Thriving on Pressure: A Factor Mixture Analysis of Sport Performers' Responses to Competitive Encounters

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Although considerable research exists on performers' responses to sporting encounters, little is known about thriving in sport contexts. The current study examined if distinct response patterns existed between sport performers who thrived in competitive encounters compared with those who did not. Participants were 535 sport performers (134 women; $M_{age} = 23.60$ years, $SD_{age} = 8.08$; $M_{competing} = 11.84$ years, $SD_{competing} = 7.11$). Results of factor mixture analysis supported a four-profile solution comprising a thriving group ($n = 146$), a low-functioning group ($n = 38$), and two groups characterized by scores marginally above ($n = 131$) and below ($n = 209$) the sample mean. Profile membership was found to be predicted by personal enablers (viz., personal resilient qualities, psychological skills use) and process variables (viz., basic psychological need satisfaction and frustration, challenge appraisal). This examination of thriving in sport performers offers significant implications for research and practice.

Keywords: athlete, performance, person-centered approach, well-being

Sport performers often encounter various stressors as part of their involvement in competitive sport. Their ability to respond effectively to these demands is likely to dictate how well they function in competition and, ultimately, whether they thrive or merely manage or succumb to the scenario (Sarkar & Fletcher, 2014b). Despite the desire to understand and promote adaptive outcomes representing fundamental interests for scholars and practitioners in sport psychology (Portenga, Aoyagi, & Cohen, 2017), little progress has been made in understanding *thriving* in sport. Across contexts, thriving has been broadly defined as "the joint experience of development and success" (Brown, Arnold, Fletcher, & Standage, 2017, p. 168), with Brown et al. suggesting that thriving in response to a situation (i.e., in state form) involves subjectively perceiving a high level of performance and experiencing a high level of well-being. To further our understanding of thriving in sport, the current work examines whether it is possible to identify sport performers who thrive in demanding competitive sporting encounters using subjective indices of performance and well-being. Furthermore, we explore whether this experience can be predicted from a range of potentially pertinent variables (e.g., resilient qualities, basic psychological need satisfaction).

Although a lack of comprehension currently exists on thriving in sport, the construct has been discussed in this context since the turn of the century. Early descriptions of thriving in sport emerged from conceptual investigations on mental toughness in elite athletes (see Bull, Shambrook, James, & Brooks, 2005; Jones, Hanton, & Connaughton, 2002). Within these studies, thriving on the pressure of competition was described as a key attribute of mental toughness. Following these initials mentions, thriving has begun to feature more prominently in sport research with scholars investigating the construct in youth (e.g., Gucciardi, Jackson, Hodge, Anthony, & Brooke, 2015; Gucciardi & Jones, 2012; Gucciardi, Stamatis, & Ntoumanis, 2017; Jones, Dunn, Holt, Sullivan, & Bloom, 2011; Jones & Lavallee, 2009) and adult populations (e.g., Galli & Reel, 2012; Harris, Myhill, & Walker, 2012). Despite the accumulation of work in this area, an understanding of the construct has been restricted by the lack of consistency in how thriving has been conceptualized. To illustrate, although some authors utilize a state-based definition of the construct (e.g., Gucciardi et al., 2015), others draw similarities between thriving and stress-related growth (e.g., Galli & Reel, 2012) or employ a positive youth development framework (e.g., Jones et al., 2011). An accumulation of knowledge in this area has been further hindered by scholars opting to include thriving as a subsidiary variable in studies where the focus of investigation has centered on other constructs (e.g., life skills, mental toughness). Collectively, these endeavors have provided

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ad hoc insights into the construct, but they have failed to provide a dedicated and systematic line of thriving inquiry in sport. To overcome the inconsistencies in previous thriving research in sport, Brown, Arnold, Reid, and Roberts (2017) recently conducted a dedicated exploration of thriving in sport performers nested in the perspectives of athletes, coaches, and sport psychologists operating in elite sport. Thriving was perceived by participants to comprise a sustained high level of performance and dimensions of well-being (e.g., being optimistic, being focused and in control; Brown, Arnold, Reid, & Roberts, 2017). Within future research, it appears important to establish a method that draws on these characteristics to identify performers who have experienced thriving.

With sport scholars conceptualizing thriving variously within past work, it is necessary to offer clarity on how thriving differs to other constructs that, superficially, may appear similar. For example, the term thriving has previously been used interchangeably with "growth" to describe positive adaptation following adverse events (see e.g., Galli & Reel, 2012). Yet, thriving is distinct from adversarial growth in that it does not depend on a traumatic event (Carver, 1998), rather it can occur following either a life opportunity or a life adversity (Feeney & Collins, 2015). This description similarly differentiates thriving from resilience, with resilience considered to represent maintaining or quickly returning to normal functioning when under pressure or following adversity (Fletcher & Sarkar, 2017; Kalisch, Müller, & Tüscher, 2015). A further term that has conceptual similarity to thriving is flourishing, with both terms concerned with human functioning, development, and success (see Brown, Arnold, Fletcher, & Standage, 2017; Keyes, 2002, 2003). In their conceptual study of flourishing in sport, Ashfield, McKenna, and Backhouse (2012) observed that flourishing represented an individually specific notion of optimal well-being, irrespective of athletic performance. Thus, a key differentiator of flourishing and thriving is the need for a perceived high level of performance for an individual to thrive (cf. Brown, Arnold, Fletcher, & Standage, 2017). Most recently, similarities have also been drawn between the constructs of wellness and thriving (see Ryan & Deci, 2017). Specifically, Ryan and Deci (2017) suggest that wellness is better described as thriving (or being fully functioning), which they characterize as "vitality, awareness, access to, and exercise of one's human capacities and true self-regulation" (Ryan & Deci, 2017, p. 241). Notably, this description includes both an energetic, eudaimonic component (i.e., vitality —a positive feeling or having available energy emanate from the self; Ryan & Frederick, 1997) and a performance component (i.e., exercise of one's human capacities). Furthermore, the authors additionally state that happiness (i.e., hedonic well-being) is an indicator of full functioning (i.e., when people are fully functioning, they tend to report higher levels of happiness; Ryan & Deci, 2017). Thus, within self-determination theory

(SDT), eudaimonic well-being, hedonic well-being, and performance all appear critical indicators of human thriving, which also suggest that thriving within SDT aligns with the operational definition of thriving used in this study.

The disparate nature of existing research on thriving in sport mirrors the broader body of literature on human thriving (see, for a review, Brown, Arnold, Fletcher, & Standage, 2017). Although there have been cogent lines of research within specific domains (e.g., positive youth development, work), much of this research has been guided by conceptual models that are yet to explain thriving across different contexts and populations (see e.g., Benson & Scales, 2009; Carver, 1998; Feeney & Collins, 2015; Gestsdóttir & Lerner, 2007; Lerner, Dowling, & Anderson, 2003; Mangelsdorf & Eid, 2015; O'Leary & Ickovics, 1995; Spreitzer, Sutcliffe, Dutton, Sonenshein, & Grant, 2005). A framework that may provide a more generalized theoretical explanation of the specific factors that facilitate thriving is SDT (Ryan & Deci, 2000, 2017). Of particular relevance are the tenets forwarded within a mini-theory of SDT, labeled basic psychological need theory (BPNT; Deci & Ryan, 2000). According to BPNT, humans have three basic and universal needs for autonomy, competence, and relatedness, and experiencing satisfaction of these needs is considered essential for thriving (Ryan & Deci, 2017). More specifically, it is purported that the needs enable human thriving by energizing and directing human behavior toward the fulfillment of the organismic tendencies for growth, wellness, and integrity (Deci & Ryan, 2000; Ryan & Deci, 2017).

A central tenet of BPNT is that psychological need satisfaction is nurtured and maintained via environments that are need supportive (Ryan & Deci, 2017). Similarly, environments that are controlling or need thwarting can result in need frustration (cf. Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011). This principle places the satisfaction or frustration of the basic psychological needs as a mediator (or process variable) through which social–contextual factors (e.g., coaches, parents) can impact thriving (Ryan & Deci, 2017). The nature and importance of these social–contextual factors (hereafter contextual enablers) will differ from context to context and from time to time (Bundick, Yeager, King, & Damon, 2010; Thoits, 1995); thus, it is necessary to identify specific enablers that may be salient to predicting thriving in sport. In addition to identifying contextual enablers, it is important to identify the attitudes, behaviors, and cognitions of an individual that may help him or her thrive in these various scenarios. These characteristics, termed *personal enablers* in the previous thriving literature (Brown, Arnold, Fletcher, & Standage, 2017; Park, 1998), may offer an alternative or simultaneous resource for sport performers to draw upon in order to thrive.

Despite the absence of a coherent body of work on thriving in sport, it is possible to identify potential contextual and personal enablers based on research

that has predicted performance and well-being outcomes separately. For example, perceptions of social support have been found to differ significantly between high and low performers (when determined by self-referenced performance; Boat & Taylor, 2015). Furthermore, when considered in combination with negative social interactions, social support has been shown to contribute to burnout and impaired well-being across the competitive season (DeFreese & Smith, 2014). Sport performers can also perceive social support from specific sources, such as their coach, teammates, and parents. To illustrate, coach support has previously been found to predict athletes' perceptions of need satisfaction, which were then found to be an important predictor of well-being (e.g., Kipp & Weiss, 2013; Reinboth, Duda, & Ntoumanis, 2004). As well as operating through need satisfaction and need frustration variables, social support has been shown to impact performance via perceived control and subsequent challenge appraisal process variables (Freeman & Rees, 2009). These processes are in accordance with the transactional theory of stress and coping (Lazarus, 1966; Lazarus & Folkman, 1984), within which individuals are proposed to appraise a situation as a challenge (i.e., the potential for gain or growth) when they perceive high levels of control. In addition to perceived social support, challenge appraisals are thought to be influenced by a range of personal resilient qualities (e.g., positive personality, confidence), which have also been suggested to influence thriving (see Fletcher & Sarkar, 2012; Sarkar & Fletcher, 2014a). Moreover, research has highlighted various psychological skills (e.g., goal-setting, imagery) that are believed to assist with adaptive stress responses and relate to sporting success and well-being (see e.g., Edwards & Edwards, 2012; Mahoney, Gabriel, & Perkins, 1987; Rees et al., 2016), and are, thus, worthy of study in relation to thriving in sport.

To begin a systematic inquiry of thriving in sport, a logical first step is to establish whether it is possible to identify performers who are thriving. Extending on the conceptual argument that thriving occurs when an individual is fully functioning (see Brown, Arnold, Fletcher, & Standage, 2017; Ryan & Deci, 2017; Su, Tay, & Diener, 2014), one approach that could be used is to assess multiple indicators of functioning (see e.g., Scales, Benson, Leffert, & Blyth, 2000), with individuals scoring highly across indicators considered to be thriving. Thus, within the context of sporting encounters (e.g., a match or competition), thriving could be determined using measures of subjective performance and well-being specific to that setting. In addition to establishing if performers thrive in competition, this approach could offer valuable insights into the other patterns of functioning that may be observed in athletes. That is, although thriving sport performers would be anticipated to score highly on all functioning indicators (i.e., to be fully functioning), other performers may display a general tendency to be functioning at moderate or low levels in competition or they may display asynchronous patterns (e.g., high on performance, low on well-being; low on performance, high on well-being). Developing an awareness of these patterns

would offer a more complete understanding of the responses displayed by performers in competition.

To enable the identification of possible responses displayed by sport performers in the present study, it is necessary to integrate both person- and variable-centered approaches. Person-centered approaches (e.g., latent profile analysis) explain the covariance between individuals through a categorical latent variable (Lubke & Muthén, 2005). In contrast, variable-centered approaches (e.g., confirmatory factor analysis) attempt to explain the covariance between variables using a continuous latent variable (Cattell, 1952). The purpose of person-centered approaches is to look for relationships between individuals, whereas variable-centered approaches are used to examine relationships between variables (Bauer & Curran, 2004). Within the present study, it is anticipated that distinct asynchronous patterns may exist with some performers reporting high levels of well-being, but low levels of performance, and vice versa. To determine these so-called *shape* effects (i.e., the tendency for a person to have a distinct pattern of factors on which they are high, medium, or low), it is appropriate to adopt person-centered techniques (see Morin & Marsh, 2015). However, it is also anticipated that a global continuous variable (i.e., general functioning level) will underpin performers' responses to the indicators; therefore, creating a *level* effect (i.e., the tendency for a person to be high, medium, or low across all factors) and the need to follow a variable-centered approach (see Morin & Marsh, 2015). To disentangle the *level* and *shape* effects and enable the extraction of cleaner profiles of performers' responses to sporting encounters, factor mixture models stipulating a categorical latent variable and a profile-invariant continuous latent factor will be used (see Lubke & Muthén, 2005). Furthermore, adopting this approach permits the additional examination of relationships between possible enabler and process variables with profile membership, through the inclusion of predictor variables (see Asparouhov & Muthén, 2014).

Using these techniques, the aim of the present study was to examine whether it is possible to identify sport performers who thrived in demanding competitive sporting encounters over the past month via the measurement of subjective performance and well-being. Furthermore, it was anticipated that through pursuit of this aim, it would be possible to develop an awareness of the other responses displayed by performers in competition. A secondary aim of the study was to examine whether profile membership could be predicted from scores for personal enablers (e.g., resilient qualities), contextual enablers (e.g., social support), and underpinning process variables (e.g., basic psychological need satisfaction).

Methods

Participants

Participants were 535 sport performers (401 males) aged between 16 and 62 years ($M_{age} = 23.60$, $SD_{age} = 8.08$),

with 91.2% reporting a British nationality. Team (e.g., field hockey, rugby union) and individual (e.g., tennis, track and field) sports were represented in the sample, with participants' average competitive experience being 11.84 years ($SD_{\text{TimeCompeting}} = 7.11$ years). The majority of performers (79.8%) reported taking part in senior (rather than junior) competitions,[1] with 3.4% of the sample competing at an intraclub level, 24.2% at a local level, 45.7% at a regional level, 21.9% at a national level, 3.7% at an international level, and 0.7% as a professional athlete.

Procedures

Following institutional ethical approval from the University of Bath, participants were invited to participate in the study either through direct correspondence or via their coaches. During this initial contact, participant information sheets were distributed, which summarized the purpose and nature of the study and the participants' ethical rights (e.g., anonymity, confidentiality, right to withdraw). For those participants who were aged 16 or 17 years, consent was initially obtained from coaches or teachers in loco parentis, and then, the sport performers were free to choose whether or not they completed the questionnaire. Participants aged 18 years or older were asked to personally provide informed consent prior to participating. After providing informed consent, participants were given a copy of a multisection questionnaire, which was available in both written and electronic formats. The psychometric properties of all measures included in the questionnaire have previously been shown to be acceptable. When responding to the items, participants were asked to reflect on their experiences in demanding competitive sporting encounters over the past month. Participants were excluded from the study if they had not participated in any encounters over the past month due to injury or nonselection.

Measures

Thriving.   To identify sport performers who thrived, participants provided evaluations of their subjective performance and well-being (cf. Brown, Arnold, Fletcher, & Standage, 2017). Subjective performance was determined by participants' satisfaction with their sporting performance over the past month on an 11-point scale (0 = *totally dissatisfied*, 10 = *totally satisfied*; cf. Pensgaard & Duda, 2003), an approach that has been used frequently in the previous literature (see e.g., Arnold, Fletcher, & Daniels, 2017; Levy, Nicholls, & Polman, 2011). In recognition of the differentiated approach to understand well-being (Ryan, Huta, & Deci, 2013), separate measures were used to assess hedonic and eudaimonic well-being. The positive affect scale from the International Positive and Negative Affect Schedule Short Form (Thompson, 2007) was used as an indicator of hedonic well-being with participants reporting the extent to which they experienced five different

emotional descriptors (viz., *active*, *alert*, *attentive*, *determined*, and *inspired*) during their sporting encounters over the past month on a 5-point Likert scale (1 = *never*, 5 = *always*). The Subjective Vitality Scale (Ryan & Frederick, 1997) was used to assess participants' aliveness and energy as an indicator of eudaimonic well-being in their sporting encounters over the past month, with participants responding to four items from the Subjective Vitality Scale (e.g., *I felt alive and vital*) on a 6-point scale (1 = *not at all true*, 6 = *very true*). Cronbach's alpha values for the positive affect and subjective vitality scales used in this study were .66 and .86, respectively. Standardized scores for positive affect and subjective vitality were generated when conducting measurement model assessments for the respective scales, and these were used with standardized scores for subjective performance in the data analysis.

Perceived stress.   To determine whether the sporting encounters were considered demanding by the participants, performers were asked how stressful they perceived the sporting encounter to be on a single item using a 6-point scale (1 = *not at all*, 6 = *extremely*; Tomaka, Blascovich, Kelsey, & Leitten, 1993).

Personal enablers.   Participants were asked to reflect on their levels of two personal enablers in their sporting encounters over the past month: personal resilient qualities and psychological skills use. To assess personal resilient qualities, participants completed the autonomous values and beliefs, proactive personality, and robust confidence subscales from the Sport Resilience Scale (Sarkar, 2014). Participants responded to the 10 items on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). Cronbach's alpha for the total resilient qualities score in the present sample was .73. Participants' psychological skills use was assessed using a modified version of the Test of Performance Strategies (Hardy, Roberts, Thomas, & Murphy, 2010), with items rephrased to encompass performers' general use of the strategies in their sporting encounters over the past month. Participants responded to three-item subscales on a 5-point Likert scale (0 = *never*, 4 = *always*) to indicate the extent to which they used activation, automaticity, emotional control, goal setting, imagery, negative thinking, relaxation, and self-talk psychological skills; negative items were reverse coded. The Cronbach's alpha value for psychological skills use was .81.

Contextual enablers.   Participants evaluated the extent to which they received support from two contextual enablers (viz., social support, need supporting environment) in their sporting encounters over the past month. The level of perceived social support was evaluated using the Perceived Available Support in Sport Questionnaire (Freeman, Coffee, & Rees, 2011). The Perceived Available Support in Sport Questionnaire is a 16-item measure that assesses emotional support, esteem support, informational support, and tangible support. Participants rate the extent to which someone provides each type of support to them on a

0 (*not at all*) to 4 (*extremely*) scale. Within the current study, the internal consistency for the full scale was 0.93. Rocchi, Pelletier, Cheung, Baxter, and Beaudry's (2017) Interpersonal Behaviors Questionnaire was used to assess the extent to which the coach created a need supportive environment and a need thwarting environment. The Interpersonal Behaviors Questionnaire asks sport performers to evaluate their coach's behavior across 24 items on a 7-point scale (1 = *do not agree*, 7 = *completely agree*). The scale comprises six subscales that assess autonomy support, autonomy thwart, competence support, competence thwart, relatedness support, and relatedness thwart. Internal consistencies for the total coach support scale and total coach thwart scale were 0.93 and 0.90, respectively.

Process variables. To determine whether differences existed on potential thriving process variables, participants were asked to report their levels of challenge and threat appraisals, and basic psychological need satisfaction and frustration in their sporting encounters over the past month. Challenge and threat appraisals were assessed using the two-item version of McGregor and Elliot's (2002) task construal measures. Participants responded to the four items (e.g., *I viewed the sporting encounters as a positive challenge*; *I thought the sporting encounters represented a threat to me*) on a 1 (*not at all true of me*) to 7 (*very true of me*) Likert scale. Internal consistencies of the scales in the present work were 0.84 for challenge and 0.90 for threat. The Basic Needs Satisfaction in Sport Scale (Ng, Lonsdale, & Hodge, 2011) was used to assess performers' levels of autonomy satisfaction (six items; e.g., *I participate in my sport willingly*), competence satisfaction (five items; e.g., *I was skilled at my sport*), and relatedness satisfaction (five items; e.g., *There were people in my sport who cared about me*). Need frustration was assessed using three-item subscales for autonomy frustration (e.g., *Pressured to do too many things*), competence frustration (e.g., *Insecure about my abilities*), and relatedness frustration (e.g., *Excluded from the group I wanted to belong to*) from the Basic Psychological Needs Scale (Chen et al., 2015). For all of the needs items, sport performers were asked to indicate how true the items were for how they felt during their sporting encounters on a 7-point Likert scale (1 = *not at all true*, 7 = *very true*). In accordance with research in this area (see e.g., Curran, Appleton, Hill, & Hall, 2013) and the strong positive correlations among the needs (see e.g., Lonsdale, Hodge, & Rose, 2009), composite scores of the three basic need satisfaction and the three basic need frustration subscales were generated. The internal consistencies for the composite scores for need satisfaction and need frustration were 0.90 and 0.83, respectively.

Data Analysis

Analyses were conducted using SPSS 22 (IBM, 2013) and Mplus 7.4 (Muthén & Muthén, 2015a). SPSS 22 was used to screen data for missing values, unengaged responses, univariate and multivariate outliers, and to generate descriptive statistics and assess bivariate correlations. In accordance with Tabachnick and Fidell's (2013) recommendations, multivariate outliers were identified using Mahalanobis distance with $p < .001$.

Mplus was used to perform factor mixture analysis (FMA) given the anticipated level and shape effects on the sport performers' response profiles (see Lubke & Muthén, 2005; Morin & Marsh, 2015). Factor mixture models combine common factor analysis and latent profile analysis to analyze multivariate data obtained from a possibly heterogeneous population consisting of distinct latent profiles (Lubke & Muthén, 2007). Two types of latent variables are included in the models: a continuous latent factor (i.e., functioning) representing the common content of the observed variables (i.e., subjective vitality, positive affect, and subjective performance) and a categorical latent profile variable indicating the profile membership of each participant (see, for an illustration, Figure 1). Covariance between the observed variables is used to define the continuous latent factor and explicitly reflect level effects in the extracted latent profiles (see Morin & Marsh, 2015). Any covariance left unexplained by this common factor is used to estimate the latent categorical variable representing the shape effects in the profiles. Factor mixture models rely on the assumption that observed variables within each profile can be modeled using a common factor model which, herein, would reflect subjective vitality, positive affect, and subjective performance acting as indicators for a performer fully functioning (cf. Brown, Arnold, Fletcher, & Standage, 2017; Ryan & Deci, 2017). In addition, this model assumes that the shape effects would emerge over and above this continuous latent factor (Morin & Marsh, 2015), with some sport performers anticipated to experience high well-being and perceive low performance, and vice versa.

In line with recommendations from Clark et al. (2013; see also, Keller et al., 2017), the first step in the analysis was to conduct a confirmatory factor analysis using Mplus 7.4 so as to substantiate the assumed underlying factor structure. As a result of the model only having three observed variables (i.e., subjective performance, subjective vitality, positive affect), it was not possible
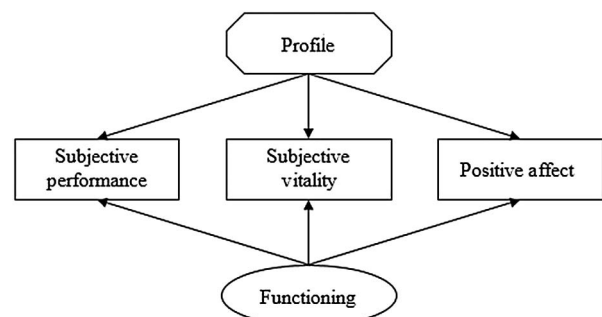
Figure 1 — An illustration of the factor mixture analysis with a continuous latent factor (i.e., functioning) and a categorical latent variable (i.e., profile).

to generate model fit statistics; however, this did allow for the examination of the indicators' factor loadings on the latent construct. In the second stage of the analysis, we estimated an increasing number of latent profiles extractions and compared them based on their model fit (Clark et al., 2013). As no prior knowledge existed for how many profiles would be represented in the functioning responses displayed by sport performers, models with 1–6 latent profiles were fit to the data, with intercepts and residuals freely estimated in all profiles. The best fitting and most parsimonious classification model was decided by the interpretability and theoretical meaningfulness of the profiles (see e.g., Lindwall, Weman-Josefsson, Sebire, & Standage, 2016) and determined using the Bayesian information criterion (BIC; Schwartz, 1978), sample-size-adjusted BIC, and the Lo–Mendell–Rubin likelihood ratio test (Lo, Mendell, & Rubin, 2001). Lower values of the BIC and sample-size adjusted BIC indicated better model fit, and Lo–Mendell–Rubin likelihood ratio test was used to test whether the k-profile model was a significantly better fit to the data compared with the $k-1$-profile model. Estimated posterior probabilities and entropy statistics were used to determine the reliability of the profile classifications with scores closest to 1 reflecting greater classification accuracy (Pastor, Barron, Miller, & Davis, 2007). Model parameters were estimated using a maximum likelihood estimation with robust standard errors to account for any nonnormality within the data and any missing values (cf. Muthén & Muthén, 2015b). Five thousand different sets of starting values were requested, 100 iterations for each random start, and the 200 starts that yielded the highest log-likelihood were retained for the final optimizations (Morin & Wang, 2016); Mplus code for the analysis is available in the Supplementary Material 1 (available online).

To examine whether profile membership could be predicted from the enablers (viz., resilient qualities, psychological skills use, need supportive and thwarting environment, social support) and processes (i.e., basic psychological need satisfaction and frustration, challenge and threat appraisal), the variables were included as auxiliary variables in the best fitting FMA model using a three-step approach (see Asparouhov & Muthén, 2014). The three-step approach includes the auxiliary variables simultaneously in a multinomial logistic regression using the following stages: (1) the latent profile variable is estimated using only latent profile indicators; (2) the most likely profile variable is created using the latent profile posterior distribution obtained in Stage 1; and (3) the most likely profile is regressed on predictor variables, taking into account misclassification in Stage 2 (Asparouhov & Muthén, 2014; Vermunt, 2010). Given the theory-based expectation that the process variables could explain the effects of the personal and contextual enablers (Deci & Ryan, 2000; Lazarus & Folkman, 1984), separate analyses were conducted with the enabler and process variables to enable identification of any direct effects of the enablers on thriving (see e.g., Mplus code; Supplementary Material 1 [available online]). To aid reader interpretation, odds ratios

(ORs) were computed from the regression coefficients and reflect the change in the likelihood of membership in a target profile in contrast to a comparison profile associated with each unit of increase in the predictor.

Results

Questionnaire responses were screened for case-wise missing data and unengaged responses, which resulted in the data from six participants being removed. In addition, five multivariate outliers were identified and removed, leaving a final analytical sample size of 524. Preliminary analysis suggested that all participants perceived some level of demand (i.e., "stress") during their sporting encounters ($M = 3.36$, $SD = 1.19$). Descriptive statistics and correlations between the thriving indices, enablers, and process variables are presented in Table 1; correlations between enabler and process variables can be found in Supplementary Material 2 (available online). The standardized factor loadings for positive affect (.67), subjective vitality (.85), and subjective performance (.55) on the continuous latent factor were all statistically significant ($p < .001$), supporting the notion of a global continuous latent construct.

Factor Mixture Analysis

The BICs and sample-size-adjusted BICs for the models are displayed in Table 2. The lowest BIC was associated with the four-profile model, whereas the sample-size-adjusted BICs were found to continually decrease following the inclusion of additional profiles. The Lo–Mendell–Rubin likelihood ratio test value for the five-profile model was nonsignificant ($p = .14$), suggesting that the fifth profile in this model was not distinct from the other profiles and therefore supporting the retention of a four-profile model. When considered in relation to the most likely latent profile membership, the four profiles derived from the model each accounted for a substantial proportion of the sample (range: 7.25–39.89%), and the model showed high classification accuracy with the average within-profile posterior probability being 0.90 (range 0.85–0.93). The classification accuracy for the four-profile model was also supported by the class proportions determined using the estimated posterior probabilities (all class proportions >8.8%) and the entropy statistic (entropy = 0.82). The three-, four-, and five-profile solutions were closely inspected and compared independently by the study authors to examine their substantive and theoretical meaningfulness. The four-profile model was deemed to be the most parsimonious and theoretical meaningful solution and was therefore retained in the subsequent analysis.

Interpretation of the Four-Profile Solution

Standardized scores for the thriving indices were used to interpret the best fitting model, and these are presented in

Table 1 Descriptive Statistics and Correlations Between Thriving Indices, Enablers, and Process Variables

	M	*SD*	1	2	3
Thriving indices					
1. Subjective vitality (1–6)	4.80	0.76	–		
2. Positive affect (1–5)	4.13	0.46	.75*	–	
3. Subjective performance (0–10)	6.66	1.72	.50*	.44*	
Enablers					
Resilient qualities (10–50)	39.37	4.40	.43*	.39*	.32*
Psychological skills use (0–94)	55.17	10.35	.35*	.38*	.28*
Social support (0–4)	2.50	0.77	.22*	.26*	.16*
Coach need supportive behaviors (1–7)	4.98	1.17	.31*	.31*	.23*
Coach need thwarting behaviors (1–7)	2.44	1.02	−.21*	−.19*	−.20*
Process variables					
Challenge appraisal (2–14)	11.41	2.15	.38*	.36*	.28*
Threat appraisal (2–14)	4.66	2.45	−.22*	−.20*	−.23*
Basic psychological need satisfaction (1–7)	5.56	0.73	.44*	.47*	.42*
Basic psychological need frustration (1–7)	2.78	0.98	−.36*	−.27*	−.37*

Note. The range for scores on each of the variables is indicated in parentheses. Mean values for indices, enablers, and process variables are scale means. Correlations between thriving indices based on the single-item subjective performance variable, and the subjective vitality and positive affect latent constructs (using structural equation modeling). Correlations between indices, enablers, and process variables were assessed using Spearman's correlation in SPSS.
*$p < .001$.

Table 2 Fit Indices, Entropy, and Model Comparisons for Estimated Factor Mixture Models

Model	LL	No. of FP	Scaling	BIC	SSA-BIC	Entropy	LMR
Profile 1	−2,024.466	9	1.3464	4,105.284	4,076.716	–	–
Profile 2	−1,955.135	16	1.1663	4,010.454	3,959.667	0.651	<.001
Profile 3	−1,860.214	23	1.1227	3,864.441	3,791.434	0.866	<.001
Profile 4	−1,812.842	30	1.1664	3,813.530	3,718.302	0.823	.006
Profile 5[a]	−1,795.407	37	1.1768	3,822.490	3,705.043	0.832	.14
Profile 6[b]	−1,784.323	44	0.0112	3,844.152	3,704.485	0.851	<.001

Note. LL = model log-likelihood; FP = free parameters; scaling = scaling factor associated with MLR log-likelihood estimator; MLR = maximum likelihood estimation with robust standard errors; BIC = Bayesian information criteria; SSA-BIC = sample-size-adjusted BIC; LMR = *p* value for adjusted Lo–Mendell–Rubin likelihood ratio test.
[a]A negative residual variance was returned for standardized positive affect (ZPA) in latent Profile 4. This suggests that the model converged on an improper solution, possibly due to overparameterization in the number of latent profile requested or allowing too many parameters to differ over profiles (Chen, Bollen, Paxton, Curran, & Kirby, 2001). Hence, more parsimonious models may be superior. [b]One or more parameters were fixed to avoid singularity of the information matrix. A number of negative residual variances were returned; therefore, more parsimonious models may be superior.

Table 3 Description of the Four Latent Profiles Based on Standardized Thriving Index Scores

Thriving Indices	Profile 1	Profile 2	Profile 3	Profile 4
Positive affect	0.762***	0.120	−0.252*	−1.495***
Subjective vitality	1.130***	0.125***	−0.455**	−1.702***
Subjective performance	0.539***	0.363***	−0.238*	−1.558***

Note. Profile 1 (*n* = 146; 27.9%) = thriving; Profile 2 (*n* = 131; 25.0%) = above average; Profile 3 (*n* = 209; 39.9%) = below average; Profile 4 (*n* = 38; 7.3%) = low functioning; counts based on participants' most likely latent profile membership.
*$p < .05$. **$p < .01$. ***$p < .001$.
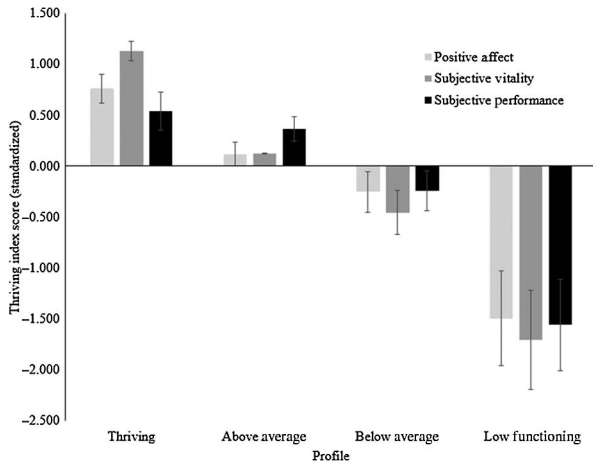
Figure 2 — Factor mixture analysis solutions for the four-profile model. Error bars = 90% confidence intervals.

Table 3 and displayed graphically in Figure 2. Profile 1 ("thriving") represents 27.9% ($n = 146$, based on most likely latent profile membership) of participants and includes individuals who reported the highest levels of subjective vitality, positive affect, and subjective performance in their sporting encounters over the past month. Profile 2 ("above average"; 25.0% of participants, $n = 131$) has mean scores marginally above the sample mean. Interestingly, inspection of the 90% confidence intervals in Figure 2 suggests that subjective performance scores in the above average and thriving profiles may not be significantly different. Profile 3 ("below average") represents 39.9% ($n = 209$) of the sport performers and has subjective vitality, positive affect, and subjective performance scores marginally below the sample mean. Profile 4 ("low functioning") is the smallest profile representing 7.3% ($n = 38$) of the sport performers. These individuals have mean scores well below the sample mean and are those who functioned least well in their sporting encounters over the past month.

Prediction of Latent Classes From Enabler and Process Variables[2]

Regression coefficients and ORs for the relationships among the five enabler predictor variables and the categorical latent class variable are presented in Table 4, with Profile 1 ("thriving") as the comparison profile. The results from this analysis show that possessing higher levels of resilient qualities significantly decreases the likelihood of membership to Profiles 2 ("above average"; $OR = 0.444$), 3 ("below average"; 0.310), and 4 ("low functioning"; 0.321) compared with membership in the thriving profile. Furthermore, reporting greater use of psychological skills was found to significantly decrease the likelihood of membership to Profiles 3 ("below average"; 0.660) and 4 ("low functioning"; $OR = 0.354$) compared with the thriving profile. Regression coefficients and ORs for the relationships among the four process predictor variables and the categorical latent class variable are presented in Table 5, with Profile 1 ("thriving") as the comparison profile. The results from the process variables suggest that, when perceiving a high level of basic psychological need satisfaction, the likelihoods of membership to all other profiles are significantly lower compared with the thriving profile (above average, $OR = 0.332$; below average, $OR = 0.294$; low functioning, $OR = 0.133$). In addition, perceiving sporting encounters as a challenge was found to significantly decrease the likelihood of membership to the low-functioning profile compared with the thriving profile ($OR = 0.368$). Finally, perceiving higher levels of basic psychological need frustration was found to significantly increase the likelihood of membership to the below average profile compared with the thriving profile ($OR = 2.257$). All other regression coefficients were nonsignificant.

Discussion

Understanding what differentiates and characterizes individuals who thrive in competition from those who do

Table 4   Results From the Multinomial Logistic Regressions for the Effects of Enabler Variables on Profile Membership

	Latent Profile 2 Versus 1		Latent Profile 3 Versus 1		Latent Profile 4 Versus 1	
	Coef. (*SE*)	OR	Coef. (*SE*)	OR	Coef. (*SE*)	OR
Resilient qualities	−0.813 (0.186)***	0.444	−1.171 (0.200)***	0.310	−1.137 (0.328)**	0.321
Psychological skills use	−0.220 (0.186)	0.803	−0.415 (0.193)*	0.660	−1.038 (0.328)**	0.354
Social support	−0.110 (0.176)	0.896	−0.017 (0.192)	0.983	−0.382 (0.318)	0.682
Coach need support	−0.264 (0.210)	0.768	−0.221 (0.221)	0.802	−0.432 (0.373)	0.649
Coach need thwart	−0.310 (0.216)	0.733	0.165 (0.193)	1.179	0.239 (0.284)	1.270

Note. Calculations based on the factor mixture model with four classes ($N = 458$). ORs less than 1 correspond to a negative logistic regression coefficient and suggest that the likelihood of membership in the target profile is reduced. ORs greater than 1 suggest that the likelihood of membership in the target profile is increased. Profile 1 = thriving; Profile 2 = above average; Profile 3 = below average; Profile 4 = low functioning; Coef. = regression coefficient; OR = odds ratio.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 5   Results From the Multinomial Logistic Regressions for the Effects of Process Variables on Profile Membership

	Latent Profile 2 Versus 1		Latent Profile 3 Versus 1		Latent Profile 4 Versus 1	
	Coef. (*SE*)	*OR*	Coef. (*SE*)	*OR*	Coef. (*SE*)	*OR*
Challenge appraisal	−0.045 (0.213)	0.956	−0.434 (0.230)	0.648	−1.001 (0.375)*	0.368
Threat appraisal	−0.200 (0.181)	0.819	−0.164 (0.183)	0.849	0.301 (0.327)	1.351
Basic psychological need satisfaction	−1.103 (0.266)**	0.332	−1.225 (0.288)**	0.294	−2.018 (0.384)**	0.133
Basic psychological need frustration	0.178 (0.246)	1.195	0.814 (0.272)*	2.257	0.474 (0.340)	1.606

Note. Calculations based on the factor mixture model with four classes ($N = 521$). *OR*s less than 1 correspond to a negative logistic regression coefficient and suggest that the likelihood of membership in the target profile (i.e., Profiles 2, 3, or 4) is reduced. *OR*s greater than 1 suggest that the likelihood of membership in the target profile (i.e., Profiles 2, 3, or 4) is increased. Profile 1 = thriving; Profile 2 = above average; Profile 3 = below average; Profile 4 = low functioning; Coef. = regression coefficient; *OR* = odds ratio.
*$p < .01$. **$p < .001$.

not can provide critical theoretical and applied insight. Couched within a proposed conceptualization of thriving (cf. Brown, Arnold, Fletcher, & Standage, 2017), the purpose of the current study was to investigate whether it was possible to identify sport performers who thrived in demanding competitive sporting encounters over the past month, the responses displayed by performers who did not thrive, and to establish whether profile membership could be predicted from scores for personal enablers, contextual enablers, and process variables. Results from FMA yielded four profiles: fully functioning (i.e., thriving), low functioning, and two types of functioning characterized by scores marginally above and below the mean. Furthermore, profile membership was found to be predicted by personal resilient qualities and psychological skills use enabler variables, and basic psychological need satisfaction, challenge appraisal, and basic psychological need frustration process variables.

The identification of a thriving profile of sport performers in this study supports the notion that humans can be fully functioning while encountering demands and that it is possible to differentiate between individuals who thrive and those who do not (Brown, Arnold, Fletcher, & Standage, 2017; Sarkar & Fletcher, 2014a). Furthermore, the identification of three additional response profiles with quantitative differences contributes significantly to an understanding of how sport performers function in demanding competitive sporting encounters and adds greater depth to the existing methods used for assessing thriving (see e.g., Porath, Spreitzer, Gibson, & Garnett, 2012). To elaborate, while Porath et al. (2012) solely consider a high–low thriving continuum, the findings in the present study suggest that a broader continuum of functioning responses exists with performers who are fully functioning (i.e., perceiving high levels of performance and experiencing high levels of well-being) and thus, thriving, appearing at the top of this scale. Furthermore, the analysis established the validity of using subjective performance, subjective vitality, and positive affect as indicators for thriving in sport, with the shared variance among these variables accounted for by a latent "functioning" construct

(cf. Ryan & Deci, 2017). To our knowledge, this represents the first time that functioning has been modeled in this way with previous sport and thriving research tending to examine performance and well-being as separate outcome variables (see e.g., Carpentier & Mageau, 2013; Porath et al., 2012). This multifaceted approach therefore offers a novel option for assessing human functioning and thriving in future research.

Notwithstanding the quantitative differences between profiles indicating a *level* effect for a continuous latent functioning factor, no clear qualitative variations emerged (i.e., none of the profiles displayed asynchronous patterns on the indicator variables). This finding suggests that performers' perceptions of in-game performance, vitality, and positive affect are linked in valence and magnitude. To illustrate, individuals who perceive low levels of positive affect were also found to report similarly low levels of vitality and performance. Consequently, this finding offers statistical support to previous qualitative work wherein thriving in sport has been recognized to include a perceived, sustained high level of performance and components of well-being (see Brown, Arnold, Reid, & Roberts, 2017), and studies that have identified relationships between self-rated performance and well-being (see e.g., Ford, Cerasoli, Higgins, & Decesare, 2011). However, it challenges the suggestion that the prediction of well-being (i.e., positive affect, vitality) and performance can lead to differentiated results; that is, the significant prediction of one functioning indicator but not another (see e.g., Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008; Sheldon & Filak, 2008). In addition, the lack of asynchronous profiles, despite controlling for an overarching functioning latent factor, suggests that covariance in the model was due to relationships between variables and that no heterogeneity could be attributed to the presence of subpopulations within the sample (cf. Lubke & Muthén, 2005).

A secondary aim of the study was to establish whether profile membership could be predicted by personal and contextual enablers and process variables.

Results pertaining to the personal enablers revealed significant prediction of profile membership. To elaborate, possessing high levels of personal resilient qualities was found to decrease the likelihood of membership to all other profiles in comparison with the thriving profile (see Table 4). Establishing resilient qualities as a significant predictor of sport performers' functioning responses (as indexed using a combined performance and well-being score) extends previous literatures that have espoused relationships between resilient qualities and performance (e.g., Fletcher & Sarkar, 2012) and well-being (e.g., Hosseini & Besharat, 2010) separately. These findings also offer initial statistical evidence from the sport literature to substantiate a relationship between resilience and thriving (see Carver, 1998; Sarkar & Fletcher, 2014a). The second personal enabler considered in the present study, use of psychological skills, was found to significantly decrease the likelihood of membership to the below average and low-functioning profiles compared with thriving; no prediction effect was found for membership to the above average profile. Identifying that psychological skills use can be used to predict membership to thriving versus lower functioning response profiles supports previous findings, suggesting that mental skills use is associated with enhanced performance and well-being (e.g., Boat & Taylor, 2015; Edwards & Edwards, 2012). However, the inability of scores on the use of psychological skills to differentiate between the likelihood of membership to above average profile when compared with the thriving profile challenges the utility of this enabler as a predictor across all functioning responses displayed by sport performers.

In contrast to the findings for personal enablers, social support, coach need support, and coach need thwart contextual factors did not predict the likelihood of profile membership (see Table 4). This finding is divergent to previous work in sport that has found relationships between social support and the separate functioning indicators (e.g., Boat & Taylor, 2015; DeFreese & Smith, 2014) and between coach behaviors and dimensions of thriving (e.g., Gucciardi et al., 2017). A possible explanation for the opposing findings in the present study to those previously reported is the choice of outcome variables. Within the present study, performance and well-being were used as indicators of performers' functioning responses, with thriving considered to represent fully functioning whereby performers would score highly for all functioning measures (i.e., subjective performance, subjective vitality, and positive affect; cf. Brown, Arnold, Fletcher, & Standage, 2017; Ryan & Deci, 2017; Su et al., 2014). In contrast, Gucciardi et al. (2017) assessed thriving using an adaptive version of the thriving at work scale (Porath et al., 2012), wherein thriving is represented by the dimensions of vitality and learning. A notable difference in these approaches, therefore, is that the thriving at work scale restricts assessment to the affective and cognitive dimensions of development (see Spreitzer et al., 2005), whereas the method of assessing thriving in the present study encompasses

measures for both success and development (Brown, Arnold, Fletcher, & Standage, 2017). Consequently, although coach need thwarting behaviors may preclude aspects of development, the results from the present study found no evidence to suggest that these behaviors can predict profile membership when thriving is assessed using performance *and* well-being.

Although the contextual enablers did not predict sport performers' functioning response profile membership, the mechanisms through which these social–contextual factors are considered to impact thriving (i.e., the satisfaction and frustration of basic psychological needs; Deci & Ryan, 2000; Ryan & Deci, 2017) were found to have statistically significant effects (see Table 5). Observing that significantly greater levels of need satisfaction predicted sport performers' membership in the thriving profile adds support to the tenets within BPNT and a growing body of literature that considers basic psychological need satisfaction to be essential for human growth and thriving (see Ryan & Deci, 2017; Spreitzer & Porath, 2014). Equally supportive of BPNT, higher levels of basic need frustration significantly predicted the likelihood of sport performers' membership to the below average profile, in comparison with the thriving profile. Such a finding further supports the role of basic needs in differentially predicting thriving and is consistent with previous research (see e.g., Vansteenkiste & Ryan, 2013). Statistically significant predictive effects were also observed for challenge appraisal, with performers who perceived the demanding competitive sporting encounters as a challenge more likely to be classified in the thriving profile, compared with the low-functioning profile. This finding offers some evidence to support the previous theoretical suggestions linking challenge appraisal to thriving (see Carver, 1998) and empirical research that has examined the potential mediating role that appraisal plays in facilitating performance (see Fletcher & Sarkar, 2012; Freeman & Rees, 2009). However, further work is required to examine the reliability of both need frustration and challenge appraisal process variables in predicting membership to all of the functioning response profiles.

Applied Implications

The results from this work have a number of potential implications for applied practice. First, based on these initial findings, practitioners wanting to facilitate thriving in sport are advised to explore methods for promoting personal enablers and process variables. In support of this venture, lessons may be taken from alternative performance domains where, for example, military personnel have participated in resilience training (Reivich, Seligman, & McBride, 2011; see also, Fletcher & Sarkar, 2017) and employees have been exposed to performance feedback and decision-making discretion interventions to enhance need support and promote need satisfaction (Spreitzer, Porath, & Gibson, 2012; see also, Mageau & Vallerand, 2003). Second, to facilitate thriving, it is suggested that practitioners

consider evidence-informed strategies that can influence both performance and well-being (e.g., Barker, Jones, & Greenlees, 2010; Weinberg, Seabourne, & Jackson, 1981), as all indicators assessed in the current study were shown to underpin sport performers' functioning responses. When devising and evaluating such interventions, it would be beneficial for researchers to follow published guidelines (see e.g., Craig et al., 2006), to ensure that the interventions achieve both intervention effectiveness (i.e., real-world utility) and intervention efficacy (i.e., rigorously examined) for the target outcomes (see American Psychological Association Presidential Task Force on Evidence-Based Practice, 2006; Rumbold, Fletcher, & Daniels, 2012).

Strengths and Limitations of the Present Study

A notable strength of the current study is the use of FMA, rather than more traditional class enumeration methods. This is for several reasons: FMA allows for the inclusion of a profile invariant latent variable to control for correlations between indicators; fit indices are produced that enable comparison between models to ensure that the best fitting model is selected; the identification of profiles in FMA is not biased toward creating classes of equal size; and FMA provides posterior probabilities, recognizing that uncertainty exists about a participant's profile membership (Lubke & Muthén, 2005; Morin & Marsh, 2015).

Notwithstanding these strengths, it is important to highlight that this analysis is data driven and therefore requires replication in other samples. This process will prove particularly important when considering the reliability of potential thresholds for each profile, given the possible overlap in subjective performance scores observed in the thriving and above average profiles (see Figure 2). Moreover, an ongoing challenge to work in this area is to systematically develop improved assessments of subjective performance. Within the present study, our analysis only examined differences between sport performers at one time point; therefore, longitudinal methods are needed to ascertain whether functioning is stable over time and if long-term patterns of functioning exist (see e.g., Louvet, Gaudreau, Menaut, Genty, & Deneuve, 2007; Martinent & Nicolas, 2016). In addition, all data for the current study were collected in the same multisection survey, and common method bias may exist (Podsakoff, MacKenzie, & Podsakoff, 2012). To reduce potential bias, future research could employ a mixed-methods approach whereby data are collected from different information sources (e.g., objective and subjective data, quantitative and qualitative data); this would also enable a more comprehensive understanding of sport performers' functioning responses to be obtained. Within subsequent analyses, it may be pertinent to unparcel the scores for the enabler and process variables examined in the current study to establish whether sub-scale-specific effects exist and to consider additional variables that may be relevant to the thriving process

(e.g., perceived ability to cope; Park, 1998). If considering these predictor variables in a hierarchical structure (e.g., in a second-order model), researchers would also do well to consider the model-based scale reliabilities of the measures used (see Brunner, Nagy, & Wilhelm, 2012).

Additional limitations of the current study are the unequal gender split of the sample (75% male) and the high proportion of sport performers with the same nationality (91% British). Although the latter sample characteristic can be explained by the fact that the research was conducted in the United Kingdom, the former gender split was unexpected and unintentional. The high numbers of male sport performers sampled (in comparison with females) appears a common theme in sport psychology literature (see Brown & Fletcher, 2017), and it may therefore be of value for future inquiry to explore why this trend occurs, its implications for the generalizability of conclusions drawn and, if necessary, potential strategies to alleviate gender-biased sampling (cf. Cuddeback, Wilson, Orme, & Combs-Orme, 2004; Ellenberg, 1994).

Conclusion

The purpose of the present study was to examine if it was possible to identify sport performers who thrived in demanding competitive sporting encounters, the functioning response profiles of those who did not, and to establish whether profile membership could be predicted from scores for personal enablers, contextual enablers, and process variables. FMA revealed four novel profiles for performers' responses including a fully functioning (thriving) group, a low-functioning group, and two groups with functioning levels slightly above and below the mean. Profile membership was found to be predicted by personal resilient qualities and psychological skills use enabler variables, basic psychological need satisfaction, challenge appraisal, and basic psychological need frustration process variables; thus providing original insight that sport performers' perceived levels on these variables can facilitate thriving. The present study advances existing literature through the introduction of a holistic approach to examine thriving in competition and by providing suggestions of pertinent variables for the facilitation of thriving that may be used to inform the development of thriving interventions.

Notes

1. Junior competitions were age-contingent events (e.g., an under 18s hockey match), whereas senior competitions were those without age restrictions (e.g., men's/ladies' hockey match).

2. Additional analyses examining the predictive effects of the enabler and process variables in isolation are available in the Supplementary Material 2 (available online) for interested readers.

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