though others can be dismissive of me.	1	2	3	4	5	6	7
There are times where I feel very lonely.	1	2	3	4	5	6	7
I feel like the other people dislike me.	1	2	3	4	5	6	7
I feel that some of the athletes around me are envious when I achieve success.	1	2	3	4	5	6	7

Study 2

Revised Pool of 18 PNTS Items

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

In my Sport...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I feel prevented from making choices with regards to the way I train.	1	2	3	4	5	6	7
I receive feedback in a way that makes me feel incompetent.	1	2	3	4	5	6	7
I feel that those around me create conflict between us.	1	2	3	4	5	6	7
I feel pushed to behave in certain ways.	1	2	3	4	5	6	7
I feel incapable because I am not given opportunities to develop my skills.	1	2	3	4	5	6	7
I feel I am rejected by those around me.	1	2	3	4	5	6	7
I feel obliged to follow training decisions made for me.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to fulfil my potential.	1	2	3	4	5	6	7
I feel I am isolated by members of my training group.	1	2	3	4	5	6	7
I feel under pressure to agree with the training regime I am provided.	1	2	3	4	5	6	7
There are occasions where I feel incompetent because others impose unrealistic expectations upon me.	1	2	3	4	5	6	7
I feel others can be dismissive of me.	1	2	3	4	5	6	7
There are situations where I am made to feel incapable.	1	2	3	4	5	6	7
I feel other people dislike me.	1	2	3	4	5	6	7
There are times when I am told things that make me feel incompetent.	1	2	3	4	5	6	7
I feel I am restricted from changing the things that I do not enjoy.	1	2	3	4	5	6	7
I feel that some of the athletes around me are envious when I achieve success.	1	2	3	4	5	6	7
There are situations where I am made to feel inadequate.	1	2	3	4	5	6	7

Autonomy items collated by Standage, Duda, and Ntoumanis (2003); Competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989); Acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998)

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that I participate in my sport because I want to.	1	2	3	4	5	6	7
I am satisfied with what I can do in my sport.	1	2	3	4	5	6	7
When participating in my sport I feel supported.	1	2	3	4	5	6	7
I have some choice in what I want to do in my sport.	1	2	3	4	5	6	7
After training at my sport for a while I feel pretty competent.	1	2	3	4	5	6	7
When participating in my sport I feel understood.	1	2	3	4	5	6	7
I have a say regarding what skills I want to practice in my sport.	1	2	3	4	5	6	7
I think I do pretty well at my sport compared to other players/athletes.	1	2	3	4	5	6	7
When participating in my sport I feel listened to.	1	2	3	4	5	6	7
I feel a certain freedom of action in my sport.	1	2	3	4	5	6	7
I think I am pretty good at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel valued.	1	2	3	4	5	6	7
I can decide which activities I want to practice in my sport.	1	2	3	4	5	6	7
I am pretty skilled at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel safe.	1	2	3	4	5	6	7

Study 3

Revised Pool of 12 PNTS Items

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

In my Sport...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I feel prevented from making choices with regard to the way I train.	1	2	3	4	5	6	7
There are situations where I am made to feel inadequate.	1	2	3	4	5	6	7
I feel pushed to behave in certain ways.	1	2	3	4	5	6	7
I feel I am rejected by those around me.	1	2	3	4	5	6	7
I feel forced to follow training decisions made for me.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to fulfil my potential.	1	2	3	4	5	6	7
I feel under pressure to agree with the training regime I am provided.	1	2	3	4	5	6	7
I feel others can be dismissive of me.	1	2	3	4	5	6	7
Situations occur in which I am made to feel incapable.	1	2	3	4	5	6	7
I feel other people dislike me.	1	2	3	4	5	6	7
There are times when I am told things that make me feel incompetent.	1	2	3	4	5	6	7
I feel that other people are envious when I achieve success.	1	2	3	4	5	6	7

Autonomy items collated by Standage, Duda, and Ntoumanis (2003); Competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989); Acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998)

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that I participate in my sport because I want to.	1	2	3	4	5	6	7
I am satisfied with what I can do in my sport.	1	2	3	4	5	6	7
When participating in my sport I feel supported.	1	2	3	4	5	6	7
I have some choice in what I want to do in my sport.	1	2	3	4	5	6	7
After training at my sport for a while I feel pretty competent.	1	2	3	4	5	6	7
When participating in my sport I feel understood.	1	2	3	4	5	6	7
I have a say regarding what skills I want to practice in my sport.	1	2	3	4	5	6	7
I think I do pretty well at my sport compared to other players/athletes.	1	2	3	4	5	6	7
When participating in my sport I feel listened to.	1	2	3	4	5	6	7
I feel a certain freedom of action in my sport.	1	2	3	4	5	6	7
I think I am pretty good at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel valued.	1	2	3	4	5	6	7
I can decide which activities I want to practice in my sport.	1	2	3	4	5	6	7
I am pretty skilled at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel safe.	1	2	3	4	5	6	7

Subjective Vitality Scale (SVS; Ryan & Frederick, 1997)

The following statements relate to the way you have felt over the past week. Please indicate on the scale the degree to which you agree with the following statements, relating to the past week.

	Strongly disagree			**Neutral**			**Strongly agree**
I feel alive and full of vitality.	1	2	3	4	5	6	7
I have energy and spirit.	1	2	3	4	5	6	7
I look forward to each day.	1	2	3	4	5	6	7
I nearly always feel alert and awake.	1	2	3	4	5	6	7
I feel I have a lot of energy.	1	2	3	4	5	6	7

The Emotional and Physical Exhaustion subscale of the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001)

The following statements relate to the way you have felt and the experiences you have had whilst in your sport over the past month. Please indicate the extent to which you have experienced each of the following, in your sport, over the past month.

	Almost never		**Sometimes**		**Almost always**
I feel so tired from my training that I have trouble finding energy to do other things.	1	2	3	4	5
I feel overly tired from my sport participation.	1	2	3	4	5
I feel “wiped out” from my sport.	1	2	3	4	5
I feel physically worn out from my sport.	1	2	3	4	5
I am exhausted by the mental and physical demands of my sport.	1	2	3	4	5

Questionnaire Items Used in Chapter 4

Study 1

Health Care Climate Questionnaire (HCCQ; Williams et al., 1996)

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that my coach provides me with choices and options.	1	2	3	4	5	6	7
My coach conveys confidence in my ability to do well at my sport.	1	2	3	4	5	6	7
I feel understood by my coach.	1	2	3	4	5	6	7
My coach encourages me to ask questions.	1	2	3	4	5	6	7
My coach listens to how I would like to do things.	1	2	3	4	5	6	7
My coach tries to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010)

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
My coach is less friendly with me if I don't make the effort to see things his/her way.	1	2	3	4	5	6	7
My coach shouts at me in front of others to make me do certain things.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I stay focused on tasks during training.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach tries to control what I do during my free time.	1	2	3	4	5	6	7
My coach threatens to punish me to keep me in line during training.	1	2	3	4	5	6	7
My coach tries to motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
My coach pays me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach intimidates me into doing the things that he/she wants me to do.	1	2	3	4	5	6	7
My coach tries to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I complete all the tasks he/she sets during training.	1	2	3	4	5	6	7
My coach is less accepting of me if I have disappointed him/her.	1	2	3	4	5	6	7
My coach embarrasses me in front of others if I do not do the things he/she wants me to do.	1	2	3	4	5	6	7
My coach only uses rewards/praise to make me train harder.	1	2	3	4	5	6	7
My coach expects my whole life to centre on my sport participation.	1	2	3	4	5	6	7

Autonomy items collated by Standage, Duda, and Ntoumanis (2003); Competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989); Acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998)

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that I participate in my sport because I want to.	1	2	3	4	5	6	7
I am satisfied with what I can do in my sport.	1	2	3	4	5	6	7
When participating in my sport I feel supported.	1	2	3	4	5	6	7
I have some choice in what I want to do in my sport.	1	2	3	4	5	6	7
After training at my sport for a while I feel pretty competent.	1	2	3	4	5	6	7
When participating in my sport I feel understood.	1	2	3	4	5	6	7
I have a say regarding what skills I want to practice in my sport.	1	2	3	4	5	6	7
I think I do pretty well at my sport compared to other players/athletes.	1	2	3	4	5	6	7
When participating in my sport I feel listened to.	1	2	3	4	5	6	7
I feel a certain freedom of action in my sport.	1	2	3	4	5	6	7
I think I am pretty good at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel valued.	1	2	3	4	5	6	7
I can decide which activities I want to practice in my sport.	1	2	3	4	5	6	7
I am pretty skilled at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel safe.	1	2	3	4	5	6	7

Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011)

The following statements relate to the general experiences you have whilst in your sport. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

In my Sport...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I feel prevented from making choices with regard to the way I train.	1	2	3	4	5	6	7
There are situations where I am made to feel inadequate.	1	2	3	4	5	6	7
I feel pushed to behave in certain ways.	1	2	3	4	5	6	7
I feel I am rejected by those around me.	1	2	3	4	5	6	7
I feel forced to follow training decisions made for me.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to fulfil my potential.	1	2	3	4	5	6	7
I feel under pressure to agree with the training regime I am provided.	1	2	3	4	5	6	7
I feel others can be dismissive of me.	1	2	3	4	5	6	7
Situations occur in which I am made to feel incapable.	1	2	3	4	5	6	7
I feel other people dislike me.	1	2	3	4	5	6	7
There are times when I am told things that make me feel incompetent.	1	2	3	4	5	6	7
I feel that other people are envious when I achieve success.	1	2	3	4	5	6	7

Subjective Vitality Scale (SVS; Ryan & Frederick, 1997)

The following statements relate to the way you have felt over the past week. Please indicate on the scale the degree to which you agree with the following statements, relating to the past week.

	Strongly disagree			**Neutral**			**Strongly agree**
I feel alive and full of vitality.	1	2	3	4	5	6	7
I have energy and spirit.	1	2	3	4	5	6	7
I look forward to each day.	1	2	3	4	5	6	7
I nearly always feel alert and awake.	1	2	3	4	5	6	7
I feel I have a lot of energy.	1	2	3	4	5	6	7

The Depression subscale of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995)

The following statements relate to the way you have felt over the past week. Please indicate the extent to which you have experienced the following over the past week.

	Not at all	**Some of the time**	**A good part of the time**	**Most of the time**
I couldn't seem to experience any positive feeling at all.	0	1	2	3
I found it difficult to work up the initiative to do things.	0	1	2	3
I felt that I had nothing to look forward to.	0	1	2	3
I felt down-hearted and blue.	0	1	2	3
I was unable to become enthusiastic about anything.	0	1	2	3
I felt I wasn't worth much as a person.	0	1	2	3
I felt that life was meaningless.	0	1	2	3

Questionnaire for Eating Disorder Diagnoses (Q-EDD; Mintz, O'Halloran, Mulholland, & Schneider, 1997)

[not available in the digital version of this thesis]

Study 2

Health Care Climate Questionnaire (HCCQ; Williams et al., 1996)

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that my coach provides me with choices and options.	1	2	3	4	5	6	7
My coach conveys confidence in my ability to do well at my sport.	1	2	3	4	5	6	7
I feel understood by my coach.	1	2	3	4	5	6	7
My coach encourages me to ask questions.	1	2	3	4	5	6	7
My coach listens to how I would like to do things.	1	2	3	4	5	6	7
My coach tries to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010)

The following statements relate to your general experiences with your current main coach. Each coach has a different style and no one style is necessarily better than another. Remember, there are no right or wrong answers; please be honest. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
My coach is less friendly with me if I don't make the effort to see things his/her way.	1	2	3	4	5	6	7
My coach shouts at me in front of others to make me do certain things.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I stay focused on tasks during training.	1	2	3	4	5	6	7
My coach is less supportive of me when I am not training and competing well.	1	2	3	4	5	6	7
My coach tries to control what I do during my free time.	1	2	3	4	5	6	7
My coach threatens to punish me to keep me in line during training.	1	2	3	4	5	6	7
My coach tries to motivate me by promising to reward me if I do well.	1	2	3	4	5	6	7
My coach pays me less attention if I have displeased him/her.	1	2	3	4	5	6	7
My coach intimidates me into doing the things that he/she wants me to do.	1	2	3	4	5	6	7
My coach tries to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7
My coach only uses rewards/praise so that I complete all the tasks he/she sets during training.	1	2	3	4	5	6	7
My coach is less accepting of me if I have disappointed him/her.	1	2	3	4	5	6	7
My coach embarrasses me in front of others if I do not do the things he/she wants me to do.	1	2	3	4	5	6	7
My coach only uses rewards/praise to make me train harder.	1	2	3	4	5	6	7
My coach expects my whole life to centre on my sport participation.	1	2	3	4	5	6	7

Autonomy items collated by Standage, Duda, and Ntoumanis (2003); Competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989); Acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998)

The following statements relate to the general experiences you have whilst in your sport. Please indicate how much you agree or disagree with each statement.

	Strongly Disagree			**Neutral**			**Strongly Agree**
I feel that I participate in my sport because I want to.	1	2	3	4	5	6	7
I am satisfied with what I can do in my sport.	1	2	3	4	5	6	7
When participating in my sport I feel supported.	1	2	3	4	5	6	7
I have some choice in what I want to do in my sport.	1	2	3	4	5	6	7
After training at my sport for a while I feel pretty competent.	1	2	3	4	5	6	7
When participating in my sport I feel understood.	1	2	3	4	5	6	7
I have a say regarding what skills I want to practice in my sport.	1	2	3	4	5	6	7
I think I do pretty well at my sport compared to other players/athletes.	1	2	3	4	5	6	7
When participating in my sport I feel listened to.	1	2	3	4	5	6	7
I feel a certain freedom of action in my sport.	1	2	3	4	5	6	7
I think I am pretty good at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel valued.	1	2	3	4	5	6	7
I can decide which activities I want to practice in my sport.	1	2	3	4	5	6	7
I am pretty skilled at my sport.	1	2	3	4	5	6	7
When participating in my sport I feel safe.	1	2	3	4	5	6	7

Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011)

The following statements relate to the general experiences you have whilst in your sport. Please indicate how much you agree or disagree with each statement.

In my Sport...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I feel prevented from making choices with regard to the way I train.	1	2	3	4	5	6	7
There are situations where I am made to feel inadequate.	1	2	3	4	5	6	7
I feel pushed to behave in certain ways.	1	2	3	4	5	6	7
I feel I am rejected by those around me.	1	2	3	4	5	6	7
I feel forced to follow training decisions made for me.	1	2	3	4	5	6	7
I feel inadequate because I am not given opportunities to fulfil my potential.	1	2	3	4	5	6	7
I feel under pressure to agree with the training regime I am provided.	1	2	3	4	5	6	7
I feel others can be dismissive of me.	1	2	3	4	5	6	7
Situations occur in which I am made to feel incapable.	1	2	3	4	5	6	7
I feel other people dislike me.	1	2	3	4	5	6	7
There are times when I am told things that make me feel incompetent.	1	2	3	4	5	6	7
I feel that other people are envious when I achieve success.	1	2	3	4	5	6	7

Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

The following statements relate to the way you have felt in general over the past month. Please indicate the extent to which you have experienced the following emotions over the past month.

	Not at all			**Neutral**			**Very much so**
Interested	1	2	3	4	5	6	7
Distressed	1	2	3	4	5	6	7
Excited	1	2	3	4	5	6	7
Upset	1	2	3	4	5	6	7
Strong	1	2	3	4	5	6	7
Guilty	1	2	3	4	5	6	7
Scared	1	2	3	4	5	6	7
Hostile	1	2	3	4	5	6	7
Enthusiastic	1	2	3	4	5	6	7
Proud	1	2	3	4	5	6	7
Irritable	1	2	3	4	5	6	7
Alert	1	2	3	4	5	6	7
Ashamed	1	2	3	4	5	6	7
Inspired	1	2	3	4	5	6	7
Nervous	1	2	3	4	5	6	7
Determined	1	2	3	4	5	6	7
Attentive	1	2	3	4	5	6	7
Jittery	1	2	3	4	5	6	7
Active	1	2	3	4	5	6	7
Afraid	1	2	3	4	5	6	7

Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001)

The following statements relate to the way you have felt and the experiences you have had whilst in your sport over the past month. Please indicate the extent to which you have experienced each of the following, in your sport, over the past month.

	Almost never		**Sometimes**		**Almost always**
I'm accomplishing many worthwhile things in my sport.	1	2	3	4	5
I feel so tired from my training that I have trouble finding energy to do other things.	1	2	3	4	5
The effort I spend in my sport would be better spent doing other things.	1	2	3	4	5
I feel overly tired from my sport participation.	1	2	3	4	5
I am not achieving much in my sport.	1	2	3	4	5
I don't care as much about my sport performance as I used to.	1	2	3	4	5
I am not performing up to my ability in my sport.	1	2	3	4	5
I feel "wiped out" from my sport.	1	2	3	4	5
I am not into my sport like I used to be.	1	2	3	4	5
I feel physically worn out from my sport.	1	2	3	4	5
I feel less concerned about being successful in my sport than I used to.	1	2	3	4	5
I am exhausted by the mental and physical demands of my sport.	1	2	3	4	5
It seems that no matter what I do I don't perform as well as I should.	1	2	3	4	5
I feel successful at my sport.	1	2	3	4	5
I have negative feelings toward my sport.	1	2	3	4	5

Study 3

Pre- and Post-Training Measures

6 Positive and Negative Affect Items (Diener & Emmons, 1984; Ryan & Frederick, 1997)

Please indicate how you are feeling at this moment.

	Not at all						**Extremely**
Frustrated	1	2	3	4	5	6	7
Happy	1	2	3	4	5	6	7
Angry/Hostile	1	2	3	4	5	6	7
Energised	1	2	3	4	5	6	7
Worried/Anxious	1	2	3	4	5	6	7
Joyful	1	2	3	4	5	6	7

2 items from the Physical Symptom Checklist (Emmons, 1991)

Please indicate how you are feeling at this moment.

	Not at all						**Very much**
Headache	1	2	3	4	5	6	7
Stomach-ache/pain	1	2	3	4	5	6	7

Post-Training Measures

3 items from the Health Care Climate Questionnaire (HCCQ; Williams et al., 1996)

Bearing in mind your experiences in training today, please indicate the extent to which you agree with each statement.

During training today, my coach...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Tried to understand how I saw things before suggesting a new way of doing things.	1	2	3	4	5	6	7
Shouted at me in front of others in order to make me do certain things.	1	2	3	4	5	6	7
Tried to interfere in aspects of my life outside of my sport.	1	2	3	4	5	6	7

3 items from the Controlling Coach Behaviors Scale (CCBS; Bartholomew et al., 2010)

Bearing in mind your experiences in training today, please indicate the extent to which you agree with each statement.

During training today, my coach...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Only used rewards/praise so that I would complete all the tasks he/she set.	1	2	3	4	5	6	7
Listened to how I would like to do things.	1	2	3	4	5	6	7
Paid me less attention because I had displeased him/her.	1	2	3	4	5	6	7

1 item from the autonomy items collated by Standage, Duda, and Ntoumanis (2003); 1 item from the Competence subscale of the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989); 1 item from the Acceptance subscale of the Need for Relatedness Scale (NRS-10; Richer & Vallerand, 1998)

Bearing in mind your experiences in training today, please indicate the extent to which you agree with each statement.

During training today...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I could decide what activities I wanted to practice.	1	2	3	4	5	6	7
I felt that I was pretty good at my sport.	1	2	3	4	5	6	7
I felt listened to.	1	2	3	4	5	6	7

3 items from the Psychological Need Thwarting Scale (Bartholomew et al., 2011)

Bearing in mind your experiences in training today, please indicate the extent to which you agree with each statement.

During training today...	**Strongly Disagree**			**Neutral**			**Strongly Agree**
I felt forced to follow training decisions made for me.	1	2	3	4	5	6	7
I was told things that made me feel incompetent.	1	2	3	4	5	6	7
I felt that other people were dismissive of me.	1	2	3	4	5	6	7

Content Validity Indexes

Chapter 2: CCBS

41 items rated by academic experts

	CVI
From past experience, I have learnt to expect rewards from my coach when I have done well. *(M)*	1.00
My coach tells me that he/she will reward me when I complete all of the tasks he/she sets in training. *(M)*	0.89
My coach will motivate me by promising to reward me if I do well.	1.00
I believe that my coach rewards/praises me to make me train harder. *(M)*	1.00
My coach uses rewards/praise to help me stay focused on tasks during training. *(M)*	0.89
My coach will often tell me what do without asking what I think, or how I feel about it.	0.78
I feel under pressure from my coach to agree with the way he/she thinks or feels about things. *(M)*	0.78
I feel under pressure to behave in certain ways when I am with my coach. *(E)*	0.67
When I train I feel as though I am under constant surveillance by my coach.	0.89
My coach expects my involvement in sport to be the main priority in my life. *(M)*	0.78
My coach likes to be aware of all my activities, not just my sporting ones. *(M)*	0.78
My coach tries to control what I do/what I don't do in my free time. *(M)*	1.00
My coach designs my training session and I feel like I have to do what he/she tells me. *(R)*	0.67
My coach does not allow me to use my own initiative when training.	0.78
When goal setting, I feel as though my coach imposes goals on me.	0.78
My coach rarely explains why we are doing certain things in a particular session. *(R)*	0.67
My coach is overly critical of me when he/she provides me with feedback.	0.89
My coach puts me down when he/she is providing me with feedback.	0.78
My coach likes to provide me with time deadlines for tasks. *(R)*	0.67
My coach says things that make me feel guilty when I perform badly. *(E)*	0.56
My coach tells me that I have/should/ought to do things. *(E)*	0.56
My coach evaluates me negatively if I perform badly.	0.78
My coach is very judgemental if I am not competing well.	0.78
My coach undervalues my contribution to the team.	0.78
The way I think and feel about some things is often overlooked.	0.89

My coach does not think that my opinions are as important as his/her own.	1.00
My coach does not value my feeling and opinions.	1.00
My coach is unresponsive to my questions and ideas. *(E)*	0.67
If I question my coach he/she questions my loyalty. *(E)*	0.11
My coach is less friendly with me if I don't make the effort to see things his/her way.	1.00
My coach's opinion of me is dependent upon my performance. *(E)*	0.67
My coach is less supportive of me when I am not training and competing well.	1.00
My coach will pay me less attention if I have displeased him/her.	0.89
My coach will avoid looking at me if I have disappointed him/her.	1.00
If I hurt my coach's feelings he/she will be distant with me until I please him/her again.	1.00
My coach completely ignores me if I have annoyed him/her.	0.78
The extent to which my coach accepts me is dependent upon my performance in my sport. *(E)*	0.67
I sometimes feel as if I am not living up to my coach's expectations. *(E)*	0.44
My coach will use the threat of punishment to keep me inline during training. *(M)*	0.89
My coach intimidates me. *(R)*	0.67
My coach shouts at me in front of others to make me do certain things.	0.89

Note: Twelve items displayed CVIs of .67 or below and were thus deemed to be invalid. Of these items, eight were eliminated *(E)* and four were revised *(R)* in line with the suggestions made by the academic experts. All of the remaining items exhibited CVIs ranging from .78 to 1.00 and were thus retained. However the wording of nine items was slightly modified *(M)* to ensure that the items clearly tapped overly controlling coach behaviors.

Content Validity Indexes

Chapter 3: PNTS

19 items rated by academic experts

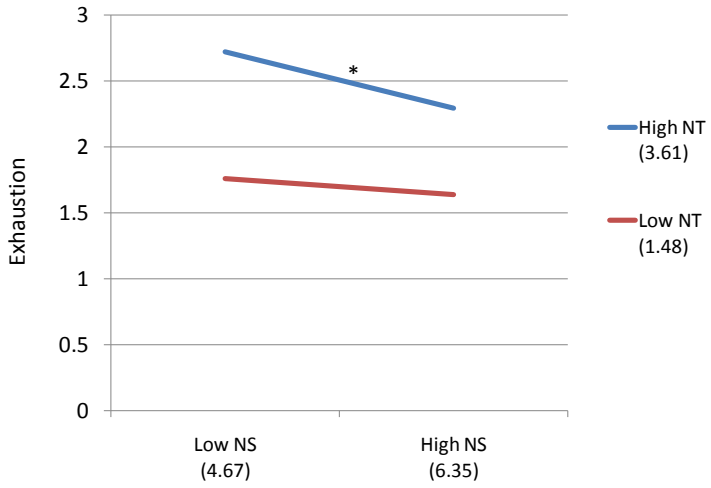
In my Sport...	**CVI**
I feel prevented from making choices with regards to the way I train.	1.00
I feel pushed to behave in certain ways.	1.00
I feel restricted by training decisions made for me by others. *(M)*	0.89
I feel under pressure to endorse the training regime I am provided. *(M)*	0.89
I feel as if my involvement is dictated by others. *(E)*	0.56
I feel restricted from changing the things that I do not enjoy.	1.00
I receive feedback in a way that makes me feel incompetent.	1.00
I feel incapable because I am not given opportunities to develop my skills.	1.00
I feel inadequate because I am not given opportunities to fulfil my potential.	0.78
I feel incompetent when I am pressured to do things I have not practiced. *(M)*	0.78
There are occasions where I feel incompetent because others impose unrealistic expectations upon me.	1.00
I feel incompetent when I am compared to athletes who are better than me. *(M)*	0.78
I am often in conflict with those around me. *(M)*	0.78
I feel rejected by those around me.	1.00
I feel isolated by others. *(M)*	0.89
I feel others can be dismissive of me.	0.78
There are times when I am told things that make me feel incompetent.	0.89
I feel other people dislike me.	1.00
I feel that some of the athletes around me are envious when I achieve success.	0.78

Note: One item displayed a CVI of .56 and was thus eliminated *(E)*. All of the remaining items exhibited CVIs ranging from .78 to 1.00 and were retained. However, based upon the expert reviewers' qualitative feedback, very minor modifications were made to the wording of six items *(M)* in order to further emphasize the active thwarting of the psychological needs by significant others in the sport environment.

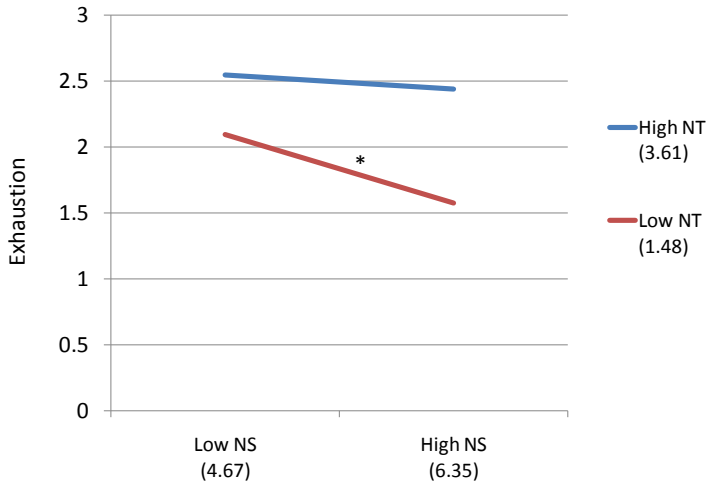
Interaction Plots

Chapter 3: Study 3

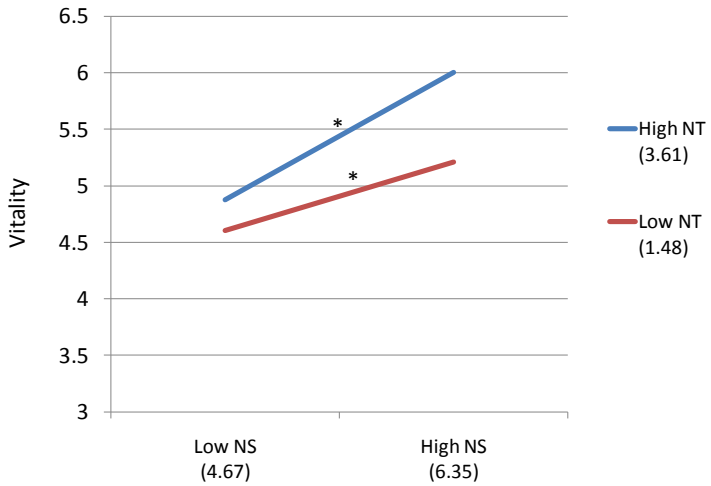
NS/NT Autonomy Predicting Exhaustion



NS/NT Competence Predicting Exhaustion



NS/NT Competence Predicting Vitality



CFA Factor Loadings

Chapter 4: Study 3

Autonomy-Supportive Coach Behaviors

	Loading	**Residual**
I feel that my coach provides me with choices and options.	.76	.65
My coach conveys confidence in my ability to do well at my sport.	.72	.69
I feel understood by my coach.	.81	.59
My coach encourages me to ask questions.	.77	.64
My coach listens to how I would like to do things. *	.86	.51
My coach tries to understand how I see things before suggesting a new way to do things. *	.82	.58

* = Strongest loading items

Controlling Coach Behaviors

	Loading	**Residual**
My coach is less friendly with me if I don't make the effort to see things his/her way.	.69	.72
My coach shouts at me in front of others to make me do certain things. *	.85	.53
My coach only uses rewards/praise so that I stay focused on tasks during training.	.56	.83
My coach is less supportive of me when I am not training and competing well.	.78	.63
My coach tries to control what I do during my free time.	.84	.55
My coach threatens to punish me to keep me in line during training.	.72	.69
My coach tries to motivate me by promising to reward me if I do well.	.54	.84
My coach pays me less attention if I have displeased him/her. *	.89	.46
My coach intimidates me into doing the things that he/she wants me to do.	.79	.62
My coach tries to interfere in aspects of my life outside of my sport. *	.89	.46
My coach only uses rewards/praise so that I complete all the tasks he/she sets during training. *	.87	.49
My coach is less accepting of me if I have disappointed him/her.	.87	.49
My coach embarrasses me in front of others if I do not do the things he/she wants me to do.	.78	.62
My coach only uses rewards/praise to make me train harder.	.83	.56
My coach expects my whole life to centre on my sport participation.	.84	.55

* = Strongest loading item on each subscale

Need Satisfaction

	Loading	**Residual**
I feel that I participate in my sport because I want to.	.48	.88
I am satisfied with what I can do in my sport.	.66	.75
When participating in my sport I feel supported.	.69	.72
I have some choice in what I want to do in my sport.	.75	.66
After training at my sport for a while I feel pretty competent.	.50	.86
When participating in my sport I feel understood.	.71	.71
I have a say regarding what skills I want to practice in my sport.	.71	.70
I think I do pretty well at my sport compared to other players/athletes.	.82	.57
When participating in my sport I feel listened to. *	.82	.57
I feel a certain freedom of action in my sport.	.71	.70
I think I am pretty good at my sport. *	.91	.42
When participating in my sport I feel valued.	.80	.60
I can decide which activities I want to practice in my sport. *	.81	.58
I am pretty skilled at my sport.	.86	.50
When participating in my sport I feel safe.	.47	.88

* = Strongest loading item on each subscale

Need Thwarting

In my Sport...	**Loading**	**Residual**
I feel prevented from making choices with regard to the way I train.	.61	.80
There are situations where I am made to feel inadequate.	.71	.70
I feel pushed to behave in certain ways.	.69	.72
I feel I am rejected by those around me.	.68	.73
I feel forced to follow training decisions made for me. *	.82	.58
I feel inadequate because I am not given opportunities to fulfil my potential.	.70	.71
I feel under pressure to agree with the training regime I am provided.	.75	.66
I feel others can be dismissive of me. *	.86	.51
Situations occur in which I am made to feel incapable.	.75	.66
I feel other people dislike me.	.68	.73
There are times when I am told things that make me feel incompetent. *	.77	.64
I feel that other people are envious when I achieve success.	.53	.85

* = Strongest loading item on each subscale