

SOCIAL-PSYCHOLOGICAL DETERMINANTS OF WELL- AND ILL-BEING
AMONG VOCATIONAL DANCERS: A SELF-DETERMINATION THEORY
APPROACH

By

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Vocational dancers are anecdotally regarded as a group ‘at risk’ of compromised health. Yet little is known of the antecedents of variability in positive and negative indicators of dancers’ welfare. Grounded in the basic needs theory (Deci and Ryan, 2000), a mini-theory of the self-determination framework (Deci & Ryan, 1985, 2000) this thesis examined the social-psychological predictors of indices of well- and ill-being among vocational dancers.

In study one, the inter-relationships between dancers’ perceptions of the social environment, basic psychological need satisfaction (BPNS) and reported affective states and exhaustion were explored via structural equation modeling. In study two, changes in autonomy support and BPNS were modeled as predictors of changes in dancers’ burnout during the academic year. Multilevel modeling techniques were employed to examine a) perceptions of autonomy support and BPNS as predictors of dancers’ daily affective states in learning and performance contexts (study three); and b) whether BPNS was relevant to dancers’ cognitive appraisals and hormonal and emotional responses in ‘real life’ performance settings (study four).

Overall, this thesis partially supports the tenets of basic needs theory. Findings point to the importance of need supportive environments if elite performers are to experience sustained and optimal physical and psychological health.

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I would like to dedicate this thesis to the loving memory of my grandmothers,

Peggy Bell and Stella Quested

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This thesis is comprised of the following four papers. Study design, data collection, statistical analysis and writing were conducted by Eleanor Quested. Professor Joan Duda 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. **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 (1), 39-60.
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During the period of postgraduate study within the School of Sport and Exercise Sciences at the University of Birmingham, the following book chapters, articles and conference abstracts were accepted for publication/presentation.

Publications

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Conference Presentations

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17. **Quested, E.**, & Duda, J. L. (2007). Social environmental predictors of motivation regulations and self-perceptions in dancers. *12th Annual Congress for Sport Psychology*, Halkidiki, Greece, September 2007.
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General Introduction

From the stadium to the stage, time investment is a recognized prerequisite for proficient performance. According to Ericsson, expert performers typically accumulate 10,000 hours of practice to become exceptional in their performance arenas (Ericsson, Krampe, & Teschroemer, 1993). However quantity represents only one facet of training that might encourage maximal performance gains. 'Going through the motions' for 10,000 hours may not be sufficient to guarantee expertise. Performers can only train at their best when they are 'firing on all cylinders' and giving maximal effort. However, performers also need to enjoy continuous good health if sustained and effective participation is to be realized. Thus, the *quality* of engagement in training holds significance not only for the optimal development of proficiency, but also for the healthfulness and longevity of the performer's career. To get the most from one's training on a personal as well as performance level, the experience should contribute towards, rather than diminish the performer's physical and psychological welfare.

Recent statistics suggest that approximately 16 thousand young people in the UK study dance at GCSE level (DanceUK, 2008). Close to 100 universities offer dance as a single subject area (UCAS, 2007) and approximately 3000 young dancers are currently engaged in fulltime dance training (DanceUK, 2008). As an industry, dance employs in the region of 30 thousand individuals in the UK alone, as dancers, teachers, managers and choreographers (DanceUK, 2008). In the milieu of vocational dance, physical training occupies the vast majority of hours the dancers spend in school each week. Drawing from the research that has been undertaken with such populations, the defining message appears to be that dancers' physical and psychological welfare is often undermined. Following a recent nationwide survey, DanceUK reported that 80% of dancers had experienced an injury in the preceding year (Laws, 2005). The findings of this investigation also point to the prevalence of psychological problems amongst the elite dance community; dancers

were found to be susceptible to a number of undesirable psychological and emotional states, including low self-esteem and burnout risk. The premise that engagement in dance may be health compromising rather than health conducive has received considerable empirical support. Body image concerns, diminished self-esteem (Bettle, Bettle, Neumarker, & Neumarker, 2001), and eating disorders (Ravaldi et al., 2006) have been reported as more prevalent amongst dancers than their non-dancing peers.

Concern about the well-being of those who participate in dance is not a new phenomenon. Indeed, such concerns have been raised anecdotally for many years; research evidence suggesting that dancers' health is often in peril dates back to at least the early 1980s (Lowenkopf & Vincent, 1982). It is only in recent years, however, that studies have begun to probe into the causes of compromised health in dancers (e.g., Thomas, Keel, & Heatherton, 2005). In a timely manner, dance organizations have brought emphasis on the promotion of "healthier dance" to the attention of those who organize, teach and participate in dance in the UK. In 2008 a 'Dance Manifesto' was presented to members of the British parliament, promoting the inaugural meeting of the All Party Parliamentary Dance Group. This was the first time in British governmental history that dance has had a dedicated interest group in parliament. A key focus of this white paper was to lobby for the promotion of healthful careers in dance, as well as to enable dance to be a central part of every child's education. This highlights the national level recognition that the mechanisms underpinning healthful dance involvement are worthy of attention.

Despite frequent examinations of the social-psychological determinants of optimal functioning among athletes (Gagne & Blanchard, 2007; Ntoumanis & Biddle, 1999), similar work undertaken in dance contexts has tended to lack any theoretical grounding. This limits the potential for conceptually-grounded and evidence based recommendations. Theories of motivation have frequently been employed as frameworks within which to

explore antecedents of sustained, healthful and optimal, as well as dysfunctional and health compromising engagement in physical and scholarly pursuits (Hagger & Chatzisarantis, 2007; Reeve, 2002; Roberts, 2001). However, little is known regarding the social-environmental factors and motivational processes predictive of variability in the physical and psychological health of dancers.

The Nature of ‘Motivation’

‘Motivation’ is one of the most widely examined psychological constructs in achievement domains. Yet in sport and other performance contexts, the term remains vague and often inadequately understood (Roberts, 1992). Early theories construed motivation as a quantitative entity synonymous to the degree of energy and effort directed towards the targeted behavior. This conceptualization does not take into account *why* the behavior was initiated (or not) or how it is regulated (Roberts, 1992). From a qualitative perspective, ‘motivation’ refers to the meaning and value of the behavior for the individual as well as the cognitive processes that underscore interpretation of the reason to act (Ames & Ames, 1984). According to this latter conceptualization, the *type* of motivation driving the behavior is considered to be the primary determinant of performance, persistence, and training quality as well as the degree to which the performer experiences well- and ill-being.

The term ‘motivation regulations’ refers to the range of motives for actions in all domains of life; in essence, the ‘why’ of behavior. Two types of motivation were originally put forward: extrinsic (i.e., from something, or someone else) and intrinsic (i.e., from within) (DeCharms, 1968; Deci, 1971; Greene & Lepper, 1974a). Essentially, these terms distinguished between behaviors that one is obliged to do, and those that are voluntarily undertaken (Greene & Lepper, 1974b). In the 1970s and 1980s, a series of

studies challenged this somewhat simplistic conceptualization of human behavior regulation (Deci, Koestner, & Ryan, 1999). Deci and colleagues undertook a number of experiments examining the motivational impact of rewards and verbal feedback. Findings indicated that social-contextual cues (such as praise and rewards) that fostered feelings of competence benefited intrinsic motivation (Deci et al., 1999). Positive verbal feedback augmented, whereas negative feedback thwarted intrinsic motivation for the activity in question. However, when rewards were contingent on performance, task completion or merely task engagement, studies found intrinsic motivation to be consistently undermined (Deci et al., 1999). This was attributed to the controlling nature of rewards; when behavioral engagement is conditional on incentives then the impetus for self-regulation is considered to be forestalled.

In the past thirty years, a plethora of studies have supported the tenets undergirding these early findings. This research evidence prompted the realization that behaviors can be guided by motives with varying degrees of underlying self-governance or autonomy. Social conditions (e.g., the psychological environment created by a social agent) and psychological processes (i.e., basic need satisfaction) were recognized to play a part in determining the degree of autonomy or self determination undergirding behavioral regulation (Deci & Ryan, 1985, 1987). Consequently, a motivational continuum of behavioral engagement was developed,¹ and the self-determination theory (SDT)

¹ Intrinsic motivation represents the most self-determined or autonomous behavior regulation. When intrinsically motivated, individuals engage in activities for reasons underpinned by inherent interest, enjoyment and satisfaction. Integrated regulation refers to behavioral engagement for reasons that are in congruence with the individuals' overall aspirations and lifestyle; the behavior is both volitional and anchored to the individual's identity. Identified regulation also represents autonomous reasons for behavioral engagement, but in this case, one recognizes the underlying purpose and potential value of the behavior for themselves and therefore freely participates. When one partakes in an activity on account of internal or external contingencies the regulation can be described as introjected. External regulations are considered to be highly controlled and underpin engagement in behaviors for reasons that are externally defined. At the far end of the continuum lies amotivation. Amotivated actions are passive and lack any intentional aim. In essence, amotivation represents a lack of motivation.

perspective of human behavior was born (Deci & Ryan, 1985, 2000). Figure 1.1 presents the central features of the SDT framework.

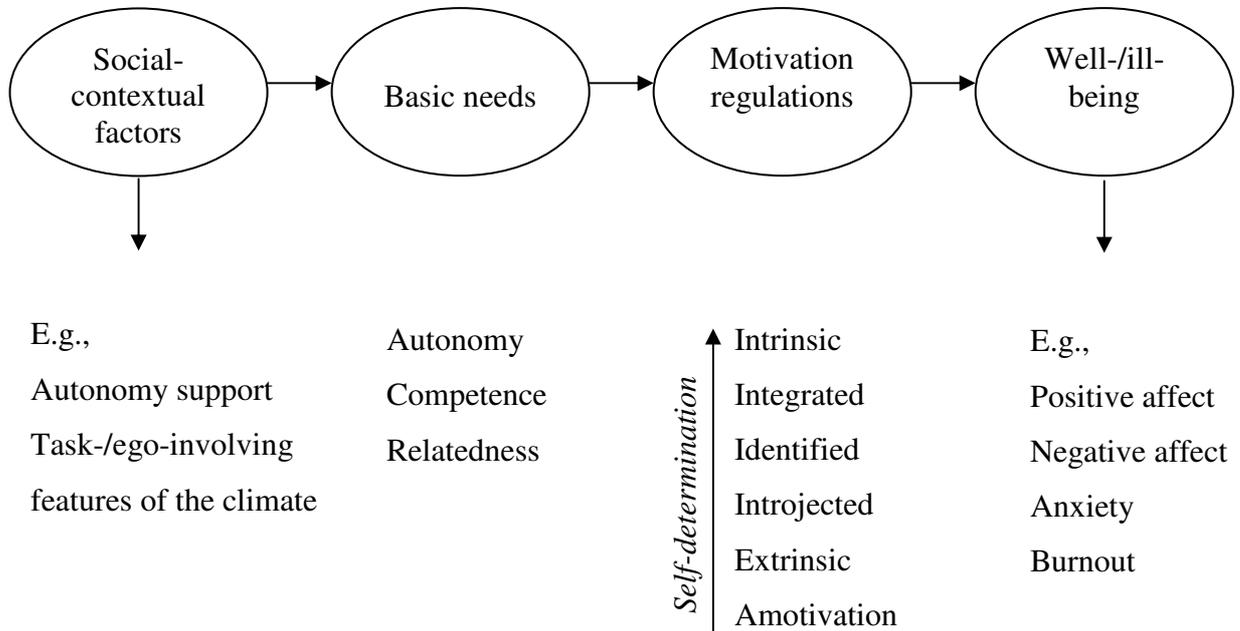


Figure 1.1. The central tenets of self-determination theory (Deci & Ryan, 2000).

Three Basic Psychological Needs

SDT assumes the satisfaction of three basic psychological needs (namely competence, autonomy and relatedness) to be essential for self-initiated actions, and subsequent psycho-social development and well-being (Deci & Ryan, 2000). The necessity of the basic needs to health and social growth is considered to be inherent to human nature and invariant regardless of culture, context or gender (Ryan & Deci, 2000b). Competence represents the feeling that one is effective in the pursuits undertaken (White, 1959). Feeling connected, cared for and that one belongs in the social context at hand is captured by the construct of relatedness (Baumeister & Leary, 1995). Satisfaction of the need for autonomy occurs when actions are perceived as self-governed, volitional and reflective of personal values (DeCharms, 1968). SDT proposes that when the desires to feel efficacious

and self-determined as well as cared for are satiated, autonomous behavioral engagement and ensuing cognitive, behavioral and affective consequences are the more likely consequences (Deci & Ryan, 2000). If the needs for autonomy, competence, and relatedness are thwarted, ill-being and compromised functioning are expected to ensue (Ryan & Deci, 2002).

The role of psychological needs satisfaction/thwarting in the ‘social environment – well-/ill-being’ dialectic is the focus of the basic needs theory (BNT; Ryan, 1995; Ryan & Deci, 2000b). As a sub-theory of the SDT framework, BNT assumes that the three basic needs are psychological nutriments upon which optimal and healthful human functioning are dependent (Deci & Ryan, 2000; Ryan, 1995). With a view to understanding the psychological processes that may encourage health-conducive physical activity involvement, recent investigations in Physical Education (PE) and sport have used the basic needs mini-theory as a framework for empirical enquiry (Gagne & Blanchard, 2007). Studies typically support the premise that the degree of basic need satisfaction afforded in achievement-related activities is a critical determinant of a performer’s cognitive, behavioral and emotional responses in the physical activity settings in question (Ryan & Deci, 2007). However, satisfaction of the basic needs is by no means considered to be automatic. A central tenet of BNT is that the social environment can support or impede basic need satisfaction and, as a result, contribute to well- or ill-being, respectively (Deci & Ryan, 2000). Research concerning the role of the basic needs in sport, PE and education settings has examined features of the social context (e.g., perceptions of autonomy support, the degree to which the environment is task- and/or ego-involving) as contextual variables within the BNT framework (Amorose, 2007; Deci, Vallerand, Pelletier, & Ryan, 1991; Ntoumanis, 2001a; Reeve, 2002). Figure 1.2 presents the central tenets of BNT (Ryan, 1995; Ryan & Deci, 2000b).

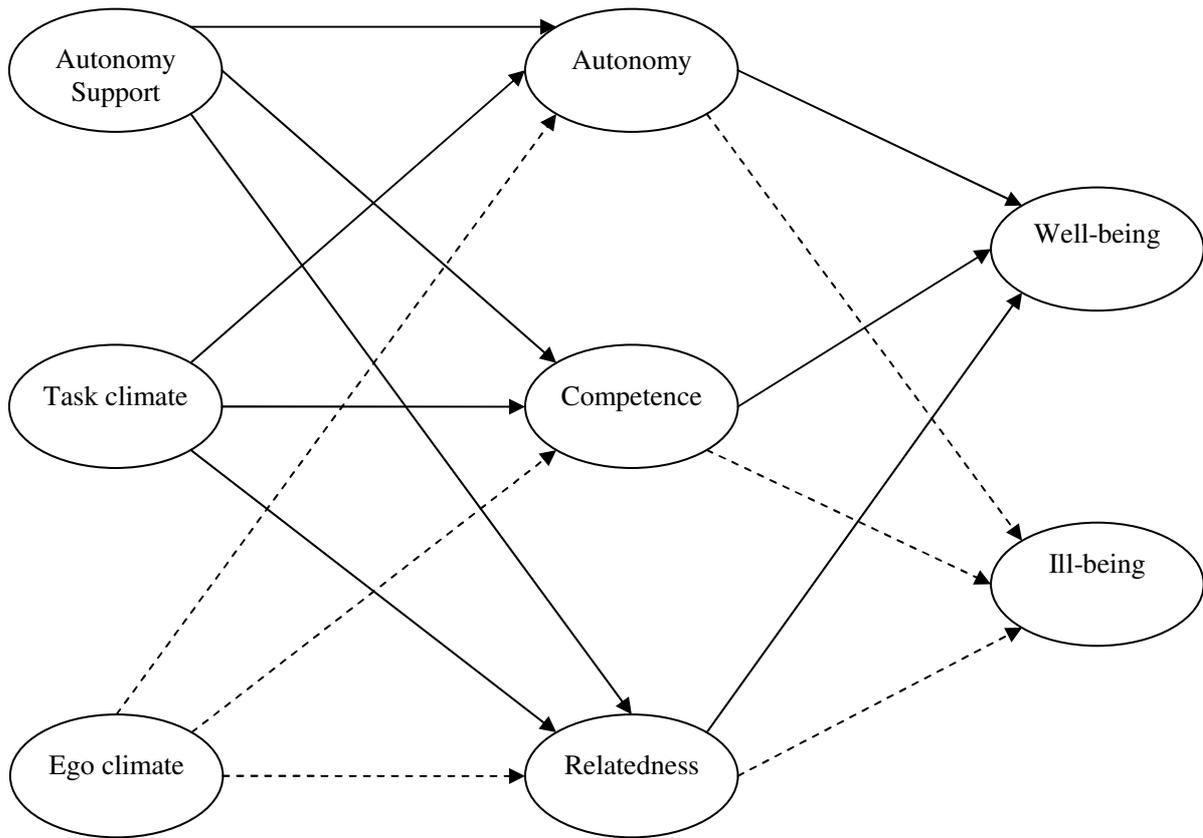


Figure 1.2. The hypothesized relationships between perceptions of the social-environment, psychological need satisfaction and indices of well- and ill-being, aligned with the tenets of the basic needs theory (Ryan & Deci, 2002). Hypothesized positive and negative relationships are represented by solid and dashed lines (respectively). The exemplar dimensions of the social environment are those targeted in this thesis.

The Social Environment

‘Autonomy support’ is the dimension of interpersonal style that has attracted the majority of SDT-grounded research attention in achievement settings. Teachers/coaches that support the learner’s autonomy encourage choice, use of initiative and self-directed behaviors (Black & Deci, 2000; Reeve, Bolt, & Cai, 1999). More controlling teachers/coaches tend to adopt a more authoritarian style, set specific agendas and endeavor to control and/or coerce the learner’s goals and behaviors towards a pre-determined outcome (Pelletier, Fortier, Vallerand, & Briere, 2001). Work in educational contexts (Reeve, 2002) indicates that leader’s attempts to exercise control (by imposing

rules, deadlines or coercion via rewards/punishments) undermines students' need satisfaction and self-determined behavior. A substantial body of research undertaken in sport settings (Adie, Duda, & Ntoumanis, 2008b; Alvarez, Balaguer, Castillo, & Duda, 2009; Amorose, 2007; Balaguer, Castillo, & Duda, 2008; Gagne & Blanchard, 2007; Gagne, Ryan, & Bargmann, 2003; Pelletier et al., 2001) indicates that need satisfaction and more autonomously motivated actions are more likely when coaches support athletes' autonomy.

Theoretical assumptions and research evidence from the classroom domain have pointed to the importance of supporting students' autonomy (Williams & Deci, 1998). Of the three needs, perceptions of autonomy support tends to be most strongly related to students' autonomy need satisfaction (Sheldon & Krieger, 2007). Intriguingly, studies in sport indicate autonomy support to be most highly associated with relatedness need satisfaction (Adie et al., 2008b). In sport settings, autonomy support and social support have been found to be highly correlated (Reinboth, Duda, & Ntoumanis, 2004). These dimensions of the social climate have been described as "mutually facilitative" (Ryan & Solky, 1996). It may be the case that relatedness profits in autonomy supportive environments where social support is also very pronounced.

There has also been some discrepancies vis-à-vis the associations between autonomy support and competence need satisfaction. Specifically, in the domain of PE, autonomy support has emerged as a strong predictor of students' perceived competence (Standage, Duda, & Ntoumanis, 2006). However, in adult sport settings competence was weakly associated with this environmental dimension (Adie et al., 2008b). These discrepant findings indicate that the strength of the 'autonomy-support – competence' association could vary dependent on the nature of the sport context (educational vs. professional vs. recreational) and/or the age of the participants.

The way that competence is construed or judged, and that success is subsequently defined in training (as well as competitions and performances), holds implications for the behavioral and affective patterns exhibited by performers. This premise is a defining feature of achievement goal theory (AGT; Ames, 1992; Nicholls, 1989). Contextual cues are held to shape individuals' interpretations of their achievement goals, views about success and the way in which they judge their level of competence (Ames, 1992; Nicholls, 1989). AGT-driven research in sport indicates that perceptions of the motivational climate can influence an array of motivational, behavioral and health-related responses in athletes (Duda, 2001). The perceived motivational climate has also been found to hold implications for quality of engagement and health-related outcomes in research conducted within the PE and mainstream educational domains (Meece, Anderman, & Anderman, 2006; Ntoumanis & Biddle, 1999).

Motivational climates that encourage self-referenced judgments of competence have been labeled as more task-involving (Ames, 1992). In such settings there is an emphasis on personal development, co-operative learning and a focus on individual effort and improvement. In ego-involving climates, a normative conception of competence is emphasized and so personal performance accomplishments and ability level are assessed relative to others (Ames, 1992; Nicholls, 1989). Thus, performers are always 'looking over their shoulder' with the end goal being the demonstration of superiority. Ego-involving climates are characterized by competition and intra-individual rivalry, reprimand following error, and marked by a hierarchy tied to the ability level of the performer; the more able receive more attention (Duda, 2001). An array of positive performance and health-related responses has been linked to perceptions of task-involving learning and performance climates. For example, previous studies in sport settings have found persistence, enjoyment (Boixados, Cruz, Torregrosa, & Valiente, 2004; Theeboom, DeKnop, & Weiss,

1995), self-esteem (Reinboth & Duda, 2004), physical self-worth (Vazou, Ntoumanis, & Duda, 2006), vitality (Reinboth & Duda, 2006), positive affect (Ntoumanis & Biddle, 1999) and less reported psychological impairment during competition (Kim & Duda, 1998) to be predicted by perceptions of task-involving sport climates. On the contrary, ego-involving athletic environments have been associated with less desirable health and performance related consequences including unhealthy eating, diminished self-esteem (de Bruin, Bakker, & Oudejans, 2009; Duda, 2001; Duda & Kim, 1997; Waldron & Krane, 2005), anxiety (Ntoumanis & Biddle, 1998) and distress (Pensgaard & Roberts, 2000), contingent self-esteem (Reinboth & Duda, 2004) and dropout from the activity in question (Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002).

Recent investigations have considered perceptions of the task- and ego-involving features of the motivational climate as relevant social-contextual variables within the BNT framework (Reinboth & Duda, 2004, 2006). Features of task-involving settings (such as the provision of co-operative and competence enhancing activities, self-referenced achievement judgments and an emphasis on individual effort and improvement) might be expected to help one feel more connected, efficacious and able. Previous studies in sport (Reinboth & Duda, 2004, 2006) and PE (Ntoumanis, 2001b; Standage, Duda, & Ntoumanis, 2003) settings have largely supported these hypotheses with regard to the expected positive relationship between perceptions of task-involving athletic or PE environments and participants' degree of need satisfaction. On the contrary, engagement in an ego-focused training context would be expected to link to the frustration of the basic needs as such a climate is inherently comparative. In such settings, the focus on normative indicators of ability might result in more fragile or compromised perceptions of competence and diminished feelings of control.

In highly ego-involving settings, intra-individual rivalry (Newton, Duda, & Yin, 2000) could serve to hinder satisfaction of the need for relatedness. However, the hypothesized associations between perceptions of an ego-involving environment and low need satisfaction have received mixed support. Previous studies in the sport domain did not uncover the expected negative relationship between perceptions of ego-involving environments and participants' autonomy and competence need satisfaction (Reinboth & Duda, 2006). In an investigation in the PE environment, the hypothesized negative relationships between perceptions of an ego-involving PE climate and satisfaction of the three needs were not supported (Standage et al., 2003).

From the perspective of AGT, examination of the interplay between perceptions of the motivational climate and athletes' need satisfaction represents an important investigative step. Such research serves to uncover the psychological processes that may mediate the known associations between perceived task- and ego-involving climates and athletes' reported well- and ill-being (respectively). From an SDT standpoint, empirical evaluation of athletes' perceptions of their coaches' autonomy supportive *and* task- and ego-involving behaviors is of value. It could be argued that such an approach reflects a more comprehensive examination of features of the social environment which may hold implications for need satisfaction. Thus, research integrating both an SDT and AGT perspective on the psychological environment may help to delineate the particular social conditions that facilitate versus forestall basic need satisfaction and well-being among those active in achievement contexts. The possibility of considering these different facets of the environment, which past work has indicated are related but not redundant (Standage et al., 2003), may allow us to provide better prediction of variability in need satisfaction and the outcomes of interest.

Well- and Ill-Being: The Eudaimonic Perspective

The multifaceted nature of well-being dictates that this construct could be operationalized in numerous ways. Assessments of subjective well-being tend to be the norm when gauging well-being in the psychological literature. Reported levels of self-esteem (Marsh, Richards, Johnson, Roche, & Tremayne, 1994), vitality (Ryan & Frederick, 1997), affective states/traits (Watson, Clark, & Tellegen, 1988), and life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985) are among the more common indicators of well-being assessed in SDT-based research undertaken in sport, as well as in other domains (Ryan & Deci, 2001).

Material gains as well as hedonistic emotional experiences are often considered the hallmark of one's degree of contentment (Waterman, 1993). However, this viewpoint is incongruent with eudaimonic conceptions of "living well" (Deci & Ryan, 2008a). Stemming from the early work of Aristotle, eudaimonia encompasses the *quality* of lived experiences (Waterman, 1993). As such, the term "well-being" is not merely reflective of material or emotional by-products of activity (captured by the term hedonism). Rather, eudaimonic well-being refers to "a way of living that focuses on what is intrinsically worthwhile to human beings" (Ryan, Huta, & Deci, 2008).

The Aristolean viewpoint positioned engagement in daily pursuits that are self-endorsed, self-initiated and underpinned by personally valued achievement strivings to be at the core of quality living (Ryan et al., 2008). More recently, the basic need theory framework has offered a perspective of human behavior that is in harmony with many of Aristotle's ideas. Deci and Ryan (2000) define well-being as more than personal experiences of positive affect and/or diminished occurrence of negative affective states. Rather, Deci and Ryan refer to "an organismic function in which the person detects the presence or absence of vitality, psychological flexibility and a deep inner sense of

wellness” (p243). In essence, performers exhibiting a high degree of well-being are fully functioning and experiencing personal growth alongside desire fulfillment in their achievement endeavors (Ryan et al., 2008). In line with Deci and Ryan’s (2000) conceptualization of well-being, it is important to recognize too that well- and ill-being are not polar opposites. The absence of physical or psychological ill-health does not necessarily equate to optimal functioning. Moreover, the social-psychological processes that lead to healthful sport engagement may not be the same as those that underpin unhealthy physical activity participation. Thus, it is essential to examine the antecedents of well-being alongside determinants of compromised welfare (e.g., anxiety and burnout, injury, illness).

The proposition that coach behaviors can impact upon the health status (degree of well- and ill-being) and performance potential of athletes is well corroborated in the literature (Amorose, 2007; Duda, 2001; Duda & Balaguer, 2007; Ntoumanis & Biddle, 1999; Pelletier et al., 2001; Ryan & Deci, 2007). Past studies have indicated that the quality of sport participation and the degree of well- and ill-being an athlete experiences may depend upon the extent to which sport engagement fosters the individual's needs for autonomy, competence and relatedness (Gagne & Blanchard, 2007).

In an investigation involving young Spanish soccer players, perceptions of autonomy support and subsequent basic need satisfaction positively related to the degree of enjoyment experienced by the players and negatively associated with the players’ reported boredom (Alvarez et al., 2009). Perceptions of autonomy support and need fulfillment have also been found to positively predict adult athletes’ experiences of vitality (i.e., feeling alive and energized) (Adie et al., 2008b) as well as young gymnasts’ daily experiences of vitality and positive affect (Gagne et al., 2003). Low basic need satisfaction has been linked with indices of ill-being in the sport domain. For example, the physical

symptoms (i.e., sore throat, runny nose), emotional and physical exhaustion (Reinboth & Duda, 2004; Reinboth et al., 2004) and burnout symptoms (Perreault, Gaudreau, Lapointe, & Lacroix, 2007) experienced by athletes have been associated with diminished basic need satisfaction.

Research also indicates that, over time, coaches can positively impact upon the degree of basic need satisfaction and subsequent well- and ill-being experienced by athletes. In a longitudinal study, increases in basic need satisfaction accounted for team sport athletes' lower susceptibility to negative emotional states and increased experiences of positive affect over the course of a competitive season (Reinboth & Duda, 2006). In line with the tenets of BNT (and consonant with AGT-based assumptions regarding the adaptive implications of social environments which promote task involvement; Duda, 2001), the observed changes in basic need satisfaction were predicted by increases in the athletes' perceptions of task-involving strategies employed by their coaches.

Summary of the Purpose of This Thesis

Taken in their totality, the tenets of BNT (Deci & Ryan, 2000; Ryan, 1995; Ryan & Deci, 2002) have been supported in research undertaken in sport and PE settings. Studies indicate that social-contextual features manifested in learning and performance-related physical activity environments impact upon the degree of need satisfaction, and in turn, well- and ill-being individuals experience in the aforementioned settings. However, there remain a number of unanswered questions regarding the hypothesized 'social-environment – basic needs – well-/ill-being' sequence that is central to BNT.

In the physical domain, the majority of BNT-based studies have targeted sport (Gagne & Blanchard, 2007), PE (Ntoumanis & Standage, 2009) and exercise (Edmunds, Ntoumanis, & Duda, 2007) contexts. To date, the field of dance has been largely

neglected. More specifically, no *theoretically-grounded* studies have systematically examined the social-environmental and motivational processes associated with dancers' degree of well- and ill-being. This state of affairs represents a major impediment in the path of those committed to more health-promotive dance training. Theoretically driven research provides insight into the mechanisms that may underpin indices of healthful and optimal as well as maladaptive and compromised functioning among those engaged in the setting in question. Moreover, theory-driven research is important for the development, implementation and testing of the effectiveness of interventions. Thus, with a view to addressing this void in the literature, the series of studies undertaken in this thesis centered on the domain of vocational dance.

BNT considers the needs for autonomy, competence and relatedness to be essential psychological mechanisms mediating the 'social environment – well-being' relationship (Deci & Ryan, 2000; Ryan & Deci, 2002). To date, there have been limitations in the analytical approaches undertaken to test this hypothesized sequence, particularly in work in the physical domain. For example, in BNT-grounded research within PE settings, a composite need satisfaction variable has been used (Standage, Duda, & Ntoumanis, 2005). This prevents the possibility of examining the three needs as separable mediators. In other work, attempts to examine the independent contribution of each of the three needs to indicators of well-being have been hampered by multicollinearity problems (Gagne et al., 2003). When the three needs have been collectively considered as independent entities, regression has been employed as the chosen analytical approach, preventing the possibility of simultaneously modeling measurement error (Reinboth & Duda, 2006). In one recent investigation in the context of sport which tested the BNT framework via structural equation modeling and considered the independent roles of the three needs as potential mediators, perceptions of autonomy support was the sole environmental dimension of

interest (Adie et al., 2008b). Drawing from the limitations identified in past work, the examination of the hypothesized mediating role of autonomy, competence and relatedness satisfaction in the ‘perceptions of the social environment – well- and ill-being’ relationship was a focal point of the thesis.

In study one, perceptions of autonomy support and of the task- and ego-involving characteristics of the climate were the targeted dimensions of the social context. Studies two and three focused specifically on the implications of the dancers’ perceptions of autonomy supportive dance teaching for dancers’ burnout risk (study two) and affective states (study three). The majority of BNT studies in the physical domain have targeted indicators of psychological well-being (Gagne & Blanchard, 2007). With the recognition that well- and ill-being are not polar opposites (Deci & Ryan, 2000), the BNT framework was employed to examine social-psychological predictors of psychological ill-being, namely negative affect (studies one and three) and burnout (study two), as well as potentially debilitating responses to stress (study four) among dancers.

The dearth in longitudinal research examining social-environmental and motivational predictors of health among those engaged in physical pursuits has long been recognized (Duda, 2001). In terms of studies grounded in BNT (Deci & Ryan, 2000; Ryan, 1995) specifically, the vast majority of work has been cross-sectional in design, regardless of the targeted domain. The overreliance on correlational investigations has been noted in the SDT literature (Vallerand, Pelletier, & Koestner, 2008). In the realm of sport, little is known regarding the degree to which perceptions of the social-environment, basic need satisfaction and indicators of well- and ill-being co-vary over short (i.e. minute to minute, or day to day) as well as more sustained (i.e., an academic year) periods of time. Exploring the correlates of basic need satisfaction via a field based cross-sectional investigation (study one) represented the first important step in the present line of research centered on

vocational dance. Studies two, three and four extended study one by adopting field based longitudinal (study two), daily diary (study three) and time series (study four) research designs. The basic needs are understood to operate as mediators in the ‘social environment – well-being’ association, at three levels of generality: global, domain specific, and situational (Vallerand & Ratelle, 2002). This multi-method approach made it possible to explore the tenets of BNT at different levels of generality.

In BNT-grounded research in the domain of sport, training environments have typically been the targeted setting. However, athletes and performing artists also spend considerable periods of time anticipating, engaging in and reflecting upon potentially stressful performance-related situations. Accordingly, in study four, a public ballet solo performance provided the context of investigation. Specifically, study four centered on the extent to which basic need satisfaction predicted dancers’ cognitive appraisals and stress-related responses associated with a public solo ballet performance.

SDT considers the basic needs to be essential for optimal functioning regardless of culture or context (Ryan & Deci, 2002). Yet to date, the majority of studies grounded in this framework have been undertaken with European or North American participants. Thus, in addition to the novelty of BNT research in the domain of dance, a subsidiary aim of the thesis was to address the targeted research questions in divergent contexts and diverse cultures. Specifically, study three was undertaken in a vocational school in Hong Kong. Within this investigation it was also possible to evaluate whether the social environment manifested in dance performances, rehearsals and classes differentially related to the students’ basic need satisfaction and reported affective states. The study also examined whether there were differences in perceptions of autonomy support and basic need satisfaction between ballet, contemporary and Chinese dancers.

The majority of studies that have examined motivation-related correlates of healthful engagement in performance pursuits have employed self-report measures of well- or ill-being. As a consequence, very little is known regarding the extent to which basic need satisfaction holds implications for biological determinants of health. This represents a major limitation to understanding whether basic need satisfaction interacts with biological as well as other psychological processes. Thus, a final key aim of this thesis was to explore the interrelationships between basic need satisfaction and biological responses to “real-life” performance scenarios (study four). More specifically, study four examined whether dancers’ degree of basic need satisfaction predicted their emotional (anxiety) and hormonal (cortisol) responses throughout a two hour period that included a ballet solo performance.

Exploring the Social-Environmental Determinants of Well- and Ill-Being in Dancers:

A Test of Basic Needs Theory

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Abstract

Grounded in the basic needs mini-theory (Deci & Ryan, 2000), this study examined the interplay between perceptions of the social environment manifested in vocational dance schools, basic need satisfaction and indices of elite dancers' well- and ill-being. The hypothesized mediating role of basic psychological need satisfaction was also tested. Dancers ($N = 392$) completed a questionnaire tapping the targeted variables.

Structural equation modeling supported a model in which perceptions of task-involving dance environments positively predicted need satisfaction. Perceived ego-involving climates negatively corresponded with competence and relatedness. Perceptions of autonomy support were positively related to autonomy and relatedness. Need satisfaction positively predicted positive affect. Competence and relatedness satisfaction corresponded negatively to reported negative affect. Emotional and physical exhaustion was not related to need satisfaction. Partial support emerged for the assumed mediation of the needs. Results highlight the relevance of task-involving and autonomy-supportive dance climates for elite dancers' need satisfaction and healthful engagement in vocational dance.

Key words: Autonomy support, motivational climate, need satisfaction, well-being

Introduction

The potential psychological benefits linked with sport involvement are well documented. Research evidence suggests sport participation to be an antecedent of emotional well-being (Steptoe & Butler, 1996) and reduced anxiety and depression (Vilhjalmsson & Thorlindsson, 1992). It has been recognized, however, that sport engagement is not always health conducive and variability in the health-related consequences of sport is dependent on social-environmental factors and motivational processes (Reinboth et al., 2004).

In dance, research attention frequently highlights the potential physical and psychological costs of involvement. Studies point to the prevalence of health problems such as eating disorders (Smolak, Murnen, & Ruble, 2000) and injuries (Bowling, 1989) among members of the professional and student dance communities. Previous research has also implicated aspects of the social environment in dance classes in the manifestation of compromised health in dancers (Thomas et al., 2005). However, the literature pointing to implications of the social context for dancers' well- and ill-being tends to be more anecdotal than evidence based (Segal, 2001). Moreover, the mechanisms by which the social environment may influence dancers' welfare remain largely unexplored.

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) has become a popular framework within which to examine the social-environmental and motivation-related correlates of positive as well as maladaptive engagement in physical activities. SDT regards social-environmental conditions as fundamental to the progression or attenuation of self-motivated actions, and health via the satisfaction or thwarting of three psychological needs (Ryan, 1995). In recent years, the physical activity literature has begun to focus on the role of these basic psychological needs in the interplay between contextual features and well- and ill-being reported by participants in these settings. This

emerging literature has centered on sport (Amorose & Anderson-Butcher, 2007; Reinboth & Duda, 2006), exercise (Edmunds, Ntoumanis, & Duda, 2006; Wilson & Rodgers, 2004) and Physical Education (PE) (Standage et al., 2005). If tested within dance, SDT could lead to a greater insight into not only if, but *how* dance environments may lead to the maladaptive consequences for dancers that have been frequently documented. This represents an important extension of the literature.

Basic Needs Theory (Deci & Ryan, 2000)

Basic needs theory (BNT), a mini-theory of the SDT framework (Deci & Ryan, 1985, 2000), proposes the nurturing of innate psychological needs, namely competence, autonomy and relatedness, to be fundamental to optimal human functioning (Ryan, 1995). Deci and Ryan (2000) consider these needs as “innate psychological nutrients that are essential for ongoing psychological growth, integrity, and well-being” (p229). When the need for competence is satisfied, one feels efficacious and able to successfully carry out the actions that he/she so desires (White, 1959). Autonomy is satiated when individuals consider themselves to be the initiators of their decisions and that they behave in a way that reflects their true aims and choices (Deci & Ryan, 1985). The need for relatedness corresponds with a feeling that one is understood by, cared for, and connected with other individuals (Baumeister & Leary, 1995).

A central tenet of BNT is that satisfaction of the three basic needs is necessary for mental health and adaptive engagement regardless of cultural differences or contextual variability (Deci & Ryan, 2000). Recent research points to the prevalence of psychological and other health-related problems among full-time professional and student dance artists (Laws, 2005). To date, there is limited evidence concerning determinants of healthful dance engagement and the predictors or consequences of satisfaction of the needs for

autonomy, competence, and relatedness in the vocational dance context are unknown. Thus, BNT-grounded research in dance is warranted.

The Social Context and Need Satisfaction

SDT assumes that characteristics of the social environment are critical to the level of need satisfaction individuals experience and their resultant cognitive, behavioral and affective responses (Amorose, 2007; Deci & Ryan, 2000). One dimension of the social environment that has received theoretical and empirical attention is autonomy support. Autonomy support is evident when a leader readily involves the other in decisions, reduces pressures, takes his/her perspective and provides opportunities for choice (Black & Deci, 2000). Studies in mainstream education (Black & Deci, 2000), PE (Standage et al., 2003) and sport (Adie et al., 2008b) have illustrated the benefits that ensue when teachers and coaches are perceived to be autonomy supportive. In autonomy supportive environments, students and athletes are more likely to report higher need satisfaction, more autonomous reasons for engagement, and more positive emotional, cognitive, and behavioral consequences.

Pulling from achievement goal theory (Ames, 1992; Nicholls, 1989), a few studies have examined variation in the perceived motivational climate as another social-environmental feature relevant to the differential satisfaction of the basic needs. The term “perceived motivational climate” refers to the goal structures that individuals recognize to be accentuated within an achievement setting that are relevant to competence centered activities (Duda, 2001). Two dimensions of the climate have been identified which are assumed to hold implications for whether a person is more or less task- and/or ego-involved in that context. In a climate that is more task-involving, performance-related progress tends to be judged by self-referenced standards and choice, co-operative and peer

learning and individual effort are emphasized. Environments described as more ego-involving are characterized by social comparison, punishment for mistakes and the encouragement of intra-individual rivalry (Ames, 1992; Newton et al., 2000). Benefits that have been associated with perceptions of task-involving climates include greater self-determined motivation for engagement among PE students (Standage et al., 2003) and higher subjective vitality among athletes (Reinboth & Duda, 2006). Conversely, perceived ego-involving environments have been found to be detrimental for healthful sport engagement (Duda, 2001). For example, performance-related anxiety and worry, body concerns and low self-esteem have all been associated with perceptions of an ego-involving sport environment (Duda, 2001; Duda & Balaguer, 2007).

Past work has also indicated that sport climates characterized by more task-involving and less ego-involving features correspond to enhanced need satisfaction in athletes (Reinboth & Duda, 2006). There is an inherent logic undergirding these findings. Perceptions of competence may profit in task-involving climates as self-referenced criteria for competence construal is emphasized. Such criteria can be considered to be more personally controllable than when judgment regarding one's competence is primarily tied to normative comparisons (which tend to be emphasized in ego-involving climates). Thus, task-involving climates should contribute towards a sense of autonomy (Duda, 2001). Ego-involving climates are marked by intra-individual competition and rivalry amongst participants (Newton et al., 2000). Subsequently, feelings of relatedness may be threatened in such an environment (Reinboth & Duda, 2006). On the other hand, task-involving climates are often marked by an emphasis on peer-learning and co-operation. In such settings, one would expect participants to feel more connected and valued. Thus, need satisfaction may represent a psychological mechanism by which variability in perceptions

of the motivational climate corresponds to differences in the physical and psychological health status of those engaged in the particular context.

In research involving dance students, Carr and Wyon (2003) found perceptions of ego-involving dance environments to be associated with maladaptive psychological attributes including neurotic perfectionism and trait anxiety. This study was the first to document a relationship between perceptions of the motivational climate in vocational dance settings and the compromised welfare of dancers. However, the Carr and Wyon research did not consider the psychological processes underlying the observed relationships between the perceived motivational climate operating and the targeted negative indicators of dancers' emotional welfare.

In a recent study of dancers in hip hop companies, Quested and Duda (2009d) provided some preliminary evidence of the role of basic needs in the interplay between the perceived motivational climate and the reported degree of well- and ill-being experienced by dancers. Specifically, they found hip hop dancers' perceptions of task-involving climates to positively predict satisfaction of the needs for autonomy, competence and relatedness. Perceptions of an ego-involving climate significantly and negatively predicted relatedness. Competence was found to mediate the associations between dancers' perceptions of the task-involving features of the dance climate and their experiences of positive and negative affective states.

The present study aims to replicate and extend the findings of Quested and Duda (2009d). In their initial work, Quested and Duda (2009d) recruited a small sample ($N = 59$) of dancers who were engaged in hip hop dance on a part time basis ($M = 16.72$ and $SD = 12.34$ hours dancing per week). In the present research, we were interested in examining the interrelationships between perceptions of the motivational climate as well as degree of autonomy support provided, need satisfaction and indices of well- and ill-being among a

large sample of full time vocational ballet and contemporary dance students. Dancers training in vocational schools are engaged in dance classes and other physical training activities for five or six full days per week. These students often live, as well as study and dance at their vocational dance school. Therefore, the degree of exposure to the social environment manifested in the dance setting, as well as the nature of the dance experience per se, differs for the present study participants when contrasted with what was the case for the hip hop dancers (Quested & Duda, 2009d).

Need Satisfaction and Well- and Ill-Being

The majority of studies grounded in BNT (Deci & Ryan, 2000) have considered needs as potential contributors to indicators of well-being. According to Ryan and Deci (2000b), the deprivation of psychological needs represents “a principal source of human distress” (p74). Therefore it seems pertinent to consider markers of both well- *and* ill-being when evaluating the role of variation in basic need satisfaction with regard to optimal functioning. In the present work, we examined whether the three needs were independently associated with indicators of dancers’ well-being (positive affect) *and* state of ill-being (negative affect and emotional and physical exhaustion). We selected these particular indices of well- and ill-being for a number of reasons. First, the Quested and Duda (2009d) study we are replicating and extending centered on the prediction of ratings of emotional and physical exhaustion, and positive and negative affect in the hip hop dancers sampled. Further, well-being has been defined as not merely the presence of positive psychological states and absence of negative psychological states, but also held to capture whether an individual feels ‘well,’ both emotionally and physically (Caspersen, Powell, & Merritt, 1994). Previous investigations have highlighted the prevalence of emotional problems and feelings of exhaustion amongst those in the vocational dance

milieu (Laws, 2005). Thus, we considered examining the determinants of positive and negative affect, as well as emotional and physical exhaustion, among the present sample of vocational dancers to be a worthy pursuit.

A few recent sport studies have tested and provided support for the ‘environment – needs – motivation – well-being’ sequence central to SDT (Ryan & Deci, 2007). However Deci and Ryan (2000) have argued that a direct relationship between the needs and markers of well-being must exist if the constructs are to be considered as ‘needs’ rather than ‘desires’. The premise that basic needs mediate the relationship between perceptions of the motivational climate and experiences of well- and ill-being (Gagne & Blanchard, 2007) remains an SDT supposition that is more often assumed than rigorously tested. In past work testing the hypothesized mediational role of need satisfaction (Quested & Duda, 2009d; Reinboth & Duda, 2006), multiple regression has been the chosen method as opposed to alternative statistical methods (i.e., structural equation modeling) that control for measurement error. In studies that have employed more sophisticated analytic techniques, a composite variable has been employed to represent the three needs as a mediator (Standage et al., 2005) or perceived autonomy support was the lone social-environmental variable under scrutiny (Adie et al., 2008b).

In sum, the major aim of this study was to test the motivational sequence proposed by BNT in a sample of vocational dance students. Specifically, we were interested in examining the social-environmental and psychological antecedents of dancers’ well-being (positive affect) and ill-being (negative affect and emotional and physical exhaustion). The second key objective was to test the assumed mediating role of each basic need in the hypothesized ‘motivational climate – well-/ill-being’ relationships via an analytic strategy that takes into account measurement error. Structural equation modeling procedures were employed to test the hypothesized mediation of autonomy, competence and relatedness in

the relationship between perceptions of the autonomy supportive and task- and ego-involving features of the dance environment and dancers' reported negative affect, emotional and physical exhaustion and positive affect. It was hypothesized that perceptions of autonomy support and a task-involving climate would positively, and perceptions of an ego-involving climate would negatively predict satisfaction of the three needs. Need satisfaction was anticipated to be positively associated with positive affect and negatively linked to negative affect and emotional and physical exhaustion. In accordance with BNT (Deci & Ryan, 2000), the three needs were expected to fully mediate the relationships between perceptions of the autonomy supportive and task- and ego-involving features of the dance climate and the outcome variables of interest in this study.

Method

Participants and Procedures

Ethical approval was garnered from a departmental ethics board at a large UK university. Participants were 392 (96 male, 293 female, 3 gender unspecified; $M_{\text{age}} = 18.67$ years, $SD = 2.26$) dancers currently engaged in fulltime vocational training in the UK. The gender skew evident in this sample is typical of the population being targeted. In terms of ethnic background, 58.6% of the sample reported being white British, 19.1% were white - other, 4% reported having a mixed background, 5.6% were Asian, 1.1% was black, and 11.6% did not report their ethnic/racial background. Dancers stated that they had been dancing for an average of 12.12 ($SD = 4.27$) years and spent 31.9 ($SD = 10.17$) hours dancing per week.

School directors were contacted in advance and the purposes of the research were explained. Consent forms and information sheets were completed and returned by all

dancers and parents of dancers that were under 16 years of age. Data collection took place in classrooms or dance studios at specifically scheduled times during the school day. The principal investigator administered a multi-section questionnaire and dancers were asked to complete the questionnaire without conferring with their fellow dancers. It was made clear to all dancers attending these sessions that completion of the questionnaire was a voluntary undertaking. No dancers declined to participate. Dancers were informed that there were no right or wrong answers and that their responses would remain confidential.

Measures

Perceived autonomy support. The dancers' perceptions of autonomy support provided in the dance schools were tapped via seven items (adapted for dance settings) from the Health Care Climate Questionnaire (HCCQ) (Williams, Grow, Freedman, Ryan, & Deci, 1996). Items (e.g., "I feel that my teachers provide me with choices and options") following the stem "*In this dance school...*" were rated on a scale ranging from one (*strongly disagree*) to seven (*strongly agree*). Previous studies in sport settings have supported the reliability and validity of the 7-item version of this scale (Adie et al., 2008b; Reinboth et al., 2004).

Perceptions of the motivational climate. The 33-item Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) (Newton et al., 2000) was employed to assess dancers' evaluations of the prevailing motivational climate operating in their dance schools. The questionnaire wording was modified accordingly. Dancers were asked to consider the typical atmosphere manifested "*in this dance school...*" Perceptions of the task-involving features of the climate were tapped with items including "trying hard is rewarded in rehearsals and performances" and "each dancer contributes in some important way". Items gauging a perceived ego-involving climate included "the teachers have their

own favorites” and “if you want to be cast for the best roles you must be one of the best dancers”. The questionnaire employs a Likert scale ranging from one (*strongly disagree*) to five (*strongly agree*). Previous studies conducted in sport and other physical activities have supported the reliability and factorial validity of the PMCSQ-2 (Newton et al., 2000). Evidence for the internal reliability of the scale has also been garnered in the dance domain (Carr & Wyon, 2003; Quested & Duda, 2009d).

Basic needs. Satisfaction of the need for relatedness was tapped by the 5-item acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). Items including “valued” and “supported” followed the stem “*In this dance school I feel...*” The questionnaire employs a scale of one (*strongly disagree*) to five (*strongly agree*). The 5-item perceived competence subscale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) was employed to assess dancers’ satisfaction of the need for competence. Items were gauged on a scale of one (*strongly disagree*) to seven (*strongly agree*). Exemplar items include “I am pretty skilled at dance” and “I am satisfied with my dancing”. Autonomy was tapped via three items (Sheldon, Elliot, Kim, & Kasser, 2001), assessing the extent to which the dancer feels he/she has an internal perceived locus of control in regard to his/her dance engagement. The stem “*in this dance school I feel...*” was followed by items including “that my choices express my “true self”/ who I really am”. The scale utilizes a Likert scale ranging from one (*not at all*) to five (*very much*). The internal reliability of all of the scales tapping need satisfaction have been supported in previous research involving dancers (Quested & Duda, 2009d).

Well-being/ill-being indicators. The extent to which dancers were experiencing positive affect (e.g., “interested”) and negative affect (e.g., “guilty”) was tapped via the Positive and Negative Affect Scale (PANAS) (Watson et al., 1988). Dancers were asked to consider if they “generally feel” this way when responding to the items. A Likert scale

ranging from one (*not at all*) to five (*extremely*) accompanies the twenty items. Previous studies in sport settings have supported the psychometric attributes of the PANAS (Crocker, 1997). Emotional and physical exhaustion experienced by the dancers was assessed using the 5-item emotional and physical exhaustion subscale from the Athlete Burnout Questionnaire (Raedeke & Smith, 2001). A scale of one (*almost never*) to five (*almost always*) accompanied items including “I am exhausted by the mental and physical demands of dance”. The validity of this scale has been supported in studies conducted in physical activity contexts (Raedeke & Smith, 2001). The internal reliability of these scales was supported in previous research involving elite hip hop dancers (Quested & Duda, 2009d).

Data Analysis

Data were analyzed via structural equation modeling (SEM) with maximum likelihood estimations. All analyses were carried out in version 16 of the AMOS software (Arbuckle, 1999). In line with the frequently advocated two-step approach to SEM analysis (Kline, 2005), the first stage of the procedure was to check the factor structure of each questionnaire and the overall measurement model. Once these were deemed acceptable, the second step was to test whether the data provided an adequate fit to our hypothesized model.

There are several options for determining the degree of model fit (Hu & Bentler, 1999). A non-significant χ^2 is considered to indicate that the data fits the model adequately. The χ^2 is known to be affected by sample size (Arbuckle, 1999; Hu & Bentler, 1999). Therefore absolute and incremental fit indices were our primary consideration when determining whether the hypothesized model accurately represented the data. The Standardized Root Mean Square Residual (SRMR) and the Root Mean Square Error of

Approximation (RMSEA) were chosen as indicators of absolute fit. Values $\leq .08$ and $.06$ (respectively) advocate a model with good fit to the data (Hu & Bentler, 1999). The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) were considered as incremental fit indices. Values $> .90$ indicate adequate model fit. However values $> .95$ are considered as the benchmark for models with excellent fit (Hu & Bentler, 1999).

The procedural recommendations of Baron and Kenny (1986) have been a popular approach to test mediation (Baron & Kenny, 1986). However, it has been argued that Baron and Kenny's causal steps method of testing mediation merely probes, rather than fully explicates the relationship of an independent variable to a dependent via intervening variables (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). This method has also been criticized on account of low statistical power (MacKinnon et al., 2002), and limited application to multiple mediation models. Specifically, it is not possible to tease out the independent intervening effect of each mediator via the casual steps method. This approach does not calculate an estimate of the indirect effects or standard errors that would enable statistical significance of the indirect effects to be ascertained (MacKinnon & Fairchild, 2009; Preacher & Hayes, 2008).

It is possible to assess the significance of each mediator by examining the joint significance of the coefficients that contribute to each mediation effect (MacKinnon et al., 2002). Via a multiple mediator model, we adopted a two-step approach to test the mediating role of the three psychological needs. Firstly we determined whether there was evidence of mediation in our hypothesized model, via the nested model strategy (Holmbeck, 1997). This approach determines whether there is evidence of an overall mediating effect. In order to explicitly ascertain the magnitude and significance of the specific mediated effects via each of the three needs, we followed the recommendations of MacKinnon (2000) in our second step of mediation analysis. Specifically, we examined

the indirect effect of perceptions of autonomy support and task- and ego- climates on each dependent variable via each need, and also tested the significance of the joint coefficients of each mediation effect (MacKinnon, 2000).

Results

Table 2.1 presents descriptive statistics and alpha reliability coefficients for, and intercorrelations between, all of the measures employed in this study. Typically, dancers considered their motivational climate to be relatively high in autonomy support, as well as task- and ego- involving features. On average, the dancers' needs for autonomy, competence and relatedness were moderately satisfied. Overall, dancers reported more positive affect than negative affect and moderate emotional and physical exhaustion.

The construct validity of each scale was examined using confirmatory factor analysis (CFA). The CFA for a model representing the PMCSQ-2 (specifying the first and second order factors of this questionnaire) revealed poor fit to the data ($\chi^2(488) = 1263.21$, $p < .01$; CFI = .84; RMSEA = .07; TLI = .83; SRMR = .09). The modification indices provided by AMOS were examined alongside consideration of the applicability of the troublesome items to the dance context. When deemed statistically acceptable and domain appropriate, problematic items were removed in a step by step fashion and model fit improved.² Alongside conceptual reasoning, modifications of this nature have been justified on account of the fact that resultant models are derived from the best performing

² Two items ["Dancers are encouraged to outperform the other dancers" and "Dancers are "fired up" (positively excited) when they perform better than their fellow dancers in a performance"] capturing perceptions of 'intra-team member rivalry' loaded onto other factors. It is conceivable that these items were problematic because dancers found it difficult to identify an emphasis on "outperforming". In dance, quantitative indicators of performance are not as apparent as they are in sport settings (where one can refer to scores, speeds, heights and distances to judge performance relative to others). Given that intra-team rivalry may also be less relevant to student dancers than sports team members, this dimension was removed. Two other items also cross-loaded. These items ["The teachers think that only the lead dancers contribute to the success of a performance" and "Each dancer feels as if he/she is an important team member"] were examined and it appeared that, despite efforts to reword appropriately, their content may not have easily transferred to vocational dance contexts. These items were removed from subsequent analyses.

indicators without sacrificing the hypothesized model structure (Hoffmann, 1995). The other measures utilized in the study demonstrated acceptable construct validity.³

In order to increase the stability of the parameter estimates and improve the variable to sample size ratio (Little, Cunningham, Shahar, & Widaman, 2002), construct specific parcels were created for the PMCSQ-2 and the PANAS scales. Items from each scale were randomly assigned (to two or three item parcels in the case of the measure of autonomy support and the PANAS and four item parcels in the case of the PMCSQ-2) and employed as indicators for each factor. Items that were eliminated on account of poor loading in scale specific CFAs were not included in the parceling procedure. In this study, our predictions regarding the dancers' perceptions of the motivational climate were based on the higher order dimensions of the motivational climate (Ames, 1992). We did not set out to differentiate between the second order characteristics of the climate captured within these higher dimensions. Therefore we created parcels from the PMCSQ-2 items by parceling items with other items that represented the same higher order factor (i.e., task climate items were parceled with other task climate items; ego climate items were paired with other ego climate items).

The measurement model was tested to evaluate whether the parceled indicators loaded onto their respective latent constructs. A satisfactory fit was evident ($\chi^2(534) = 1092.12, p < .001$; CFI = .95; RMSEA = .04; TLI = .94; SRMR = .05). The data in the measurement model did not display multivariate normality (Mardia's multivariate kurtosis = 127.21). Therefore the bootstrapping technique was employed in all further SEM analyses.

³ Details of the factor analyses performed on each scale are available from the lead author.

Table 2.1

Descriptive Statistics, Cronbach's Alpha Coefficients for, and Correlations Between, the Observed Subscale Scores

Variable	<i>M</i>	<i>SD</i>	<i>a</i>	1	2	3	4	5	6	7	8
(1) Autonomy support	4.43	1.19	.89	-							
(2) Ego-involving climate	3.37	.67	.90	-.43**							
(3) Task-involving climate	3.86	.54	.87	.59**	-.30*						
(4) Autonomy	3.13	.85	.74	.51**	-.32*	.44*					
(5) Competence	4.61	1.02	.85	.23*	-.23*	.31*	.33*				
(6) Relatedness	3.45	.89	.87	.71**	-.48*	.59*	.50*	.36*			
(7) Positive affect	3.73	.62	.86	.43**	-.25*	.41*	.38*	.42*	.47*		
(8) Negative affect	2.40	.72	.84	-.25**	.33*	-.29*	-.24*	-.39*	-.35*	-.28*	
(9) Exhaustion	3.23	.92	.90	-.22**	.21*	-.14*	-.22*	-.18*	-.21*	-.27*	.32*

Note. All variables were measured on a 1-5 Likert scale, except competence and autonomy support (1-7).

* = $p < .01$. ** = $p < .001$.

Bootstrapping is a statistical re-sampling technique which treats the data as a pseudo-population, and simulates the drawing of multiple samples from the targeted population (Kline, 2005). This enables parameter distributions to be estimated for each sample redrawn, which cumulatively provide a bootstrap sampling distribution (Bryne, 2001). The calculation of model statistics, parameters and standard errors are derived from the bootstrap sample distribution.

The hypothesized structural model was specified in accordance with the tenets of BNT (Deci & Ryan, 2000). An inherent assumption of BNT is that the three needs are inter-related (Ryan & Deci, 2000b). Given that latent endogenous variables cannot be linked in SEM, their associated error terms were allowed to correlate to reflect this theoretical supposition. This approach has been adopted in previous research (Reinboth et al., 2004; Sheldon & Bettencourt, 2002; Standage et al., 2003).

The structural model demonstrated a reasonable fit to the data ($\chi^2(641) = 1142.38$, $p < .001$; CFI = .94; RMSEA = .05; TLI = .94; SRMR = .06). Significant path co-efficients are presented in Figure 2.1. All hypothesized paths predicting autonomy, competence and relatedness were significant, except for the paths between perceptions of autonomy support and competence, and between perceptions of ego-involving dance climates and autonomy. Contrary to our hypotheses, there were no significant paths between the three needs and emotional and physical exhaustion. In addition, autonomy need satisfaction did not significantly predict the dancers' reported negative affective states.

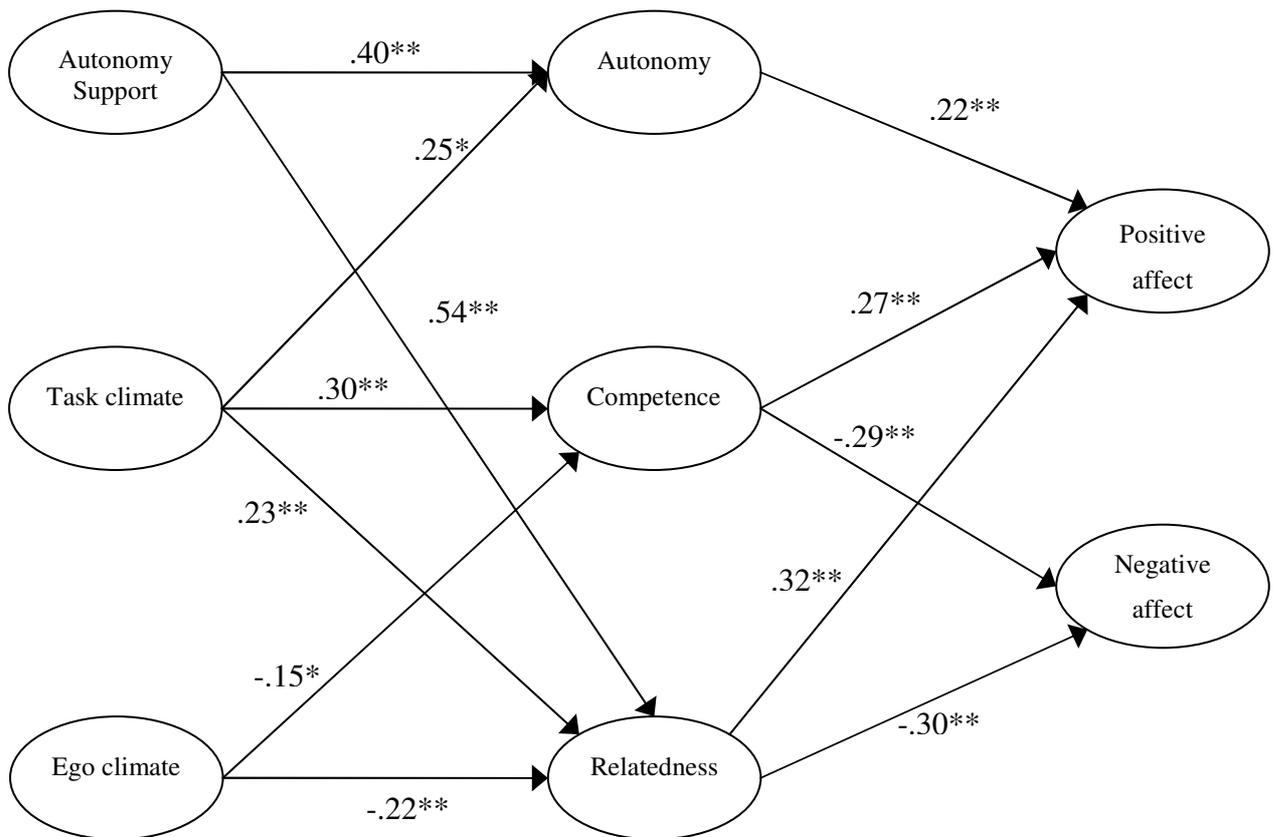


Figure 2.1. The structural model of the inter-relationships between dancers' perceptions of the social environment, need satisfaction, affective states and emotional and physical exhaustion.

All coefficients presented are standardized and significant (* = $p < .05$, ** = $p < .01$). There were no significant paths to emotional and physical exhaustion. Therefore this latent variable is not represented in the figure. For visual simplicity variances are not presented but all were significant ($p < .01$). Non-significant paths in the model were between autonomy support and competence ($\beta = -.03$, $p = .70$), ego climate and autonomy ($\beta = -.09$, $p = .22$), autonomy and negative affect ($\beta = -.02$, $p = .89$), as well as between autonomy ($\beta = -.18$, $p = .11$), competence ($\beta = -.07$, $p = .28$) and relatedness ($\beta = -.12$, $p = .23$) and emotional and physical exhaustion.

The percentage of variance (based on squared multiple correlations) accounted for in each mediator and dependent variable were as follows: Autonomy: 40%, competence: 13%, relatedness: 70%, exhaustion: 9%, positive affect: 41%, negative affect: 25%. All R^2 were statistically significant ($p < .01$). Correlations in the model were as follows: Task climate – ego climate = $-.35$, autonomy support – task climate = $.63$, autonomy support – ego climate = $-.48$. Correlations between disturbance terms in the model were as follows: autonomy – competence = $.22$, competence – relatedness = $.20$, autonomy – relatedness = $.18$.

Testing Mediation

A direct effects model, specifying direct associations between the independent variables (perceptions of autonomy support and task- and ego-involving climates) and the dependent variables demonstrated an acceptable fit to the data ($\chi^2(263) = 486.83, p < .001$; CFI = .96; RMSEA = .05; TLI = .95; SRMR = .07). Path co-efficients are presented in Table 2.2. The dancers' perceptions of autonomy support did not significantly predict their reported emotional and physical exhaustion or negative affect. Further, perceptions of ego-involving climates were not significantly associated with the dancers' positive affect and the direct path between perceptions of task-involving climates and emotional and physical exhaustion was also not significant. If the independent variable does not predict the criterion, the mediator cannot be said to account for this association (Holmbeck, 1997). Thus, while there may still be evidence of an indirect effect, a condition required for tests of mediation per se has been violated.⁴ According to Holmbeck (1997) significant paths should be evident between the independent variables and the mediators, and the mediators and the outcome variables in a constrained model. This condition was satisfied in all relationships represented in Figure 2.1. Finally one must ascertain the fit of an unconstrained model (i.e., paths between the independent variables and dependent variables are also estimated in the model). This model demonstrated an acceptable fit ($\chi^2(632) = 1119.38, p < .01$; CFI = .94; RMSEA = .05; TLI = .94; SRMR = .06). It is noteworthy that in this model, perceptions of an ego-involving environment remained a significant predictor of emotional and physical exhaustion ($\beta = .18, p = .048$) and negative affect ($\beta = .25, p < .01$), despite the inclusion of the three needs in this model. This defies

⁴ Evidence of a direct path provides the most convincing evidence of mediation effects occurring (Shrout & Bolger, 2002). In the absence of a direct effect there may still be evidence of an indirect effect between the two variables (Holmbeck, 1997; Preacher & Hayes, 2008). However it is not appropriate to consider the mediators as "accounting" for this relationship as their association independent of the mediators was not significant (Hoyle & Smith, 1994).

the possibility of mediation via the three needs with respect to the relationships between perceptions of ego-involving dance climates and emotional and physical exhaustion and negative affect.

According to Holmbeck (1997), there would be evidence of the needs fulfilling a mediating role if the unconstrained model does not offer an advanced representation of the data to that of the constrained model. In this case, the chi square difference test indicated that the unconstrained model offered a superior fit to the data over that of the constrained model (χ^2 difference = 23.002, df difference = 9, $p = < .01$). However, the application of the chi square difference test for determining mediation has been criticized on account of the fact that it only tests for complete mediation (Preacher & Hayes, 2008). Thus, we determined the significance of the indirect effects in the model [see MacKinnon (2000) for details of the method employed to test significance]. Table 2.2 presents the indirect effects via each mediator for all 'independent variable – criterion' pairings. There were differences in the magnitude of the indirect effects through each need.

Table 2.2

Direct and Indirect Effects via Each Need Between Each Independent and Criterion Variable Pairing

Independent variable	Criterion	Direct effect	Indirect effect		
			Autonomy	Competence	Relatedness
Task-involving climate	Positive affect	0.24**	0.05* ^a	0.08* ^a	0.07* ^a
	Negative affect	-0.25**	-0.01	-0.09* ^a	-0.07* ^a
	Exhaustion	-0.01	-0.04	-0.02	-0.03
Ego-involving climate	Positive affect	-0.09	-0.02*	-0.04*	-0.07*
	Negative affect	0.32**	0.002	0.04*	0.07*
	Exhaustion	0.18*	0.02	0.01	0.03
Autonomy Support	Positive affect	0.29**	0.09* ^a	-0.01	0.17* ^a
	Negative affect	0.03	-0.01	0.01	-0.16*
	Exhaustion	-0.14	-0.07	0.002	-0.06

Note. Standardized beta coefficients are presented. * The indirect effect was statistically significant ($z > 1.96$). ^a Denotes a relationship in which there was evidence of mediation, according to Holmbeck's criteria.

Discussion

Grounded in BNT (Deci & Ryan, 2000) and extending previous research, this study determined the inter-relationships between dancers' perceptions of the task- and ego-involving and autonomy supportive features of their dance schools, need satisfaction and indices of ill- and well-being. Testing the hypothesized mediating role of the basic needs in the theoretical sequence assumed in BNT was also a focus of our investigation. Overall, the study partially supported the tenets of BNT in the vocational dance context.

Perceptions of Social-Environmental Features and Dancers' Need Satisfaction

In line with our hypotheses, dancers' perceptions of task-involving climates positively predicted satisfaction of each of the three basic needs. The observed associations between perceived task-involving cues and fulfillment of the need for competence and autonomy are consistent with previous research in sport (Reinboth & Duda, 2006) and dance (Quested & Duda, 2009d) and in the case of competence, PE (Ntoumanis, 2001b). The provision of opportunities to experience mastery (Ames, 1992; Duda, 2001), as well as the promotion of self-referenced criteria for gauging success, are features endemic to task-involving environments (Nicholls, 1989). Dancers who perceive their climate to be high in these characteristics may feel more in control of their learning, less threatened by the evaluation process and more proficient as their judgments of competence are more self-referenced (Ames, 1992). Thus, competence and autonomy would be expected to be promoted in a more task-involving dance context.

The dancers' perceptions of autonomy support significantly and positively predicted autonomy and relatedness satisfaction. In line with past work in sport (Adie et al., 2008b), the strongest relationship was evident for relatedness need satisfaction. As anticipated, perceptions of task-and ego-involving dance climates positively and

negatively (respectively) predicted the dancers' reported feelings of relatedness. Aligned with the findings of Quested and Duda (2009d) in the case of hip hop dancers, the strength of the relationships between perceived task- and ego-involving climates and vocational dancers' sense of relatedness exceeded the observed links between this environmental dimension and the other basic needs. In previous research in PE, perceived ego-involving features of the setting were unrelated to the PE students' basic need satisfaction (Standage et al., 2003). In the athletic milieu, support for the association between perceptions of ego-involving climates and relatedness satisfaction has been weak (Reinboth & Duda, 2006). In explicating these differential findings, it is important to note that the dancers in this study reported that they spent between thirty and fifty hours per week dancing in their vocational schools. In contrast, PE students and athletes involved in university sport and recreational clubs would most likely be engaged in the activity in question for a far smaller proportion of their waking hours. That is, it may be the case that the amount of time one spends in a setting may moderate the relative contribution of ego-involving environments to the individuals' sense of belongingness. Present findings suggest that the prevalence of autonomy supportive and ego-involving characteristics of the vocational dance context may be particularly important to whether dancers feel allied to or alienated from their fellow dancers and teachers.

Consistent with our hypotheses, perceptions of an ego-involving dance climate negatively predicted dancers' reported competence. When dancers perceive their training environment to be high in ego-involving cues one might expect their sense of competence to be fragile. This is because in an ego-involving atmosphere, individuals are led to focus on demonstrating superior ability that is normatively defined, and thus, less within their perceived control than self-referenced competence. It is therefore unsurprising that such a motivational atmosphere was associated with diminished perceived competence in the

present study. Previous research in sport (Reinboth & Duda, 2006), PE (Standage et al., 2003) and dance (Quested & Duda, 2009d) has failed to support a negative relationship between perceptions of an ego-involving climate and participants' degree of competence. The disparity between these and our present findings is intriguing; it would appear contradictory to the tenets of BNT (Deci & Ryan, 2000) if the associations between perceptions of ego-involving environments and compromised athlete health (Duda, 2001) were not mediated by this basic need. An inspection of the mean scores in the aforementioned studies suggests ego-involving cues to be equally pronounced in vocational dance contexts ($M = 3.37, SD = .67$) and PE classes ($M = 3.45, SD = .49$), but less so in sport settings ($M = 2.42, SD = .47$). However there may be inherent differences in the specific features of ego-involving climates that are more or less prominent in dance schools as opposed to PE and sport settings. For example, in a vocational dance setting, dancers regularly perform in front of peers and teachers prompting daily overt evaluations of the dance students' progress and capability. However, in contrast to sport and PE, these public displays of the dancers' movement and artistic ability are nearly always subjectively judged; the nature of dance is such that objective indicators of progress are not as salient or readily available as in most sports (e.g., measures of runners' speeds, or soccer players' shot accuracy) or in PE (where the focus is often on objective markers of fitness, physical abilities or sport skills). Thus, the lack of objective indicators of ability and predominance of subjective, public evaluations may exacerbate the influence of ego-involving features of the climate on dancers' perceptions of competence. Moreover, as argued above, it is also possible that the amount of time one spends in an environment perceived as more ego-involving moderates the effect of this climate upon competence need satisfaction.

In line with the aforementioned studies however (Quested & Duda, 2009d; Reinboth & Duda, 2006; Standage et al., 2003), perceptions of an ego-involving climate

were unrelated to the dancer's reported autonomy in our structural model. Nevertheless, it should be noted that the observed simple correlation coefficient supported the hypothesized negative association between perceptions of ego-involving dance climates and autonomy need satisfaction. When explicating the non-significant path between perceptions of ego-involving dance climates and autonomy need satisfaction, it is important to keep in mind that the social-environmental dimensions assessed in this study were inter-related. The observed moderate negative association between perceived task- and ego-involving climates ($R = -.35$) reflects a consistent finding in the literature (Newton et al., 2000). Thus, it is possible that the expected association between a perceived ego-involving dance climate and autonomy was captured within this shared variance (as a significant path between perceptions of a task-involving dance environment and autonomy need satisfaction was observed).

Need Satisfaction and Dancers' Reported Well- and Ill-Being

In past work, need satisfaction during training has been found to positively predict changes in gymnasts' reported well-being (Gagne et al., 2003), as well as adaptive outcomes in PE students (Standage et al., 2005). Inclusion of the three needs as independent mediators within one model has enabled us to delineate the role of each need as a predictor of the targeted indices of well- and ill-being. Providing support for BNT, dancers' reported positive affect was significantly predicted by satisfaction of all three needs. Competence and relatedness need satisfaction were negatively linked to the dancers' negative affect. In previous studies, competence has been identified as the most salient need in the prediction of emotional responses of athletes (Reinboth et al., 2004) and hip hop dancers (Quested & Duda, 2009d). This pattern of findings may be attributed to the functional significance of feeling competent in the physical domain (Reinboth et al., 2004).

Vocational dancers also operate in a context where one's degree of capability is publicly displayed on a daily basis. Thus, perceptions of competence are very relevant in the vocational dance setting too. However contrary to past research in elite hip hop dance contexts (Quested & Duda, 2009d) and sport settings (Reinboth et al., 2004), relatedness emerged as the strongest predictor of the targeted indices of well- and ill-being in this present study of young vocational dancers.

Relatedness has been suggested to play a more distal role with regard to psychological growth and development (Deci & Ryan, 2000). In explicating the apparent disparate finding between the results reported by Quested and Duda (2009d) and the present results, it is important to remember that many dancers in the vocational schools sampled had left their homes and/or home countries for the first time to pursue their training. It is therefore conceivable that a sense of relatedness with those in their new prevailing social environment would be strongly associated with the affective states experienced by these young people. The high number of hours dancers spend in school with their fellow dance students and teachers may contribute towards the significance of feeling connected and cared for in this context.

The observed significant paths between relatedness and competence to the degree of negative affect reported by the dancers support the tenets of BNT regarding the assumed role of the needs in the manifestation of ill-being (Ryan & Deci, 2000a). However the absence of a negative association between autonomy and negative affect was counter to theoretical predictions. This non-finding may be attributed to the dancers' expectations regarding the degree of autonomy they would be afforded in training. Historically, the teachers of some dance genres (in particular, ballet) have been considered as highly authoritarian, providing limited autonomy support to their pupils (Aalten, 2005). If a more controlling teaching style typifies the dancers' past and potentially current experiences, it

is plausible that being deprived of autonomy would not necessarily correspond to negative emotions (at least in a “one slice in time” study). That is not to say that dancers do not have a need to feel autonomous, or indeed that they can be ‘fully functioning’ in the absence of autonomy. SDT holds that autonomy deprivation will halt the extent to which dancers can experience optimal growth (Ryan & Deci, 2006). However, if low autonomy has become ‘normalized’ in dance settings, in cross-sectional studies at least, the relationship of low autonomy satisfaction upon negative affective states may be attenuated. Longitudinal research (and, of course, intervention studies) would be important to further understanding of the potential influence of deprived or promoted autonomy on dancers’ experiences of negative emotions. It is also possible, in explicating the non-significant link between autonomy and negative affect, that autonomy must be directly thwarted rather than merely ‘not satisfied’ to induce negative feelings (Ryan & Deci, 2000a). Our measure of autonomy centered on the degree of need satisfaction and not how much one’s need for autonomy is thwarted.

Contrary to our hypotheses, but complimenting the findings of past research (Hodge, Lonsdale, & Ng, 2008; Lonsdale, Hodge, & Rose, 2009; Quested & Duda, 2009d), autonomy, competence and relatedness need satisfaction were unrelated to the dancers’ reported emotional and physical exhaustion. These results challenge the tenets of BNT that posit the synergistic satisfaction of needs as necessary to avoid compromised physical and psychological health (Deci & Ryan, 2000). It is possible that the expected associations between need satisfaction and emotional and physical exhaustion were compromised by measurement limitations. In the present study and previous work in sport and dance (Adie et al., 2008b; Hodge et al., 2008; Lonsdale et al., 2009; Quested & Duda, 2009d), reported emotional *and* physical exhaustion have been measured by the same scale. When these two manifestations of feeling exhausted are assessed together, it is not

possible to delineate the specific predictors of emotional tiredness and physical fatigue as separate states. Although clearly inter-related, it is plausible that motivation-related processes may be more relevant to emotional exhaustion, while other variables (e.g., hours of physical training, injury status, quality of sleep) may contribute more substantially to the experience of physical exhaustion. This line of thought gains further credence when it is considered that in other work (Reinboth et al., 2004), physical symptoms (e.g., coughs, sore throats) reported by athletes were unrelated to satisfaction of the needs for autonomy or relatedness. In line with Reinboth and Duda (2006), it might be the case that psychological needs are stronger predictors of indicators of psychological or emotional ill-being than physical ill-health (which is not to say that need satisfaction is not relevant to variability in physical health status). Supporting this argument, previous research has indicated that motivational *and* physiological processes contribute to athlete burnout (Lemyre, Roberts, Treasure, Stray-Gundersen, & Matt, 2004). Burnout is understood to represent a syndrome characterized by a reduced sense of athletic accomplishment and depersonalization as well as emotional and physical exhaustion (Raedeke, 1997).

Taken in their totality, the results of the mediation analyses offer partial support for BNT (Deci & Ryan, 2000). Evidence of mediation was most compelling with regard to prediction of the dancers' positive affective states. It is important to note however, that mediation is a specific type of indirect effect. In the present study a number of significant indirect effects emerged via the three needs (see Table 2.2). Our research entailed the testing of a complex model, including multiple predictors, mediators, and endogenous variables. Given that the three needs were significantly inter-related in the model, the indirect effects reported reflect only the *unique* mediating effect via each need. Effects through each mediator in a multiple mediation model are not equivalent to what they would be when tested alone (Preacher & Hayes, 2008). Collectively, these points may

explain why there is less evidence of significant mediating effects in the current research than in previous studies that employed less sophisticated tests of mediation (e.g., Reinboth & Duda, 2006).

It is also important to point out that the present findings suggest the associations between the social-environmental features tapped in this study and the targeted indicators of dancers' well- and ill-being may be mediated by other variables not examined in the present research. With respect to the observed direct link between perceptions of an ego-involving dance climate and dancers' reported emotional and physical exhaustion specifically, further research may delineate alternative psychological and/or biological mechanisms via which this facet of the dance environment may be detrimental to dancers' welfare.

Conclusions and Future Directions

This investigation highlights the value of SDT, and in particular the BNT framework (Deci & Ryan, 2000), in the understanding of healthy engagement in dance. From a theoretical standpoint, the present study points to the value of considering autonomy supportive facets of the teaching environment alongside the task- and ego-involving features when testing the BNT framework in achievement settings. Although significant inter-relationships were observed between the two dimensions of the motivational climate and perceived autonomy support (i.e., autonomy support – task-involving climate $R^2 = .40$, autonomy support – ego-involving climate $R^2 = -.23$), the results indicated that these environmental characteristics are not redundant. The significant paths between the targeted social-environmental factors and the three needs (presented in Figure 2.1) reinforce the point that these aspects of the perceived environment made distinctive contributions to the prediction of the dancers' autonomy and relatedness.

Moreover, in the direct effects model, both task-involving *and* autonomy-supportive features of the dance climate significantly predicted the dancers' reported positive affective states. These findings suggest that these two positive dimensions of the dance climate seem to work in common but also capture unique variance in basic need satisfaction and positive affect.

On the contrary however, the present findings are less telling regarding the social-environmental predictors of the assessed indices of dancers' ill-being. Perhaps other components of the social environment are more relevant to the manifestation of the dancers' ill-health. It is possible that indices of ill-being would be better accounted for if perceptions of a controlling environment (Amorose, 2007) were included alongside perceptions of autonomy support as well as the perceived positive and potentially negative aspects of the motivational climate in the model.

The relative infancy of research concerning social-psychological correlates of dancers' health is reflected in the paucity of theoretically-based but also dance-specific measures of the relevant social-environmental characteristics. In this study we had to adapt, to vocational schools, measures of the social environment that have been developed for use in other contexts [i.e., the PMCSQ-2, Newton et al (2000), and the HCCQ, Williams et al (1998)]. The psychometric properties of the adapted HCCQ were good. However there were some psychometric problems with the modified version of the PMCSQ-2. Some items from the PMCSQ-2 loaded poorly onto their intended factor and had to be excluded from our analyses. The latter results limit the extent to which our findings can be generalized. The emerging field of dance psychology would benefit from the development of dance specific measures of the social environment (Quested & Duda, 2009c).

Future research might also consider monitoring daily within- and between-person variability in dancers' perceptions of the social environment, need satisfaction and indices of well- and ill-being via a diary methodology (Gagne et al., 2003). In such a study, dancers could complete the relevant measures before and after different classes (e.g., contemporary versus ballet) on a daily basis for a period of time. This would help to delineate predictors of day-to-day variability in well- and ill-being, and also allow for the examination of class and potentially school level effects. Incorporating markers of metabolic and immunological functioning (Lemyre et al., 2004), alongside self-report measures of health status (i.e., well- and ill-being), would also advance our understanding of the role of basic needs in the manifestation of physical and psychological health in dance settings, as well as other physical activity contexts.

**Antecedents of Burnout Among Elite Dancers: A Longitudinal Test of Basic Needs
Theory**

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Abstract

Objectives: Little is known regarding the social-psychological predictors of burnout in the dance domain. Drawing from basic needs theory, a sub-theory in the self-determination theory framework (Deci and Ryan, 2000), this study examined whether changes in vocational dancers' autonomy, competence and relatedness satisfaction mediated the relationships between changes in the dancers' perceived autonomy support and burnout over a year of fulltime training.

Method: Dancers ($N = 219$) enrolled in vocational dance training, completed a questionnaire package tapping the variables of interest at three time points over a 36-week period.

Results: SEM indicated that the observed decreases in the dancers' perceptions of autonomy support positively predicted observed changes in reported basic need satisfaction that occurred over the school year. In turn, increases in the dancers' global burnout were negatively predicted by changes in satisfaction of the three needs. The three basic needs fully mediated the 'autonomy support – global burnout' relationship. When the sub-dimensions of burnout were examined independently, there were inconsistencies in the salience of each basic need. The increases in emotional and physical exhaustion experienced by the dancers over the school year were unrelated to changes in autonomy, competence and relatedness satisfaction. Changes in competence need satisfaction negatively predicted reduced accomplishment. Increases in the dancers' dance devaluation were negatively predicted by changes in satisfaction of the three needs.

Conclusions: Overall, the tenets of self-determination theory are supported. Findings point to the relevance of promoting and sustaining autonomy supportive training environments if burnout is to be avoided in elite dance settings.

Key words: Autonomy support, basic needs, burnout, dance

Introduction

It has been hypothesized that 10,000 hours of practice is required to reach expert status in any pursuit (Ericsson et al., 1993). In performance-related physical activity settings such as sport and dance, the physical and psychological demands of hour upon hour of training can take their toll. Indeed, the inherent risk of burnout for athletes and dancers engaged in full time training has previously been noted (Cresswell & Eklund, 2006; Laws, 2005). In sport, burnout has been defined as a psychosocial syndrome incorporating emotional and physical exhaustion, sport devaluation and reduced sense of accomplishment regarding the activity in question (Raedeke & Smith, 2001). Recent research has implicated burnout to be triggered by the psychological as well as physical demands of elite sport (Lemyre et al., 2004). Nevertheless, burnout is not an inevitable consequence of high level performance (Cresswell & Eklund, 2006). Thus, identifying the social-psychological conditions that preclude burnout is a worthy topic of investigation.

Changes in levels of sport motivation have been considered to play a role in the development of burnout in athletes. Gould (1996) suggested that when motivational patterns change from intense desire, towards sport disengagement (i.e., a change in *quantity* of motivation), burnout is the likely consequence (Gould, 1996). In a series of studies, Lemyre and colleagues identified that the *quality* of motivation (i.e., the reasons *why* one participates) predicted variability in burnout symptomology experienced by elite swimmers (Lemyre, 2005; Lemyre, Hall, & Roberts, 2008). In their work, Lemyre et al applied the self-determination theory (SDT) framework (Deci & Ryan, 1985, 2000) as a theoretical lens through which to examine the social-psychological antecedents of athlete burnout. This perspective considers the quality as well as the quantity of motivation. Thus, unlike their predecessors examining motivation-related predictors of burnout (Gould,

1996), these authors concluded that the origin of burnout was a more complex phenomenon than ‘motivation gone awry.’

SDT proposes fulfilment of three basic psychological needs as central to the process via which optimal human engagement results (Ryan & Deci, 2002). When the need for autonomy is satisfied, one feels volitional in his/her actions and perceives that his/her behaviours are a reflection of self-endorsed goals and values (Deci & Ryan, 2000). Competence need satisfaction is evident when one feels that he/she is sufficiently proficient in the activity in question and can meet the associated demands (White, 1959). The need for relatedness is akin to a feeling of belongingness within the social setting (Baumeister & Leary, 1995). SDT holds that basic psychological need satisfaction (BPNS) will result in more self-determined forms of behaviour regulation, and in turn, signs of optimal functioning and well-being. On the contrary, need frustration is considered to lead to the adoption of more controlled regulations (i.e., behavior driven by internal or external contingencies), understood to lead to states of ill-being (Deci & Ryan, 2000).

A fundamental tenet of SDT, and the basic needs theory (BNT) specifically, is that a direct relationship exists between the degree of BPNS and indications of well- and ill-being (Deci & Ryan, 2000; Ryan & Deci, 2002). Studies undertaken in sport, as well as other performance-centred physical activities such as dance, tend to support the BNT-driven hypotheses regarding the needs as predictors of performers’ well-being (e.g., self-esteem, positive affect) and ill-being (e.g., negative affect) [for reviews see Gagne & Blanchard, 2007 (sport), Quested & Duda, 2009e (dance)].

Self-Determination Theory and Burnout

The application of SDT as a framework to explore determinants of athlete burnout is relatively new. Of the work undertaken to date, the focus has leaned towards motivation

regulations as direct predictors of athlete burnout. In line with SDT, the over-riding conclusions of these investigations suggest burnout is more likely to result when athletes are amotivated and report low levels of self-determined motivation for engagement in their sport (Cresswell & Eklund, 2005a, 2005b; Gould, Tuffey, Udry, & Loehr, 1996; Lemyre, Roberts, & Stray-Gundersen, 2007; Raedeke & Smith, 2001).

For some time, research evidence has alluded to athlete burnout being a corollary of compromised BPNS. In the 1980's, athlete burnout was conceptualised as an outcome of the stress response process (Smith, 1986). Smith (1986) proposed that low perceptions of accomplishment and control would result when sporting demands outweighed the athlete's perceived available resources. This perspective corresponds with the hypothesis that autonomy and competence depletion may be important precursors of burnout risk. With regard to relatedness, Gould and colleagues (1996) suggested that high level sport involvement can lead to social isolation and consequently, athlete burnout. Thus, a reduction in the athletes' sense of belongingness may also be an instigator of burnout.

A few recent BNT-based studies have directly examined the role of BPNS as an antecedent of athlete burnout. Following a qualitative investigation involving elite rugby players, Cresswell and Eklund (2007) concluded that chronic frustration of the three needs appears to be central to the manifestation of athlete burnout. In another study involving young adult rugby players, diminished autonomy and competence were strongly associated with players' reported burnout (Hodge et al., 2008). Conversely, in research on high school student athletes, relatedness was the predominant predictor of burnout (Perreault et al., 2007).

Past research has identified discrepant results pertaining to the relevance of each basic need to the prediction of the three burnout sub-dimensions, namely, reduced accomplishment, devaluation, and emotional and physical exhaustion. Among adult

athletes, moderate relationships were found between autonomy and competence satisfaction and the athletes' reduced sense of accomplishment and global burnout (Lonsdale et al., 2009). Only autonomy significantly predicted reported sport devaluation. Weak but significant negative paths linked each need with emotional and physical exhaustion. Hodge et al (2008) found inconsistencies in the strength of relationships between the basic needs and the three characteristics of athlete burnout. Autonomy, competence and relatedness satisfaction were unrelated to the emotional and physical exhaustion reported by the adult rugby players. In a recent investigation examining the individual needs as predictors of indicators of adult sport participants' ill-being (Adie et al., 2008b), autonomy was the only need to be significantly related to the players' reported emotional and physical fatigue.

Research has started to address the implications of BPNS for burnout among dancers. In recent investigations with vocational dancers (Quested & Duda, 2010), as well as company-based hip hop performers (Quested & Duda, 2009d), need satisfaction was not significantly related to the dancers' reported emotional and physical exhaustion. It is important to note however, that the other dimensions of burnout (i.e., dance devaluation, reduced sense of accomplishment) were not assessed in these studies. In the present work therefore, we considered the relevance of BPNS to dancers' reported reduced accomplishment and dance devaluation as well as emotional and physical exhaustion.

The assumption that social-environmental factors serve as antecedents of the degree of BPNS experienced by those engaged in the setting in question is an inherent constituent of BNT (Deci & Ryan, 2000; Gagne & Blanchard, 2007; Ryan & Deci, 2007). BNT-based investigations of athlete and dancer burnout have yet to consider social-contextual predictors of BPNS. In order to address this limitation of past work conducted in the physical domain, we centred on the concomitants of autonomy support as

antecedents of BPNS and burnout in the targeted sample of vocational dancers. Autonomy supportive coaching/teaching is evidenced when coaches/instructors provide opportunities for choice, recognise the feelings and experiences of the learners and minimise the use of pressures and demands (Black & Deci, 2000). Autonomy support has been found to relate to BPNS reported by athletes (Adie et al., 2008b; Amorose, 2007; Gagne et al., 2003), and dancers (Quested & Duda, 2010) as well as students in mainstream education settings (Reeve, 2002).

A central characteristic of burnout is that it is a syndrome that manifests over time. In previous research, SDT-driven examinations of the motivation-related predictors of burnout have been marked by an over-reliance on cross-sectional research designs. One longitudinal study has examined changes in rugby players' burnout (Cresswell & Eklund, 2005a). This investigation spanned twelve weeks, and motivation regulations were the exclusive SDT-based predictors under scrutiny. In the present study we set out to longitudinally test a BNT-based model of burnout, specifically focusing on the role of autonomy support and BPNS in the manifestation of dancers' burnout experiences over thirty six weeks of the vocational dance school year.

We hypothesised that changes in the dancers' perceptions of autonomy support and BPNS would negatively predict changes in reported burnout over time. We also expected any association between changes in perceptions of autonomy support and dancers' burnout to be mediated by changes in need satisfaction. The strength and significance of the relationships between BPNS and each burnout dimension have been inconsistent in previous cross-sectional investigations (Hodge et al., 2008; Lonsdale et al., 2009; Perreault et al., 2007; Quested & Duda, 2010). Consequently, the present study also examined whether a change in the satisfaction of each basic need differentially predicted change in each burnout dimension. Based primarily upon the findings of past research (Hodge et al.,

2008; Lonsdale et al., 2009), our third hypothesis stipulated that the paths between the three needs and emotional and physical exhaustion would be weaker than those paths linking the three needs and the other dimensions of burnout as well as global burnout.

Method

Participants and Procedures

With the approval of a departmental ethics board at a large UK university, at time one (T1) 614 dancers (453 female, 156 male, 5 gender unspecified) were recruited from full time dance schools within the UK. Dancers were asked to complete three questionnaires over an eight month period. 425 dancers completed the time two questionnaire (T2) and 325 participated at in the final data collection (T3). Overall, 232 dancers participated at all time points. A further 13 dancers were excluded on account of substantial missing data, resulting in a final sample of 219 dancers (161 female, 58 male, $M_{\text{age}} = 18.44$ years, $SD = 2.29$). There were no significant differences in T1 burnout between the final sample and the dropouts. Dancers had been at their schools for an average of 12.17 months and had typically been dancing since they were 6.34 years old.

Data collection times were pre-arranged with school personnel. Dancers congregated in a studio or classroom where the study was explained and the dancers were invited to participate. Under the supervision of a trained researcher, dancers were asked to complete the questionnaires individually, were informed that there was no right or wrong answers, and were assured that their anonymity would be retained. Prior to participation, all dancers (and parents of dancers aged less than 16 years) provided written informed consent.

The T1 data collection took place at the onset of the school year (during weeks 1-3) when a 'baseline' assessment of burnout was made. The literature suggests that it can take

six weeks to establish the perceived motivational climate in youth sport settings (Miller & Roberts, 2004). Therefore, to ensure that the dancers had been at their school a sufficient amount of time to experience and judge the social environment manifested in dance classes we assessed initial perceptions of autonomy support as well as BPNS at T2 (six weeks post-baseline). All variables were reassessed in the T3 data collection, occurring approximately eight months after T1.

Measures

The dancers' perceptions of autonomy support offered in their dance school were tapped via seven items adapted from the Health Care Climate Questionnaire (Reinboth et al., 2004; Williams et al., 1996). Dancers were asked to think about the typical atmosphere in their dance school as they responded to seven items (e.g., "I feel that my teachers provide me with choices and options") on a one (*strongly disagree*) to seven (*strongly agree*) scale. Items followed the stem "In this dance school...". The reliability and validity of this scale has been supported in previous investigations involving athletes (Reinboth et al., 2004) and dancers (Quested & Duda, 2010) of a similar age to the targeted population.

To tap BPNS, the dancers were asked to respond to a series of items reflecting on their feelings of autonomy, competence and relatedness in their school "over the past few weeks." The stem "In this dance school I feel..." preceded all need satisfaction items. Autonomy need satisfaction was tapped via three items including "that my choices are based on my true interests and values" (Sheldon et al., 2001). Items were anchored on a Likert scale ranging from *not at all* (1) to *very much* (5). Five items (e.g., "I am pretty skilled at dance") from the Intrinsic Motivation Inventory (McAuley et al., 1989) were employed to tap the dancers' competence need satisfaction. Dancers responded to the items assessing competence on a Likert scale ranging from one (*strongly disagree*) to

seven (*strongly agree*). Satisfaction of the need for relatedness was gauged via five items (e.g., “supported”, “valued”) (Richer & Vallerand, 1998). Relatedness items were gauged on a scale from one (*strongly disagree*) to five (*strongly agree*). All scales used to assess BPNS have demonstrated sound reliability and validity in a recent study involving similarly aged dancers (Quested & Duda, 2010).

The dancers’ degree of burnout was assessed using a version of the 15-item Athlete Burnout Questionnaire (ABQ) (Raedeke & Smith, 2001) modified for the dance population. This scale is comprised of three 5-item subscales. Specifically, the ABQ measures dancers’ perceived emotional and physical exhaustion (e.g., “I feel overly tired from my dance participation”), degree of dance devaluation (“I am not into dance like I used to be”) and reduced sense of dance accomplishment (“I am not achieving much in dance”) on a scale of one (*almost never*) to five (*almost always*). The psychometric properties of the ABQ have been supported in investigations involving athletes (Raedeke & Smith, 2001). In recent studies with dancers (Quested & Duda, 2010), the validity and reliability of the emotional and physical exhaustion subscale was supported.

Data Analysis

Structural equation modeling (SEM) with maximum likelihood estimation was the primary data analysis tool. All models were tested using version 17 of the AMOS software (Arbuckle, 1999). Adopting a two-step approach to analysis (Kline, 2005), we preceded the main analysis by evaluating the factor structure of each scale.

The application of the chi square to assess adequacy of model fit has been criticized on account of the statistic’s sensitivity to sample size (Marsh, Balla, & McDonald, 1988). The Standardized Root Mean Square Residual (SRMR) has been recommended in instances where the sample size is ≤ 250 (Hu & Bentler, 1998). In line

with Hu and Bentler's two-index presentation recommendations, this indicator of absolute fit was accompanied by the Comparative Fit Index (CFI) as a gauge of incremental fit. When the RMSEA was less than .08 and when the CFI was greater than .90, the data were considered to show good fit to the hypothesized models. CFI values > .95 are the target for an excellently fitting model (Hu & Bentler, 1999).

The primary goal of our study was to determine whether changes in perceptions of autonomy support predicted changes in the dancers' need satisfaction, and in turn, burnout, over the course of the school year. To this end, we tested our T3 data in a hypothesized model (see Figure 3.1) with paths also specified between the T3 variables and their corresponding T1 or T2 measure. This approach results in the paths connecting the T3 variables representing a prediction of change over time (Sheldon & Elliot, 1999). As such, the basic needs were modeled as dynamic variables that are susceptible to environmental influence with the propensity to illicit change in well- and ill-being (Sheldon & Elliot, 1999). On account of the number of parameters in the proposed model, mean scores were employed as indicators of the targeted variables. The three basic needs are considered to be interrelated constructs (Ryan & Deci, 2000b). Therefore, replicating the approach of others (Quested & Duda, 2010; Reinboth et al., 2004), we correlated the error terms associated with the indicator variables representing each need at T3, and also took this action with respect to the T2 need error terms.

A further analytical objective was to determine whether the association between changes in autonomy support and burnout were mediated by changes in basic need satisfaction over the time period of the study. Accordingly, the procedural recommendations of Holmbeck (1997) were employed to judge the total mediating effect of the three needs. Specifically, we firstly examined whether autonomy support predicted burnout in a direct effects model (testing only the *c* path). In a mediation model, we next

evaluated the ‘autonomy support – basic needs’ paths (*a*, *d* and *f*) and ‘basic needs – burnout’ paths (*b*, *e* and *g*). Holmbeck advocated mediation to be supported if a combined effects model (testing all *a – f* paths) does not significantly improve the fit compared to that of the mediation model (i.e., χ^2 difference $p > .05$). The degree of mediation is judged by whether the previously significant *c* path in the direct effects model is reduced (partial mediation) or annulled (full mediation) in the combined effects model. This appraisal of total mediating effects was coupled with an assessment of the significance of each mediator’s independent effect (MacKinnon, 2000; MacKinnon et al., 2002). A final aim of the study was to examine whether these inter-relationships were consistent between the three sub-dimensions and the composite measure of burnout. Consequently, these analyses were replicated four times in models predicting reduced accomplishment, emotional and physical exhaustion, dance devaluation, and global burnout.

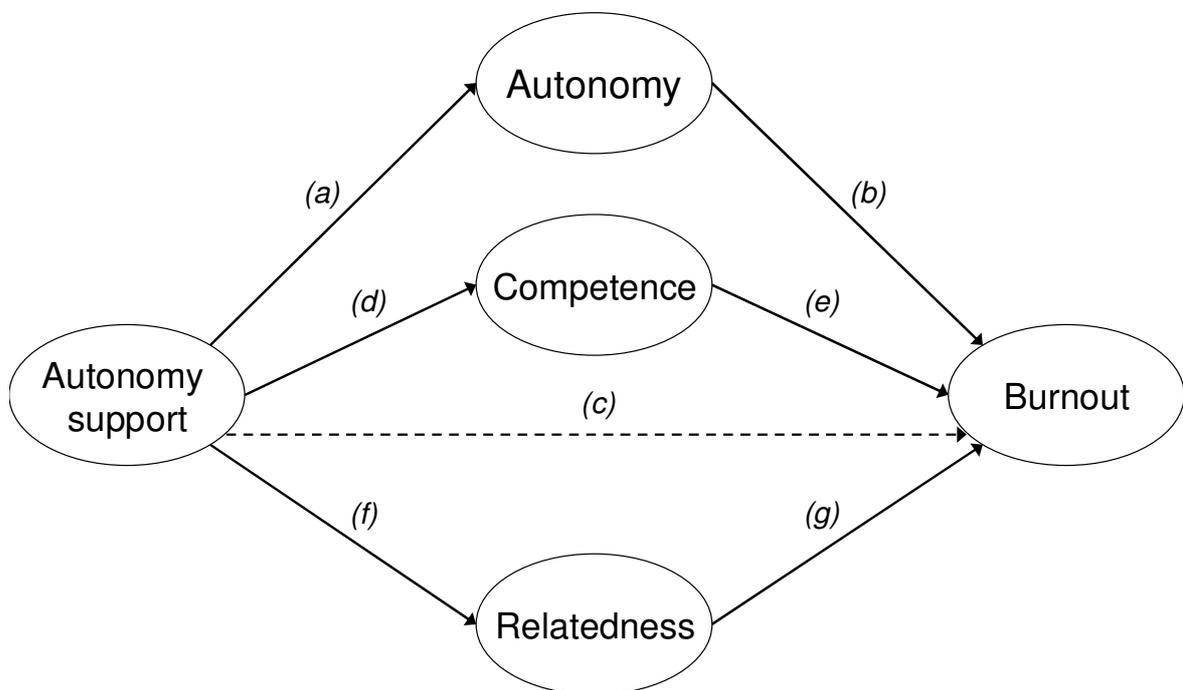


Figure 3.1. Hypothesized structural model of the associations between perceptions of autonomy support, BPNS and burnout.

Results

Mean scores indicated that, at T2, the dancers experienced moderate BPNS and perceived their teachers to offer relatively high autonomy support (see Table 3.1).

Table 3.1

Mean Scores of Study Variables

Variable	T1/T2		T3		<i>F</i> (1, 218)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Autonomy support (1-7)	5.02	.97	4.61	1.24	29.06***
Autonomy (1-5)	3.52	.74	3.33	.81	10.12**
Competence (1-7)	4.51	1.13	4.61	1.11	2.43
Relatedness (1-5)	3.72	.78	3.46	.96	18.83***
Global burnout (1-5)	2.25	.57	2.46	.77	21.07***
Exhaustion (1-5)	2.66	.87	2.86	.99	9.04**
Reduced accomplishment (1-5)	2.32	.73	2.50	.88	10.88**
Dance devaluation (1-5)	1.76	.70	2.01	.94	16.44***

Note. * $p < .05$. ** = $p < .01$. *** = $p < .001$.

The mean for T1 global burnout was under the scale's midpoint. Scrutiny of the ABQ subscale means revealed that the dancers reported low dance devaluation, and emotional and physical exhaustion that was just above the scale midpoint. Repeated Measures Multivariate Analysis of Variance (MANOVA) ($F(1, 218) = 8.24, p < .001, \eta^2 = .21$) indicated that the dancers perceived their dance climates to be less autonomy supportive at T3 than at T2. The dancers' satisfaction of the needs for autonomy and

relatedness also significantly decreased, whereas reported global burnout and the sub-dimensions of burnout increased, over the school year (see Table 3.1). At T2 and T3, autonomy support positively correlated with the three needs. These variables were negatively related to the burnout dimensions when assessed at T1 and T3. The three needs were positively related at both time points; however the associations were stronger (though not significantly) at T3 than at T2 (see Table 3.2).

No significant outliers were identified in the dataset. There was evidence of significant negative skew in the mean scores of competence satisfaction and dance devaluation at both time points. Given that the under estimations associated with negative skew disappear with sample sizes over 200 (Tabachnick & Fidell, 2001), this was not considered problematic. The data showed evidence of significant multivariate nonnormality (Mardia's co-efficient = 22.26). Thus, when assessing the path coefficients in the structural models, we examined parameter estimates derived from multiple re-samples drawn via the bootstrapping approach (Kline, 2005).

Fit indices for the measurement models are available from the first author. Overall, responses to the scales demonstrated acceptable fit to the confirmatory factorial models. The reliability co-efficients of all scales were satisfactory (α range = .69 - .91). While some caution should be exercised when interpreting findings associated with the T2 measure of autonomy need satisfaction ($\alpha = .69$), co-efficients of 0.6 have been deemed acceptable for scales with few items (Hair, Black, Babin, Anderson, & Tatham, 2006).

Table 3.2

Correlations Between Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) T2 Autonomy support															
(2) T2 Autonomy	.40**														
(3) T2 Competence	.18**	.41**													
(4) T2 Relatedness	.63**	.50**	.26**												
(5) T1 Global burnout	-.37**	-.40**	-.35**	-.43**											
(6) T1 Exhaustion	-.31**	-.29**	-.12	-.32**	.72**										
(7) T1 Reduced accomplishment	-.29**	-.35**	-.44**	-.38**	.78**	.27**									
(8) T1 Dance devaluation	-.23**	-.26**	-.25**	-.26**	.75**	.24**	.52**								
(9) T3 Autonomy support	.51**	.25**	.31**	.41**	-.43**	-.28**	-.40**	-.29**							
(10) T3 Autonomy	.35*	.36**	.27**	.31**	-.31**	-.25**	-.25**	-.19**	.55**						
(11) T3 Competence	.15*	.27**	.68**	.14*	-.36**	-.14*	-.41**	-.29**	.45**	.43**					
(12) T3 Relatedness	.39**	.30**	.38**	.48**	-.44**	-.29**	-.37**	-.33**	.77**	.54**	.49**				
(13) T3 Global burnout	-.31**	-.40**	-.44**	-.36**	.54**	.41**	.46**	.35**	-.48**	-.48**	-.58**	-.53**			
(14) T3 Exhaustion	-.28**	-.27**	-.20**	-.29**	.43**	.49**	.27**	.18**	-.28**	-.31**	-.24**	-.31**	.77**		
(15) T3 Reduced accomplishment	-.21**	-.34**	-.48**	-.28**	.44**	.22**	.52**	.26**	-.46**	-.44**	-.67**	-.50**	.83**	.40**	
(16) T3 Dance devaluation	-.28**	-.38**	-.41**	-.32**	.47**	.27**	.37**	.43**	-.46**	-.44**	-.54**	-.51**	.87**	.46**	.69**

Note. * $p < .05$. ** = $p < .01$.

The hypothesized model, specifying a ‘T3 autonomy support – T3 basic needs – T3 global burnout’ sequence (while controlling for the corresponding variables at T1 and T2) demonstrated a poor fit to the data ($\chi^2(29) = 252.10$, CFI = .79, SRMR = .23). The modification indices indicated that the inclusion of paths connecting T1 and T2 variables in a manner theoretically consistent with BNT (i.e., ‘T2 autonomy support – T2 needs – T1 global burnout’) would substantially improve model fit. The wording of the measures and the timeframe of the data collection may help to explicate the recommendations of the modification indices. Although the T2 perceptions of autonomy support and need satisfaction measures were taken after the T1 burnout measures, the T2 assessments tapped the “past few weeks”, a time span that would have included the time of the first burnout assessment. Theoretical predictions and findings of past cross-sectional research (Quested & Duda, 2010; Reinboth et al., 2004) indicate that the inter-relationships presented in Figure 3.1 would be expected between the autonomy support, basic needs and burnout variables in a static as well as dynamic manner. With these theoretical and measurement-related points in mind, it was considered comprehensible that BPNS reported at T2 would be related to the degree of burnout the dancers had been experiencing at the baseline data collection. Drawing from this reasoning and the strong recommendations of the modification indices, paths were added between T2 autonomy support and T2 BPNS, and between T2 BPNS and T1 burnout, in the preceding models. This substantially improved model fit (see Table 3.3). With the inclusion of the aforementioned paths, the structural model centered on predictors of change in global burnout supported our hypotheses with respect to the positive associations between changes in autonomy support and each basic need over the school year. In line with our expectations, changes in autonomy, competence and relatedness satisfaction significantly predicted the changes in global burnout that occurred during this time (see Table 3.3).

Results from the ‘autonomy support – global burnout’ direct effects model indicated that decreases in the dancers’ perceptions of autonomy support significantly predicted 33% of the change in global burnout over the school year. In line with our hypotheses, there was evidence of mediation via changes in the dancers’ reported autonomy, competence, and relatedness satisfaction. Support for Holmbeck’s (1997) first mediation criterion is evidenced in the significant direct path (*c*) between perceptions of autonomy support and global burnout ($\beta = -.31, p < .01$). Significant relationships were evident between autonomy support and each basic need (paths *a*, *d*, and *f*), and between each need and global burnout (paths *b*, *e* and *g*) in the mediation model (see Table 3.3). In line with our hypotheses, the χ^2 difference test indicated that the combined model did not offer a superior representation of the data to the mediation model (χ^2 difference = 3.77, $p = .15$). Moreover, the *c* path reduced to insignificance with the inclusion of the mediators ($\beta_c = -.31, p < .01$; $\beta_{c'} = .01, p > .05$). The indirect effects via autonomy ($\beta_a\beta_b = -.09, p < .05$), competence ($\beta_d\beta_e = -.09, p < .01$) and relatedness ($\beta_f\beta_g = -.10, p < .05$) were statistically significant (MacKinnon, 2000). In sum, these analyses suggested changes in the dancers’ BPNS to be a mechanism linking negative changes in perceptions of teachers’ autonomy support, and increases in global burnout, over the school year.

According to Holmbeck’s principles (1997), there was also evidence of the three needs providing a total mediation effect in the case of each individual facet of burnout. Specifically, the combined effects models did not offer any improvement in fit to the mediation models predicting reduced accomplishment, dance devaluation, and emotional and physical exhaustion. The insignificant *c*’ path in the corresponding combined effects models provided further evidence regarding the mediating role of the basic needs (Holmbeck, 1997). However, the independent mediating role of each basic need was not equal in the models predicting each dimension of burnout. In the case of reduced

accomplishment, only competence emerged as a significant mediator ($\beta_d\beta_e = .13, p < .001$), although the indirect effect via autonomy was nearing significance ($\beta_a\beta_b = -.09, p = .07$). Holmbeck's criteria supported mediation via autonomy and competence in the models predicting changes in dance devaluation. In this case, the indirect effects via autonomy ($\beta_a\beta_b = -0.08, p < .05$) competence ($\beta_d\beta_e = -.09, p < .01$) and relatedness ($\beta_f\beta_g = -0.14, p < .05$) were significant (MacKinnon, 2000). However, changes in satisfaction of the three needs did not significantly predict changes in emotional and physical exhaustion. Therefore, the basic needs could not be considered to play a mediating role in the 'autonomy support – emotional and physical exhaustion' relationship.

Table 3.3
Fit Indices and Standardized Pathways for All Models Tested

Burnout dimension	Fit indices			Autonomy Support – Needs			Needs – Burnout			AS – BO	BO	Model comparison
	X^2 (df)	CFI	SRMR	Auto (a)	Comp (d)	Rel (f)	Auto (b)	Comp (e)	Rel (g)	(c)	R^2	$X^2 \Delta$ (df)
Global burnout												
Direct effects	20.35*** (2)	.91	.08							-.31**	.33**	
Mediation	72.22*** (22)	.95	.09	.49**	.28**	.68**	-.18**	-.32**	-.15*		.46*	
Combined effects	68.45*** (20)	.95	.08	.49**	.28**	.68**	-.18*	-.32**	-.16*	.006	.47**	3.77 (2)
Reduced accomplishment												
Direct effects	22.25*** (2)	.90	.09							-.31**	.30**	
Mediation	65.66*** (22)	.96	.08	.49**	.28**	.68**	-.13 ^a	-.45**	-.13		.50**	
Combined effects	64.82*** (20)	.96	.08	.49**	.28**	.68**	-.13 ^a	-.44**	-.14	.02	.51**	.84 (2)
Dance devaluation												
Direct effects	9.41** (2)	.95	.05							-.38**	.28**	
Mediation	66.62*** (22)	.95	.08	.49**	.28**	.68**	-.16*	-.31**	-.20**		.39**	
Combined effects	65.12*** (20)	.95	.08	.49**	.28**	.68**	-.15*	-.31**	-.17 ^a	-.05	.40**	1.50 (2)
Emotional and physical exhaustion												
Direct effects	6.69* (2)	.97	.05							-.15*	.25**	
Mediation	57.79*** (22)	.96	.08	.49**	.28**	.68**	-.13 ^a	-.08	-.08		.27*	
Combined effects	53.79** (20)	.96	.07	.49**	.28**	.68**	-.14	-.09	-.10	.03	.27*	4.00 (2)

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. ^a $p < .07$. AS = Autonomy Support. BO = Burnout.

Discussion

Past work, grounded in SDT, has supported the hypothesized associations between motivation regulations and burnout (Cresswell & Eklund, 2005a, 2005b; Gould et al., 1996; Lemyre et al., 2007; Raedeke & Smith, 2001). Recent sport research (Cresswell & Eklund, 2007; Hodge et al., 2008) has emphasized the relevance of basic needs (Ryan & Deci, 2000b) to variability in athlete burnout. These (typically cross-sectional) investigations have neglected to consider the role of social-environmental features in the manifestation of this maladaptive syndrome. Centering on the vocational dance milieu, the present study examined whether changes in perceptions of autonomy support predicted dancers' enhancement or depletion in BPNS, and in turn, reported burnout over the 36-week school year. Overall, this investigation supported the predictions of BNT (Ryan & Deci, 2000b) with regard to these presumed social-psychological determinants of changes in dancers' burnout susceptibility.

Autonomy Support and Basic Need Satisfaction

The expected association between perceptions of autonomy supportive atmospheres and BPNS has been supported in studies undertaken with athletes (Adie et al., 2008b; Amorose, 2007) and dancers (Quested & Duda, 2010). Adding to this literature, the present study indicates that this autonomy promotive facet of the social context may also be a central determinant of *change* in dancers' degree of autonomy, competence and relatedness satisfaction. Findings suggest that when instructors increase the extent to which they take the dancers perspective, encourage choice and self-regulation, and temper extrinsic demands and pressures (Black & Deci, 2000), the dancers' BPNS will be enhanced. The results indicate that the converse may also be true; present findings

revealed that the dancers' perceptions of autonomy support, and in turn, BPNS decreased over the school year.

The strength of the path ($\beta = .49$) between the reduction in the dancers' perceptions of their instructors' autonomy support and the corresponding decrease in autonomy satisfaction is unsurprising, given the inherent connection between these variables and the theoretical predictions regarding their association (Deci & Ryan, 2000). Findings suggest that when instructors are autonomy supportive, dancers are more likely to feel as though they are the initiators of their own actions and have a sense of personal autonomy. In the PE context, autonomy support has been found to link strongly with the students' competence satisfaction (Standage et al., 2006). This finding is contrary to results stemming from cross-sectional research undertaken in adult sport (Adie et al., 2008b) and vocational dance settings (Quested & Duda, 2010). In the aforementioned studies, the paths between autonomy support and competence were weak (Adie et al., 2008b) and non-significant (Quested & Duda, 2010). In the present research, perceived autonomy support emerged as a significant predictor of changes in dancers' perceived competence over time. It makes sense that when dance teachers reduce pressures and encourage self-initiated and self-controlled actions, the dancers are more likely to feel efficacious. It is important to keep in mind that the observed path between autonomy support and competence was only moderate ($\beta = .28$). This suggests that other dimensions of the teacher-created social environment (e.g., perceptions of the task- and/or ego-involving features, (Duda & Balaguer, 2007)) may also be influential in terms of dancers' sense of competence. This was certainly the case in a recent cross-sectional investigation examining social-environmental predictors of dancers' BPNS (Quested & Duda, 2010).

In congruence with research by Adie et al, (2008b) and Quested & Duda (2010), changes in perceived autonomy support had the most pronounced relationship with the

dancers' change in relatedness satisfaction. This finding might be attributable to the teachers' conveyance of respect and shared perspective, benchmarks of an autonomy supportive teaching atmosphere (Black & Deci, 2000). In the absence of close family and friends, social agents in school may become the prevailing source of relatedness support for vocational dancers studying away from home (Quested & Duda, 2009e). Overtime, dancers may feel a greater sense of belongingness in their school when they are empowered by teachers that provide choices and empathize with the demands inherent in elite level training. From the present findings it is not possible to delineate which aspects of autonomy support are most pertinent to increased relatedness. Future research is warranted to identify which specific dimensions of autonomy supportive teaching behaviors are most likely to lead dancers to feel a sense of belongingness in their school.

Psycho-Social Predictors of Burnout

Previous studies have indicated that athletes and dancers report signs of ill-being when they perceive their context to be low in autonomy support (Adie et al., 2008b; Amorose, 2007; Quested & Duda, 2010). Findings from all four of the direct path models add credence to this hypothesis. The present study highlights that dancers' burnout risk is enhanced when teachers do not foster and sustain an autonomy supportive learning environment.

It is important to recognize that we did not specifically assess controlling teacher behaviors in this study. The results indicate that dancers' health may even be in jeopardy as a corollary of teachers' *inaction* (i.e., low provision of autonomy support), as opposed to active attempts to thwart autonomy or control behavior. Future investigations examining determinants of burnout could measure the dancers' perceptions of their teachers' controlling behaviors (Assor, Kaplan, Kanat-Maymon, & Roth, 2005), *alongside*

perceptions of provided autonomy support. Such research would clarify whether controlling atmospheres are accountable for, or contribute independently towards, the dancers' experiences of ill-being states.

Aligned with our hypotheses and in accordance with the predictions of BNT (Deci & Ryan, 2000), changes in satisfaction of the three needs mediated the negative relationship between changes in the dancers' perceived autonomy support and global burnout. As revealed in previous cross-sectional research on athletes (Lonsdale et al., 2009), change in competence satisfaction was the most salient predictor of changes in the dancers' global burnout. The results also support the premise that differential psychological processes may account for each burnout dimension (Lemyre, Treasure, & Roberts, 2006; Lonsdale et al., 2009). Of all the models tested, change in the basic needs accounted for the greatest proportion of the explained variance in reduced accomplishment. More specifically, it was changes in competence that were most relevant to changes in this facet of burnout. Supporting and extending previous cross-sectional findings (Lonsdale et al., 2009), the present results suggest that a sense of competence may play a central role in the development or depletion of perceived accomplishment in achievement settings. From the standpoint of SDT, this makes conceptual sense. When a dancer feels competent, he/she is more likely to exhibit adaptive motivational patterns and achievement-related behaviors, increasing the likelihood of perceived goal attainment.

In the present study, changes in satisfaction of all three needs predicted changes in the dancers' reported dance devaluation. However, only autonomy and competence mediated the association between changes in perceptions of autonomy support and this characteristic of the burnout syndrome. In past work in the sport domain, autonomy was found to be the only basic need to predict the athletes' reported sport devaluation

(Lonsdale et al., 2009). The present findings highlight the importance of teachers' attempts to sustain dancers' perceived autonomy *and* competence if the devaluation aspect of feeling burned out is to be forestalled. Our results also indicate that dancers are less likely to undervalue their dance experience when they feel volitional, as well as proficient in relation to their dance engagement.

Overall, the dancers reported higher levels of emotional and physical exhaustion at T3 than at T1. The direct negative path between changes in autonomy support and exhaustion was significant. However, the dancers' increased feelings of fatigue were unrelated to their reported changes in need satisfaction over the preceding months. These results concur with findings of cross-sectional studies, in which BPNS was found to have a weak or insignificant association with the emotional and physical exhaustion of dancers (Quested & Duda, 2010) and athletes (Hodge et al., 2008; Lonsdale et al., 2009). Collectively, these findings challenge the SDT-grounded conceptualization of the needs as 'essential' for optimal functioning and well-being (Deci & Ryan, 2000). However, it may be the case that need thwarting, rather than low need satisfaction per se, would better explain dancers' experiences of ill-being.

In explicating their findings, Lonsdale and colleagues suggested that the physical demands of sport participation may account for the exhaustion dimension of burnout to a greater extent than psychological antecedents (Lonsdale et al., 2009). Indeed, past research has indicated that athlete burnout may be a consequence of physical as well as motivational factors (Lemyre et al., 2004). This explanation assumes that emotional and physical exhaustion are always experienced concurrently; the possibility that exaggerated affective expressions of fatigue may occur in the absence of excessive physical tiredness (or vice versa) is neglected. It has been proposed that basic needs may be more salient predictors of emotional welfare than physical well-being (Quested & Duda, 2010).

However, it is not feasible to test this possibility with data collected via the ABQ. It could be argued that the items assessing emotional and physical exhaustion (“I feel so tired from my dance training that I have trouble finding energy to do other things”, “I feel overly tired from my dance participation”, “I feel “wiped out” (exhausted) from dance”, “I feel physically worn out from dance”) are non-specific with regard to the targeted experience of exhaustion. The wording of these items is more appropriate for gauging physical fatigue, which is not necessarily experienced in conjunction with emotional tiredness. It is possible that, regardless of a dancers’ degree of BPNS, he/she would experience physical exhaustion after intense daily dance training. This is not to say however, that the performer is also emotionally worn out. Thus, a comprehensive examination of the interplay between BPNS, physical fatigue and emotional exhaustion may currently be clouded by limitations in measurement. It is important to note that although direct paths from each need to emotional and physical exhaustion were insignificant, there was still evidence of a total mediating effect via the needs in the ‘autonomy support – exhaustion’ relationship. Therefore, although it was not possible to tease out independent effects, the evidence suggests BPNS to be a relevant mechanism in this association.

The three needs are considered to be inter-related (Ryan & Deci, 2000b) and the observed correlation co-efficients indicate this to be the case (see Table 3.2). Thus, shared variance between the needs may account for the presence of an overall mediating effect in the absence of significant paths between each need and exhaustion. Independent assessments of the emotional and physical facets of fatigue, alongside consideration of seemingly relevant physiological antecedents (e.g., hours and days of training per week, energy expenditure per training session and across sessions) may help to tease out the relevance of particular basic needs to the emotional and physical exhaustion experienced by elite performers.

When assessed at one point in time, relatedness satisfaction has been more strongly associated with indicators of vocational dancers' emotional well- and ill-being (i.e., positive and negative affective states) than the needs for competence or autonomy (Quested & Duda, 2010). In the present investigation, the strength of the negative paths between changes in relatedness and burnout were overshadowed by the impact of changes in competence and/or autonomy. These results are aligned with cross-sectional investigations undertaken with athletes (Hodge et al., 2008; Lonsdale et al., 2009). In SDT, autonomy and competence need satisfaction are considered to predominate because of their integral links with the development of intrinsic motivation (Ryan & Deci, 2002). The salience of autonomy and competence in the physical domain may explain why these needs appear to play a more prominent role in the manifestation of performers' burnout than the need for relatedness. Nevertheless, while other studies have pointed to the limited association between relatedness need satisfaction and indicators of physical welfare (Reinboth & Duda, 2006; Reinboth et al., 2004), links between relatedness and athletes' emotional health have previously been supported (Adie et al., 2008b; Quested & Duda, 2010; Reinboth & Duda, 2006). The inconsistencies in these findings vis-à-vis the 'relatedness – well-/ill-being' association in the physical domain is intriguing, and may be attributable to the targeted well- or ill-being outcomes. Future research, in which need satisfaction as well as need thwarting are assessed alongside multiple markers of physical and emotional health/ill-health, will help to delineate the relationships between relatedness and athletes' and dancers' welfare.

Conclusions and Future Directions

In the context of vocational dance, this longitudinal investigation supports the BNT (Ryan & Deci, 2000b) premise that perceptions of autonomy support and BPNS are

pertinent to the development or prevention of burnout. Findings represent an important extension of recent BNT-grounded cross-sectional investigations concerning athlete burnout (Hodge et al., 2008; Lonsdale et al., 2009), in which the role of the social environment in the burnout process was not examined. In addition and furthering the current literature, results suggest that differential psychological processes may dominate in the development of each of the three facets of the burnout syndrome. Nevertheless, nurturing the basic needs of vocational dancers via autonomy supportive approaches to teaching appears to represent an important step in forestalling this undesirable state.

Studying the antecedents of athlete and dancers' burnout will only be a worthwhile pursuit if research findings and their theoretical underpinnings contribute towards evidence based practice. Dancers may be less at risk of burnout if researchers and practitioners focus upon the practical applications of recent BNT-grounded burnout research. Drawing from the present study, understanding *how* teachers and coaches can create and sustain an autonomy supportive teaching environment may be the next important step in reducing the prevalence of burnout experienced by elite performers.

**Daily Fluctuations in Dancers' Affective States: A Cross-Contextual Test of Basic
Needs Theory**

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Abstract

Grounded in basic needs theory (BNT) (Deci & Ryan, 2000), this study tested the cross-contextual universality of the needs across different learning and performance contexts within vocational dance. Firstly, we examined a) between-person differences in daily perceived autonomy support, basic psychological need satisfaction (BPNS) and positive and negative affect between dancers studying three distinct genres; and b) the potential moderating effect of genre upon the predictive utility of daily perceptions of autonomy support and BPNS as predictors of changes in affective state during dance classes. Secondly, we conducted a within-person analysis of the universality of the BNT sequence across learning/performance contexts that varied in their evaluative potential (class, rehearsal, performances). Fifty-five dancers completed an initial questionnaire and daily diaries tapping the targeted variables. Forty-two dancers also completed diaries before and after rehearsals and performances. Multilevel modeling analyses revealed partial support for the universality hypothesis. There were contextual differences in the salience of each need as a predictor of affective states.

Key words: Autonomy, competence, relatedness, autonomy support, dance

Introduction

From the first days of schooling to the time of retirement, ‘living’ comprises a repeated cycle of daily strivings, usually within a workplace or educational setting. In the context of vocational dance, students train for approximately nine hours per day and for five or six days per week. Despite the potential repetition of any daily routine, fluctuation in the extent to which one feels he/she ‘has a good day’ or perhaps a ‘bad day’ is inevitable.

Grounded in self-determination theory (Deci & Ryan, 1985, 2000), numerous studies have examined the psychological mechanisms predictive of *between-person* variability in subjective well-being (Ryan & Deci, 2001). This work has been undertaken in performance-related contexts such as education (Vansteenkiste, Lens, Soenens, & Luyckx, 2006), sport (Gagne & Blanchard, 2007) and more recently, vocational dance (Quested & Duda, 2010). Less is known regarding the psychological processes that may account for *day-to-day* fluctuations in well-being in any of these settings. Thus, examining the predictors of daily peaks and troughs in well- and ill-being is an important step in delineating the antecedents of sustained and optimized psychological health.

Determinants of Optimal Functioning

Self-determination theory (SDT) (Deci & Ryan, 1985, 2000) has proven to be an applicable framework within which to evaluate the social-environmental influences and ensuing psychological processes that lead some people to generally function, and feel, better than others (Ryan & Deci, 2002). The framework has also been applied to help delineate why one person may be functioning more or less optimally on any one day (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). SDT postulates three basic needs to be the key psychological mechanisms underpinning the ‘environment – well-being’ relationship.

Specifically, the needs for autonomy, competence and relatedness are considered to be essential nutrients for well-being (Ryan, 1995). According to the basic needs mini theory (BNT) (Deci & Ryan, 2000), the need for autonomy is satisfied when one engages in activities that are self-selected, self-regulated and personally endorsed (DeCharms, 1968). Competence need fulfillment infers feeling that one possesses the behavioral capability and efficacy to carry out targeted actions (White, 1959). To feel cared for and a sense of belongingness is reflective of relatedness need satisfaction (Baumeister & Leary, 1995).

Basic psychological need satisfaction (BPNS) is understood to lead to more self-determined motivation regulations and promote desirable emotional, behavioral and affective outcomes (Deci & Ryan, 2000). Ryan and Deci (2002) stated that satisfaction of the three basic needs is universally required for optimal functioning and well-being to ensue, regardless of the culture at hand or setting in question. With respect to the latter, the so called 'universality hypothesis' has never been tested across different learning and performance contexts within the same activity. The present study centered on vocational dance and tested the universality hypothesis in two ways. Firstly, we examined the universality of the basic needs across three different dance forms studied in the vocational dance setting. Secondly, we tested the universality hypothesis with respect to different activities in dance that vary in their evaluative potential.

As a meta-theory of human behavior, SDT recognizes that need fulfillment does not occur automatically; numerous studies have identified variability in the degree of BPNS experienced (Ryan & Deci, 2002). Inequality in BPNS is not attributed to chance. For human beings to realize their potential, function optimally, and be 'well', the social environment must provide conditions that will cultivate BPNS (Deci & Ryan, 2000). When leaders create so called 'autonomy supportive' climates (Black & Deci, 2000; Reeve et al., 1999), they are empathetic and promote volition and choice. Studies undertaken in

sport (Adie et al., 2008b), exercise (Edmunds et al., 2006), PE (Ntoumanis, 2001b) and vocational dance (Quested & Duda, 2010) settings have examined between-person variability in perceptions of autonomy support, BPNS and ensuing health-related consequences. These investigations have typically found perceptions of autonomy support provided by coaches, teachers or instructors to positively relate to BPNS and indices of well-being and optimal functioning among those engaged in these physical activity-related environments. In the present work, we examined whether dance genre moderated the relationship between the dancers' perceptions of autonomy support and changes in affective states experienced in dance classes. Perceptions of autonomy support were also examined in relation to BPNS and associated changes in positive and negative affect in different learning and performance-related contexts encountered in vocational dance.

Day to Day Experiences in Learning and Performance Settings

Within vocational dance, not everyone is primarily training in the same activity; dancers usually specialize in a particular genre. While ballet environments are typically regarded as authoritarian and controlled (Aalten, 2005), the contemporary genre is typified by freedom, personal expressiveness and exploration. In past cross-sectional work, authors have suggested that 'the norm' of low autonomy in dance settings (particularly implicating the ballet environment) may explicate the non-significant relationship between autonomy need satisfaction and dancers' experiences of negative affect (Quested & Duda, 2010). The authors' argument centered on the point that if low autonomy has traditionally been normalized in dance classes, deprived autonomy may be less likely to impact upon the dancers' experiences of negative affective states (at least at one point in time). However, there is no evidence to support these postulations.

The first major purpose of this study was to test the BNT universality hypothesis with respect to the dancers' major genre of study. More specifically, daily levels of perceived autonomy support, BPNS and reported affective states were tapped via a daily diary methodology and compared between dancers partaking in classes in three learning environments that vary in terms of the structure and degree of individual input. As well as targeting ballet and contemporary dance, we also included dancers specializing in Chinese dance. This genre stems from a traditional heritage that has developed over hundreds of years and is typified by ritual and a specific movement vocabulary and technique, with minimal personal expressiveness and novelty. To specifically test the universality hypothesis with respect to dance genre, we examined whether genre interacted with daily perceptions of autonomy support and autonomy, competence and relatedness satisfaction as predictors of changes in the dancers' daily affective states experienced in the learning environment (i.e., ballet, contemporary, or Chinese dance classes, rehearsals and performances).

The role of the social context as an antecedent of BPNS and well-being is a central feature of BNT (Deci & Ryan, 2000). Yet within-person variability in perceptions of the social environment created by significant others has largely been neglected in BNT-based diary studies. Consequently it is not possible to ascertain whether variability in daily provision of autonomy support corresponds systematically with daily fluctuations in BPNS and well-being. In their work with university students, Reis and colleagues identified that the nature of social experiences (e.g., doing fun things, hanging out with others, feeling self-conscious) was associated with the degree of BPNS and well-being afforded each day (Reis et al., 2000). From a pedagogical perspective, it is important to also target specific teacher behaviors that may facilitate versus forestall BPNS each day among those engaged in the learning setting in question. Accordingly, in the present study we examined whether

dancers' *daily* perceptions of autonomy support predict *daily* BPNS and changes in the affective states dancers experienced in contexts that are learning or performance orientated.

Studies using a diary methodology have supported the hypothesis that daily fluctuations in BPNS are relevant to daily changes in well-being (Reis et al., 2000; Sheldon, Ryan, & Reis, 1996). Whilst controlling for the previous days' well-being (to avoid a 'crossover' effect), Reis and colleagues found daily autonomy, competence and relatedness satisfaction to contribute towards students' reported daily vitality and positive affect. Daily autonomy and competence satisfaction negatively related to negative affect.

Correlates of daily BPNS have also been explored in athletic settings. Gagne and colleagues examined the role of BPNS in training as a predictor of young gymnasts' post-training well-being (whilst controlling for pre-practice well-being). BPNS experienced during coaching sessions predicted the gymnasts' post-practice positive affect, vitality and self-esteem. BPNS during practice was unrelated to changes in negative affect from before to after the training (Gagne et al., 2003). It is noteworthy that the observed associations between BPNS and positive and negative affect were masked when the inter-relationships were explored in aggregated data. This highlights the importance of assessing and subsequently analyzing situation-specific BPNS if the psychological mechanisms relevant to daily well-being are to be effectively delineated.

In their work, Gagne and colleagues (2003) also considered gymnasts' perceptions of autonomy support typically provided by coaches. Simple correlations revealed perceptions of autonomy support to positively relate to aggregates of daily autonomy, competence and relatedness. However, this typical feature of the social environment did not moderate the association between daily BPNS and positive and negative affect experienced during training. In the present study we examined whether the dancers'

perceptions of autonomy support usually characterizing the dance school were related to changes in affective states experienced by the dancers during classes.

Dancing in class represents one salient context in the daily educational experiences of a vocational dancer. However, dancers also spend time in the more evaluative settings of rehearsals and performances. SDT hypothesizes that the basic needs are essential for optimal human functioning and well-being regardless of culture or context (Ryan & Deci, 2002). Cross-sectional research, in which dancers are asked to consider the ‘typical’ environment manifested in their dance school, precludes the possibility of delineating between the atmospheres created in each learning and performance environment. To date, the universality hypothesis central to BNT (Ryan & Deci, 2002) has not been tested across learning and more evaluative performance-related situations. Therefore, as the second major aim of this study, we explored whether the inter-relationships between perceptions of autonomy support, BPNS, and changes in affective states, varied across dance contexts that were divergent in their learning and evaluative potential (dance classes, rehearsals, and performances). Mean differences in daily perceptions of autonomy support, BNPS and affective states experienced in the three targeted settings were also examined. As a sub question, we also tested the presumed universal BNT-driven hypothesis (Deci & Ryan, 2000; Ryan & Deci, 2002) that the three needs mediate the ‘autonomy support – well-being’ relationship at the daily level in the three targeted settings. In past cross-sectional research in sport and vocational dance, respectively, there has been only partial support for this hypothesis (e.g., Adie et al., 2008b; Quested & Duda, 2010).

The majority of studies applying the BNT framework in physical activity contexts have focused on perceptions of ‘general’ autonomy support and BPNS in the context in question. For example, in vocational dance, researchers have asked the dancers to consider what it is ‘usually’ like in school, over the past few weeks (Quested & Duda, 2010). It

would be naïve to assume that those with relatively high or low perceptions of autonomy support and BPNS in school are immune to day-to-day fluctuations in well-being. Past work has pointed to the importance of considering person- *and* state-level determinants of fluctuations in daily well-being (Reis et al., 2000). In the present study we examined whether the degree of autonomy support and BPNS the dancers *usually* experienced in their school (termed “typical level” throughout this paper) contributed towards changes in the dancers’ daily experiences of affective states in each class (or rehearsal or performance), over and above their experiences of autonomy support and BPNS in each class (or rehearsal or performance).

Study Objectives and Hypotheses

In sum, the main aim of this study was to test the universality hypothesis in two specific ways. Firstly, we examined differences in daily perceptions of autonomy support, BPNS and positive and negative affect between dancers studying three distinct genres, namely, ballet, contemporary and Chinese. We also determined whether genre moderated the relationships between the dancers’ daily perceptions of autonomy support and reported BPNS, and changes in affective states in classes, rehearsals and performances. Secondly, we tested the universality of the BNT sequence, as well as the assumed mediating role of BPNS in the ‘daily perceptions of autonomy support – daily changes in well-/ill-being’ association, in class, rehearsal and performance contexts. Consideration of the relative contribution of autonomy support and BPNS in each class, rehearsal and performance, and the typical levels of autonomy support and BPNS encountered in school, to dancers’ daily changes in affective states in the aforementioned contexts, was also a focus of our analysis. In this regard, interactions between daily and typical level variables were examined as predictors of changes in the dancers’ affective states during the events in question.

We hypothesized that dancers engaged in ballet and Chinese dance classes would report lower perceptions of autonomy support and BPNS after classes than their contemporary counterparts. Perceptions of autonomy support (measured after classes, rehearsals and performances) were hypothesized to positively predict post class ratings of autonomy, competence and relatedness, across the different activities. Changes in positive affect and negative affect during class were expected to be related to perceptions of autonomy support and need satisfaction (positively and negatively, respectively). Drawing from the findings of past work in the dance domain (Quested & Duda, 2010), we expected relatedness to be the most salient need in all three settings. In line with BNT (Deci & Ryan, 2000), the three needs were anticipated to mediate the association between daily perceptions of autonomy support and changes in the dancers' affective states. We hypothesized that these relationships would be consistent across rehearsal and performance environments.

Finally, we hypothesized that perceptions of the typical levels of autonomy support offered and BPNS experienced in school would be positively associated with changes in positive affect and negatively associated with changes in negative affect during the targeted events. However, we expected state level perceptions of autonomy support and BPNS to explain the most variance in changes in the dancers' daily affective states. With regard to the interactions, we hypothesized that no significant moderating effects would be found.

Methods

Participants

Fifty five dancers (9 male, 41 female, 5 gender unspecified, $M_{\text{age}} = 20.58$ years, $SD = 2.59$) were recruited from an elite dance conservatoire in Hong Kong. Dancers were enrolled on fulltime vocational dance programmes. Thirty eight percent of the dancers were specializing in ballet, 43.1% in contemporary, and 13.8% studied Chinese dance as their primary genre. On average, the dancers had been at the school for 2.29 years ($SD = 1.15$) and had been dancing since they were 9.30 years old ($SD = 5.44$).

Procedure

This study was approved by the departmental ethical review board at a large UK University. With full support of the dance school personnel, the primary researcher met with the students and explained the purposes of the study. The dancers were informed that participation was voluntary, that their anonymity would be retained throughout and that they were free to withdraw from the study at any point. Dancers who wished to participate completed and returned consent forms. At this point in time, the dancers completed the initial questionnaires (person-level measures) in a dance studio and under the supervision of the primary researcher.

The dancers collected diary booklets from the primary researcher on a weekly basis. Each booklet contained sufficient sections for the dancers to complete diary entries immediately before and after every daily technique class undertaken in their major genre for a period of four consecutive weeks. At the end of each week, dancers placed the completed diaries in a secure 'drop box'. The number of class diaries per participant ranged between five and twenty one. The median number of completed entries was fifteen. Altogether, 792 class diary entries were completed. The ratios of participants to days to

variables were favorable when compared with other diary-style studies (Gagne et al., 2003).

Of the main sample, forty-two dancers (8 male, 31 female, 3 gender unspecified $M_{\text{age}} = 21.23$ years, $SD = 2.47$) also completed diary entries before and after daily rehearsals during the first two weeks of the study. The number of rehearsal diaries completed per person ranged between five and ten (median = 5), resulting in a total of 380 rehearsal entries. These dancers also completed diary entries before and after four group performances at the end of the second week. Dancers performed in a large theatre in front of a live audience.

Person-Level Measures

All written materials were translated from English into Chinese by a researcher in the field whose first language is Chinese. The Chinese versions were back translated into English by a second academic whose first language is Chinese. The primary investigator evaluated the accuracy of the back translation. Any discrepancies between the two versions were discussed with the back translator and a solution was agreed upon. Dancers had the option of using English or Chinese versions of the study materials. The initial multi-section questionnaire was completed one week prior to the start of the diary data collection. Dancers supplied some personal information including their age, gender, how many years they had been dancing and indicated their major dance genre of study. In reference to their prevailing experiences in their school over the past few weeks, the dancers completed the following measures:

Autonomy support. Seven items (e.g., “My teachers encourage me to ask questions”) adapted from the Health Care Climate Questionnaire (Williams et al., 1996) measured the dancers’ perceptions of the degree of autonomy support provided in their

vocational dance school. Dancers were asked to respond to the items thinking about the typical environment manifested in their school over the past few weeks. Items followed the stem “In this dance school...” and were gauged on a scale from one (*strongly disagree*) to seven (*strongly agree*). The modified 7-item scale has demonstrated acceptable factorial validity and reliability in past research involving vocational dance students (Quested & Duda, 2010). Internal reliability in the present data set was acceptable ($a = .91$).

Basic need satisfaction. The dancers were asked to think about how they felt when participating in dance at their school “over the past few weeks” when responding to the three BPNS subscales. Six items (e.g., “I feel free to express my ideas and opinions”) gauged on a scale of one (*not at all true*) to seven (*very true*) tapped satisfaction of the need for autonomy (Deci et al., 2001). The validity and reliability of the autonomy need satisfaction measure has been supported in past research with athletes (Reinboth & Duda, 2006). The 5-item acceptance subscale from the Need for Relatedness Scale (Richer & Vallerand, 1998) was used to tap relatedness need satisfaction. A Likert scale ranging from one (*strongly disagree*) to five (*strongly agree*) accompanied the items (e.g., “understood”). The perceived competence subscale from the Intrinsic Motivation Inventory (McAuley et al., 1989) assessed the dancers’ perceived competence. Dancers responded to the five items (e.g., “I am satisfied with my dancing”) on a scale of one (*strongly disagree*) to seven (*strongly agree*). The reliability and validity of the scales tapping competence and relatedness need satisfaction have been demonstrated in recent studies involving British vocational dancers (Quested & Duda, 2010). The three basic need subscales demonstrated good internal reliability in the present study (Autonomy: $a = .85$, Competence $a = .84$, Relatedness $a = .89$).

Affective states. The brief measure of positive and negative affect (PANAS) (Watson et al., 1988) was employed to tap the dancers positive and negative affective

states experienced “over the past few weeks”. The twenty items tapping positive affect (e.g., “enthusiastic”) and negative affect (e.g., “afraid”) followed the stem “I have generally felt...”. The validity and reliability of the PANAS has been validated in previous studies in the dance domain (Quested & Duda, 2009b, 2010). The reliability estimates were acceptable for the positive ($\alpha = .84$) and negative affect subscales ($\alpha = .89$).

Diary Measures

Diaries were made up of selected items from the initial questionnaire to measure autonomy support, autonomy, competence and relatedness satisfaction and positive and negative affect. Before each class, rehearsal and performance, dancers responded to ten items tapping their affective states “at this moment in time/right now”, on a scale one (*not at all*) to five (*extremely*) scale. The ten items followed the stem “I feel...”. The factorial validity of this shortened version of the PANAS has previously been supported (MacKinnon et al., 1999). After the event in question, the dancers addressed the same items tapping their affective states at that point in time. The dancers were also asked to respond to a series of items thinking about how they felt in the event they had just attended. This section of the diary included two items randomly selected from each of the initial measures tapping autonomy support, and autonomy, competence and relatedness satisfaction. For simplicity and parity, all items were gauged on a scale of one (*strongly disagree*) to seven (*strongly agree*). In the class diaries, autonomy support and BPNS items followed the stem “in this class”. When completing the autonomy support and BPNS rehearsal-focused items, the dancers were asked to think specifically about how they felt in the rehearsal they had just attended. Autonomy support and BPNS items were preceded with the stem, “In this rehearsal..”. When tapping these variables in the performance context, dancers were asked to think about how they had been feeling when they went into

the performance. The items were preceded with the stem, “going into this performance...”. Where necessary, minor tweaks were made to item content to relate specifically to the rehearsal or performance situation.

Data Analysis

Multilevel modeling (MLM) with version 2.14 of the MLwiN software (Rasbash, Charlton, Browne, Healy, & Cameron, 2009) was employed as the primary analysis tool. MLM is suitable when data are hierarchically structured, such as when events (e.g., classes; level one) are nested within persons; level two (Snijders & Bosker, 1999). The level one model captures the extent to which each dancer’s perceptions of autonomy support, basic need satisfaction and affective states fluctuate over time. In the first step of each analysis, the three basic needs and perceptions of autonomy support were modeled (in separate models), as predictors of post-event positive and negative affect. Individual difference factors that may account for event-to-event fluctuations were examined via the level two model. The level two predictors (‘typical’ level perceptions of autonomy support and autonomy, competence and relatedness satisfaction in school) were added to the model in the second step of each analysis. Also in step two, cross-level interactions (Reis et al., 2000) between typical level and daily measures of autonomy support, autonomy, competence and relatedness satisfaction were simultaneously added to the model. Significant interactions between typical and daily measures were probed following the recommendations of Aiken and West (1991). The simple slopes for high (+ 1SD) and low (- 1SD) levels of the moderators were plotted and the significance of the simple slopes was tested (Preacher, Curran, & Bauer, 2006). Person level variables were centered on the sample means and daily measures were centered on each individual’s mean for the variable in question (Singer & Willet, 2003). Mediation was examined via a set of multilevel

models following the recommendations of Krull and MacKinnon (1999, 2001). The mediation analysis determined the total mediating effect of each need in the ‘daily perceived autonomy support – changes in positive/negative affect’ relationship, as well as the magnitude and significance of the indirect effects (Krull & MacKinnon, 1999, 2001).

Results

Preliminary Analyses

Prior to the main analysis, class diary data were reduced to aggregate scores by averaging the daily data for each variable. Table 4.1 presents descriptive statistics and correlations between the typical level and aggregated daily class measures (descriptive statistics and correlation matrices for the rehearsal and performance datasets are available from the first author on request). Mean scores of the typical level variables indicated that the dancers’ usually perceived their instructors to provide moderately high autonomy support. Autonomy, competence and relatedness need satisfaction were above the scales’ midpoints. The dancers’ typically experienced positive affective states more than negative emotions. The direction of the correlations between variables measured at the typical level, as well as at the daily level, conformed with BNT (Deci & Ryan, 2000). Preliminary MLM analysis revealed post-class positive affect ($B = -0.49, p < .05$) and competence ($B = -0.79, p < .05$) were significantly lower for females. Therefore, we controlled for gender in all models.

Testing BNT in the Context of Different Dance Genres

A series of multilevel models were tested to examine whether there were significant differences in the dancers’ daily perceptions of autonomy support, need satisfaction and positive and negative affective states as a function of the main genre in

Table 4.1

Mean Scores and Standard Deviations for, and Correlations Between, Typical Level and Day Level Class Variables

Variable	<i>M</i> (<i>SD</i>)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
General level														
(1) Autonomy support	4.65 (1.24)													
(2) Autonomy	4.10 (1.09)	.74**												
(3) Competence	4.46 (.95)	.39**	.50**											
(4) Relatedness	3.32 (.85)	.75**	.67**	.40**										
(5) Positive affect	3.18 (.62)	.35*	.25	.46**	.33*									
(6) Negative affect	2.53 (.75)	-.55**	-.37**	-.29*	-.42**	-.23								
Daily (pre)														
(7) Positive affect	2.59 (.67)	.16	.22	.09	.19	.39**	.18							
(8) Negative affect	1.65 (.57)	-.15	-.16	-.19	-.07	-.05	.35*	.21						
Daily (post)														
(9) Autonomy support	4.49 (1.01)	.44**	.44**	.36*	.38**	.41**	-.39**	.47**	-.37**					
(10) Autonomy	3.92 (1.24)	.25	.22	.27	.21	.27	-.17	.41**	-.20	.80**				
(11) Competence	4.26 (.98)	.22	.33*	.63**	.21	.38**	-.22	.24	-.40**	.61**	.62**			
(12) Relatedness	4.45 (1.03)	.31*	.30*	.45**	.26	.47**	-.45**	.36**	-.43**	.85**	.70**	.71**		
(13) Positive affect	2.71 (.64)	.19	.25	.18	.20	.45**	.05	.91**	.16	.57**	.58**	.37**	.49**	
(14) Negative affect	1.67 (.61)	-.19	-.23	-.27	-.10	-.08	.37**	.17	.96**	-.40**	-.22	-.47**	-.49**	.13

Note. All responses were provided on a 1-7 scale, with the exception of the initial assessments of relatedness, positive and negative affect, and the diary measures of positive and negative affect which were measured on a 1-5 Likert scale.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$.

which the dancers' trained. In each model, the magnitude of the beta associated with each predictor was statistically tested against the reference category via contrast coding.

There were genre differences in perceptions of autonomy support (ballet = 0, contemporary = 1 ($B = -0.18, p = .53$), Chinese = 2 ($B = -0.86, p = .04$)). Specifically, those specializing in Chinese dance perceived their classes to be lower in autonomy support than their ballet and contemporary peers. Chinese dancers also reported lower autonomy (ballet = 0, contemporary = 1, ($B = 0.43, p = .23$), Chinese = 2 ($B = -1.05, p = .04$)), competence (ballet = 0, contemporary = 1, ($B = -0.43, p = .13$), Chinese = 2 ($B = -0.82, p = .03$) and relatedness (ballet = 0, contemporary = 1, ($B = -0.28, p = .35$), Chinese = 2 ($B = -0.88, p = .03$)) need satisfaction in dance classes. Dance genre differentially predicted changes in positive affect in class (controlling for pre-class positive affect; ballet = 0, contemporary = 1 ($B = 0.47, p < .001$), Chinese = 2 ($B = -0.11, p = .43$)). Genre also significantly predicted changes in negative affect (ballet = 0, contemporary = 1 ($B = 0.69, p < .001$), Chinese = 2 ($B = 0.10, p = .65$)). These analyses revealed that contemporary dancers reported higher changes in positive and negative affect than the ballet and Chinese dancers.

To test the universality hypothesis, the potential moderating effect of genre was examined with respect to perceived autonomy support and autonomy, competence and relatedness satisfaction as predictors of changes in the dancers' affective states during dance classes, rehearsals and performances. A total of twenty four interactions were tested. The only interaction term to emerge as significant was daily autonomy need satisfaction x contemporary dance, as a predictor of changes in positive affect during class ($B = 0.14, p = .01$). An examination of the simple slopes revealed that, for ballet ($B = -0.04, p = .42$) and Chinese ($B = 0.06, p = .39$) dancers, changes in positive affect were not influenced by the

degree of autonomy need satisfaction in class. Contemporary dancers ($B = 0.10, p < .01$) experienced higher positive affect when autonomy need satisfaction in class was high.

Testing BNT in the Context of Class, Rehearsal and Performance Environments

Repeated measures multivariate analysis of variance (controlling for gender and genre) was employed to examine whether there were within-subject mean differences in the dancers' perceptions of autonomy support, BPNS and changes in affective states across the three contexts. For the purposes of this analysis, only the class data collected during the first two weeks of the study (i.e., when the dancers were also rehearsing and performing) were included in the analysis. There was evidence of a main effect for context ($F(2, 36) = 6.74, p < .01, \eta^2 = .85$).

Table 4.2

Mean Scores and Standard Deviations for Mean Day Level Variables Measured Before and After Classes, Rehearsals and Performances

	Class	Rehearsal	Performance	$F(df)$
Pre event				
Positive affect	2.56 (.69)	2.70 (.68)	3.20 ^a (.71)	2.21 (1.55, 36)
Negative affect	1.69 ^b (.52)	1.84 (.56)	1.90 (.64)	0.06 (2, 36)
Post event				
Autonomy support	4.37 (.98)	4.49 (1.08)	4.91 ^a (1.39)	3.26 (1.70, 36)
Autonomy	3.87 (1.28)	4.06 (1.30)	4.64 ^a (1.44)	2.21 (2, 36)
Competence	4.18 (1.07)	4.29 (1.12)	4.87 ^a (1.15)	1.30 (2, 36)
Relatedness	4.31 (1.05)	4.44 (1.13)	5.06 ^a (1.29)	1.25 (2, 36)
Positive affect	2.69 (.66)	2.69 (.69)	3.15 ^a (.70)	4.69 (2, 36)
Negative affect	1.66 (.55)	1.81 ^b (.64)	1.74 (.71)	0.51 (2, 36)

Note. Only the class data collected during the same two week period in which the dancers undertook the rehearsals and performances were utilized in these analyses.

^a = performance was significant different to classes and rehearsals. ^b = rehearsal was significantly different to classes and performances.

Typically, the dancers reported significantly lower negative affect before classes than before rehearsals and performances. Pre-event positive affect was highest before performances. Perceptions of autonomy support, autonomy, competence and relatedness satisfaction and positive affect were higher after performance than after classes and rehearsals. Negative affective states after rehearsals were significantly higher than after classes or performances. Mean scores are presented in Table 4.2.

MLM techniques examined the interrelationships specified in BNT (Deci & Ryan, 2000). Gender and genre were included as fixed predictors in a baseline model upon which all subsequent models were built. In the first step of each analysis concerning changes in positive or negative affect, the pre-event measure of the corresponding affect was included as a predictor in the equation. This effectively controls for any ‘carryover’ effect from the beginning to the end of the event. Models were built in two stages. In step one, the targeted daily variables were modeled as random between-person (where the between-person variance was found to be non-significant, they were entered as fixed) predictors of change in positive or negative affect during the event in question. In step two, the typical level measures of the targeted variable(s), and the product terms of daily and typical (e.g., daily autonomy support x typical autonomy support) were simultaneously added to the equation as fixed level two predictors.

Class. In step one, the dancers’ perceptions of autonomy support during class positively predicted changes in positive affect during class. In step two, typical perceptions of autonomy support and the typical x daily autonomy support interaction were significant determinants of changes in positive affect (see Table 4.3). In this latter equation, the contribution of autonomy support measured at the daily level remained significant. When added to the baseline model, these predictors explained 21% of the variance in the dancers’ changes in positive affect during classes, which is an indicator of effect size (Snijders &

Bosker, 1999). These results indicate that perceptions of the prevailing atmosphere, as well as the nature of the climate in each class, are relevant to dancers' changes in positive affective states during each class. The significant product term represents a synergistic effect. This suggests that dancers experience highest positive affect after class when typical *and* class-specific perceptions of autonomy support are high. The simple slopes for high and low typical autonomy support were significant (high: $B = 0.36, p < .001$, low: $B = 0.48, p < .001$).

These analyses were repeated predicting post-class negative affect. In step one, dancers' perceptions of autonomy support in class negatively predicted changes in negative affect. When added to the equation in step two, typical perceptions of autonomy support, as well as the typical x daily autonomy support product term, did not significantly relate to changes in negative affect. Three percent of the variance in changes in negative affect was explained by these predictors.

To determine whether BPNS experienced during class related to changes in positive affect, a model was specified with pre-class positive affect, and post-class autonomy, competence and relatedness as fixed predictors at the person-level. Results revealed that competence and relatedness satisfaction during classes positively predicted changes in positive affect during class. Next, typical level autonomy, competence and relatedness satisfaction and three product terms between the corresponding daily and typical measures of each need were added to the equation. Post-class autonomy, competence and relatedness significantly predicted positive affect in this equation, but typical level BPNS did not. Results revealed the interaction between daily and typical level autonomy need satisfaction to significantly predict changes in positive affect.

Table 4.3

Predicting Dancers' Positive and Negative Affect From Typical-level and Daily Measures of Perceptions of Autonomy Support and BPNS

	Class		Rehearsal		Performance	
	Positive affect	Negative affect	Positive Affect	Negative Affect	Positive affect	Negative Affect
Autonomy Support						
Step one						
Daily autonomy support	0.17***	-0.08**	0.15**	-0.03	0.04	-0.07
Step two						
Daily autonomy support	0.42***	-0.20	0.21	-0.03	0.05	-0.05
Typical autonomy support	0.25***	-0.01	0.26**	-0.13	0.22	-0.02
Typical x daily autonomy support	-0.05*	0.03	-0.01	-0.02	-0.003	-0.06
Basic psychological needs						
Step one						
Daily autonomy	0.05	-0.05*	0.10*	0.003	0.15*	-0.04
Daily competence	0.11***	-0.07*	0.08	-0.12*	0.27*	-0.16*
Daily relatedness	0.17***	-0.06*	0.09*	-0.04	-0.02	0.08
Step two						
Daily autonomy	0.05*	-0.05*	0.10*	0.01	0.10	-0.09
Typical autonomy	0.13	-0.11	0.10	-0.15	0.15	-0.11
Typical x daily autonomy	-0.09***	0.03	-0.07	-0.03	0.02	0.14**
Daily competence	0.12**	-0.07*	0.06	-0.12**	0.25**	-0.17**
Typical competence	0.04	-0.13	-0.14	-0.19	-0.22	-0.12
Typical x daily competence	-0.001	0.01	0.06	0.003	0.12	0.05
Daily relatedness	0.17***	-0.06*	0.10*	-0.04	-0.08	0.10
Typical relatedness	0.16	0.18	0.34*	0.18	0.11	0.26
Typical x daily relatedness	0.02	-0.019	0.06	-0.01	-0.07	-0.22***

Note. * = $p < .05$. ** = $p < .01$. *** = $p < .001$.

Eighteen percent of the variance in changes in positive affect was explained by the predictors in this model. An examination of the interaction plot revealed that when typical autonomy need satisfaction was low, autonomy need satisfaction during classes predicted increased positive affect ($B = 0.15, p < .001$). On the contrary, when typical level autonomy need satisfaction was high, changes in positive affect were largely unaffected ($B = -0.04, p = .20$) by whether daily autonomy need satisfaction in class was high or low.

Next, the three needs were modeled as fixed predictors of changes in negative affect. Analyses revealed that competence, relatedness, and autonomy satisfaction during class negatively predicted changes in negative affect during class. In step two, typical level autonomy, competence and relatedness satisfaction and the three product terms between the corresponding daily and typical level measures of each need were specified as predictors of post-class negative affect. Post-class autonomy, competence and relatedness significantly predicted negative affect, but typical BPNS and the interaction terms did not ($ps < .05$). Seven percent of the variance in changes in negative affect was explained in the equation specified in step two.

Rehearsal. In step one, daily perceptions of autonomy support positively predicted changes in positive affect during rehearsals. When added to the model in step two, typical perceptions of autonomy support positively predicted the changes in the dancers' positive affect from beginning to the end of the rehearsal. The typical x daily autonomy support interaction did not significantly predict the observed changes in positive affect when added in this second step. Twenty two percent of the variance in changes in positive affect was explained by the predictors in this model. Changes in negative affect during rehearsals were not significantly predicted by perceptions of autonomy support during the rehearsal. When added in step two, typical perceptions of autonomy support, as well as the typical x state perceived autonomy support interaction were not significant predictors of negative

affect. Eight percent of the variance in changes in negative affect was explained in this model.

Next, the basic needs were modeled as predictors of changes in positive affect during rehearsals. In step one, post-rehearsal autonomy and relatedness, but not competence satisfaction significantly predicted changes in positive affect during rehearsals. Twenty three percent of the variance in changes in positive affect was explained in a model with typical and daily autonomy, competence and relatedness, as well as the typical x daily interaction terms as predictors. In this model, typical relatedness satisfaction, as well as daily autonomy and relatedness significantly predicted changes in positive affect during rehearsals. Changes in negative affect during rehearsals were significantly predicted by competence, but not by daily autonomy or relatedness need satisfaction. When the typical level needs and daily x typical interaction terms were added to the model in step two, competence need satisfaction remained the only significant predictor. The predictors explained 15% of the variance in change in negative affect during rehearsals.

Performance. A model was specified with changes in positive affect during performances predicted by daily autonomy support. Pre-performance positive affect was specified as a fixed predictor. Daily perceptions of autonomy support did not significantly predict changes in positive affect during performance. Typical levels of autonomy support and the daily x typical autonomy support interaction were added to the model in step two, but these variables did not emerge as significant predictors of performance-related changes in positive affect. Fifteen percent of the variance in changes in positive affect during performance was explained by the predictors. These models were run with post-performance negative affect as the dependent variable. Pre-performance negative affect was entered as a fixed predictor. Changes in negative affect during performances were not

significantly predicted by daily perceptions of autonomy support (step one) or by typical perceptions of autonomy support, or the daily x typical interaction (added at step two). This model explained less than .1% of the variance.

Next, the basic needs were examined as predictors of changes in positive affect during performances. In step one, daily autonomy and competence need satisfaction significantly predicted the dancers' changes in positive affect during the shows. When typical levels of need satisfaction and the daily BPNS x typical level BPNS product terms were added in step two the model failed to converge. The model was re-tested with all predictors fixed at the between-person level. In this model, daily competence was the only significant predictor of changes in positive affect during the performance. As all predictors were fixed at the between-person level, it was not possible to calculate variance explained.

Daily autonomy, competence and relatedness were modeled as fixed predictors of change in negative affect during performances. Only competence significantly predicted changes in negative affect in performances. When typical need satisfaction and the typical x daily interactions were added in step two, interactions between the daily and typical levels of autonomy and relatedness significantly predicted changes in negative affect during performance, and daily competence remained a significant predictor. Seven percent of the variance was explained in this model. Inspection of the interaction plots (Aiken & West, 1991) revealed that when general autonomy need satisfaction was low, increases in situational levels of autonomy need satisfaction were related to decreases in negative affect during performances ($B = -0.18, p < .01$). However, when typical autonomy need satisfaction was high, increases in situational autonomy need satisfaction were not related to changes in negative affect during the performance ($B = -0.002, p = .97$). With regard to relatedness, an inspection of the interaction plots revealed that when typical relatedness need satisfaction was high, increases in situational relatedness satisfaction were not related

to increases in negative affect ($B = -0.10, p = .15$). However, when typical relatedness need satisfaction was low, increases in daily relatedness need satisfaction were significantly related to increases in negative affect during performances ($B = 0.30, p < .001$).

Mediation

The recommendations of MacKinnon et al. (1999, 2001) for MLM were followed to test for significant mediation and indirect effects (see Krull & MacKinnon, (1999, 2001) for details of the approach taken to test mediation). A series of models indicated that daily autonomy support in class significantly predicted daily autonomy ($B = 0.50, p < .001$), competence ($B = 0.41, p < .001$) and relatedness ($B = 0.61, p < .001$). Autonomy ($z = -2.31, p = .02$), competence ($z = -2.88, p < .01$) and relatedness ($z = -3.04, p < .01$) significantly mediated the relationship between daily perceptions of autonomy support and changes in negative affect in classes. In the case of positive affect, there was evidence of significant mediation via relatedness ($z = 5.33, p < .001$) and competence ($z = 3.77, p < .001$). Indirect effects are presented in Table 4.4.

In rehearsal settings, daily perceptions of autonomy support significantly predicted daily autonomy ($B = 0.28, p < .01$), competence ($B = 0.39, p < .001$) and relatedness ($B = 0.55, p < .001$). Competence ($z = 2.36, p = .02$) significantly mediated the ‘autonomy support – negative affect’ relationship. There was no support for mediation in the case of positive affect, however the indirect effect via relatedness was significant (see Table 4.4).

In the performance setting, daily autonomy ($B = 0.26, p = .046$), competence ($B = 0.32, p < .001$) and relatedness ($B = 0.29, p = .01$) were significantly predicted by perceived autonomy support reported after the performance. As perceptions of autonomy support were unrelated to changes in affective states during performance, there was no premise to examine mediating effects.

Table 4.4

Indirect Effects Via the Daily Basic Needs in the 'Daily Autonomy Support – Daily Affective States' Relationships

	Indirect effects		
	Class	Rehearsal	Performance
Positive Affect			
Autonomy	0.02	0.03	0.04
Competence	0.05***	0.03	0.08*
Relatedness	0.11***	0.05*	0.01
Negative Affect			
Autonomy	-0.02*	<.001	-0.01
Competence	-0.03*	-0.05*	-0.04*
Relatedness	-0.04**	-0.02	0.02

Note. * = $p < .05$. ** = $p < .01$. *** = $p < .001$.

Discussion

This BNT-based (Deci & Ryan, 2000; Ryan, 1995) diary study tested the cross-contextual universality of the basic needs (Ryan & Deci, 2002) across different dance genres, as well as in dance classes, rehearsals and performances. We also tested at the within-person level, the 'perceived autonomy support – BPNS – affective states' sequence and the hypothesized meditational role of the three psychological needs in the three dance contexts that varied in their evaluative potential. Collectively, the results provide partial support for the universality hypothesis within the larger domain of vocational dance.

Testing the Universality of BNT Across Dance Genres

The first over-riding aim of this study was to test the universality of the three needs across three dance genres. Firstly we explored mean differences in the targeted variables between dancers training in genres known to be typically more controlled and structured

(ballet and Chinese) and those training in a genre typified by freedom and self-expressiveness (contemporary). Results revealed Chinese dancers to perceive their classes as significantly lower in perceived autonomy support than their peers training in contemporary and ballet classes. Despite anecdotal reports to the contrary, the results indicate that the social environment in ballet and contemporary dance classes may be equally autonomy supportive. Parallel to what was observed in terms of their ratings of autonomy support provision, findings suggest that Chinese dancers experience lower autonomy, competence and relatedness need satisfaction in classes than fellow students specializing in ballet or contemporary dance (between whom there were no significant differences in BPNS).

Taken in their totality, findings indicate that the nature of the dance genre may play a role in the opportunities for BPNS afforded in the class. As these conclusions are based on between-person analyses only, findings should be cautiously interpreted. Future research might examine within-person variability in perceptions of autonomy support, basic need satisfaction and affective states across classes in these different genres. This would help to clarify whether the observed differences are a function of individual differences or features of the genre. Objective assessments of the teaching climate alongside measures of dancers' perceptions of other dimensions of the social environment (e.g., controlling teacher behaviors) may help to explain why Chinese dancers may be less likely to perceive their classes as autonomy supportive and experience lower BPNS than their peers.

A major purpose of the genre-based analysis was to explore the universality hypothesis by examining the moderating effect of genre in the 'autonomy support – changes in affective states' and 'BPNS – changes in affective states' relationships. This was addressed in models testing these theoretical sequences in class, rehearsal and

performance contexts. Despite the considerable number of interactions tested (twenty four), genre was not found to be a significant moderator in the aforementioned relationships, except in one case. Overall, these associations were not influenced by which dance form was the focus of the class and therefore the universality hypothesis with respect to the basic needs was supported.

The significant interaction between autonomy and genre emerged as a significant predictor of changes in positive affect in class. In what are typically perceived as more authoritarian and controlling ballet and Chinese dance contexts, changes in the dancers' positive affective states during class did not depend upon whether the dancers' autonomy need satisfaction has been supported in class. On the contrary, contemporary dancers experienced elevated positive affective states when classes lead to increases in autonomy need satisfaction. Contemporary dance classes typically afford more opportunities for freedom and self-expression. Thus, drawing from past theorizing with regard to the role of autonomy in the dance domain (Quested & Duda, 2010), it is possible that the 'expected' degree of autonomy in a particular learning context influences the extent to which state autonomy satisfaction impacts upon positive affective states. This suggests that the results are not aligned with the classification of autonomy as a universal "basic need" (Deci & Ryan, 2000). Nevertheless, the present findings should not be interpreted as an indication that these dancers would not benefit from increased autonomy need satisfaction. Overtime, we would predict that the ballet and Chinese dancers would function more optimally if they were exposed to an increase in opportunities to feel autonomous in their dance classes.

In general, the dancers in the present study had been dancing since aged nine. Based on the present findings it could be argued that prolonged training in ballet or Chinese dance desensitizes the dancers' need for autonomy in classes. Nevertheless, while

state experiences of low autonomy need satisfaction may not appear to have a detrimental impact upon state positive affect for ballet and Chinese dancers, BNT predicts that low autonomy need satisfaction would compromise optimal functioning and health in the long term (Deci & Ryan, 2000). A recent longitudinal study in the dance domain suggests that this would indeed be the case. The observed decreases in the dancers' autonomy (as well as competence and relatedness) need satisfaction significantly predicted observed increases in the dancers' reported burnout over the 36-week dance school year (Quested & Duda, under review; see chapter three). Longitudinal research examining the BNT-based social-psychological predictors of dancers' well- and ill-being, in which the genre-specific nature of the learning environment is considered, would be pertinent to understanding determinants of optimal functioning in the domain of dance.

The BNT Sequence in Class, Rehearsal and Performance Contexts

The findings regarding the 'autonomy support – basic needs' relationship were consistent across contexts. Specifically, the results indicate that situational perceptions of autonomy supportive teaching behaviors positively predicted the dancers' state levels of autonomy, competence and relatedness satisfaction in classes, as well as within the more evaluative environments of rehearsals and performances. These findings extend past research that had implicated general levels of autonomy support in the targeted setting (Gagne et al., 2003) and other social factors (Reis et al., 2000) as accounting for day-to-day fluctuations in BPNS. Aligned with cross-sectional (Quested & Duda, 2010) and longitudinal (Quested & Duda, under review) BNT-based (Deci & Ryan, 2000; Ryan, 1995) investigations in dance, the present dancers' daily perceptions of autonomy support in classes and rehearsals were most strongly associated with relatedness need satisfaction. The findings indicate that peaks and troughs in dancers' feelings of belongingness may be

especially sensitive to daily change as a consequence of the degree of autonomy support one experiences in class and rehearsals. However, in performances, perceptions of autonomy support were most strongly associated with dancers' competence need satisfaction.

In line with predictions, perceptions of autonomy supportive rehearsal and class atmospheres positively contributed towards changes in the dancers' levels of positive affect during classes and rehearsals. Although perceived autonomy support was also associated with changes in dancers' negative affective states during class, this was not the case in rehearsals. In addition, the dancers' perceptions of autonomy support provided by their teachers as they went into each performance were unrelated to the changes in positive and negative affect that occurred during the performances. One explanation for these inconsistent findings rests in the nature of the activity in question. It is possible that in the more evaluative context of rehearsals and performances, other facets of the social environment are more salient as predictors of affective states. For example, previous studies have found perceived ego-involving (Ames, 1992) sport climates to be associated with higher performance-related distress and anxiety among athletes (Ntoumanis & Biddle, 1998; Pensgaard & Roberts, 2000) and dancers (Carr & Wyon, 2003). Ego-involving climates are marked by their inherent focus on normatively evaluated conceptions of ability (Ames, 1992; Duda & Balaguer, 2007). In such settings, mistakes are not tolerated and only the best dancers are likely to receive praise (Newton et al., 2000). On the contrary, task-involving climates encourage dancers to focus on their own effort and important role in the performance (Duda, 2001).

The demonstration of competency is more 'on the line' during rehearsals and performances (in contrast to daily classes). Therefore affective states may be more predominantly determined by whether the psychological climate surrounding the

performance itself was perceived as task- and/or ego-involving. Cross-sectional research established that, when collectively modeled as predictors, these dimensions of the social-environment account for unique variance in dancers' affective states (Quested & Duda, 2010).

Future research using a diary methodology might simultaneously tap a range of social environmental characteristics pertinent to daily fluctuations in BPNS and affective states within more learning and/or performance-related settings. Drawing from the achievement goal theory literature (Ames, 1992; Newton et al., 2000) as well as the aforementioned cross-sectional research in dance, it may be pertinent to evaluate the task- and ego-involving features of the climate manifested in each dance class, rehearsal or performance. From the perspective of SDT (Deci & Ryan, 1985, 2000), it may also be worth measuring perceptions of social supportive (Ryan & Solky, 1996) and controlling (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, in press) teacher behaviors. Researchers have speculated that controlling (Bartholomew et al., in press) and socially supportive (Quested & Duda, 2009a) coaching/teaching behaviors may explain additional variance in BPNS and states of ill-being, not accounted for by perceptions of autonomy support.

Daily autonomy, competence and relatedness satisfaction have previously been identified as relevant contributors to the daily emotional experiences of students (Reis et al., 2000; Sheldon et al., 1996) and gymnasts (Gagne et al., 2003). In the present results, each need made a unique contribution towards the observed changes in positive and negative affect that the dancers experienced during classes. However, there were inconsistencies in the relevance of each need to changes in affective states across the three environments. This suggests that contextual cues may influence the extent to which state levels of autonomy, competence and relatedness satisfaction are relevant to changes in

daily affective states. This finding is seemingly contrary to predictions emanating from BNT. Drawing from this theory, we would hypothesize that the needs are invariant across contexts (Ryan & Deci, 2002). Nevertheless, it is worth reiterating that the present findings suggest that need satisfaction *does* seem to be a relevant concomitant of affective states across different contexts within the world of vocational dance. More specifically though, the results indicate that the role of each need is not invariant across the three targeted settings.

Competence was the only need to significantly predict changes in the dancers' negative affective states during rehearsals and performances. As young trainee dancers suddenly in the unfamiliar limelight, it is perhaps unsurprising that competence need satisfaction contributed most substantially towards the changes in negative affect (and in the case of performance, also positive affect) that the dancers experienced during these more performance-focused events. The rehearsal and performance situations demanded that the dancers demonstrated their aptitude in relation to an event that was highly regarded in the school. In the performances themselves, future employers (e.g., the directors of professional companies), as well as friends, family, peers and teachers would most likely have been members of the audience. Competence need satisfaction has previously been recognized as particularly salient among those engaged in athletic and hip hop dancers, as displays of ability are an integral and important feature of sport and dance participation (Quested & Duda, 2009d; Reinboth et al., 2004).

Aligned with the findings of past cross-sectional work in the dance domain with fulltime dance students (Quested & Duda, 2010), relatedness emerged as the strongest predictor of the vocational dancers' positive affective responses in the class setting. However, the findings vis-à-vis the 'relatedness – positive affect' association were not as strong (rehearsals) or not significant (performance) in the other targeted contexts. As

proposed earlier, this may be because competence need satisfaction was more relevant in the more performance-focused events. Another possibility is that daily classes allow more opportunities for social exchanges with fellow students. It has previously been hypothesized that dancers' affective states may be especially sensitive to the extent to which they feel a sense of belongingness in their full time learning domain (Quested & Duda, 2010).

The Mediating Role of the Basic Needs

Supporting our hypotheses and the tenets of BNT (Deci & Ryan, 2000; Ryan, 1995), the three needs fulfilled a total mediating role in the 'autonomy support – negative affect' relationship operating at the daily level in class settings. In the case of positive affect, there was evidence of mediation via relatedness and competence. These results extend past work that has examined whether the three needs mediate the relationship between perceptions of the social environment and between-person variability in dancers' (Quested & Duda, 2010) and athletes' (Reinboth & Duda, 2006) reported positive affect.

In rehearsal and performance settings, there was limited support for the mediation hypothesis. However, it bears reiterating that the 'autonomy support – basic needs' relationships were consistently supported in all contexts. The mediation hypothesis was compromised in the rehearsal and performance domains because the associations between perceptions of autonomy support and positive and negative affect were not significant. This may be because other untapped features of the social environment were more relevant to affective states in these contexts.

Typical and Daily Level Perceptions of Autonomy Support, BPNS and Daily Affect

Past research has indicated that day to day experiences of BPNS may be more significant as predictors of well-being than general level measures (Reis et al., 2000). The present study supports this proposition and extends the finding by examining context specific BPNS. Typical levels of the dancers' BPNS experienced in the dance school over time were not significantly associated with the changes in affective states experienced during dance classes. The only exception to this finding was that general level relatedness predicted changes in positive affect during rehearsals. In a rehearsal context there may be a sense of camaraderie, as the team work together towards a common goal of maximizing the quality of the forth-coming performance. If the dancers usually feel a sense of belongingness within their school, then it makes sense that they might experience increases in positive affect after engaging in this social atmosphere.

Milyavaskaya and associates (2009) speculated that imbalance in BPNS across contexts may be more common than variability in satisfaction across the three needs. In their investigation, Milyavaskaya and colleagues considered general levels of BPNS in different life domains as the focal point and established that BPNS in one context does not compensate for deprivation in need satisfaction in other life domains (Milyavskaya et al., 2009). Specifically, they found that the degree of balance in BPNS in different life contexts contributed unique variance towards the levels of adjustment and well-being experienced by the adolescents in the study. The present investigation points to variability in general and daily BPNS across different learning and performing contexts. Future research might examine whether students' long term well-being is more likely to be compromised if experiences in different classes cause BPNS to fluctuate throughout the day, or over a week. To date, little is known regarding the significance of need *fluctuation* (as opposed to high or low BPNS) for long term health. In vocational dance, such evidence

would clarify whether dancers would profit from consistent levels of BPNS across all learning and performance-related activities within one major life domain.

It is noteworthy that typical perceptions of autonomy support in the dance school were significantly related to the dancers' changes in positive affect during classes and rehearsals. The significant general x state autonomy support interaction is supportive of a sensitization effect, indicating that the higher the general level is, the more likely it will be that the dancer values and will benefit from experiencing autonomy support on a daily basis (Reis et al., 2000). With respect to the present findings, the dancers who usually perceived their teachers as autonomy supportive were found to be more sensitive to the daily effects of autonomy supportive teaching. These dancers were more likely to report positive affect after class when the autonomy supportive behaviors of the teacher were reflective of what they considered to be typical in their school.

Two significant interactions were found between typical and situation specific autonomy need satisfaction. Specifically, this interaction significantly predicted changes in positive affect in class, and changes in negative affect during performances. In this case, and aligned with the deprivation hypothesis (Reis et al., 2000), higher state experiences of autonomy in classes and performances had a more substantial impact upon affective states when the dancers' typically autonomy need satisfaction in school was low. In contrast, the affective states of dancers with generally high autonomy need satisfaction in school were not emotionally affected by low levels of state autonomy need satisfaction in their classes and performances.

The significant interaction for relatedness is more complex to explicate. Findings indicated that, for dancers whose usual levels of relatedness satisfaction in their school environment were reported to be low, increases in daily relatedness were associated with increases in negative affect in performances. One possible explanation is that these dancers

experienced greater concern about letting down their peer group with whom they felt more connected on that very important day. If the dancers were not used to experiencing high levels of relatedness need satisfaction, the dancers may feel they have more to lose by letting down their compatriots; high state experiences of relatedness may have increased the levels of expectancy to perform well. However, this interpretation is highly speculative.

Collectively, these findings regarding the typical x day level need interactions indicate that there may be individual differences in potential emotional consequences or correlates of BPNS. The results points to the benefits of fostering dancers' general levels of autonomy and relatedness need satisfaction within the dance school. When general levels are high, dancers may be less emotionally affected by occasions when daily BPNS is compromised. Qualitative research may be a relevant means to uncover the relevance of a sense of belongingness in performance-related activities.

Conclusions and Practical Implications

Taken in their totality, the findings from this study indicate that daily experiences of autonomy support and BPNS have implications for the psychological health of performing artists. Using a daily diary methodology, it was possible to uncover differences in the relevance of each basic need in learning (class) and more evaluative performance (rehearsal, performance) contexts, across a number of days.

This study was only able to offer partial support for the universality hypothesis that is central to BNT (Ryan & Deci, 2002). Overall (i.e., with one exception), the between-person analyses indicated dance genre did not moderate the relationships between perceived autonomy support and BPNS, and changes in the dancers' affective states in classes, rehearsals and performance settings. Findings also supported the applicability of

the BNT sequence (Deci & Ryan, 2000; Ryan, 1995) at the within-person level in the targeted learning-orientated setting. However, results were less telling about the predictors of state well- and ill-being in more evaluative environments. Nevertheless, this study indicates that in every situation, at least one need significantly predicted changes in affective states during the event in question. Thus, it seems clear that BPNS *is* of relevance to daily experiences of affective states. However, the relative importance of each basic need may vary as a function of social and/or situational characteristics of the context in question. Further BNT-based research using the diary approach is warranted. Such research could target a wider range of social and situational environmental characteristics, in both learning and performance contexts.

BNT holds that healthful functioning will be forestalled when BPNS is compromised (Deci & Ryan, 2000). Future research could examine the long term health impact of day to day fluctuations in BPNS, in demanding performance as well as learning contexts. Repeated measures of BPNS, alongside regular assessments of psychological as well as biological functioning, would be informative with regard to the short term and long term consequences of daily variability in BPNS.

In sum, findings point to the importance of daily provision of need supportive dance training, if dancers are to experience optimal affective states in dance classes. This aspiration could be considered challenging when dance teachers must balance the traditions of a dance discipline, as well as demanding teaching, rehearsals and performance schedules. Future research, in which BNT-based (Deci & Ryan, 2000; Ryan, 1995) dance teacher training interventions are designed and rigorously tested, is warranted. Such research would be a strong first step on the path towards maximizing the possibility of health conducive training and performance climates in the dance domain.

**Basic Psychological Need Satisfaction, Cognitive Appraisals and Dancers' Hormonal
and Emotional Responses**

This manuscript is under review with the *Journal of Personality*

Abstract

Self-determination theory (Deci & Ryan, 2000) posits three basic psychological needs (autonomy, competence and relatedness) as essential for optimal human functioning and health. Grounded in this framework, this study examined the role of basic psychological need satisfaction (BPNS) in the manifestation of dancers' cognitive appraisals and hormonal and emotional responses to performance stress. Dancers reported their degree of BPNS one month prior to a solo performance. Threat and challenge appraisals of the forthcoming dance performance were recorded two hours before the performance. Salivary cortisol and anxiety (intensity and interpretation) were measured 15 minutes prior, and 15, 30, 45 and 60 minutes post the performance. Multilevel modeling analyses found BPNS to negatively predict the dancers' cortisol and anxiety intensity. BPNS emerged as a positive predictor of the dancers' tendency to interpret anxiety symptoms as facilitative throughout the performance period. Challenge appraisals significantly mediated the association between BPNS and cortisol. The relationship between BPNS and intensity of cognitive anxiety symptoms was significantly mediated by threat appraisals. Findings point to the importance of fostering BPNS in performance-related situations for optimal emotional and hormonal homeostasis in demanding performance scenarios.

Key words: Basic psychological needs, stress, threat, challenge, cortisol, anxiety

Introduction

For elite athletes and performing artists alike, performances represent the culmination of many hours dedicated to training and practice. The anticipation and undertaking of athletic and artistic feats evokes an array of psychological and biological reactions. Indeed, psychosocial stress associated with performance is considered to be the primary catalyst of hormonal (Miller, Chen, & Zhou, 2007), as well as emotional, fluctuations (Jones, Meijen, McCarthy, & Sheffield, 2009). These responses may have implications for the quality of performance as well as the long term health of the performer (Burns, 2006; Gaab, Rohleder, Nater, & Ehlert, 2005; Swain & Jones, 1996). While the situational predictors of hormonal responses to performance stressors have been well established (Dickerson & Kemeny, 2004; Michaud, Matheson, Kelly, & Anisman, 2008), less is known about individual differences as determinants of hormonal fluctuations. This void in the literature seems amiss, given the importance of maintaining biological and emotional homeostasis for the performing athlete or artist.

The basic needs theory (Ryan & Deci, 2000b), a mini-theory of the self-determination framework (Deci & Ryan, 1985, 2000), has become a popular approach to understanding antecedents of healthful functioning in performance domains (Gagne & Blanchard, 2007). The theory advocates satisfaction of three psychological needs (i.e., autonomy, competence and relatedness) to be a primary determinant of cognitive, emotional, and behavioral responses. The role of basic psychological need satisfaction (BPNS) in the manifestation of stress-related appraisals and subsequent emotional and biological responses is yet to be determined.

Basic Psychological Needs

Basic needs theorists (Deci & Ryan, 2000; Ryan & Deci, 2000b) define the need for autonomy as feeling that one's actions are self-directed, self-endorsed and derived from personal choices, as opposed to external controls or pressures. The extent to which one feels capable of meeting task demands effectively is inferred by the term competence (DeCharms, 1968). The need for relatedness is satisfied when one feels that there is a sense of mutual and meaningful care amongst those in the context at hand (Baumeister & Leary, 1995).

Numerous studies undertaken in the physical domain support the role of BPNS as a central determinant of athletes' psychological health (Gagne & Blanchard, 2007). For example, recent evidence demonstrates that BPNS predicts variability in athletes' and dancers' experiences of positive affect (Adie et al., 2008b; Quested & Duda, 2009b, 2009d, 2010), subjective vitality (Adie et al., 2008b), burnout (Hodge et al., 2008), and negative affective states (Quested & Duda, 2009b, 2010). Only a few studies have considered the role of basic needs as predictors of stress-related emotional responses (Baard, Deci, & Ryan, 2004; Black & Deci, 2000; Deci et al., 2001). These studies, undertaken in workplace and academic settings, found the basic needs to relate negatively to anxiety responses. The aforementioned investigations have typically relied upon self-reported indicators of health and cross-sectional study designs. As a consequence, very little is known about how and to what extent BPNS co-varies with biological determinants of health. In the present study, we examined whether BPNS predicted variability in secretion of the stress hormone cortisol before and after a public dance performance.

Psychophysiological Stress Reactions

Cortisol has been studied extensively as a putative biological mediator of the links between social context, stress, and physical health (Miller, Chen, & Cole, 2009). Cortisol release regulates homeostatic control via the modulation of metabolic and immunological processes. However, when cortisol secretion is excessive and/or sustained bodily systems may be adversely influenced (Miller et al., 2007). Consequently, repeated exposure to situations perceived as excessively stressful may have metabolic and immunological effects (Raison & Miller, 2003), as well as long term physical (Burns, 2006) and psychological (Raedeke & Smith, 2004) health implications.

Athletic and artistic events are naturalistic stressors that have been recognized to elicit dramatic changes in cortisol secretion (Eubank, Collins, Lovell, Dorling, & Talbot, 1997; Filaire, Sagnol, Ferrand, Maso, & Lac, 2001; Rohleder, Beulen, Chen, Wolf, & Kirschbaum, 2007). These studies merely focused on situational features of the performance or competition (e.g., win/loss experiences, dancing alone or in a group). To date, the role of individual difference factors has been neglected. This void spans more than merely the physical domain; following a multidisciplinary meta-analysis, Miller et al (2007) concluded that future models of stress and metabolic and immunological processes should consider individual difference factors. This may help to explain variability in biological stress responses.

Predictors of Stress Responses

Cognitive appraisals can shape emotional, physiological and behavioral responses to stressful situations (Lazarus, 2000; Lazarus & Folkman, 1984). Threat appraisals are construed when danger to well-being or self-esteem is anticipated, and one lacks confidence in one's ability to deal with the threat. On the contrary, when one focuses on

the opportunities for success, growth, learning and mastery, a challenge appraisal is formed (Lazarus & Folkman, 1984). Typically, though not universally, threat appraisals are associated with undesirable anxiety responses, whereas challenges tend to augment positive emotions and interpretations of these symptoms in a more positive manner (Jones et al., 2009). Threat appraisals are believed to exaggerate cortisol reactions (Gaab et al., 2005; Jones et al., 2009). A recent meta-analysis (Dickerson & Kemeny, 2004) indicates human cortisol responses are strongest in situations that pose a threat.

Despite the recognition that individuals do not appraise and respond to stressful circumstances in a uniform manner, predictors of this between-person variability remain under-explored. BPNS has been proposed to impact upon the appraisal process in psychologically demanding situations, shaping “the apparent reality of objective events” (p306; Skinner & Edge, 2002). Recent theorizing implies that one’s degree of BPNS may determine whether one is vulnerable to potentially damaging emotional and physiological responses in demanding scenarios (Ntoumanis, Edmunds, & Duda, 2009). However, no evidence exists to support a theoretical sequence linking BPNS, appraisal processes, and hormonal and emotional responses in stressful circumstances. Given that the health status of dancers is often recognized to be in peril (Laws, 2005), it is imperative to determine the psychological processes and biological mechanisms that may underpin variability in the health status of elite performers. In sum, a basic needs theory (Ryan & Deci, 2000b) driven approach to examining predictors of emotional and hormonal stress responses is warranted. Such work is relevant to our understanding of healthy vs. health risky dance participation.

Study Hypotheses

Firstly, it was hypothesized that the dancers' degree of BPNS in their dance school (one month prior to performance) would significantly predict the dancers' perceptions of the performance as a threat and challenge (negatively and positively, respectively) on the day of performance. Cortisol responses have been found to be augmented when individuals perceive a threat to competence, the social self and one's perspective of control (Dickerson & Kemeny, 2004). In light of this, and given that BPNS has been proposed to shape adaptive responses in stressful circumstances (Skinner & Edge, 2002), we hypothesized that BPNS and challenge appraisals would negatively, and threat appraisals would positively predict the dancers' salivary cortisol secretion and ratings of anxiety intensity before and after the solo performance. We also expected that BPNS and challenge appraisals would be positively, and threat appraisals negatively, related to facilitative interpretations of anxiety symptoms. In line with recent theorizing (Jones et al., 2009; Ntoumanis et al., 2009), threat and challenge appraisals were expected to mediate the association between BPNS and the dancers' anxiety and cortisol responses.

Method

Participants and Procedure

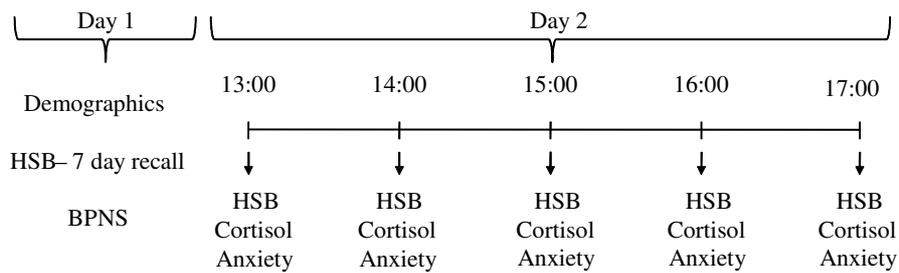
Sixty one (20 male, 41 female, $M_{\text{age}} = 19.30$ years, $SD = 1.74$) dancers undertaking full time training at a leading dance conservatoire in London, UK were recruited for the study. It was made clear that participants were free to withdraw at any stage without any implications for their ongoing training. Dancers agreeing to take part provided informed consent. The study was approved by a departmental ethics board at a large UK University. The duration of the study period spanned four weeks. In week one, the dancers completed the control day protocol over two consecutive days. In week four, participants performed a

ballet solo in front of an audience of peers and teachers. The data collection protocol is presented in Figure 5.1.

Control day. A day before the control condition, dancers completed a questionnaire packet recording BPNS, demographic information (including age, weight, height, years of dance experience) and their health status and associated behaviors over the past seven days. On the control day, dancers collected five envelopes, each containing a questionnaire and a saliva collection tube. Instructions specified that each envelope should be opened on, or as close to, the hour between 1pm and 5pm. Each time, dancers were asked to provide a saliva sample, to respond to four questions assessing their state anxiety (intensity and direction), and to provide details of health related behaviors in the preceding twenty four hours (first envelope only) and the past hour. During the control day, dancers completed their usual activities, including practical dance classes. Dancers were asked to return the saliva samples to the researcher immediately or to refrigerate them until a convenient time for their return.

Performance day. On the morning of their solo performance, dancers completed a questionnaire assessing their perceptions of threat and challenge associated with the upcoming performance. The performance day protocol for assessing health status and behaviors, saliva collection and anxiety measurements mimicked that of the control day, except that the sampling time points differed. Specifically, dancers were asked to provide saliva samples and complete the anxiety measures fifteen minutes prior to their performance, and immediately, fifteen minutes, thirty minutes, and one hour after their solo finished. Performances took place between 2pm and 4pm and lasted for approximately two minutes.

Control Condition



Performance Condition

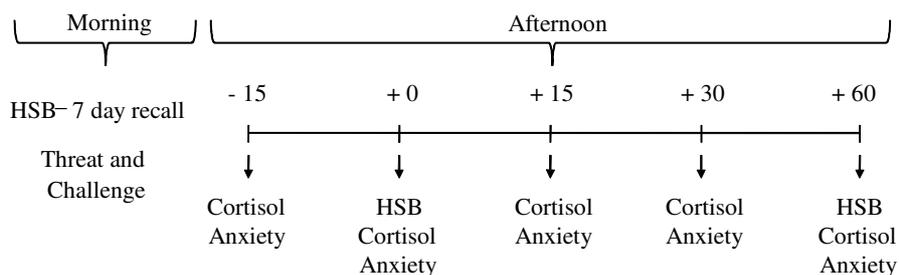


Figure 5.1. Data collection protocol for the control and performance day. Control day timeline is chronological, performance day timeline is represented in minutes, relative to termination of performance. HSB = Health status and behaviors.

Measures

Cortisol. Unstimulated salivary cortisol samples were collected using “Salivettes” (Sarstedt, Nümbrecht, Germany). Dancers were asked to leave the cotton swab under their tongue for a timed period of two minutes. The chronological time that each sample was provided and the exact length of time the salivette remained under the tongue was recorded. Once returned, salivettes were refrigerated and subsequently frozen at -80 degrees pending analysis. Following defrosting, saliva samples were centrifuged at 9400 rpm for ten minutes and assayed using a commercially available Enzyme-Linked ImmunoSorbent Assay.

Health status and behaviors. These assessments targeted the seven days and twenty four hours prior to the control and performance days and tapped a series of indicators of health status and behaviors (details available from the first author). Dancers

also reported the number of nicotine products, beverages containing caffeine or alcohol, and recreational drugs taken in the preceding twenty four hours and throughout the saliva sampling periods.

Basic psychological need satisfaction. Three scales tapped need satisfaction and a composite BPNS score was calculated from the scale means. The selected measures were specifically chosen because their scale reliability and factor structure had been supported in previous research involving dancers and/or athletes (Quested & Duda, 2009d; Reinboth & Duda, 2006). Satisfaction of the need for competence was measured using the 5-item competence subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989). Dancers responded to items (e.g. “I am satisfied with my dancing”) on a Likert scale of one (*strongly disagree*) to seven (*strongly agree*). Six items (e.g., “I feel free to express my ideas and opinions”) targeting the degree to which the dancer felt he/she had choice and could make decisions in terms of his/her dance engagement, assessed satisfaction of the need for autonomy (Deci et al., 2001). This scale employs a Likert scale ranging from *not at all true* (1) to *very true* (7). The dancers’ need for relatedness was tapped via five items (e.g., “valued”) from the acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998) on a Likert series of *strongly disagree* (1) to *strongly agree* (5). Dancers were asked to respond in relation to their experiences and feelings in their school “over the past few weeks”. All items followed the stem “In this dance school I feel”.

Perceptions of threat and challenge. Six items measured challenge and threat appraisals with regard to the upcoming performance. Items were selected from those employed in studies concerning appraisals of academic exams (McGregor & Elliot, 2002) and athletic pursuits (Adie, Duda, & Ntoumanis, 2008a). Dancers were instructed to think specifically about how they felt about the performance. Items followed the stem “When I think about this performance”. Dancers responded to three threat (e.g., “I view this

performance as a threat”) and three challenge (e.g., “I look forward to being challenged”) appraisal items on a scale of one (*not at all true for me*) to seven (*very true for me*). Some items were marginally adapted to be relevant to the performance. The factorial validity and reliability of the long (Adie et al., 2008a) and short (Nien, 2007) versions of this scale were supported in research involving athletes similar in age to the dancers in the present study.

Anxiety. Dancers responded to four items assessing state anxiety each time a saliva sample was provided during the performance day. Items were adapted from a short form self-report assessment previously designed to tap athletes’ state anxiety (Thomas, Hanton, & Jones, 2002) and were assessed on a 7-point scale ranging from *not at all* to *extremely*. Dancers were asked to indicate their “thoughts right now” regarding their level of cognitive anxiety (“I feel concerned/worried/ anxious”) and somatic anxiety (“I feel physically nervous (e.g., tense, fast heart rate, “butterflies”)). The directional component of cognitive anxiety (i.e., extent to which symptoms were interpreted facilitative or debilitating) was tapped with the question, “How positive (helpful) or negative (unhelpful) do you think these thoughts are for your solo performance?” The same item assessed the directional component of somatic anxiety; however the term “physical feelings” replaced “thoughts”.

Data Analysis

Multivariate analysis of variance determined whether cortisol response patterns differed between the performance day and control day. Regression analyses determined whether the dancers’ BPNS predicted their threat and challenge appraisals on the day of performance. Multilevel modeling (MLM) techniques using MLwiN version 2.11 (Rasbash et al., 2009) were utilized to examine whether BPNS, threat, and challenge

appraisals predicted the level and between-person variability of cortisol and anxiety reactions during the performance day. A two-level MLM was employed, with a level one model examining individual changes in the dependent variable over time. Variability in response patterns between participants was represented at level two (Singer & Willet, 2003). When the pattern of change of the dependent variables was curvilinear, both a linear and a quadratic term for time were included as predictors in the equations, in addition to BPNS and/or appraisals (Dickerson, Mycek, & Zaldivar, 2008; Singer & Willet, 2003). The predictors were initially treated as random at the person level, but when the between-person (i.e., level two) variance of a predictor was non-significant, analysis proceeded with the predictors fixed at the person-level. A series of conditional growth models were run to examine: a) the direct effects of the dancers' BPNS on cortisol responses; b) the direct effects of the dancers' threat and challenge appraisals on cortisol levels; and c) whether threat and challenge appraisals mediated the association between BPNS and cortisol levels. The same approach was adopted to analyze the anxiety data. A set of multilevel models were tested to evaluate multiple mediation with respect to each of the five dependent variables (Krull & MacKinnon, 2001). The change in the magnitude of the direct X to Y path (c) with the inclusion of the mediators (i.e., path c') provides information regarding the total mediation effect (see Figure 5.2). The magnitude and significance of each mediator's unique effect ($B_a B_b$) was also determined (Krull & MacKinnon, 1999).

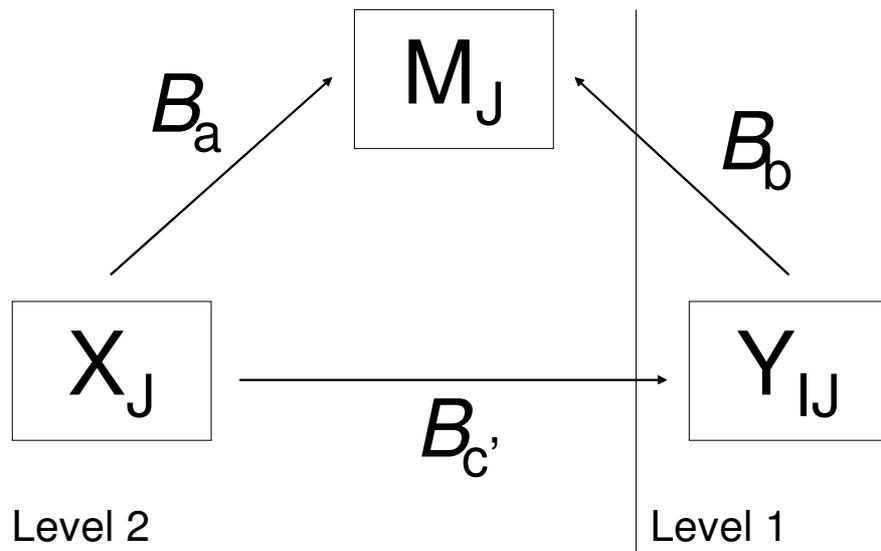


Figure 5.2. Mediation paths tested in MLM analyses (adapted from Krull and MacKinnon, 2001). X denotes the independent variable, which was BPNS in all models. M represents the mediators: threat and challenge. Cortisol, somatic anxiety intensity, somatic anxiety direction, cognitive anxiety intensity, and cognitive anxiety direction were interchangeably entered as the dependent variable (Y).

Results

Data Preparation and Screening

Data were examined for distribution (skewness and kurtosis), mahalanobis distances, multicollinearity and violations of standard univariate and multivariate analysis assumptions (Tabachnick & Fidell, 2001). These assumptions were met, except in the case of the cortisol data distribution. Log transformations ($\text{Log}_{10} x + 1$) improved the distribution of the positively skewed cortisol data, and the one univariate outlier was removed.

Preliminary Analysis

There were no differences in cortisol responses on account of smoking status ($ps > .23$), caffeine consumption ($ps > .43$), or gender ($ps > .22$). Therefore these variables were

not included in the models tested. There were significant differences between dancers in their first and second year of dance training in cortisol responses at all time points in the performance day and the time-matched -15 control day data point ($p < .05$), as well as in challenge appraisals ($p = .02$). Therefore, dance experience was controlled in all analyses where challenge or cortisol were dependent variables. Internal consistency of the autonomy ($\alpha = .79$), competence ($\alpha = .86$), relatedness ($\alpha = .91$), threat ($\alpha = .91$) and challenge ($\alpha = .72$) measures were acceptable.

Cortisol Responses: Control Day vs. Performance Day

Performance day cortisol responses at -15, +15 and +1 hour were time-matched with the three closest corresponding control day samples. Figure 5.3 reveals differences in the patterning of cortisol between the two conditions. Specifically, cortisol responses in the control day maintained a flat profile. On the contrary, the performance day showed a marked increase, peaking fifteen minutes post performance and then gradually decreasing. Repeated measures analysis of variance revealed a main effect for time ($F(2,31) = 4.01, p = .02, \eta^2 = .11$), a main effect for condition that approached statistical significance ($F(2,31) = 3.27, p = .08, \eta^2 = .09$), and a significant condition x time interaction ($F(2,31) = 4.17, p = .02, \eta^2 = .12$), indicating that cortisol secretion during the performance day increased at a greater rate than in the control day.

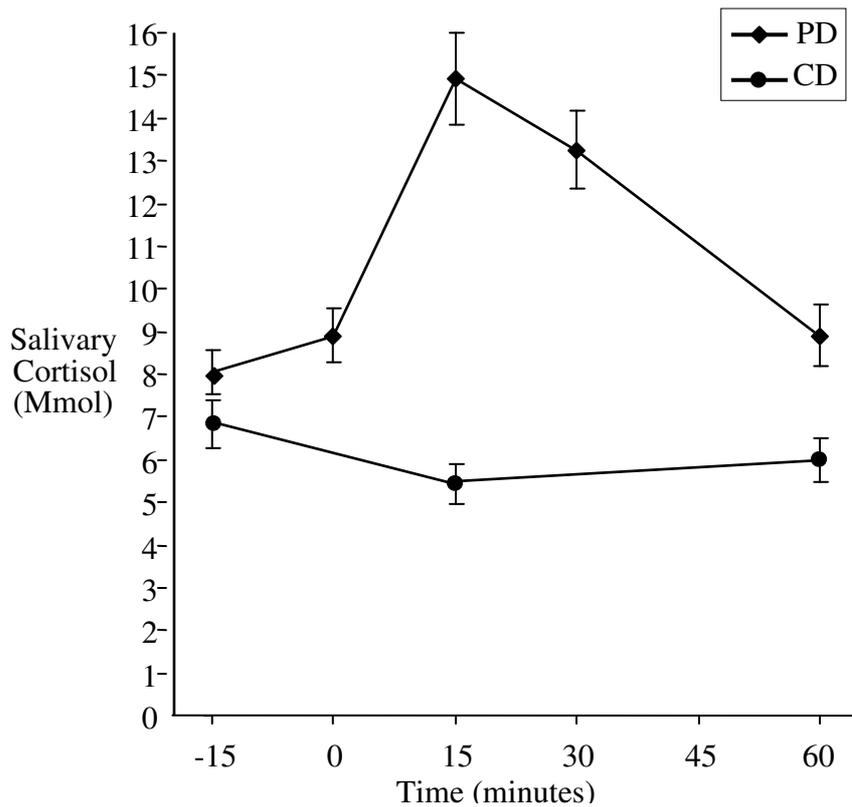


Figure 5.3. Mean cortisol values during the control and performance day.

Descriptive Statistics and Correlations

Table 5.1 presents the descriptive statistics for the study variables. Overall, dancers reported moderate BPNS and were more likely to appraise their upcoming performance as a challenge than as a threat. Mean anxiety scores averaged across time suggested that the dancers experienced moderate cognitive and somatic anxiety symptoms, and perceived these symptoms as more facilitative than debilitating. BPNS was significantly related to all self-reported variables in the hypothesized directions. The association between BPNS and cortisol (represented as area under the curve relative to ground) approached significance. Challenge appraisals positively correlated with the dancers' directional interpretation of cognitive anxiety symptoms (i.e., cognitive anxiety was viewed to be more facilitative by those with greater challenge appraisals), whereas threat appraisals positively related to the intensity of the cognitive anxiety symptoms reported.

Regression Analyses: Predicting Threat and Challenge Appraisals (B_a path)

Least squares regression analyses were performed to determine whether the dancers' BPNS predicted threat and challenge appraisals associated with the upcoming performance. Our hypotheses were supported with respect to these associations. BPNS negatively predicted the dancers' threat appraisals ($B = -0.795, p < .001, R^2 = .09$) and positively predicted the dancers' challenge appraisals ($B = 0.291, p = .01, R^2 = .04$).

Multilevel Regression Analyses: Predicting Cortisol Responses

The dancers' cortisol response peaked fifteen minutes after the end of their performance (see Figure 5.3). As this peak was of interest in our study, time was centered at +15 minutes when predicting cortisol responses. First, an unconditional growth model was tested, specifying the intercept, as well as the linear and quadratic terms for time as random (Singer & Willet, 2003). This model examined: a) whether there were significant changes in cortisol responses over time; and b) if there was between-person variability in the mean levels of cortisol at the point of centering (i.e., +15 minutes), as well as in the rates of change. The results showed significant linear ($B = 0.027, p < .001$) and quadratic ($B = -0.014, p < .001$) changes in cortisol responses over time. The between-person variability associated with the linear and quadratic slopes was negligible and not significant. This finding was reinforced via a visual inspection of the data. This suggests there to be no between-person variability in the patterns of cortisol secretion over time.

Table 5.1

Descriptive Statistics, Internal Reliability, and Bivariate Correlations Among the Study Variables

Variable	<i>M</i>	<i>SD</i>	Min	Max	1	2	3	4	5	6	7	8
(1) BPNS mean (1-7)	3.96	.68	2.28	5.28								
(2) Challenge (1-7)	5.52	1.05	2.67	7.00	.16							
(3) Threat (1-7)	2.51	1.69	1.00	7.00	-.35*	-.13						
(4) CA (Level) (1-7)	3.10	1.33	1.00	7.00	-.44**	-.16	.43**					
(5) CA (Direction) (1-7)	4.49	1.17	1.00	7.00	.41**	.33*	-.20	-.59**				
(6) SA (Level) (1-7)	3.22	1.19	1.00	7.00	-.33*	.01	.18	.73**	-.40**			
(7) SA (Direction) (1-7)	4.50	1.06	1.00	7.00	.32*	.26	-.15	-.42**	.82**	-.32*		
(8) Cortisol AUC _G	841.01	384.33	305.81	2242.42	-.31 ^a	-.17	.22	.16	-.20	.04	-.07	
(9) Cortisol AUC _I	233.87	282.84	-311.50	992.88	-.26	-.19	.12	.17	-.10	.17	-.05	.72**

Note. AUC_G = Area under the curve relative to ground; AUC_I = Area under the curve relative to baseline (-15); CA = Cognitive anxiety; SA = Somatic anxiety (means for all anxiety variables are averaged across time points). Bracketed numbers following variable names indicate possible range of scores.

^a = $p < .06$. * = $p < .05$. ** = $p < .01$.

Further, the difference in the deviance statistic when the linear and quadratic components of time were fixed (IGLS deviance = -243.246) versus random (IGLS deviance = -234.990) was non-significant (difference = 8.26, $df = 5$, $p = .14$). Therefore, analysis proceeded with the two terms for time fixed at the between-person level. Supporting the main study hypotheses, BPNS ($B = -0.066$, $p = .047$) and challenge ($B = -0.044$, $p = .04$) were found to significantly predict the cortisol responses. The association between threat and cortisol was not significant ($B = 0.009$, $p = .52$). Table 5.2 presents the results of the mediation analysis. When BPNS, threat and challenge were simultaneously included as predictors, the BPNS co-efficient (B_c) was reduced and became non-significant (B_c'), suggesting an overall mediating effect. The indirect effect ($B_a B_b$) via challenge (but not via threat) was significant (one tailed $p = .04$). BPNS accounted for 11%, and threat and challenge contributed a further 5% to the variance in cortisol AUC_G . A threat x linear time interaction term significantly predicted cortisol responses ($B = 0.004$, $p = .047$) indicating that the cortisol responses of those with higher threat appraisals increased at a greater rate than those with lower threat appraisals. No other interaction terms were significant.

Table 5.2

Multilevel Estimates of the B_a , B_b , B_c , and B_c' Co-Efficients for the Mediation Models. BPNS was Specified as the X Variable in All Models

Y	Threat			Challenge			BPNS	BPNS
	B_a (S.E)	B_b (S.E)	Mediated effect ($B_a B_b$)	B_a (S.E)	B_b (S.E)	Mediated effect ($B_a B_b$)	B_c (S.E)	B_c' (S.E)
Cortisol	-0.795*** (0.162)	-0.002 (0.015)	0.002	0.291** (0.099)	-0.052* (0.024)	-0.02*	-0.066* (0.033)	-0.050 (0.034)
Anxiety intensity								
<i>Somatic</i>	-0.795*** (0.162)	0.172 (0.104)	-0.14	0.291** (0.099)	0.020 (0.167)	0.01	-0.585* (0.249)	-0.356 (0.258)
<i>Cognitive</i>	-0.795*** (0.162)	0.272** (0.089)	-0.22*	0.291** (0.099)	0.050 (0.145)	0.01	-0.695** (0.239)	-0.361 (0.227)
Anxiety direction								
<i>Somatic</i>	-0.795*** (0.162)	-0.114 (0.080)	0.09	0.291** (0.099)	0.174 (0.142)	0.05	0.596* (0.234)	0.329 (0.205)
<i>Cognitive</i>	-0.795*** (0.162)	-0.118 (0.104)	0.09	0.291** (0.099)	0.326* (0.167)	0.09	0.704** (0.258)	0.456 (0.258)

Note. * = $p < .05$. ** = $p < .01$. *** = $p < .001$.

Multilevel Regression Analyses: Predicting Anxiety Responses

The dancers' somatic and cognitive anxiety intensities were highest fifteen minutes prior to their performance (see Figure 5.4). Therefore, time was centered at -15 minutes in the models predicting anxiety responses. Interactions between the independent variables and linear and quadratic components of time were examined as predictors of all anxiety variables. No interaction terms were significant.

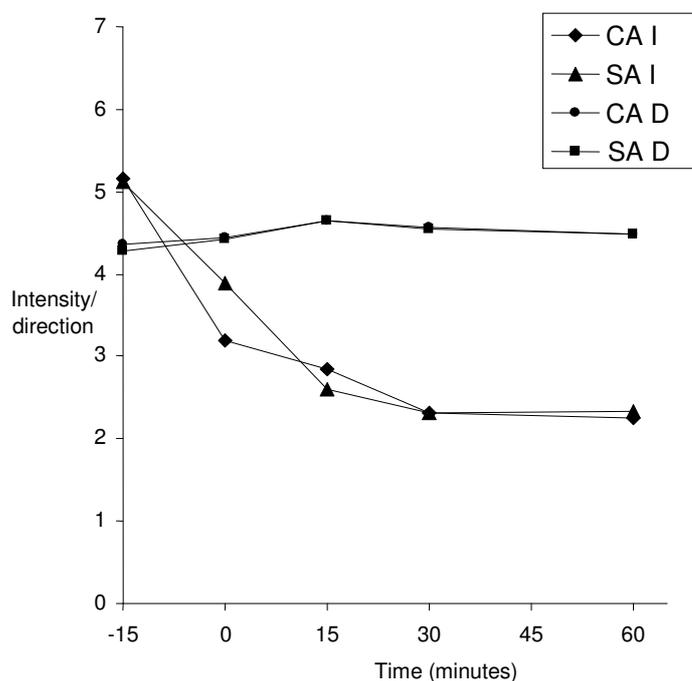


Figure 5.4. Mean anxiety responses throughout the performance period. CA = cognitive anxiety. SA = somatic anxiety. I = intensity. D = direction.

Somatic anxiety intensity. In an unconditional growth model, both linear ($B = -1.060, p < .001$), and quadratic ($B = 0.091, p < .001$) changes in the intensity of somatic anxiety were found. The between-person variances associated with the linear and quadratic terms were non-significant ($p > .05$). Also, there was no significant difference (difference = 6.14, $df = 5, p = .34$) between the deviance statistic when the linear and quadratic components of time were specified as random (IGLS deviance = 886.875), versus when

they were treated as fixed (IGLS deviance = 892.579). Similarly, we found no between-person variability in BPNS, challenge and threat appraisals. Thus, all predictors were treated as fixed at the between-person level.

Results indicated BPNS to significantly and negatively predict somatic anxiety intensity ($B = -0.585, p = .02$). In a separate model, when threat and challenge were entered as predictors, threat ($B = 0.211, p = .03$) significantly and positively predicted somatic anxiety intensity, but the relationship between somatic anxiety and challenge ($B = 0.070, p = .64$) was not significant. The multilevel estimates from the mediation analyses are presented in Table 5.2. When BPNS, threat and challenge were simultaneously included as predictors of somatic anxiety intensity, the BPNS co-efficient reduced and became non-significant, indicative of a mediating effect. The indirect effect via challenge approached significance (one tailed $p = .06$). BPNS accounted for 11% of the variance in mean somatic anxiety intensity, with threat and challenge appraisals contributing a further 1%.

Cognitive anxiety intensity. Both linear ($B = -1.001, p < .001$) and quadratic changes ($B = 0.087, p < .001$) in cognitive anxiety intensity were found. The difference in the deviance statistic between a model in which the linear and quadratic components of time were specified as random (IGLS deviance = 878.138), and a model where both were fixed (IGLS deviance = 908.229) was significant (difference = 30.10, $df = 5, p < .001$). Therefore, linear time and quadratic time were modeled as random predictors. As there was no significant between-person variance in BPNS, challenge and threat appraisals these predictors were fixed.

BPNS significantly and negatively predicted cognitive anxiety intensity ($B = -0.695, p = .004$). When threat and challenge were entered as predictors, threat significantly and positively predicted cognitive anxiety intensity ($B = 0.377, p < .001$), but there was no

significant relationship with challenge ($B = 0.020, p = .88$). With the inclusion of the mediators in the equation, the BPNS co-efficient reduced and became non-significant; further, a significant mediating effect via threat was evident ($B_a B_b = -0.22, p < .01$). BPNS predicted 19% of the variance in mean cognitive anxiety intensity and an additional 9% was contributed by threat and challenge appraisals.

Somatic anxiety direction. There was no significant linear ($B = 0.131, p = .23$) or quadratic ($B = -0.014, p = .10$) changes in the directional interpretation of somatic anxiety. The between-person variances associated with the linear and quadratic terms were not significant ($ps > .05$). Visual inspection of the data also indicated negligible change over time (see Figure 5.4). Thus, time was not modeled in the analyses involving directional interpretations of somatic anxiety. There was significant between-person variance in BPNS and challenge; therefore these were modeled as random coefficients. Threat was included as a fixed predictor on account of there being no between-person variance.

BPNS ($B = 0.596, p = .01$) and threat ($B = -0.154, p = .04$) but not challenge ($B = 0.160, p = .29$) were significant predictors of the dancers' directional interpretation of their somatic anxiety. When BPNS, threat, and challenge were simultaneously modeled, BPNS was no longer a significant predictor. Ten percent of the variance in the extent to which somatic anxiety was perceived as facilitative was accounted for by BPNS, with a further 4% contributed by threat and challenge appraisals. The mediating effect via threat approached significance ($p = .09$).

Cognitive anxiety direction. As with somatic anxiety direction, no linear ($B = 0.108, p = .35$) or quadratic ($B = -0.012, p = .36$) changes in the directional interpretation of cognitive anxiety were found (see also Figure 5.4). The between-person variances associated with the linear and quadratic terms were also not significant ($ps > .05$). Thus, time was not modeled in these analyses. BPNS and appraisals were entered in the

equations as fixed at the between-person level on account of there being no between-person variance.

BPNS positively predicted the degree to which cognitive anxiety symptoms were interpreted as facilitative ($B = 0.704, p = .01$). In a separate model specifying threat and challenge as predictors, challenge emerged as a significant positive predictor ($B = 0.300, p = .047$). The relationship between threat and the directional component of cognitive anxiety approached statistical significance ($B = -0.179, p = .056$). When BPNS, threat, and challenge were simultaneously included as predictors, the previously significant path from BPNS was no longer significant. The mediating effect via challenge was close to statistical significance (one tailed $p = .05$). BPNS predicted 17% of the variance in the directional interpretation of cognitive anxiety, and threat and challenge appraisals contributed a further 7%.

Discussion

BPNS is considered to be a psychological necessity for optimal functioning and well-being (Deci & Ryan, 2000; Ryan, 1995). This study demonstrated the relevance of BPNS and cognitive appraisal of a stressful event to dancers' state hormonal and emotional stress responses. Findings were largely supportive of the study hypotheses.

The results indicate that a 'general' level of BPNS experienced in dance school shapes the way in which dancers perceive an upcoming salient performance. Previous authors have pointed to the potential for BPNS to equip individuals to appraise potentially stressful situations in a more positive light (Ntoumanis et al., 2009; Skinner & Edge, 2002). Our findings are largely supportive of this theorizing and consistent with the overarching tenets of basic needs theory (Deci & Ryan, 2000). The cognitive appraisal process is understood to be largely driven by an evaluation of the resources available to tackle a

forthcoming demand (Blascovich, Mendes, Tomaka, Salomon, & Seery, 2003). The findings indicate that BPNS has the propensity to foster valuable psychological resources that can be accessed and applied to promote facilitative pre-performance appraisals. For example, a dancer who has 'typically' high perceived dance competence might be more likely to appraise that he/she has the physical and technical skills to perform the ballet solo. If the dancer also generally feels supported, authentic and in control with regard to his/her dance training, he/she would feel more in command and comfortable when publicly executing dance skills. With these psychological resources available, the construal that an opportunity to perform in front of others is a challenge is perhaps unsurprising. On the contrary, when a dancer feels less competent, connected and autonomous in his/her behaviors, personal resources are more likely to be perceived as inadequate. In this case, it is understandable that performances are more likely to elicit a sense of pressure and apprehension, resulting in threat appraisals. Our findings point to the importance of promoting BPNS in dance training if dancers are to feel equipped with the psychological resources to handle evaluative performance-related demands.

BPNS, Cognitive Appraisals and Cortisol Secretion

Salivary cortisol showed a sharp increase immediately following the stressful solo performance. There is little to assume that this increase is due to the physical strains of the performance. First, the control condition involved physical dance classes which did not elicit a cortisol response. Secondly, evidence suggests that exercise must be intense (> 70% VO^2 max) and exceed forty minutes in duration to result in significant increases in cortisol secretion (Jacks, Sowash, Anning, McGloughlin, & Andres, 2002). While it has been recognized that the aerobic demands of ballet can reach 80% VO^2 max (Schantz & Astrand, 1984), the dancers' solo performances were between one and three minutes in

duration. Third, Rohleder and colleagues established that dancers' cortisol levels before and after a simulated, but non-public and non-competitive dance performance were significantly lower than at equivalent times during an authentic public performance. In the former condition, cortisol profiles mimicked those of an inactive day (Rohleder et al., 2007). Collectively, these points indicate that the dancers' elevated cortisol profiles over the study time period were psychologically, rather than physiologically, stimulated.

Previous studies have failed to establish a relationship between personality level variables and cortisol fluctuations induced by independent episodes of acute stress (Pruessner et al., 1997). The need for further theoretically driven hypotheses regarding the role of cognitive, behavioral and emotional mechanisms in this hormonal response has been emphasized (Miller et al., 2007). In line with the tenets of self-determination theory (Deci & Ryan, 2000), the present study indicates that BPNS may be a central psychological mechanism in this biological response. Characteristics of the stressor, such as perceived controllability, threats to self-esteem and threats to the social self, have previously been linked with cortisol output (Dickerson & Kemeny, 2004). Thus, satisfaction of the needs for autonomy, competence, and relatedness could be psychological individual difference factors of relevance to the biological impact of stressful performance situations.

The present findings suggest that dancers with low BPNS may be particularly at risk of prolonged cortisol elevation and, consequently, physiological and psychological deregulation (Michaud et al., 2008). Given that cortisol levels following dance performance can remain above baseline for six to twelve hours (Rohleder et al., 2007), longitudinal research is required to delineate the role of BPNS in safeguarding against compromised allostasis and health. For example, it would be valuable to examine whether

BPNS predicts the extent to which cortisol responses to performance stress habituate or adapt.

Findings support our hypotheses regarding the role of challenge, but not threat, in the 'BPNS – cortisol' relationship. Threat and challenge appraisals are considered to induce differential physiological mechanisms (Blascovich et al., 2003). Specifically, hypothalamic-pituitary-adrenal axis activity is understood to be triggered by perceptions of threat, but unstimulated in challenge states (Jones et al., 2009). In the present study, challenge appraisals were negatively associated with cortisol secretion. On the surface, this result may appear contradictory to these perspectives. In explicating the present findings, it is notable that only two dancers scored below the mid-point range in the scale assessing challenge appraisals. Therefore we are not in a position to argue that low challenge appraisals stimulated the release of cortisol. Rather, our findings support suggestions that challenge appraisals have the propensity to suppress cortisol secretion (Dienstbier, 1989; Eubank et al., 1997). Findings from the mediation analysis partially support the hypothesis that BPNS may abate hormonal stress responses via the fostering of challenge appraisals.

Contrary to our expectations, threat appraisals did not significantly relate to the dancers' cortisol secretion. An examination of the mean scores suggests that on the whole, the dancers did not consider the performance to be threatening ($M = 2.51 \pm 1.69$); only five of the dancers scored five or above on the one (low) to seven (high) threat scale. Nevertheless, the direction of the beta co-efficient supports the expected association between threat appraisals and cortisol secretion. In line with our hypotheses, the findings also indicate that cortisol was secreted at a higher rate when dancers had higher threat appraisals. The direct effect of BPNS upon cortisol secretion suggests other mechanisms besides stress-related appraisals may also mediate the 'BPNS – cortisol' association.

BPNS, Cognitive Appraisals and Anxiety Responses

Our hypotheses were supported with regard to the association between BPNS and the intensity and interpretation of the dancers' cognitive and somatic anxiety. Findings indicate that BPNS instigates facilitative interpretations of cognitive anxiety. In past research, self-efficacy and perceptions of control have predicted the extent to which anxiety symptoms are perceived as helpful (Hanton, Thomas, & Maynard, 2004; Ntoumanis & Biddle, 1998). Self-efficacy and control exemplify the psychological resources a dancer with high BPNS may draw upon when evaluating performance demands and interpreting his/her cognitive anxiety.

Threat appraisals significantly predicted the intensity of the dancers' cognitive and somatic anxiety responses, and significantly mediated the impact of BPNS upon the intensity of reported state cognitive anxiety. In addition, threat appraisals negatively predicted the dancers' interpretations of their somatic anxiety symptoms as facilitative, throughout the performance period. If one considers a performance as threatening, it makes sense that he/she would not regard any physical anxiety symptoms in a positive light (Jones et al., 2009). Although not quite reaching statistical significance ($p = .056$) threat appraisals also negatively predicted the dancers' interpretations of cognitive anxiety. Collectively, these findings point to the relevance of BPNS for performers. Even in the midst of physically and psychologically demanding situations, BPNS may enhance resilience to maladaptive cognitive appraisals, and as a consequence, emotional responses may be more desirable.

The insignificant paths between challenge appraisals and the intensity and interpretation of the dancers' somatic anxiety were contradictory to our hypothesis. Challenge states have been hypothesized to elicit intense negative as well as positive emotions (Jones et al., 2009). Thus, when viewed as challenging, there might still be the

potential for public dance performances to elicit unease and uncertainty. Even if the dancer felt competent, self-determined and cared for (i.e., high in BPNS), an important performance may be associated with worry, not necessarily through fear of failure, but perhaps reflecting the value and importance the dancer places on tackling this challenge. Positive emotions, such as excitement and exhilaration associated with challenge appraisals (Folkman, 2008), may also instigate uncontrollable somatic reactions. While some dancers may have the self-regulatory skills to manipulate their physiological arousal, for others, somatic responses may become disruptive to the ideal physical performance state. This complex association may explain the null finding between the dancers' challenge appraisals and the level and interpretations of their somatic anxiety symptoms. It is also possible that challenge appraisals are predominantly associated with positive emotions, which were not tapped in the present study.

Conclusions and Future Directions

This study found that BPNS and challenge appraisals, coupled with low threat appraisals, may result in a physiological and emotional state that is advantageous for dance performance. The exploration of the inter-relationships between dancers' BPNS, cognitive appraisals and cortisol/anxiety responses in an ecologically valid setting was a notable strength of the present study. This enabled the examination of naturally occurring, rather than laboratory manipulated, emotional and hormonal responses.

While challenge appraisals were more salient in the relationship between BPNS and cortisol reactions, threat was the principal mechanism in the 'BPNS – anxiety' association. The expected association between threat and cortisol secretion may not have emerged on account of the dancers' low perceptions of threat in the circumstances of this study. Nevertheless, the observed association between threat and state anxiety indicates

that the threshold at which threat appraisals stimulate anxiety responses may be lower than that required to trigger cortisol secretion. The role of BPNS in the stimulation of other anticipatory physiological stress reactions (e.g., sympathetic adreno-medullary activity) considered to be differentially associated with performance stress (Jones et al., 2009) warrants research attention.

Recent studies in dance point to the important role of teachers in the nurturing or thwarting of BPNS (Quested & Duda, 2009b, 2009d, 2010). Perceptions of autonomy supportive teaching have previously been associated with decreases in students' anxiety throughout a semester (Black & Deci, 2000). In light of these and the present findings, it is reasonable to hypothesize that teachers may be able to help dancers become less susceptible to potentially debilitating performance stress reactions, via the fostering of BPNS.

In conclusion, findings support self-determination theory (Deci & Ryan, 1985, 2000) as a relevant framework within which to advance understanding of individual difference factors that may contribute towards psychophysiological stress responses. The social-psychological and motivational processes underpinning variability in performance appraisals, and ensuing emotional and biological responses, remains an intriguing and under-explored line of enquiry.

General Discussion

A burgeoning collection of studies have considered the social environmental determinants and health-related consequences of basic psychological need satisfaction (BPNS) experienced by athletes (see Hagger & Chatzisarantis, 2007). Just as sunlight, food, and water represent physical necessities for human functioning, basic needs theory (BNT) maintains that BPNS contributes towards an individual's optimal functioning, well-being and thriving (Deci & Ryan, 2000; Ryan, 1995). Grounded in BNT (Deci & Ryan, 2000; Ryan & Deci, 2000b) this thesis comprised a series of studies designed to extend conceptual understanding of the role of BPNS as a determinant of healthful functioning in the physical domain. More specifically, the studies examined the interrelationships between perceptions of the social environment, BPNS and indices of psychological and physical health in the context of vocational dance. A paucity of studies has considered the social-psychological antecedents of well-being among performing artists. Thus, the present work was undertaken with the intention of creating an empirical basis for further BNT-based research and applied work in performing arts settings.

The studies contained within the thesis support the application of BNT as a framework in which to examine determinants of well- and ill-being in the vocational dance domain. That is, the results support the BNT proposal that healthful or compromised functioning depends upon the extent to which the three needs are satisfied (Deci & Ryan, 2008b). Across the four empirical chapters, the thesis has addressed a number of key conceptual and methodological issues related to this founding principal. In this final chapter, each issue will be independently addressed as a way to surmise and integrate the four studies. The targeted topics provide a stimulus for discussion of the thesis findings as well as the ensuing theoretical, measurement-related and applied implications.

The Health Status of Vocational Dancers: Is the Reputation the Reality?

In the UK, ballet and contemporary dance are the genres studied by the majority of vocational students. These dance styles are often considered polarized by the extent to which they provide opportunities for dancers to exercise freedom, creativity and novelty in their work. Anecdotally, it is often remarked that ballet dancers' health may be more at risk because of the form or content of the genre and the typically authoritarian and controlling environment in which classes are taught. Study three provided some preliminary evidence that may serve to demystify this perception. The study found there to be no significant differences in the extent to which ballet and contemporary dancers perceived their dance classes to provide autonomy support, or in the levels of BPNS that the dancers experienced in dance classes. Intriguingly, the dancers specializing in Chinese dance reported lower perceptions of autonomy support and BPNS in their classes than their contemporary and ballet peers. Chinese dance is founded in long-held, deep rooted traditions. Thus, it may be that these culturally-specific and ritualistic characteristics of Chinese dance make this type of environment more distinct from ballet and contemporary than these genres are from each other.

The findings of study three indicate that, in some circumstances, the characteristics of the dance genre may influence the extent to which dance teaching can facilitate need satisfaction. In this study, Chinese dancers experienced lower perceptions of autonomy support and autonomy, competence and relatedness need satisfaction than ballet and contemporary dance students. This study cannot confirm there to be differences in the social climate in ballet and contemporary classes, at least in terms of autonomy supportive features. However, it may be the case that these two learning atmospheres differ in the extent to which other characteristics of the climate are prevalent, such as controlling teacher behaviors (Bartholomew et al., in press), task- and/or ego-involving cues (Newton

et al., 2000) and socially supportive approaches to teaching (Sarason, Sarason, Shearin, & Pierce, 1987).

Overall, this thesis presents a promising picture of the nature of the social environment in dance classes. In the past, the reputation of dance education has been marked by reports of highly controlled, punitive and controlling approaches to teaching (Aalten, 2005). The studies included in this thesis consistently show that this perspective of the psychological environment is not always realized in the dance studio. Mean scores from studies one, two and three indicate that, on the whole, the dancers perceive their learning environments to be predominantly autonomy supportive and task-involving and low in ego-involving cues.

Over the years, a case has been made to suggest that dancers are a performing group 'at risk' of physical and psychological problems (Bettle, Bettle, Neumarker, & Neumarker, 2001; Laws, 2005; Ravaldi et al., 2006). The descriptive statistics reported in this thesis indicated that in general, dancers experienced low burnout, negative affect, threat-based performance appraisals and performance related anxiety. Mean scores for challenge-based performance appraisals, facilitative interpretations of performance anxiety, positive affect and autonomy, competence and relatedness satisfaction were consistently above the respective scale's midpoints. Collectively, these findings indicate that healthful dance training is not necessarily an oxymoron. The data also suggest that many dance teachers exhibit behaviors that are more likely to lead to adaptive consequences for the students engaged in their classes. For those concerned with maximizing the quality of engagement amongst those in the vocational dance community, this is seemingly good news.

However, this picture must be presented in conjunction with some caveats. Firstly, in all studies, there was evidence of variability in each of the targeted outcomes, indicating

that not all dance students had a positive experience in school, reported high BPNS or experienced well-being. Secondly, it is important to acknowledge that the dance schools' agreement to participate in this research may have reflected an existing interest in creating positive learning climates. Along a similar line, teachers in the schools agreeing to be involved in the present research may have already been aware of some of the principles that contribute towards autonomy supportive and task-involving dance teaching. The thesis data may have been more variable, and potentially pointed to a less positive story, if the participating dance schools had been entirely naïve to the implications of their teaching behaviors for dancers' health or if all vocational dance schools in the UK had been required to participate in the present studies. Thirdly, study two revealed that the dancers' perceptions of autonomy supportive climates, autonomy need satisfaction, and relatedness need satisfaction decreased, whereas burnout symptomology increased over the school year. Study four also found evidence of variability in the dancers' perceptions of the social climate and reported affective states from day to day, and class to class. Thus, health promotive dance training is not inherent to and consistent in dance classes. Via the studies in this thesis, it has been possible to offer some theoretically grounded explanations for why such temporal differences and situational variability may exist.

Under What Social Conditions Will Dancers be Most Likely to Experience

Autonomy, Competence and Relatedness Need Satisfaction?

A key tenet of self-determination theory (SDT) (Deci & Ryan, 1985, 2000) is that social agents (e.g., teachers, coaches) play a central role in determining the quality of experience afforded in physical activity settings, via the nature of the social environment they create (Ryan & Deci, 2007). Studies undertaken in the domains of exercise and sport have illustrated that exercisers' and athletes' perceptions of the social climate provided by

instructors and coaches explains between-person variability in BPNS (for reviews see Edmunds et al., 2007; Gagne & Blanchard, 2007). This thesis found consistent support for the BNT-based (Deci & Ryan, 2000; Ryan & Deci, 2002) hypothesis that perceptions of the social environment would be relevant to the degree of BPNS experienced by vocational dancers.

In study one, between-person differences in dancers' perceptions of autonomy support were shown to predict between-person variability in the dancers' degree of autonomy, competence and relatedness satisfaction. In this study, the dancers' perceptions of task- (+) and ego- (-) involving features of the dance climate (Newton et al., 2000) were also associated with BPNS. Moreover, the three features of the social context targeted in study one explained unique variance in the dancers' reported BPNS.

Study one extends beyond work that has only targeted autonomy support and/or other facets of the environment deemed significant to motivational processes via an SDT lens. The study highlights the importance of also including environmental structures that may influence *how* performers define and assess their perceived competence by also tapping perceptions of the task- and ego-involving features of the motivational climate (Newton et al., 2000). This study clearly illustrates that multiple dimensions of the social environment serve to contribute towards dancers' need fulfillment.

In study two, consonant with the specific tenets of BNT (Deci & Ryan, 2000), the 'autonomy support – need satisfaction' relationship was supported over time; the observed decreases in the extent to which dance teaching was considered autonomy supportive co-varied systematically with increases in satisfaction of the three needs. This finding provides compelling evidence regarding the presumed link between perceptions of autonomy support provision and the degree to which participants in that setting feel autonomous, competent and related.

Like the majority of research grounded in SDT (Deci & Ryan, 1985, 2000), the aforementioned investigations focused on predictors of between-person variability in BPNS. In other words, these studies tapped what is “typical”, or how the situation at hand “usually” is, in terms of an athlete or dancers’ perceptions of the degree of autonomy support afforded in their training context. Study three extended this work and demonstrated that situational perceptions of autonomy support impact upon BPNS with immediate effect. Specifically, study three found that the dancers’ perceived autonomy support in each class was relevant to the degree of autonomy, competence and relatedness satisfaction that the dancers reported immediately after each class. Moreover, study three found the ‘autonomy support – need satisfaction’ association to be consistent in learning (classes) as well as more evaluative (rehearsal, performance) environments.

A consistent and noteworthy finding across studies one, two and three was the strength of the association between perceptions of the social environment and relatedness satisfaction. In the case of perceptions of autonomy support, the findings from studies one, two and three are aligned with past work in sport (Adie et al., 2008b) and PE (Standage et al., 2006). In study one, perceived task-involving dance environments also significantly predicted relatedness (as well as competence and autonomy) satisfaction. Strong relationships between perceptions of task-involving sport environments and relatedness satisfaction have previously been documented in sport research drawing from SDT (Reinboth & Duda, 2006). However, the observed negative association between perceptions of ego-involving dance contexts and dancers’ relatedness satisfaction revealed in study one is inconsistent with findings from PE (Standage et al., 2003) and sport (Reinboth & Duda, 2006) settings. Collectively, these findings indicate that vocational dancers’ feelings of relatedness may be sensitive to multiple cues or dimensions of the social environment.

Providing rationale, taking the others' perspective, and providing choice and decision making opportunities are considered to be the benchmarks of autonomy supportive teaching (Black & Deci, 2000; Reeve, 2006). These characteristics might be expected to be more aligned with feelings of self-governance and volition (i.e., autonomy) than feelings of connectedness and belonging (i.e., relatedness). The studies in this thesis cannot clarify whether all autonomy supportive teaching behaviors contribute towards a sense of relatedness satisfaction, or whether there are particular features of autonomy supportive teaching that render relatedness more likely to benefit. In explicating the findings regarding the strong observed 'autonomy support – relatedness' connection, it has been acknowledged that autonomy-supportive teaching often reflects characteristics associated with higher quality relationships between teachers and students, such as attunement, supportiveness and relatedness support (Reeve, 2006). Previous work in the physical domain has supported a strong interdependence between perceptions of autonomy support and social support (e.g., Reinboth et al., 2004) as well as involvement (e.g., Gagne et al., 2003). If the aforementioned interpersonal qualities are also embedded within autonomy-supportive dance teaching then it makes sense that the quality of the student-teacher relationship, and in turn, dancers' feelings of relatedness would profit.

Past research in the sport domain evaluated the relationship between perceived autonomy support and socially supportive coaching behaviors and athlete's BPNS (Reinboth et al., 2004). However, in their structural equation model, Reinboth and colleagues only examined the relative contribution of these environmental features to satisfaction of the most conceptually similar need (i.e. autonomy support – autonomy, social support – relatedness). In the family domain however, perceived involvement and autonomy support have explained unique variance in variability in satisfaction of all three basic needs (Grolnick, Ryan, & Deci, 1991).

Recent work in the vocational dance setting has indicated that socially supportive dance teaching is strongly associated with BPNS (Quested & Duda, 2009a). However, the potential for socially supportive coaching to be perceived as controlling has previously been noted in the literature (Amorose, 2007). In a longitudinal study involving college athletes, high frequencies of perceived social support offered by the coach were associated with decreases in the athletes' intrinsic motivation during the athletic season (Amorose & Horn, 2000). Thus, dance teaching that is socially supportive but lacking in autonomy support may be less likely to optimize dancers' need satisfaction or indeed could lead to low need satisfaction. In such atmospheres, the environment could be perceived as controlling if the dancer does not want to let down a caring teacher or the social support provided is marked by expectations and contingencies ("I care for you if..."). It has previously been noted that autonomy support and social support may be "mutually facilitative" in promoting desirable motivational tendencies (Ryan & Solky, 1996). It might also be the case that socially supportive teaching moderates the relationship between perceived autonomy support and satisfaction of the need for relatedness. In other words, it is possible that autonomy-supportive teaching may be most likely to enhance relatedness satisfaction when it is undertaken with a high level of care and interpersonal involvement.

The BNT-grounded literature would certainly benefit from research that considers correlates of perceptions of autonomy support *alongside* socially supportive teaching. However, this goal is easier to state than it is to accomplish, at least with existing methods of measurement of the constructs in question. In an investigation connected with but not included in the thesis, the author attempted to model dancers' perceptions of autonomy support and social support as predictors of motivation regulations. Multicollinearity problems associated with the measurement of perceived autonomy support (as assessed via the Health Care Climate Questionnaire; Williams et al., 1996) and social support (as

measured via the Social Support Questionnaire; Sarason et al., 1987) prevented this objective from being realized. This was also the case in a recent study involving athletes (Adie et al., personal communication).

Environments that are marked by pressure and control (termed controlling environments) are understood to be liable to undermine the BPNS of those engaged in the setting in question (Bartholomew et al., in press). To date, controlling coach or instructor behaviors have largely been neglected in work examining social environmental predictors of BPNS. These facets of the climate have also not yet been examined in dance contexts. Thus, an enhanced understanding of the array of social-environmental conditions that may thwart or sustain dancers' need fulfillment is warranted. In this thesis the only contextual dimension targeted that may be assumed to hold implications for need thwarting per se was perceptions of ego-involving dance environments. Further, need thwarting, which may not necessarily be the same as low need satisfaction, was not directly assessed in this work. Nevertheless, the findings of study one indicate that when dance climates are perceived as ego-involving, compromised competence and relatedness satisfaction are likely to ensue. Future research, in which the more negative aspects of the social environment in dance settings are tapped alongside measures of need thwarting, would make an interesting contribution to the literature.

To date, an array of independent assessment tools have been employed to gauge the social characteristics of the psychological environment in performance settings. These instruments differ in their format, stems and anchors, as well as having different psychometric strengths and weaknesses. On the basis of the arguments raised above, it would seem prudent to develop a multidimensional measurement tool tapping facets of the larger social environment which would be assumed to hold motivational implications. Based on the large SDT literature and specific studies presented in this thesis, such a

questionnaire would target perceptions of task- and ego-involving, autonomy supportive, controlling and socially supportive facets of the social climate, as well as the degree of structure and involvement provided by the teacher. 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 teacher takes an active interest in and commits time, attention, resources and care towards the dancer (Gagne et al., 2003; Grolnick & Ryan, 1989). The development and application of this multi-subscale and potentially hierarchically structured questionnaire would help to examine how, and to what extent, specific elements of the social environment may interactively or independently foster BPNS among performers. The creation of such an instrument would help to delineate the prominent and motivationally significant features of the social environment in training and performance settings.

It is important to point out that, to date, there is a notable lack of dance-specific measures of motivation-related constructs (Quested & Duda, 2009c). In research on dancers, as was the case in studies comprising this thesis, relevant measures previously developed and validated for athletes, students or other populations are adapted. Thus, the development of a dance specific and theoretically-based assessment tool tapping perceptions of the psychological environment in dance classes is needed. However, the described measure would also make a valuable contribution to understanding of the antecedents of BPNS in other physical activity contexts.

Does BPNS Explain Variability in Dancers' Psychological Well-and Ill-Being?

A central feature of BNT (Deci & Ryan, 2000) is the postulation that BPNS is essential for health and well-being regardless of culture or context (Ryan & Deci, 2002). A number of studies undertaken in the physical domain have demonstrated the importance of

BPNS for healthful functioning in athletic settings (Gagne & Blanchard, 2007). For example, subjective vitality and positive affect are indices of well-being known to be associated with BPNS experienced by athletes (Adie et al., 2008b; Gagne et al., 2003). In studies one and three, positive affect was employed as a gauge of emotional well-being among vocational dancers. At the between-person level (study one), the three needs positively predicted the dancers' typical experiences of positive affective states. SDT postulates that BPNS should also predict enduring signs of effective functioning and psychological health (Deci & Ryan, 2000). The diary technique affords the possibility of exploring the social-psychological processes that may underlie within-person variability in reported well-being over time (Bolger, Davis, & Rafaeli, 2003). Via the application of this method (study three), BPNS was shown to consistently predict dancers' daily experiences of positive affective states in class, rehearsal and performance environments. This adds credence to the BNT postulate with regard to the psychological mechanisms important for sustained well-being. However, it is not immediately clear why only two of the three needs predicted changes in positive affect in each environment considered in study three (classes, rehearsals, performances). In classes, competence and relatedness predicted changes in the dancers' positive affect. In rehearsal contexts, changes in positive affect were significantly predicted by autonomy and relatedness, whereas in performances autonomy and competence were the only significant predictors of changes in the dancers' affective states. The interrelationships between the three needs is an assumption inherent to SDT (Ryan & Deci, 2000b). The three basic needs were consistently found to be positively related throughout the thesis (see Table 6.1) although multicollinearity was not a problem. Therefore, in explicating the findings of study three, it is possible that shared variance confounded the effect of one need in each dance setting examined.

Table 6.1

Intercorrelations (R) Between the Three Needs in Each Study in the Thesis

	Study one	Study two (T2)	Study two (T3)	Study three
Competence – Autonomy	.33	.41	.43	.50
Competence – Relatedness	.36	.26	.49	.40
Autonomy – Relatedness	.50	.50	.54	.67

Taken in their totality, the thesis findings largely support the postulate that ongoing autonomy, competence and relatedness satisfaction is a universal necessity for psychological well-being (Deci & Vansteenkiste, 2004). It is important to note that according to SDT, the mere presence of positive affect is not indicative of eudaimonic well-being (Ryan & Deci, 2001). Moving beyond outcomes associated with *feelings* such as happiness or affective states, eudaimonia refers more specifically to an overall sense of wellness, also capturing the *processes* that underscore living well (Ryan et al., 2008). With this in mind, the thesis targeted a range of outcomes that would capture the processes, content and experiences associated with quality and healthful living (i.e., cognitive appraisals, hormonal and emotional stress responses, burnout and affective states).

Despite recent theorizing on the topic (Ntoumanis et al., 2009; Skinner & Edge, 2002) prior to this thesis, little was known regarding the role of BPNS in potentially stressful performance scenarios. In study four, dancers' BPNS was positively associated with adaptive cognitions (i.e., challenge appraisals) prior to a performance. BPNS also negatively predicted the intensity of anxiety the dancers' experienced and positively predicted their facilitative interpretations of anxiety symptoms. This finding points specifically to the role of BPNS as a nutriment of effective functioning in evaluative, performance-focused activities.

Just as sustained need satisfaction is understood to contribute towards well-being, BNT maintains that need deprivation will be costly for healthful functioning and is associated with individuals' compromised welfare (Deci & Ryan, 2000). The relevance of attenuated BPNS to indicators of ill-being has received less attention in the SDT literature. To address this void, multiple indices of psychological ill-being were targeted in the thesis (i.e., negative affect, burnout, anxiety). In each of the four studies there was empirical evidence to suggest that low BPNS significantly predicted variability in such indicators of dancers' ill-being.

The observed inconsistency in the extent to which each of the three psychological needs accounted for levels of psychological ill-being is not a finding unique to this thesis. In other studies, there has been a marked imbalance in the relative contribution of each need to the targeted ill-being indicators (e.g., Adie et al., 2008b; McDonough & Crocker, 2007). Deci and Ryan (1985) have indicated that the functional significance of the situation may influence the relative impact of each need upon cognitive, behavioral and emotional responses (Deci & Ryan, 1985). In past work undertaken with athletes (Reinboth et al., 2004), PE students (Ntoumanis, 2001b) and hip hop dancers (Quested & Duda, 2009d), competence was the most salient need in predicting the targeted motivational and well-being outcomes. When explicating their findings, these authors pointed to the functional significance and readily apparent features of physical competence in the physical domain. However, in study one, which used a cross-sectional research design, relatedness was the most significant predictor of vocational dancers' well- and ill-being experiences. The number of hours the dancers spent in school with their peers and teachers was put forward as an explanation for this finding. Conversely, in the longitudinal investigation (study two), competence was the most relevant need in accounting for increases in the dancers' global burnout, reduced accomplishment and dance devaluation.

Moreover, in study three, while relatedness played an important role in accounting for the dancers' changes in positive affect during dance classes, only competence need satisfaction significantly predicted changes in the dancers' negative affective states during performances.

The variation in the prominence of competence and relatedness across the three studies suggests that need salience may be more situation specific than has been acknowledged in the SDT literature (e.g., Ntoumanis, 2001b; Reinboth et al., 2004). However, perhaps a more notable finding across the thesis was that autonomy was not always a predictor of the targeted outcome variables. More specifically, autonomy need satisfaction was unrelated to negative affect (study one) and changes in the dancers' reported emotional and physical exhaustion and dance devaluation over the school year (study two). In studies one, two and three the beta coefficients indicated that the predictive utility of autonomy was consistently weaker than competence and relatedness. Autonomy is a central and distinguishing feature of SDT; as an overall framework, SDT focuses on the antecedents and consequences of autonomous behavior (Ryan & Deci, 2002). Indeed the inclusion of autonomy into this theoretical framework of motivation and quality of functioning could be considered to be its' hallmark. SDT proposes that competence and relatedness satisfaction can facilitate the integrative process, but autonomy is a necessity for behaviors or values to be fully integrated with a sense of self (Deci & Ryan, 2000). It is not immediately clear why autonomy need satisfaction appeared to be less relevant as a predictor of dancers' well- and ill-being than the needs for competence and relatedness. Previous authors have argued that autonomy may function as a feature of actions that support relatedness or competence satisfaction, rather than as an independent need (Little, Hawley, Henrich, & Marsland, 2002). As a characteristic of the action, these authors suggest that autonomy satisfaction is mediated by the extent to which one pursues actions

that would lead to competence and relatedness fulfillment. The arguments of Little and colleagues (2002), the findings in this thesis, and the consistent evidence (in the thesis and other work) pointing to shared variance between the three needs, collectively indicate that the three needs are interdependent. Despite the relative weakness of the paths, throughout the thesis it was clear that autonomy did contribute towards dancers' well and ill-being experiences. Specifically, in studies one and three, autonomy significantly predicted changes in positive affect. In study three, changes in autonomy significantly predicted changes in global burnout and dance devaluation over the school year (and the paths between changes in autonomy need satisfaction and changes in emotional and physical exhaustion and reduced dance accomplishment were nearing significance). Moreover, the simple correlations reported in all studies support the hypotheses that autonomy, competence and relatedness are associated with the well- and ill-being experiences of the dancers. Thus, we cannot conclude that autonomy is not important for dancers. Rather, it may be the case that it is difficult to fully capture how autonomy contributes towards well- and ill-being, either as an independent need or in conjunction with relatedness and competence.

It would seem that the pertinent question at this juncture is not whether BPNS is or is not an antecedent of well- and ill-being. Rather, researchers might focus on trying to delineate the circumstances that render satisfaction of each need more or less likely to be associated with indicators of healthful functioning. It may be the case that the three needs vary in the extent to which they are predictive of particular indices of well- and ill-being. Another possibility could be that the approach taken to measure the needs may have clouded an association that exists in "real life". Typically, studies (including those in this thesis) have adapted existing measures of autonomy, competence and relatedness to tap BPNS in the physical domain. These measures may not be the most effective means via

which need satisfaction can be tapped in dance settings. Moreover, given the interdependence between the three needs, perhaps it is not helpful to try and tease out their independent contribution to health and well-being; the three needs may operate as a 'package', rather than as independent constructs. A further explanation may rest in the dynamics and demands of the setting in question. That is, situational characteristics may influence the relevance of each need to indices of well- and ill-being.

The findings of the present thesis point to some particular conditions that may influence the relative salience of competence and relatedness in the dance domain. When assessed cross-sectionally (study one) and in the context of fulltime daily activities that are part of an established daily routine (i.e., dance classes; study three), relatedness satisfaction appeared to be particularly relevant to the dancers' emotional experiences. Full time vocational dance students spend the majority of their time in classes so this might well be their most significant social context. Consequently, it is conceivable that feeling that one 'belongs' and holds a meaningful connection with others in this setting would have a more pronounced impact upon the dancers' affective states experienced each day. In research undertaken in performance domains in which competence held the most functional significance, the targeted activities were part time and less regular (e.g., part time hip hop or youth sporting activities (Quested & Duda, 2009d; Reinboth et al., 2004) or performances and rehearsals (study three)). In these circumstances, the relevance of feeling that one belongs may have less of an emotional impact than would be the case in fulltime settings.

Drawing from the findings of study three, another potential explanation for the observed variability in need salience could lie in the extent to which the context is learning or performance focused. In learning settings where dancers interact every day with a group of peers, feelings of relatedness might be most predictive of their affective experiences.

However, when operating in more evaluative circumstances where proficiency is ‘on the line,’ it is comprehensible that satisfaction of the need for competence would be more predictive of emotional responses.

Objective and subjective judgments of success or failure are known to illicit emotional responses (Nummenmaa & Niemi, 2004; Schantz & Conroy, 2009). Achievement goal theorists describe two central goal perspectives that shape judgments of competence, success and accomplishment known to be manifested at state (i.e., goal involvement) and dispositional (i.e., goal orientation) levels (Duda, 2001; Nicholls, 1989; Roberts, 2001). Task-involved individuals tend to focus on exhibiting effort, improving skills and performing one’s best (Duda, 2001). When task focused, perceptions of competence depend upon the extent to which the individual considers his/her performance has met these objectives. On the contrary, ego-involved performers are concerned with demonstrating their adequacy and/or superiority (Nicholls, 1989; Wang & Biddle, 2007). When ego focused, social comparison provides an unstable and uncontrollable yard stick against which a dancer judges his/her competence. Drawing from the achievement goal theory literature (Nicholls, 1989), it may be the case that the nature of competence construal determines the extent to which feeling competent and related in performance settings augments emotional performance responses. To date, little is known regarding the interaction between task- and ego- goal perspectives and basic need satisfaction.

Throughout this thesis, speculative explanations of why each of the three needs may be more or less relevant to well- and ill-being have been offered. There are several avenues via which future studies could explore the question of relative need salience. Research in other settings in which performers train fulltime for a performance-based activity (e.g., sport academies, drama schools) may identify whether the amount of time one spends in the setting in question enhances the significance of relatedness. It would also

be informative to delineate the particular social and/or situational conditions that influence the relative importance of each need. For example, it is possible that specific facets of autonomy supportive and task- or ego-involving approaches to teaching influence the relevance of each need. Objective and subjective assessments of the characteristics of the psychological climate created in dance classes may also help to determine the conditions that lead each need to be more or less predictive of affective states each day.

In their seminal paper, Deci and Ryan wrote specifically about the expected ill-being consequences when the psychological needs are thwarted (Deci & Ryan, 2000). In their work however, Deci and Ryan did not distinguish between low need satisfaction (i.e., low levels of competence, autonomy and relatedness satisfaction) and need thwarting (i.e., deprivation of the three needs). Need thwarting reflects a separate dimension and is not exactly equivocal to *low* BPNS. However, in the past twenty years of SDT research on basic needs this distinction has not been explicit. Most studies have examined high or low BPNS in regard to indices of health and functioning. To add to the confusion, in the literature low BPNS is often referred to as thwarted need satisfaction. The relevance of specifically targeting the consequences of need thwarting has recently been raised (Vallerand et al., 2008). Need thwarting per se was not assessed in this thesis. Rather, the premise that ill-being may be the consequence of low BPNS was the primary focus. The findings indicate that even when BPNS is low, as opposed to actually thwarted, dancers may still be liable to experience compromised mental health. Future research in dance settings could target high and low BPNS as well as high and low levels of need thwarting in regard to positive and negative indicators of dancers' welfare. It would also be interesting to examine whether the salience of autonomy, competence and relatedness thwarting varies depending on the nature of the targeted indicator of ill-being as well as the temporal, social and/or contextual characteristics in question.

Can BPNS Adequately Explain Variability in the Manifestation of Physical Ill-Being Among Vocational Dancers?

In studies one and two, the expected associations between autonomy, competence and relatedness and dancers' reported emotional and physical exhaustion were not supported. In past work, BPNS has been found to be unrelated to self-reported indicators of physical health including exhaustion (Hodge et al., 2008; Lonsdale et al., 2009) and physical symptoms (Reinboth & Duda, 2006; Reinboth et al., 2004). In studies one and two, BPNS significantly predicted other indices of psychological health, namely positive and negative affect and the burnout sub dimensions of dance devaluation and reduced sense of accomplishment. Collectively, these findings bring into question the relevance of psychological needs to indices of physical welfare.

Over the past thirty years, self-report measures have been the standard method of assessing psychological and physical well- or ill-being in SDT-based studies. Despite frequent assumptions, there is currently no empirical evidence to qualify whether one's degree of BPNS is associated with biological processes central to health. In this regard, the findings of study four make a novel contribution to the SDT literature. The findings indicate that BPNS is an antecedent of biological processes relevant to healthful functioning.

In study four, salivary cortisol levels were examined as a key biological marker known to be relevant to metabolic and immunological functioning (Miller et al., 2009). Study four found low BPNS to be associated with higher cortisol output during the two hour time period that included a ballet solo. Aligned with the predictions of SDT (Deci & Ryan, 2000; Ryan & Deci, 2002), this indicates that dancers with low BPNS may be more susceptible to biological and psychological deregulation (Michaud et al., 2008). Study four

also found challenge appraisals to mediate the observed negative association between BPNS and cortisol secretion.

However, study four was less telling about the role of BPNS and cognitive appraisals as antecedents of extreme and/or sustained cortisol responses; BPNS accounted for only 11% of the variance in cortisol (AUC_G). This may be because the measure of BPNS captured general levels of need satisfaction rather than need fulfillment relevant to the specific performance in question. Drawing from the findings of study three (which was completed after study four), it would seem that state indicators of BPNS may be more useful than general measures in predicting state emotional responses. It may also be the case that state level BPNS would better predict hormonal stress responses than ‘typical’ levels of need satisfaction. Thus, an appropriate next step would be to repeat study four and examine situation specific, state BPNS alongside a more general measure. It is also important to recognize that threat and challenge appraisals may be dynamic as well. Previous research has pointed to the relevance of state threat and challenge appraisals as predictors of emotional responses to performance (Skinner & Brewer, 2002). In study four we assessed cognitive appraisals with respect to the dancers’ threat and challenge appraisals of the forth-coming solo performance, on one occasion two hours prior to the performance. To increase understanding of the antecedents of temporal variability in the hormonal and emotional reactions and cognitions targeted in study four, future research might also assess fluctuations in threat and challenge appraisals during performances and also the potential implications of these appraisals for cortisol secretion and anxiety responses.

Drawing from the findings of study four, it is only possible to speculate that the observed relationship between BPNS and cortisol secretion may be indicative of risk of long term health complications. Although BPNS was found to be a significant correlate of

cortisol secretion, there was no evidence that the secretion of this hormone was prolonged or excessively high. Cortisol secretion is understood to lead to dysregulation of bodily functions when the release is excessive or sustained (Miller et al., 2007). Thus, future research might consider monitoring cortisol levels for an extended period after the performance has concluded. It would also be interesting to gauge the interdependencies between BPNS, cognitive appraisals, emotional responses and indices of metabolic and immunological functioning throughout the school year, as there may be temporal variability in the extent to which events are evaluative and potentially stressful. In addition, this question is worthy of pursuit at the professional level in the world of dance. It is often the case that professional dancers must return to the stage for an evening performance just hours after leaving the stage from the matinee show. In this circumstance, dancers who find performing particularly stressful may be at increased risk of sustained and excessive cortisol elevation and associated health risks.

Future studies might also consider other health-related markers of immunological functioning known to be associated with protracted stress, such as Secretory Immunoglobulin A (S-IgA) and measures of microbial clearance (Bosch et al., 2003). S-IgA's main function is to promote clearance of microbes by preventing their adhesion to mucosal tissues. Lower levels of S-IgA are associated with increased susceptibility to infectious disease (Bosch, Ring, de Geus, Veerman, & Amerongen, 2002). Measures of microbial clearance (e.g., bacterial adhesion) would establish the *effectiveness* (rather than just the quantity) of secretory factors in determining bacterial clearance. In longitudinal BNT-based research, the inclusion of these measures would be particularly informative regarding the potential immunological pathways by which social environmental factors and motivational processes may lead to variability in health.

In settings where performers partake in daily rigorous physical training, the study of states of exhaustion is understandably complex. Collectively, the findings in this thesis highlight the benefits that could be accrued from a multi-disciplinary approach to the study of social-psychological predictors of exhaustion and other indices of ill-being. More specifically, in looking at exhaustion, it would be valuable to employ self-report and objective indices of fatigue, burnout and emotional welfare *alongside* objective indices such as energy expenditure, injury and immunological and metabolic functioning.

Drawing from the limitations of the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) raised in chapter two, an improved measure of reported exhaustion is warranted if the antecedents of burnout symptomology are to be delineated. The present subscale of the ABQ is limited by the extent to which it is repeatedly vague about the targeted component of exhaustion (e.g., “I feel overly tired from my dance participation”). Item wording makes it difficult to discern whether the respondent is referring to physical, and/or emotional and/or mental experiences of tiredness. When the mental aspects of exhaustion are directly referred to in one item, this is couched in terms of the demands of the activity rather than the experience of exhaustion (e.g., “I am exhausted by the mental and physical demands of dance”). Once again, mental, emotional and physical manifestations of exhaustion are blurred in the item content.

Throughout the empirical studies presented in this thesis, perceptions of the social environment have repeatedly explained variability in the targeted indices of well- and ill-being. With the knowledge that such direct effects are evidenced, it would be remiss to disregard perceptions of the social environment as antecedents of stress reactions and biological markers of health and functioning. For example, perceptions of ego-involving sport climates have known associations with performance-related distress and anxiety (Ntoumanis & Biddle, 1998; Pensgaard & Roberts, 2000), as well as other indicators of

compromised health (Duda, 2001). In study one, perceptions of an ego-involving dance climate was the only social environmental variable to explain variability in dancers' reported emotional and physical exhaustion. Thus, it would seem pertinent to examine whether this type of learning and/or performance environment is likely to lead to undesirable biological responses when performers face the limelight.

Does BPNS Mediate the 'Social-Environment – Well-/Ill-Being' Relationship?

According to BNT (Deci & Ryan, 2000), the psychological needs for autonomy, competence and relatedness are expected to mediate the association between perceptions of the social environment and indices of well- and ill-being (Deci & Ryan, 2000; Ryan & Deci, 2002). This hypothesis has previously been examined in sport settings and within education. However, there have been methodological limitations in the approaches undertaken to test mediation in these studies (Gagne et al., 2003; Reinboth & Duda, 2006; Standage et al., 2005). That is, in this past work, mediation was tested via multiple regression (Reinboth & Duda, 2006), with a composite need variable (Standage et al., 2005), or the three needs were tested in separate equations (Gagne et al., 2003). In studies one, two and three, the recommendations of MacKinnon and colleagues (Krull & MacKinnon, 1999, 2001; MacKinnon, 2000; MacKinnon & Fairchild, 2009; MacKinnon et al., 2002) were followed to rigorously test this BNT-based supposition that autonomy, competence and relatedness serve as mediators.

When the results of the thesis studies are considered collectively, it is only possible to offer partial support for the mediation hypothesis (Ryan & Deci, 2002). Within each study there were inconsistencies in the predictive utility of each need with regard to the targeted indices of well- and ill-being. As discussed earlier in this chapter, it is as yet unknown whether this variability could be a function of measurement limitations, specific

characteristics of the situation in question, or which outcome variables were being targeted. Nevertheless, throughout this thesis there is more evidence to suggest that the three needs *are* mediators in the association between perceptions of the social environment and well- and ill-being, than there is to suggest this claim is suspect. Collectively, the findings of this thesis point to the need for on-going research that will test the BNT sequence in innovative ways. To date, researchers have typically chosen to focus on a limited number of social environmental dimensions and indices of well- and ill-being in each study. These decisions are usually dictated by practical and statistical requirements. However these often logistical considerations do not detract from the fact that, as a consequence, it has not been possible to date to capture a truly holistic picture of how one's experiences in social settings may influence healthful functioning via the satisfaction of the basic psychological needs. Given the associated methodological demands, this challenge may always be insurmountable. Nevertheless, future research, in which innovative approaches to the assessment of health and functioning are employed alongside multi-dimensional measures of the motivational climate, as well as measures of need satisfaction and need thwarting, will add further color and depth to a BNT-inspired picture of the determinants of optimal and compromised functioning.

Practical Implications and Future Directions

Grounded in the basic needs theory framework (Deci & Ryan, 2000; Ryan, 1995), this thesis was undertaken with the intention of addressing a number of specific issues related to the interplay between BPNS and healthful or compromised functioning in the physical domain. Aside from the desire to make a contribution to the evolving literature concerned with health-related implications of psychological need satisfaction, this work was motivated by a personal desire to contribute towards the advancement of health

conducive training environments for artists as well as other ‘performers’ in physical activity settings (e.g., athletes).

The practical recommendations stemming from this thesis are aligned with the conceptual foundation upon which the studies were based, namely the self-determination theory framework (Deci & Ryan, 1985, 2000), and to a lesser degree, the achievement goal theory (Ames, 1992; Nicholls, 1989) literature. Study one pointed to the advantages of integrating these perspectives when considering the characteristics that may help to produce the most adaptive learning climates. The findings indicate that dance teachers will create health-conducive training environments when they couple autonomy supportive behaviors with task-involving teaching practices and temper ego-involving characteristics. Given that each dimension of the climate predicted unique variance in the three basic needs, there would be obvious disadvantages of making practical recommendations that address singular facets of the social environment.

For two decades, the TARGET acronym has been the default approach when motivational climate based recommendations have been made for coaches and teachers. The TARGET framework (Epstein, 1989) is a taxonomy representing the central achievement structures in learning settings. According to Ames (1992), specific dimensions of the training environment (i.e., the Task, Authority, Recognition, Grouping, Evaluation, and Timing) can be targeted with a view to enhancing the task-involving and tempering the ego-derived features of the context at hand. Although originally applied to the AGT literature, the emphasized environmental dimensions in the TARGET taxonomy appear to hold implications for satisfaction of the needs for autonomy, competence and relatedness. For example, with respect to the ‘task’ facet, provision of opportunities for performers to undertake diverse, personally challenging and self-selected tasks in training would create a learning environment supportive of autonomy as well as competence need

satisfaction. If recognition and reward are more private, and founded on personal progress, feelings of competence may be enhanced. A reduction in public, normative comparisons may reduce intra-individual rivalry and competition, and as a consequence a sense of greater relatedness between performers may result. The submission of more authority to the “learners” by actively endorsing self-monitoring, enabling them to be involved in decision making and to take leadership roles, and encouraging cooperative peer-learning could serve to enhance autonomy and competence, as well as relatedness need satisfaction.

Drawing on the findings of this thesis as well as the contemporary literature grounded in SDT, it may be timely to develop a guiding framework that considers the multi-faceted nature of the climate. More specifically, such a framework might integrate AGT and SDT perspectives and specifically focus on the environmental dimensions that may be most likely to foster need satisfaction in physical activity settings. This approach could encompass not only task-involving and autonomy supportive teaching behaviors, but also the environmental components of structure and involvement. The findings of this thesis have indicated that, at least in terms of autonomy support provision, the nature of the social environment can fluctuate when the focus of the activity switches from learning to more performance-related, as well as when assessed at the beginning and towards the end of the school year. Thus, it would seem pertinent to establish a framework that would help teachers maintain good practice regardless of the demands generated by the circumstance (e.g., classes vs. rehearsals) or by curriculum requirements or performance schedules.

Throughout this chapter, the most pertinent findings from the thesis have been presented and discussed. In addressing the targeted issues, some research questions have been answered and others remain unresolved. The research process has brought to light a new set of intriguing measurement issues and theoretical nuances worthy of research attention. The important research aims stemming from this thesis work have been outlined

throughout this chapter. In moving towards a conclusion, the central points that warrant further consideration will be briefly summarized.

With regard to measurement, the thesis studies point to the need for a multi-dimensional measure of the social environment that is specific to dance. The development of dance-specific measures of need satisfaction and also need thwarting would contribute towards understanding of the relevance of the psychological needs for healthful functioning in performance-related domains. The exploration of alternative approaches to the assessment of emotional and physical exhaustion also appears to be warranted. This may be particularly insightful with regard to distinguishing between the social-psychological determinants of different manifestations of fatigue (i.e., physical, emotional, mental). Further research incorporating objective indicators associated with physical fatigue (e.g., indicators of endocrinological function) alongside self-reported measures of basic need satisfaction (and need thwarting) and emotional and physical exhaustion may help to delineate the specific mechanisms associated with physiological and psychological tiredness.

Research undertaken in the educational domain has pointed to the influence of institutional pressures as having a significant influence upon the extent to which teachers are able to teach in an autonomy supportive way (Pelletier, Seguin-Levesque, & Legault, 2002). Thus, if dancers are to experience BPNS, more positive and less negative affective states after every class throughout the day, and during the academic year, dance teachers must be equipped with the skills to identify how they can be autonomy supportive, in every class, rehearsal and performance, regardless of the targeted outcome of the activity or pressures from within or outside the school system. In terms of linking theory, research and practice, a significant challenge is to identify *how* to effectively train instructors to create and maintain a need supportive teaching atmosphere. Research undertaken in the

domain of PE has also pointed to the relevance of teachers' perceived job pressure and perceptions of their students' motivation as determinants of the degree of BPNS the teachers themselves experience (Taylor, Ntoumanis, & Standage, 2008). It is highly likely that teachers will be able to create need supportive teaching environments when their own needs are satisfied in the setting and their decision to teach in this way is integrated with their sense of self. Identifying how to help teachers and coaches appreciate the value of need supportive coaching, *and* be able to adopt need supportive behaviors regardless of the situational (or potentially organizational) demands is an additional conundrum with which dance, sport and educational psychologists need to wrestle.

Research in exercise and academic class settings has indicated that it is possible to train instructors to be more autonomy-supportive (Edmunds, Ntoumanis, & Duda, 2008; Reeve, 1998) and such interventions result in more positive outcomes for class participants (Edmunds et al., 2008). Limited research in sport and PE has examined whether it is possible to make the environment more task- and less ego-involving (e.g., Smith, Smoll, & Cumming, 2007). To date, no work has been conducted entailing the creation and evaluation of SDT-based, as well as AGT-aligned, interventions in the dance domain specifically. From both a theoretical and applied standpoint therefore, the development, implementation and evaluation of an intervention centered on the promotion of autonomy-supportive and task-involving dance environments is warranted. In such work, it would be interesting to then consider the association between these environmental dimensions, BPNS and the previously described indices of psychological and biological functioning over time. Findings would have significant implications for vocational dance, as well as other educational and physical activity settings.

Conclusion

All over the world, and for hundreds of years, dance and sport have been prominent in civilized society. Whether under the spotlight or the floodlight, dance and sport provide opportunities that may contribute towards every individual's emotional, physical and social well-being. Whether participation is recreational or elite, the two activities can provide opportunities for self-expression, self-development and social integration. However, the potential physical and psychological benefits of physical activity participation are not always realized. At the elite level specifically, where performers invest heavily in terms of time and training, there is sometimes a health-related cost.

The findings of this thesis, as well as the theoretical framework upon which the studies were founded, highlight the importance of social-psychological processes in differentiating between health conducive and health compromising elite training. The stage is now set for future SDT-driven research that will extend the studies within this thesis in the dance setting, as well as other performance domains. The ongoing application of the SDT framework as an approach to understanding healthful functioning will be an important step in helping performing artists and athletes to thrive and flourish throughout their careers.

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APPENDICES

Appendices

Questionnaire Items Used in Study One

Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) (Newton et al., 2000)

Read each of the following items carefully and respond to each item in terms of how you view the typical atmosphere in your dance school or company.

	In this dance school/company...	Strongly disagree		Neutral		Strongly agree
1	The teachers want us to try new skills/movements/expressions.	1	2	3	4	5
2	The teachers get mad when a dancer makes a mistake.	1	2	3	4	5
3	The teachers give most of their attention to the “stars”.	1	2	3	4	5
4	Each dancer contributes in some important way.	1	2	3	4	5
5	The teachers believe that all of us are crucial to the success of a performance.	1	2	3	4	5
6	The teachers praise dancers only when they outperform other dancers.	1	2	3	4	5
7	The teachers think that only the lead dancers contribute to the success of a performance.	1	2	3	4	5
8	Dancers feel good when they try their best.	1	2	3	4	5
9	Dancers are not selected for the best roles if they make mistakes.	1	2	3	4	5
10	Dancers at all skill levels have an important role in performances.	1	2	3	4	5
11	Dancers help each other learn.	1	2	3	4	5
12	Dancers are encouraged to outperform the other dancers.	1	2	3	4	5
13	The teachers have their own favourites.	1	2	3	4	5
14	The teachers make sure dancers improve on skills or movements they’re not good at.	1	2	3	4	5
15	The teachers yell at dancers for messing up.	1	2	3	4	5

	In this dance school/company...	Strongly disagree		Neutral		Strongly agree
16	Dancers feel successful when they improve.	1	2	3	4	5
17	Only the best dancers get praise.	1	2	3	4	5
18	Dancers are punished when they make a mistake.	1	2	3	4	5
19	Each dancer has an important role.	1	2	3	4	5
20	Trying hard is rewarded in rehearsals and performances.	1	2	3	4	5
21	The teachers encourage dancers to help each other.	1	2	3	4	5
22	The teachers make it clear who they think are the best dancers.	1	2	3	4	5
23	Dancers are “fired up” (positively excited) when they perform better than their fellow dancers in a performance.	1	2	3	4	5
24	If you want to be cast for the best roles you must be one of the best dancers.	1	2	3	4	5
25	The teachers emphasise always trying your best.	1	2	3	4	5
26	Only the top dancers “get noticed” by the teachers.	1	2	3	4	5
27	Dancers are afraid to make mistakes.	1	2	3	4	5
28	Dancers are encouraged to work on their weaknesses.	1	2	3	4	5
29	The teachers favour some dancers more than others.	1	2	3	4	5
30	The focus is to improve each class /rehearsal /performance.	1	2	3	4	5
31	The dancers really “work together” as a team when it comes to performances.	1	2	3	4	5
32	Each dancer feels as if they are an important team member.	1	2	3	4	5
33	The dancers help each other to get better and excel.	1	2	3	4	5

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

The following statements represent what the environment is typically like in your dance school or company. Please indicate on the scale the degree to which you agree with the following statements.

	In this dance school/company...	Strongly disagree			Neutral			Strongly agree
1	I feel that my teachers provide me with choices and options.	1	2	3	4	5	6	7
2	I am able to be open with my teachers while engaged in dance.	1	2	3	4	5	6	7
3	My teachers make sure I really understand the goals of my dance involvement and what I need to do.	1	2	3	4	5	6	7
4	My teachers encourage me to ask questions.	1	2	3	4	5	6	7
5	My teachers answer my questions fully and carefully.	1	2	3	4	5	6	7
6	My teachers listen to how I would like to do things.	1	2	3	4	5	6	7
7	My teachers try to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Perceived competence subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989)

Respond to the following statements considering your experiences as a dancer in this school or company:

		Strongly disagree			Neutral			Strongly agree
1	I think I am pretty good at dance.	1	2	3	4	5	6	7
2	I am satisfied with my dancing.	1	2	3	4	5	6	7
3	After practicing a particular routine/movement for a while, I feel pretty competent.	1	2	3	4	5	6	7
4	I am pretty skilled at dance.	1	2	3	4	5	6	7
5	I can't dance very well.	1	2	3	4	5	6	7

Autonomy was tapped via three items (Sheldon et al., 2001).

The statements below allow you to think about how much the choices and decisions you make in this dance school or company are your own. Please indicate how much each statement is like you.

	In this dance school/company, I feel...	Not at all		Somewhat		Very much
1	That my choices are based on my true interests and values.	1	2	3	4	5
2	Free to do things my own way.	1	2	3	4	5
3	That my choices express my "true self"/ who I really am.	1	2	3	4	5

Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998)

Please circle the answer that best describes how you feel when participating in this dance school or company

	In this dance school/company I feel...	Strongly disagree		Neutral		Strongly agree
1	Supported.	1	2	3	4	5
2	Listened to.	1	2	3	4	5
3	Understood.	1	2	3	4	5
4	Valued.	1	2	3	4	5
5	Safe.	1	2	3	4	5

Emotional and physical exhaustion subscale from the Athlete Burnout Questionnaire (Raedeke & Smith, 2001)

Please respond honestly to the following items regarding how you are feeling at this present moment in time in relation to your participation in dance.

	At this present moment...	Almost never		Neutral		Almost always
1	I feel so tired from my dance training that I have trouble finding energy to do other things.	1	2	3	4	5
2	I feel overly tired from my dance participation.	1	2	3	4	5
3	I feel wiped out (exhausted) from dance.	1	2	3	4	5
4	I feel physically worn out from dance.	1	2	3	4	5
5	I am exhausted by the mental and physical demands of dance.	1	2	3	4	5

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

How you generally feel - This scale consists of a number of words that describes different feelings and emotions. Read each item and then indicate to what extent you generally feel this way using the scale provided.

I generally feel...	Not at all	A Little	Moderately	Quite a bit	Extremely
1. Interested.	1	2	3	4	5
2. Distressed.	1	2	3	4	5
3. Excited.	1	2	3	4	5
4. Upset.	1	2	3	4	5
5. Strong.	1	2	3	4	5
6. Guilty.	1	2	3	4	5
7. Scared.	1	2	3	4	5
8. Hostile.	1	2	3	4	5
9. Enthusiastic.	1	2	3	4	5
10. Proud.	1	2	3	4	5
11. Irritable.	1	2	3	4	5
12. Alert.	1	2	3	4	5
13. Ashamed.	1	2	3	4	5
14. Inspired.	1	2	3	4	5
15. Nervous.	1	2	3	4	5
16. Determined.	1	2	3	4	5
17. Attentive.	1	2	3	4	5
18. Jittery.	1	2	3	4	5
19. Active.	1	2	3	4	5
20. Afraid.	1	2	3	4	5

Questionnaire Items Used in Study Two

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

The following statements represent what the environment is has typically been like in your dance school over the past few weeks. Please indicate on the scale the degree to which you agree with the following statements:

	In this dance school...	Strongly disagree			Neutral			Strongly agree
1	I feel that my teachers provide me with choices and options.	1	2	3	4	5	6	7
2	I am able to be open with my teachers while engaged in dance.	1	2	3	4	5	6	7
3	My teachers make sure I really understand the goals of my dance involvement and what I need to do.	1	2	3	4	5	6	7
4	My teachers encourage me to ask questions.	1	2	3	4	5	6	7
5	My teachers answer my questions fully and carefully.	1	2	3	4	5	6	7
6	My teachers listen to how I would like to do things.	1	2	3	4	5	6	7
7	My teachers try to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Perceived competence subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989)

Respond to the following statements considering your experiences as a dancer in this school over the past few weeks:

		Strongly disagree			Neutral			Strongly agree
1	I think I am pretty good at dance.	1	2	3	4	5	6	7
2	I am satisfied with my dancing.	1	2	3	4	5	6	7
3	After practicing a particular routine/movement for a while, I feel pretty competent.	1	2	3	4	5	6	7
4	I am pretty skilled at dance.	1	2	3	4	5	6	7
5	I can't dance very well.	1	2	3	4	5	6	7

Autonomy was tapped via three items (Sheldon et al., 2001).

The statements below allow you to think about how much the choices and decisions you make in this dance school or company are your own. Thinking back over the past few weeks, please indicate how much each statement is like you.

	In this dance school, I feel...	Not at all		Somewhat		Very much
1	That my choices are based on my true interests and values.	1	2	3	4	5
2	Free to do things my own way.	1	2	3	4	5
3	That my choices express my "true self"/ who I really am.	1	2	3	4	5

Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998)

Please circle the answer that best describes how you feel when participating in this dance school over the past few weeks:

	In this dance school I feel...	Strongly disagree		Neutral		Strongly agree
1	Supported.	1	2	3	4	5
2	Listened to.	1	2	3	4	5
3	Understood.	1	2	3	4	5
4	Valued.	1	2	3	4	5
5	Safe.	1	2	3	4	5

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

Please respond honestly to the following items regarding how you are feeling at this present moment in time in relation to your participation in dance.

	At this present moment...	Almost never		Neutral		Almost always
1	I'm accomplishing many worthwhile things in dance.	1	2	3	4	5
2	I feel so tired from my dance training that I have trouble finding energy to do other things.	1	2	3	4	5
3	The effort I spend in dance would be better spent doing other things.	1	2	3	4	5
4	I feel overly tired from my dance participation.	1	2	3	4	5
5	I am not achieving much in dance.	1	2	3	4	5
6	I don't care as much about my dance performance as I used to.	1	2	3	4	5
7	I am not performing up to my ability in dance.	1	2	3	4	5
8	I feel "wiped out" (exhausted) from dance.	1	2	3	4	5
9	I am not into dance like I used to be.	1	2	3	4	5
10	I feel physically worn out from dance.	1	2	3	4	5
11	I feel less concerned about being successful in dance than I used to.	1	2	3	4	5
12	I am exhausted by the mental and physical demands of dance.	1	2	3	4	5
13	It seems that no matter what I do, I don't perform as well as I should.	1	2	3	4	5
14	I feel successful at dance.	1	2	3	4	5
15	I have negative feelings towards dance.	1	2	3	4	5

Questionnaire Items Used in Study Three

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

The following statements represent what the environment is has typically been like in your dance school over the past few weeks. Please indicate on the scale the degree to which you agree with the following statements:

	In this dance school...	Strongly disagree			Neutral			Strongly agree
1	I feel that my teachers provide me with choices and options.	1	2	3	4	5	6	7
2	I am able to be open with my teachers while engaged in dance.	1	2	3	4	5	6	7
3	My teachers make sure I really understand the goals of my dance involvement and what I need to do.	1	2	3	4	5	6	7
4	My teachers encourage me to ask questions.	1	2	3	4	5	6	7
5	My teachers answer my questions fully and carefully.	1	2	3	4	5	6	7
6	My teachers listen to how I would like to do things.	1	2	3	4	5	6	7
7	My teachers try to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7

Perceived competence subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989)

Respond to the following statements considering your experiences as a dancer in this school over the past few weeks:

		Strongly disagree			Neutral			Strongly agree
1	I think I am pretty good at dance.	1	2	3	4	5	6	7
2	I am satisfied with my dancing.	1	2	3	4	5	6	7
3	After practicing a particular routine/movement for a while, I feel pretty competent.	1	2	3	4	5	6	7
4	I am pretty skilled at dance.	1	2	3	4	5	6	7
5	I can't dance very well.	1	2	3	4	5	6	7

Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998)

Please circle the answer that best describes how you feel when participating in this dance school over the past few weeks:

	In this dance school I feel...	Strongly disagree		Neutral		Strongly agree
1	Supported.	1	2	3	4	5
2	Listened to.	1	2	3	4	5
3	Understood.	1	2	3	4	5
4	Valued.	1	2	3	4	5
5	Safe.	1	2	3	4	5

Autonomy was tapped via six items (Deci et al., 2001).

Please respond to each of the following statements by rating how you feel when participating in dance in this school over the past few weeks:

	In this dance school ...	Not at all true			Neutral			Very true
1	I feel free to express my ideas and opinions.	1	2	3	4	5	6	7
2	I feel free to do things my own way.	1	2	3	4	5	6	7
3	I feel I can give a lot of inputs to deciding what skills/movements/expressions I want to practice.	1	2	3	4	5	6	7
4	I have the opportunity to take part in deciding what choreography should be used.	1	2	3	4	5	6	7
5	I have a say in what happens in dance classes and rehearsals and I feel free to give my opinion.	1	2	3	4	5	6	7
6	I feel I have a lot of inputs in deciding how rehearsals and class are to be carried out.	1	2	3	4	5	6	7

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

This scale consists of a number of words that describe different feelings and emotions. Read each item and then indicate to what extent you have felt this way over the past few weeks, using the scale provided.

I generally feel...	Not at all	A Little	Moderately	Quite a bit	Extremely
1. Interested.	1	2	3	4	5
2. Distressed.	1	2	3	4	5
3. Excited.	1	2	3	4	5
4. Upset.	1	2	3	4	5
5. Strong.	1	2	3	4	5
6. Guilty.	1	2	3	4	5
7. Scared.	1	2	3	4	5
8. Hostile.	1	2	3	4	5
9. Enthusiastic.	1	2	3	4	5
10. Proud.	1	2	3	4	5
11. Irritable.	1	2	3	4	5
12. Alert.	1	2	3	4	5
13. Ashamed.	1	2	3	4	5
14. Inspired.	1	2	3	4	5
15. Nervous.	1	2	3	4	5
16. Determined.	1	2	3	4	5
17. Attentive.	1	2	3	4	5
18. Jittery.	1	2	3	4	5
19. Active.	1	2	3	4	5
20. Afraid.	1	2	3	4	5

Measures in the diary

Shortened version of the PANAS (MacKinnon et al., 1999)

*How you feel – These are words that describe different feelings and emotions. Read each item and then indicate to what extent you feel this way **RIGHT NOW/at THIS MOMENT.***

	I feel...	Not at all	A Little	Moderately	Quite a bit	Extremely
1	Distressed.	1	2	3	4	5
2	Excited.	1	2	3	4	5
3	Upset.	1	2	3	4	5
4	Scared.	1	2	3	4	5
5	Enthusiastic.	1	2	3	4	5
6	Alert.	1	2	3	4	5
7	Inspired.	1	2	3	4	5
8	Nervous.	1	2	3	4	5
9	Determined.	1	2	3	4	5
10	Afraid.	1	2	3	4	5

Selected items included in the daily measures of autonomy support (1 & 2), relatedness (3 & 4), competence (5 & 6) and autonomy, (7 & 8) in the class, rehearsal and performance diaries.

Please respond to the following items, thinking about how you felt in the class you just attended:

	In this class...	Strongly disagree		Neutral				Strongly agree
1	I felt that my teachers provided me with choices and options.	1	2	3	4	5	6	7
2	My teachers made sure I really understood the goals of my involvement in the class and what I needed to do.	1	2	3	4	5	6	7
3	I felt valued.	1	2	3	4	5	6	7
4	I felt supported.	1	2	3	4	5	6	7
5	I was satisfied with my dancing.	1	2	3	4	5	6	7
6	I thought I was pretty good at dance.	1	2	3	4	5	6	7
7	I felt I could give a lot of input to deciding which skills/movements/expressions I wanted to practice.	1	2	3	4	5	6	7
8	I felt free to do things my own way.	1	2	3	4	5	6	7

In the rehearsal diaries, ‘class’ was replaced with ‘rehearsal’.

In the performance diaries, the instructions were worded as ‘*Please respond to the following items, thinking about how you felt as you went into this performance.*’ The stem read ‘*Going into this performance ...*’

Minor modifications were also made to item seven (‘I felt I had the opportunity to give a lot of input to deciding which skills/movements/ expressions I wanted to practice in preparation for this performance’) and item two (‘I felt that my teachers had made sure I really understood the goals of my involvement in the performance and what I needed to do’).

Questionnaire Items Used in Study Four

Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998)

Please circle the answer that best describes how you feel when participating in this dance school over the past few weeks

	In this dance school I feel...	Strongly disagree		Neutral		Strongly agree
1	Supported.	1	2	3	4	5
2	Listened to.	1	2	3	4	5
3	Understood.	1	2	3	4	5
4	Valued.	1	2	3	4	5
5	Safe.	1	2	3	4	5

Autonomy was tapped via six items (Deci et al., 2001).

Please respond to each of the following statements by rating how you feel when participating in dance in this school over the past few weeks:

	In this dance school ...	Not at all true			Neutral			Very true
1	I feel free to express my ideas and opinions.	1	2	3	4	5	6	7
2	I feel free to do things my own way.	1	2	3	4	5	6	7
3	I feel I can give a lot of inputs to deciding what skills/movements/expressions I want to practice.	1	2	3	4	5	6	7
4	I have the opportunity to take part in deciding what choreography should be used.	1	2	3	4	5	6	7
5	I have a say in what happens in dance classes and rehearsals and I feel free to give my opinion.	1	2	3	4	5	6	7
6	I feel I have a lot of inputs in deciding how rehearsals and class are to be carried out.	1	2	3	4	5	6	7

Perceived competence subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989)

Respond to the following statements considering your experiences as a dancer in this school over the past few weeks:

		Strongly disagree			Neutral			Strongly agree
1	I think I am pretty good at dance.	1	2	3	4	5	6	7
2	I am satisfied with my dancing.	1	2	3	4	5	6	7
3	After practicing a particular routine/movement for a while, I feel pretty competent.	1	2	3	4	5	6	7
4	I am pretty skilled at dance.	1	2	3	4	5	6	7
5	I can't dance very well.	1	2	3	4	5	6	7

Perceptions of threat and challenge (McGregor & Elliot, 2002)

What do you think about this solo performance?

Some dancers would find performance situations rather threatening (i.e., they can provide potential harm to you). Others might view performances as a positive challenge (i.e., they can provide an opportunity for personal development and growth).

Think about how you feel about your performance today and please respond to the items below. There are no right or wrong answers – we want to know how different dancers vary in their feelings regarding an upcoming performance.

	When I think about this performance...	Not at all true of me						Very true of me
1	I look forward to being challenged	1	2	3	4	5	6	7
2	I think that this performance represents a threat to me	1	2	3	4	5	6	7
3	I view this performance as a positive challenge	1	2	3	4	5	6	7
4	I believe that this performance could have negative consequences for me	1	2	3	4	5	6	7
5	I think that this performance represents a challenge to me	1	2	3	4	5	6	7
6	I view this performance as a threat	1	2	3	4	5	6	7

Short form self-report state anxiety assessment (Thomas et al., 2002)

Place a cross (X) in the circles below to indicate your thoughts *RIGHT NOW*.

	Not at all			Neutral			Extremely
I feel concerned/worried/ anxious about my solo performance	<input type="radio"/>						
How positive (helpful) or negative (unhelpful) do you think these thoughts are for you?	Very negative	<input type="radio"/>	<input type="radio"/>	Neutral	<input type="radio"/>	<input type="radio"/>	Very positive

	Not at all			Neutral			Extremely
I feel physically nervous (e.g., tense, fast heart rate, “butterflies”) about my solo performance	<input type="radio"/>						
How positive (helpful) or negative (unhelpful) do you think these physical feelings are for you?	Very negative	<input type="radio"/>	<input type="radio"/>	Neutral	<input type="radio"/>	<input type="radio"/>	Very positive