



Citation for published version:

Brown, DJ, Arnold, R, Standage, M & Fletcher, D 2017, 'Thriving on Pressure: A Factor Mixture Analysis of Sport Performers' Responses to Competitive Encounters', *Journal of Sport and Exercise Psychology*, vol. 39, no. 6, pp. 423-437. <https://doi.org/10.1123/jsep.2016-0293>

DOI:

[10.1123/jsep.2016-0293](https://doi.org/10.1123/jsep.2016-0293)

Publication date:

2017

Document Version

Peer reviewed version

[Link to publication](#)

As accepted for publication.

University of Bath

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

1 Article accepted for publication in *Journal of Sport & Exercise Psychology* on January 8
2 2018

3

4

5

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

7 Competitive Encounters

8 Daniel J. Brown, Rachel Arnold, and Martyn Standage

9 University of Bath, United Kingdom

10 David Fletcher

11 Loughborough University, United Kingdom

12

13

14

15

16 Author Note

17

18 Daniel J. Brown, Rachel Arnold, and Martyn Standage, Department for Health,

19 University of Bath, United Kingdom; David Fletcher, School of Sport, Exercise, and Health

20 Sciences, Loughborough University, Loughborough, United Kingdom.

21 Daniel J. Brown is now at the Department of Sport & Exercise Science, University of

22 Portsmouth, United Kingdom.

23 Correspondence concerning this article should be addressed to Rachel Arnold,

24 Department for Health, University of Bath, Claverton Down, Bath BA2 7AY, United

25 Kingdom. Telephone: 4412-2538-5107. E-mail: R.S.Arnold@bath.ac.uk

1 Abstract

2 Although considerable research exists on performers' responses to sporting encounters, little
3 is known about thriving in sport contexts. The current study examined if distinct response
4 patterns existed between sport performers who thrived in competitive encounters compared to
5 those who did not. Participants were 535 sport performers (134 women; $M_{age} = 23.60$ years,
6 $SD_{age} = 8.08$; $M_{competing} = 11.84$ years, $SD_{competing} = 7.11$). Results of factor mixture analysis
7 supported a four-profile solution comprising a thriving group ($n = 146$), a low-functioning
8 group ($n = 38$), and two groups characterized by scores marginally above ($n = 131$) and
9 below ($n = 209$) the sample mean. Profile membership was found to be predicted by personal
10 enablers (viz., personal resilient qualities, psychological skills use), and process variables
11 (viz., basic psychological need satisfaction and frustration; challenge appraisal). This
12 examination of thriving in sport performers offers significant implications for research and
13 practice.

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

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

3 Sport performers often encounter various stressors as part of their involvement in
4 competitive sport. Their ability to respond effectively to these demands is likely to dictate
5 how well they function in competition and, ultimately, whether they thrive, or merely manage
6 or succumb to the scenario (Sarkar & Fletcher, 2014b). Despite the desire to understand and
7 promote adaptive outcomes representing fundamental interests for scholars and practitioners
8 in sport psychology (Division 47 (Exercise and Sport Psychology) of the American
9 Psychological Association, 2017), little progress has been made in understanding *thriving* in
10 sporting contexts. Across contexts, thriving has been broadly defined as “the joint experience
11 of development and success” (Brown, Arnold, Fletcher, & Standage, 2017, p. 168), with
12 Brown and colleagues suggesting that thriving in response to a situation (that is, in state
13 form) involves subjectively perceiving a high-level of performance and experiencing a high-
14 level of well-being. To further our understanding of thriving in sport, the current work
15 examines whether it is possible to identify sport performers who thrive in demanding
16 competitive sporting encounters using subjective indices of performance and well-being.
17 Further, we explore whether this experience can be predicted from a range of potentially
18 pertinent variables (e.g., resilient qualities, basic psychological need satisfaction).

19 Although a lack of comprehension currently exists on thriving in sport, the construct
20 has been discussed in this context since the turn of the century. Early descriptions of thriving
21 in sport emerged from conceptual investigations on mental toughness in elite athletes (see,
22 Bull, Shambrook, James, & Brooks, 2005; Jones, Hanton, & Connaughton, 2002). Within
23 these studies, thriving on the pressure of competition was described as a key attribute of
24 mental toughness. Since these initial mentions, thriving has begun to feature more
25 prominently in sport research with scholars investigating the construct in youth (e.g.,

1 Gucciardi, Jackson, Hodge, Anthony, & Brooke, 2015; Gucciardi & Jones, 2012; Gucciardi,
2 Stamatis, & Ntoumanis, 2017; Jones, Dunn, Holt, Sullivan, & Bloom, 2011; Jones &
3 Lavallee, 2009) and adult populations (e.g., Galli & Reel, 2012; Harris, Myhill, & Walker,
4 2012). Despite the accumulation of work in this area, an understanding of the construct has
5 been restricted by the lack of consistency in how thriving has been conceptualized. To
6 illustrate, while some authors utilize a state-based definition of the construct (e.g., Gucciardi
7 et al., 2015), others draw similarities between thriving and stress-related growth (e.g., Galli &
8 Reel, 2012), or employ a positive youth development framework (e.g., Jones et al., 2011).
9 An accumulation of knowledge in this area has been further hindered by scholars opting to
10 include thriving as a subsidiary variable in studies where the focus of investigation has
11 centered on other constructs (e.g., life skills, mental toughness). Collectively, these
12 endeavors have provided ad hoc insights into the construct, but they have failed to provide a
13 dedicated and systematic line of thriving inquiry in sport. To overcome the inconsistencies in
14 previous thriving research in sport, Brown, Arnold, Reid, and Roberts (2017) recently
15 conducted a dedicated exploration of thriving in sport performers nested in the perspectives
16 of athletes, coaches, and sport psychologists operating in elite sport. Thriving was perceived
17 by participants to comprise a sustained high-level of performance and dimensions of well-
18 being (e.g., being optimistic, being focused and in control; Brown, Arnold, Reid et al., 2017).
19 Within future research, it appears important to establish a method that draws on these
20 characteristics to identify performers who have experienced thriving.

21 With sport scholars conceptualizing thriving variously within past work, it is
22 necessary to offer clarity on how thriving differs to other constructs that, superficially, may
23 appear similar. For example, the term thriving has previously been used interchangeably
24 with 'growth' to describe positive adaptation following adverse events (see, e.g., Galli &
25 Reel, 2012). Yet, thriving is distinct from adversarial growth in that it does not depend on a

1 traumatic event (Carver, 1998), rather it can occur following either a life opportunity or a life
2 adversity (Feeney & Collins, 2015). This description similarly differentiates thriving from
3 resilience, with resilience considered to represent maintaining or quickly returning to normal
4 functioning when under pressure or following adversity (Fletcher & Sarkar, 2016; Kalisch,
5 Müller, & Tüscher, 2015). A further term that has conceptual similarity to thriving is
6 flourishing, with both terms concerned with human functioning, development, and success
7 (see, Brown, Arnold, Fletcher et al., 2017; Keyes, 2002, 2003). In their conceptual study of
8 flourishing in sport, Ashfield, McKenna, and Backhouse (2012) observed that flourishing
9 represented an individually-specific notion of optimal well-being, irrespective of athletic
10 performance. Thus, a key differentiator of flourishing and thriving, is the need for a
11 perceived high-level of performance for an individual to thrive (cf. Brown, Arnold, Fletcher
12 et al., 2017). Most recently, similarities have also been drawn between the constructs of
13 wellness and thriving (see, Ryan & Deci, 2017). Specifically, Ryan and Deci (2017) suggest
14 that wellness is better described as thriving (or being fully functioning), which they
15 characterize as “vitality, awareness, access to, and exercise of one’s human capacities and
16 true self-regulation” (Ryan & Deci, 2017, p. 241). Notably, this description includes both an
17 energetic, eudaimonic component (i.e., vitality – a positive feeling or having available energy
18 emanate from the self; Ryan & Frederick, 1997) and a performance component (i.e., exercise
19 of one’s human capacities). Further, the authors additionally state that happiness (i.e.,
20 hedonic well-being) is an indicator of full functioning (i.e., when people are fully
21 functioning, they tend to report higher levels of happiness; Ryan & Deci, 2017). Thus, within
22 self-determination theory (SDT), eudaimonic well-being, hedonic well-being, and
23 performance all appear critical indicators of human thriving, which also suggests that thriving
24 within SDT aligns with the operational definition of thriving used in this study.

25 The disparate nature of existing research on thriving in sport mirrors the broader body

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

17 A central tenet of BPNT is that psychological need satisfaction is nurtured and
18 maintained via environments that are need supportive (Ryan & Deci, 2017). Similarly,
19 environments that are controlling or need thwarting can result in need frustration (cf.
20 Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011). This principle
21 places the satisfaction or frustration of the basic psychological needs as a mediator (or
22 process variable) through which social-contextual factors (e.g., coach, parents) can impact
23 thriving (Ryan & Deci, 2017). The nature and importance of these social-contextual factors
24 (hereafter contextual enablers), will differ from context to context and from time to time
25 (Bundick, Yeager, King, & Damon, 2010; Thoits, 1995); thus it is necessary to identify

1 specific enablers that may be salient to predicting thriving in sport. In addition to identifying
2 contextual enablers, it is important to identify the attitudes, behaviors, and cognitions of an
3 individual that may help him or her thrive in these various scenarios. These characteristics,
4 termed *personal enablers* in the previous thriving literature (Brown, Arnold, Fletcher, et al.,
5 2017; Park, 1998), may offer an alternative or simultaneous resource for sport performers to
6 draw upon in order to thrive.

7 Despite the absence of a coherent body of work on thriving in sport, it is possible to
8 identify potential contextual and personal enablers based on research that has predicted
9 performance and well-being outcomes separately. For example, perceptions of social support
10 have been found to differ significantly between high and low performers (when determined
11 by self-referenced performance; Boat & Taylor, 2015). Further, when considered in
12 combination with negative social interactions, social support has been shown to contribute to
13 burnout and impaired well-being across the competitive season (DeFreese & Smith, 2014).
14 Sport performers can also perceive social support from specific sources such as their coach,
15 teammates, and parents. To illustrate, coach support has previously been found to predict
16 athletes' perceptions of need satisfaction, which were then found to be an important predictor
17 of well-being (e.g., Kipp & Weiss, 2013; Reinboth, Duda, & Ntoumanis, 2004). As well as
18 operating through need satisfaction and need frustration variables, social support has been
19 shown to impact performance via perceived control and subsequent challenge appraisal
20 process variables (Freeman & Rees, 2009). These processes are in accordance with the
21 transactional theory of stress and coping (Lazarus 1966; Lazarus & Folkman, 1984), within
22 which individuals are proposed to appraise a situation as a challenge (i.e., the potential for
23 gain or growth) when they perceive high levels of control. Alongside perceived social
24 support, challenge appraisals are thought to be influenced by a range of personal resilient
25 qualities (e.g., positive personality, confidence), which have also been suggested to influence

1 thriving (see, Fletcher & Sarkar, 2012; Sarkar & Fletcher, 2014a). Moreover, research has
2 highlighted various psychological skills (e.g., goal-setting, imagery) that are believed to assist
3 with adaptive stress responses and relate to sporting success and well-being (see, e.g.,
4 Edwards & Edwards, 2012; Mahoney, Gabriel, & Perkins, 1987; Rees et al., 2016), and are,
5 thus, worthy of study in relation to thriving in sport.

6 To begin a systematic inquiry of thriving in sport, a logical first step is to establish
7 whether it is possible to identify performers who are thriving. Extending on the conceptual
8 argument that thriving occurs when an individual is fully functioning (see, Brown et al.,
9 2017; Ryan & Deci, 2017; Su et al., 2014), one approach that could be used is to assess
10 multiple indicators of functioning (see, e.g., Scales, Benson, Leffert, & Blyth, 2000), with
11 individuals scoring highly across indicators considered to be thriving. Thus, within the
12 context of sporting encounters (e.g., a match or competition), thriving could be determined by
13 using measures of subjective performance and well-being specific to that setting. Alongside
14 establishing if performers thrive in competition, this approach could offer valuable insights
15 into the other patterns of functioning that may be observed in athletes. That is, although
16 thriving sport performers would be anticipated to score highly on all functioning indicators
17 (i.e., to be fully functioning), other performers may display a general tendency to be
18 functioning at moderate, or low levels in competition, or they may display asynchronous
19 patterns (e.g., high on performance, low on well-being; low on performance, high on well-
20 being). Developing an awareness of these patterns would offer a more complete
21 understanding of the responses displayed by performers in competition.

22 To enable the identification of possible responses displayed by sport performers in the
23 present study, it is necessary to integrate both person- and variable-centered approaches.
24 Person-centered approaches (e.g., latent profile analysis) explain the covariance between
25 individuals through a categorical latent variable (Lubke & Muthén, 2005). In contrast,

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

20 Using these techniques, the aim of the present study was to examine whether it is
21 possible to identify sport performers who thrived in demanding competitive sporting
22 encounters over the past month via the measurement of subjective performance and well-
23 being. Further, it was anticipated that through pursuit of this aim, it would be possible to
24 develop an awareness of the other responses displayed by performers in competition. A
25 secondary aim of the study was to examine whether profile membership could be predicted

1 from scores for personal enablers (e.g., resilient qualities), contextual enablers (e.g., social
2 support), and underpinning process variables (e.g., basic psychological need satisfaction).

3 **Method**

4 **Participants**

5 Participants were 535 sport performers (401 male) aged between 16 and 62 ($M_{age} =$
6 23.60, $SD_{age} = 8.08$) years, with 91.2% reporting a British nationality. Team (e.g., field
7 hockey, rugby union) and individual (e.g., tennis, track and field) sports were represented in
8 the sample, with participants' average competitive experience being 11.84 years
9 ($SD_{TimeCompeting} = 7.11$ years). The majority of performers (79.8%) reported taking part in
10 senior (rather than junior) competitions¹, with 3.4% of the sample competing at an intraclub
11 level, 24.2% at a local level, 45.7% at a regional level, 21.9% at a national level, 3.7% at an
12 international level, and 0.7% as a professional athlete.

13 **Procedures**

14 Following institutional ethical approval, participants were invited to participate in the
15 study either through direct correspondence or via their coaches. During this initial contact,
16 participant information sheets were distributed which summarized the purpose and nature of
17 the study and the participants' ethical rights (e.g., anonymity, confidentiality, right to
18 withdraw). For those participants who were aged 16 or 17 years, consent was initially
19 obtained from coaches or teachers in loco parentis and then the sport performers were free to
20 choose whether or not they completed the questionnaire. Participants aged 18 years or older
21 were asked to personally provide informed consent prior to participating. After providing
22 informed consent, participants were given a copy of a multi-section questionnaire, which was
23 available in both written and electronic formats. The psychometric properties of all measures
24 included in the questionnaire have previously been shown to be acceptable. When
25 responding to the items, participants were asked to reflect on their experiences in demanding

1 competitive sporting encounters over the past month. Participants were excluded from the
2 study if they had not participated any encounters over the past month due to injury or non-
3 selection.

4 **Measures**

5 **Thriving.** To identify sport performers who thrived, participants provided
6 evaluations of their subjective performance and well-being (cf. Brown, Arnold, Fletcher et
7 al., 2017). Subjective performance was determined by participants' satisfaction with their
8 sporting performance over the past month on an 11-point scale (0 = *totally dissatisfied*, 10 =
9 *totally satisfied*; cf. Pensgaard & Duda, 2003); an approach that has been used frequently in
10 the previous literature (see, e.g., Arnold, Fletcher, & Daniels, 2017; Levy, Nicholls, &
11 Polman, 2011). In recognition of the differentiated approach to understanding well-being
12 (Ryan, Huta, & Deci, 2013), separate measures were used to assess hedonic and eudaimonic
13 well-being. The positive affect scale from the International Positive and Negative Affect
14 Schedule Short Form (I-PANAS-SF; Thompson, 2007) was used as an indicator of hedonic
15 well-being with participants reporting the extent to which they experienced five different
16 emotional descriptors (*viz.*, *active*, *alert*, *attentive*, *determined*, *inspired*) during their sporting
17 encounters over the past month on a five-point Likert scale (1 = *never*, 5 = *always*). The
18 Subjective Vitality Scale (SVS; Ryan & Frederick, 1997) was used to assess participants'
19 aliveness and energy as an indicator of eudaimonic well-being in their sporting encounters
20 over the past month, with participants responding to four items from the SVS (e.g., *I felt alive*
21 *and vital*) on a six-point scale (1 = *not at all true*, 6 = *very true*). Cronbach's alpha values for
22 the positive affect and subjective vitality scales used in this study were .66 and .86
23 respectively. Standardized scores for positive affect and subjective vitality were generated
24 when conducting measurement model assessments for the respective scales, and these were
25 used with standardized scores for subjective performance in the data analysis.

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

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

19 **Contextual enablers.** Participants evaluated the extent to which they received
20 support from two contextual enablers (*viz.*, social support, need supporting environment) in
21 their sporting encounters over the past month. The level of perceived social support was
22 evaluated using the Perceived Available Support in Sport Questionnaire (PASS-Q; Freeman,
23 Coffee, & Rees, 2011). The PASS-Q is a 16-item measure that assesses emotional support,
24 esteem support, informational support, and tangible support. Participants rate the extent to
25 which someone provides each type of support to them on a 0 (*not at all*) to 4 (*extremely*)

1 scale. Within the current study, the internal consistency for the full scale was .93. Rocchi
2 and colleagues' (2017) Interpersonal Behaviours Questionnaire (IBQ) was used to assess the
3 extent to which the coach created a need supportive environment and a need thwarting
4 environment. The IBQ asks sport performers to evaluate their coach's behavior across 24
5 items on a seven-point scale (1 = *do not agree*, 7 = *completely agree*). The scale comprises
6 six subscales that assess autonomy support, autonomy thwart, competence support,
7 competence thwart, relatedness support, and relatedness thwart. Internal consistencies for the
8 total coach support scale and total coach thwart scale were .93 and .90, respectively.

9 **Process variables.** To determine whether differences existed on potential thriving
10 process variables, participants were asked to report their levels of challenge and threat
11 appraisals, and basic psychological need satisfaction and frustration in their sporting
12 encounters over the past month. Challenge and threat appraisals were assessed using the two-
13 item version of McGregor and Elliot's (2002) task construal measures. Participants
14 responded to the four items (e.g., *I viewed the sporting encounters as a positive challenge*; *I*
15 *thought the sporting encounters represented a threat to me*) on a 1 (*not at all true of me*) to 7
16 (*very true of me*) Likert scale. Internal consistencies of the scales in the present work were
17 .84 for challenge and .90 for threat. The Basic Needs Satisfaction in Sport Scale (BNSSS;
18 Ng, Lonsdale, & Hodge, 2011) was used to assess performers' levels of autonomy
19 satisfaction (six items; e.g., *I participate in my sport willingly*), competence satisfaction (five
20 items; e.g., *I was skilled at my sport*), and relatedness satisfaction (five items; e.g., *There*
21 *were people in my sport who cared about me*). Need frustration was assessed using three-
22 item subscales for autonomy frustration (e.g., *Pressured to do too many things*), competence
23 frustration (e.g., *Insecure about my abilities*), and relatedness frustration (e.g., *Excluded from*
24 *the group I wanted to belong to*) from the Basic Psychological Needs Scale (BPNS; Chen et
25 al., 2015). For all of the needs items sport performers were asked to indicate how true the

1 items were for how they felt during their sporting encounters on a seven-point Likert scale (1
2 =not at all true, 7 = very true). In accordance with research in this area (see, e.g., Curran,
3 Appleton, Hill, & Hall, 2013) and the strong positive correlations among the needs (see, e.g.,
4 Lonsdale, Hodge, & Rose, 2009), composite scores of the three basic need satisfaction and
5 the three basic need frustration were generated. The internal consistencies for the composite
6 scores for need satisfaction and need frustration were .90 and .83, respectively.

7 **Data Analysis**

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

13 Mplus was used to perform factor mixture analysis (FMA) given the anticipated level
14 and shape effects on the sport performers' response profiles (see, Lubke & Muthén, 2005;
15 Morin & Marsh, 2015). Factor mixture models combine common factor analysis and latent
16 profile analysis to analyze multivariate data obtained from a possibly heterogeneous
17 population consisting of distinct latent profiles (Lubke & Muthén, 2007). Two types of latent
18 variables are included in the models: a continuous latent factor (i.e., functioning) representing
19 the common content of the observed variables (i.e., subjective vitality, positive affect, and
20 subjective performance), and a categorical latent profile variable indicating the profile
21 membership of each participant (see, for an illustration, Figure 1). Covariance between the
22 observed variables is used to define the continuous latent factor and explicitly reflect level
23 effects in the extracted latent profiles (see, Morin & Marsh, 2015). Any covariance left
24 unexplained by this common factor is used to estimate the latent categorical variable
25 representing the shape effects in the profiles. Factor mixture models rely on the assumption

1 that observed variables within each profile can be modeled using a common factor model
2 which, herein, would reflect subjective vitality, positive affect, and subjective performance
3 acting as indicators for a performer fully functioning (cf. Brown, Arnold, Fletcher, et al.,
4 2017; Ryan & Deci, 2017). In addition, this model assumes that the shape effects would
5 emerge over and above this continuous latent factor (Morin & Marsh, 2015), with some sport
6 performers anticipated to experience high well-being and perceive low performance, and vice
7 versa.

8 In line with recommendations from Clark, Muthén, Kaprio, D’Onofrio, Viken, and
9 Rose (2013; see also, Keller et al., 2017), the first step in the analysis was to conduct a
10 confirmatory factor analysis (CFA) using Mplus 7.4 so as to substantiate the assumed
11 underlying factor structure. As a result of the model only having three observed variables
12 (i.e., subjective performance, subjective vitality, positive affect) it was not possible to
13 generate model fit statistics; however, this did allow for the examination of the indicators’
14 factor loadings on the latent construct. In the second stage of the analysis, we estimated an
15 increasing number of latent profiles extractions and compared them based on their model fit
16 (Clark et al., 2013). As no prior knowledge existed for how many profiles would be
17 represented in the functioning responses displayed by sport performers, models with one-six
18 latent profiles were fit to the data, with intercepts and residuals freely estimated in all
19 profiles. The best fitting and most parsimonious classification model was decided by the
20 interpretability and theoretical meaningfulness of the profiles (see, e.g., Lindwall, Weman-
21 Josefsson, Sebire, & Standage, 2016), and determined using the Bayesian information
22 criterion (BIC; Schwartz, 1978), sample-size adjusted BIC, and the Lo-Mendell-Rubin
23 likelihood ratio test (LMR; Lo, Mendell, & Rubin, 2001). Lower values of the BIC and
24 sample-size adjusted BIC indicated better model fit, and LMR was used to test whether the k -
25 profile model was a significantly better fit to the data compared to the $k - 1$ -profile model.

1 Estimated posterior probabilities and entropy statistics were used to determine the reliability
2 of the profile classifications with scores closest to 1 reflecting greater classification accuracy
3 (Pastor, Barron, Miller, & Davis, 2007). Model parameters were estimated using a maximum
4 likelihood estimation with robust standard errors (MLR) to account for any non-normality
5 within the data and any missing values (cf. Muthén & Muthén, 2015b). Five thousand
6 different sets of starting values were requested, 100 iterations for each random start, and the
7 200 starts that yielded the highest log-likelihood were retained for the final optimizations
8 (Morin & Wang, 2016); Mplus code for the analysis is available in the Electronic
9 Supplementary Material S1.

10 To examine whether profile membership could be predicted from the enablers (viz.,
11 resilient qualities, psychological skills use, need supportive and thwarting environment,
12 social support) and processes (i.e., basic psychological need satisfaction and frustration,
13 challenge and threat appraisal), the variables were included as auxiliary variables in the best
14 fitting FMA model using a three-step approach (see, Asparouhov & Muthén, 2014). The
15 three-step approach includes the auxiliary variables simultaneously in a multinomial logistic
16 regression using the following stages: (1) the latent profile variable is estimated using only
17 latent profile indicators; (2) the most likely profile variable is created using the latent profile
18 posterior distribution obtained in stage 1; and (3) the most likely profile is regressed on
19 predictor variables, taking into account misclassification in stage 2 (Asparouhov & Muthén,
20 2014; Vermunt, 2010). Given the theory-based expectation that the process variables could
21 explain the effects of the personal and contextual enablers (Deci & Ryan, 2000; Lazarus &
22 Folkman, 1984), separate analyses were conducted with the enabler and process variables to
23 enable identification of any direct effects of the enablers on thriving (see, for example Mplus
24 code, Electronic Supplementary Material S1). To aid reader interpretation, odds ratios were
25 computed from the regression coefficients and reflect the change in the likelihood of

1 membership in a target profile in contrast to a comparison profile associated with each unit of
2 increase in the predictor.

3 **Results**

4 Questionnaire responses were screened for case-wise missing data and unengaged
5 responses, which resulted in the data from six participants being removed. In addition, five
6 multivariate outliers were identified and removed, leaving a final analytical sample size of
7 524. Preliminary analysis also suggested that all participants perceived some level of demand
8 (i.e. “stress”) during their sporting encounters ($M = 3.36$, $SD = 1.19$). Descriptive statistics
9 and correlations between the thriving indices, enablers, and process variables are presented in
10 Table 1; correlations between enabler and process variables can be found in Electronic
11 Supplementary Materials S2. The standardized factor loadings for positive affect (.67),
12 subjective vitality (.85), and subjective performance (.55) on the continuous latent factor
13 were all statistically significant ($p < .001$), supporting the notion of a global continuous latent
14 construct.

15 **Factor Mixture Analysis**

16 The BICs and sample-size adjusted BICs for the models are displayed in Table 2. The
17 lowest BIC was associated with the four-profile model, whereas the sample-sized adjusted
18 BICs were found to continually decrease following the inclusion of additional profiles. The
19 LMR value for the five-profile model was non-significant ($p = .14$), suggesting that the fifth
20 profile in this model was not distinct from the other profiles and, therefore, supporting the
21 retention of a four-profile model. When considered in relation to the most likely latent
22 profile membership, the four profiles derived from the model each accounted for a substantial
23 proportion of the sample (range 7.25% - 39.89%) and the model showed high classification
24 accuracy with the average within-profile posterior probability being .90 (range .85 to .93).
25 The classification accuracy for the four-profile model was also supported by the class

1 proportions determined using the estimated posterior probabilities (all class proportions >
2 8.8%) and the entropy statistic (entropy = .82). The three, four, and five profile solutions
3 were closely inspected and compared independently by the study authors to examine their
4 substantive and theoretical meaningfulness. The four-profile model was deemed to be the
5 most parsimonious and theoretical meaningful solution, and was therefore retained in the
6 subsequent analysis.

7 **Interpretation of the Four-Profile Solution**

8 Standardized scores for the thriving indices were used to interpret the best fitting
9 model and these are presented in Table 3 and displayed graphically in Figure 2. Profile 1
10 (“thriving”) represents 27.9% ($n = 146$, based on most likely latent profile membership) of
11 participants and includes individuals who reported the highest levels of subjective vitality,
12 positive affect, and subjective performance in their sporting encounters over the past month.
13 Profile 2 (“above average”; 25.0% of participants, $n = 131$) has mean scores marginally
14 above the sample mean. Interestingly, inspection of the 90% confidence intervals in Figure 2
15 suggests that subjective performance scores in the above average and thriving profiles, may
16 not be significantly different. Profile 3 (“below average”) represents 39.9% ($n = 209$) of the
17 sport performers and has subjective vitality, positive affect, and subjective performance
18 scores marginally below the sample mean. Profile 4 (“low functioning”) is the smallest profile
19 representing 7.3% ($n = 38$) of the sport performers. These individuals have mean scores well
20 below the sample mean and are those who functioned least well in their sporting encounters
21 over the past month.

22 **Prediction of Latent Classes from Enabler and Process Variables²**

23 Regression coefficients and odds ratios (ORs) for the relationships among the five
24 enabler predictor variables and the categorical latent class variable are presented in Table 4,
25 with profile 1 (“thriving”) as the comparison profile. The results from this analysis show that

1 possessing higher levels of resilient qualities significantly decreases the likelihood of
2 membership to profiles 2 (“above average”; OR = 0.444), 3 (“below average”; 0.310), and 4
3 (“low functioning”; 0.321) compared to membership in the thriving profile. Further,
4 reporting greater use of psychological skills was found to significantly decrease the
5 likelihood of membership to profiles 3 (“below average”; 0.660) and 4 (“low functioning”;
6 OR = 0.354) compared to the thriving profile. Regression coefficients and odds ratios (ORs)
7 for the relationships among the four process predictor variables and the categorical latent
8 class variable are presented in Table 5, with profile 1 (“thriving”) as the comparison profile.
9 The results from the process variables suggest that, when perceiving a high level of basic
10 psychological need satisfaction, the likelihoods of membership to all other profiles are
11 significantly lower compared to the thriving profile (above average, OR = 0.332; below
12 average, OR = 0.294; low functioning, OR = 0.133). In addition, perceiving sporting
13 encounters as a challenge was found to significantly decrease the likelihood of membership
14 to the low functioning profile compared to the thriving profile (OR = 0.368). Finally,
15 perceiving higher levels of basic psychological need frustration was found to significantly
16 increase the likelihood of membership to the below average profile compared to the thriving
17 profile (OR = 2.257). All other regression coefficients were non-significant.

18 Discussion

19 Understanding what differentiates and characterizes individuals who thrive in
20 competition from those who do not can provide critical theoretical and applied insight.
21 Couched within a proposed conceptualization of thriving (cf. Brown, Arnold, Fletcher et al.,
22 2017), the purpose of the current study was to investigate whether it was possible to identify
23 sport performers who thrived in demanding competitive sporting encounters over the past
24 month, the responses displayed by performers who did not thrive, and to establish whether
25 profile membership could be predicted from scores for personal enablers, contextual enablers,

1 and process variables. Results from factor mixture analysis yielded four profiles: fully
2 functioning (i.e., thriving), low functioning, and two types of functioning characterized by
3 scores marginally above and below the mean. Further, profile membership was found to be
4 predicted by personal resilient qualities and psychological skills use enabler variables, and
5 basic psychological need satisfaction, challenge appraisal, and basic psychological need
6 frustration process variables.

7 The identification of a thriving profile of sport performers in this study supports the
8 notion that humans can be fully functioning whilst encountering demands, and that it is
9 possible to differentiate between individuals who thrive, and those who do not (Brown,
10 Arnold, Fletcher et al., 2017; Sarkar & Fletcher, 2014a). Further, the identification of three
11 additional response profiles with quantitative differences contributes significantly to an
12 understanding of how sport performers function in demanding competitive sporting
13 encounters and adds greater depth to the existing methods used for assessing thriving (see,
14 e.g., Porath, Spreitzer, Gibson, & Garnett, 2012). To elaborate, while Porath et al. (2012)
15 solely consider a high-low thriving continuum, the findings in the present study suggest that a
16 broader continuum of functioning responses exists with performers who are fully functioning
17 (i.e., perceiving high-levels of performance and experiencing high-levels of well-being) and
18 thus, thriving, appearing at the top of this scale. Further, the analysis established the validity
19 of using subjective performance, subjective vitality, and positive affect as indicators for
20 thriving in sport, with the shared variance amongst these variables accounted for by a latent
21 “functioning” construct (cf. Ryan & Deci, 2017). To our knowledge, this represents the first
22 time that functioning has been modeled in this way with previous sport and thriving research
23 tending to examine performance and well-being as separate outcome variables (see, e.g.,
24 Carpentier & Mageau, 2013; Porath et al., 2012). This multifaceted approach therefore
25 offers a novel option for assessing human functioning and thriving in future research.

1 Notwithstanding the quantitative differences between profiles indicating a *level* effect
2 for a continuous latent functioning factor, no clear qualitative variations emerged (i.e., none
3 of the profiles displayed asynchronous patterns on the indicator variables). This finding
4 suggests that performers' perceptions of in-game performance, vitality, and positive affect are
5 linked in valence and magnitude. To illustrate, individuals who perceive low levels of
6 positive affect, were also found to report similarly low levels of vitality and performance.
7 Consequently, this finding offers statistical support to previous qualitative work wherein
8 thriving in sport has been recognized to include a perceived, sustained high-level of
9 performance and components of well-being (see, Brown, Arnold, Reid et al., 2017), and
10 studies which have identified relationships between self-rated performance and well-being
11 (see, e.g., Ford, Cerasoli, Higgins, & Decesare, 2011). However, it challenges the suggestion
12 that the prediction of well-being (i.e., positive affect, vitality) and performance can lead to
13 differentiated results; that is, the significant prediction of one functioning indicator but not
14 another (see, e.g., Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008; Sheldon & Filak,
15 2008). In addition, the lack of asynchronous profiles, despite controlling for an overarching
16 functioning latent factor, suggests that covariance in the model was due to relationships
17 between variables, and that no heterogeneity could be attributed to the presence of
18 subpopulations within the sample (cf. Lubke & Muthén, 2005).

19 A secondary aim of the study was to establish whether profile membership could be
20 predicted by personal and contextual enablers, and process variables. Results pertaining to
21 the personal enablers revealed significant prediction of profile membership. To elaborate,
22 possessing high levels of personal resilient qualities was found to decrease the likelihood of
23 membership to all other profiles in comparison to the thriving profile (see Table 4).
24 Establishing resilient qualities as a significant predictor of sport performers' functioning
25 responses (as indexed using a combined performance and well-being score), extends previous

1 literatures that have espoused relationships between resilient qualities and performance (e.g.,
2 Fletcher & Sarkar, 2012) and well-being (e.g., Hosseini & Besharat, 2010) separately. These
3 findings also offer initial statistical evidence from the sport literature to substantiate a
4 relationship between resilience and thriving (see, Carver, 1998; Sarkar & Fletcher, 2014a).
5 The second personal enabler considered in the present study, use of psychological skills, was
6 found to significantly decrease the likelihood of membership to the below average and low
7 functioning profiles compared to thriving; no prediction effect was found for membership to
8 the above average profile. Identifying that psychological skills use can be used to predict
9 membership to thriving versus lower functioning response profiles, supports previous
10 findings suggesting that mental skills use is associated with enhanced performance and well-
11 being (e.g., Boat & Taylor, 2015; Edwards & Edwards, 2012). However, the inability of
12 scores on the use of psychological skills to differentiate between the likelihood of
13 membership to above average profiles when compared to the thriving profile, challenges the
14 utility of this enabler as a predictor across all functioning responses displayed by sport
15 performers.

16 In contrast to the findings for personal enablers, social support, coach need support,
17 and coach need thwart contextual factors did not predict the likelihood of profile membership
18 (see Table 4). This finding is divergent to previous work in sport that has found relationships
19 between social support and the separate functioning indicators (e.g., Boat & Taylor, 2015;
20 DeFreese & Smith, 2014), and between coach behaviors and dimensions of thriving (e.g.,
21 Gucciardi et al., 2017). A possible explanation for the opposing findings in the present study
22 to those previously reported, is the choice of outcome variables. Within the present study,
23 performance and well-being were used as indicators of performers functioning responses,
24 with thriving considered to represent fully functioning whereby performers would score
25 highly for all functioning measures (i.e., subjective performance, subjective vitality, and

1 positive affect; cf. Brown, Arnold, Fletcher et al., 2017; Ryan & Deci, 2017; Su et al., 2014).
2 In contrast, Gucciardi et al. (2017) assessed thriving using an adaptive version of the thriving
3 at work scale (Porath et al., 2012), wherein thriving is represented by the dimensions of
4 vitality and learning. A notable difference in these approaches, therefore, is that the thriving
5 at work scale restricts assessment to scales of well-being/development, whereas the method
6 of assessing thriving in the present study encompasses measures for both success and
7 development (Brown, Arnold, Fletcher et al., 2017). Consequently, although coach need
8 thwarting behaviors may preclude development if these variables are considered in isolation,
9 the results from the present study found no evidence to suggest that these behaviors can
10 predict profile membership when functioning responses, and thriving, are assessed using
11 performance *and* well-being.

12 Although the contextual enablers did not predict sport performers' functioning
13 response profile membership, the mechanisms through which these social-contextual factors
14 are considered to impact thriving (i.e., the satisfaction and frustration of basic psychological
15 needs; Deci & Ryan, 2000; Ryan & Deci, 2017), were found to have statistically significant
16 effects (see Table 5). Observing that significantly greater levels of need satisfaction
17 predicted sport performers' membership in the thriving profile adds support to the tenets
18 within BPNT and a growing body of literature that considers basic psychological need
19 satisfaction to be essential for human growth and thriving (see, Ryan & Deci, 2017; Spreitzer
20 & Porath, 2014). Equally supportive of BPNT, higher levels of basic need frustration
21 significantly predicted the likelihood of sport performers' membership to the below average
22 profile, in comparison to the thriving profile. Such a finding further supports the role of basic
23 needs in differentially predicting thriving and is consistent with previous research (see, e.g.,
24 Vansteenkiste & Ryan, 2013). Statistically significant predictive effects were also observed
25 for challenge appraisal, with performers who perceived the demanding competitive sporting

1 encounters as a challenge more likely to be classified in the thriving profile, compared to the
2 low functioning profile. This finding offers some evidence to support the previous theoretical
3 suggestions linking challenge appraisal to thriving (see, Carver, 1998), and empirical research
4 that has examined the potential mediating role that appraisal plays in facilitating performance
5 (see, Fletcher & Sarkar, 2012; Freeman & Rees, 2009); however, further work is required to
6 examine the reliability of this process variable in predicting membership to all of the
7 functioning response profiles.

8 **Applied Implications**

9 The results from this work have a number of potential implications for applied
10 practice. First, based on these initial findings, practitioners wanting to facilitate thriving in
11 sport are advised to explore methods for promoting personal enablers and process variables.
12 In support of this venture, lessons may be taken from alternative performance domains
13 where, for example, military personnel have participated in resilience training (Reivich,
14 Seligman, McBride, 2011; see also, Fletcher & Sarkar, 2017) and employees have been
15 exposed to performance feedback and decision-making discretion interventions to enhance
16 need support and promote need satisfaction (Spreitzer, Porath, & Gibson, 2012; see also,
17 Mageau & Vallerand, 2003). Second, to facilitate thriving, it is suggested that practitioners
18 consider evidence-informed strategies that can influence both performance and well-being
19 (e.g., Barker, Jones, & Greenlees, 2010; Weinberg, Seabourne, & Jackson, 1981), as all
20 indicators assessed in the current study were shown to underpin sport performers' functioning
21 responses. When devising and evaluating such interventions, it would be beneficial for
22 researchers to follow published guidelines (see, e.g., Craig, et al., n.d.), to ensure that the
23 interventions achieve both intervention effectiveness (i.e., real-world utility) and intervention
24 efficacy (i.e., rigorously examined) for the target outcomes (see, American Psychological
25 Association Presidential Task Force on Evidence-Based Practice, 2006; Rumbold, Fletcher,

1 & Daniels, 2012).

2 **Strengths and Limitations of the Present Study**

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

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

1 obtained. Within subsequent analyses, it may be pertinent to unparcel the scores for the
2 enabler and process variables examined in the current study to establish whether sub-scale
3 specific effects exist, and to consider additional variables that may be relevant to the thriving
4 process (e.g., perceived ability to cope; Park, 1998). If considering these predictor variables
5 in a hierarchical structure (e.g., in a second-order model), researchers would also do well to
6 consider the model-based scale reliabilities of the measures used (see, Brunner, Nagy, &
7 Williams, 2012).

8 Additional limitations of the current study are the unequal gender split of the sample
9 (75% male) and the high proportion of sport performers with the same nationality (91%
10 British). Although the latter sample characteristic can be explained by the fact that the
11 research was conducted in the United Kingdom, the former gender split was unexpected and
12 unintentional. The high numbers of male sport performers sampled (in comparison to
13 females) appears a common theme in sport psychology literature (see, Brown & Fletcher,
14 2017), and it may therefore be of value for future inquiry to explore why this trend occurs, its
15 implications for the generalizability of conclusions drawn and, if necessary, potential
16 strategies to alleviate gender biased sampling (cf. Cuddeback, Wilson, Orme, & Combs-
17 Orme, 2004; Ellenberg, 1994).

18 **Conclusion**

19 To conclude, the purpose of the present study was to examine if it was possible to
20 identify sport performers who thrived in demanding competitive sporting encounters, the
21 functioning response profiles of those who did not, and to establish whether profile
22 membership could be predicted from scores for personal enablers, contextual enablers, and
23 process variables. Factor mixture analysis revealed four novel profiles for performers'
24 responses including a fully functioning (thriving) group, a low functioning group, and two
25 groups with functioning levels slightly above and below the mean. Profile membership was

1 found to be predicted by personal resilient qualities and psychological skills use enabler
2 variables, and basic psychological need satisfaction, challenge appraisal, and basic
3 psychological need frustration process variables; thus providing original insight that sport
4 performers' perceived levels on these variables can facilitate thriving. The present study
5 advances existing literature through the introduction of a holistic approach to examine
6 thriving in competition, and by providing suggestions of pertinent variables for the
7 facilitation of thriving that may be used to inform the development of thriving interventions.

ACCEPTED VERSION

References

- 1
2 American Psychological Association Presidential Task Force on Evidence-Based Practice.
3 (2006). Evidence-based practice in psychology. *American Psychologist*, *61*, 271-285.
4 doi:10.1037/0003-066X.61.4.271
- 5 Arnold, R., Fletcher, D., & Daniels, K. (2017). Organisational stressors, coping, and
6 outcomes in competitive sport. *Journal of Sports Sciences*, *35*, 694-703.
7 doi:10.1080/02640414.2016.1184299
- 8 Ashfield, A., McKenna, J., & Backhouse, S. (2012). The athlete's experience of flourishing.
9 *Qualitative Methods in Psychology Bulletin*, *14*, 4-13.
- 10 Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step
11 approaches using Mplus. *Structural Equation Modeling: A Multidisciplinary Journal*,
12 *21*, 329-341. doi:10.1080/10705511.2014.915181
- 13 Barker, J. B., Jones, M. V., & Greenlees, I. (2010). Assessing the immediate and maintained
14 effects of hypnosis on self-efficacy and soccer wall-volley performance. *Journal of*
15 *Sport & Exercise Psychology*, *32*, 243-252. doi:10.1123/jsep.32.2.243
- 16 Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., Bosch, J. A., & Thøgersen-Ntoumani, C.
17 (2011). Self-determination theory and diminished functioning: The role of
18 interpersonal control and psychological need thwarting. *Personality and Social*
19 *Psychology Bulletin*, *37*, 1459-1473. doi:10.1177/0146167211413125
- 20 Bauer, D. J., & Curran, P. J. (2004). The integration of continuous and discrete latent variable
21 models: Potential problems and promising opportunities. *Psychological Methods*, *9*,
22 3-29. doi:10.1037/1082-989X.9.1.3
- 23 Benson, P. L., & Scales, P. C. (2009). The definition and preliminary measurement of
24 thriving in adolescence. *The Journal of Positive Psychology*, *4*, 85-104.
25 doi:10.1080/17439760802399240

- 1 Boat, R., & Taylor, I. M. (2015). Patterns of change in psychological variables leading up to
2 competition in superior versus inferior performers. *Journal of Sport & Exercise*
3 *Psychology, 37*, 244-256. doi:10.1123/jsep.2014-0216
- 4 Brown, D. J., Arnold, R., Fletcher, D., & Standage, M. (2017). Human thriving: A conceptual
5 debate and literature review. *European Psychologist, 22*, 167-179. doi:10.1027/1016-
6 9040/a000294
- 7 Brown, D. J., Arnold, R., Reid, T., & Roberts, G. (2017). A qualitative exploration of thriving
8 in elite sport. *Journal of Applied Sport Psychology*. Advance online publication.
9 doi:10.1080/10413200.2017.1354339
- 10 Brown, D. J., & Fletcher, D. (2017). Effects of psychological and psychosocial interventions
11 on sport performance: A meta-analysis. *Sports Medicine, 41*, 77-99.
12 doi:10.1007/s40279-016-0552-7
- 13 Brunner, M., Nagy, G., & Wilhelm, O. (2012). A tutorial on hierarchically structured
14 constructs. *Journal of Personality, 80*, 796-846. doi:10.1111/j.1467-
15 6494.2011.00749.x
- 16 Bull, S. J., Shambrook, C. J., James, W., & Brooks, J. E. (2005). Towards an understanding
17 of mental toughness in elite English cricketers. *Journal of Applied Sport Psychology,*
18 *17*, 209-227. doi:10.1080/10413200591010085
- 19 Bundick, M. J., Yeager, D. S., King, P. E., & Damon, W. (2010). Thriving across the life
20 span. In R. M. Lerner, M. E. Lamb, & A. M. Freund (Eds.), *The handbook of life-span*
21 *development* (pp. 882-923). Hoboken, NJ: John Wiley & Sons, Inc.
- 22 Carpentier, J., & Mageau, G. A. (2013). When change-oriented feedback enhances
23 motivation, well-being and performance: A look at autonomy-supportive feedback in
24 sport. *Psychology of Sport and Exercise, 14*, 423-435.
25 doi:10.1016/j.psychsport.2013.01.003

- 1 Carver, C. S. (1998). Resilience and thriving: Issues, models, and linkages. *Journal of Social*
2 *Issues, 54*, 245-266. doi:10.1111/0022-4537.641998064
- 3 Chen, B. W., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder,
4 J., . . . Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and
5 need strength across four cultures. *Motivation and Emotion, 39*, 216-236.
6 doi:10.1007/s11031-014-9450-1
- 7 Chen, F., Bollen, K. A., Paxton, P., Curran, P. J., & Kirby, J. B. (2001). Improper solutions in
8 structural equation models. *Sociological Methods & Research, 29*, 468-508.
9 doi:10.1177/0049124101029004003
- 10 Clark, S. L., Muthén, B., Kaprio, J., D'Onofrio, B. M., Viken, R., & Rose, R. J. (2013).
11 Models and strategies for factor mixture analysis: An example concerning the
12 structure underlying psychological disorders. *Structural Equation Modeling: A*
13 *Multidisciplinary Journal, 20*, 681-703. doi:10.1080/10705511.2013.824786
- 14 Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (Eds.). (n.d.).
15 *Developing and evaluating complex interventions: New guidance*. Retrieved from
16 <http://www.mrc.ac.uk/documents/pdf/complex-interventions-guidance/>
- 17 Cuddeback, G., Wilson, E., Orme, J. G., & Combs-Orme, T. (2004). Detecting and
18 statistically correcting sample selection bias. *Journal of Social Service Research, 30*,
19 19-33. doi:10.1300/J079v30n03_02
- 20 Curran, T., Appleton, P. R., Hill, A. P., & Hall, H. K. (2013). The mediating role of
21 psychological need satisfaction in relationships between types of passion for sport and
22 athlete burnout. *Journal of Sports Sciences, 31*, 597-606.
23 doi:10.1080/02640414.2012.742956
- 24 Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and
25 the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

- 1 doi:10.1207/S15327965PLI1104_01
- 2 DeFreese, J. D., & Smith, A. L. (2014). Athlete social support, negative social interactions,
3 and psychological health across a competitive sport season. *Journal of Sport &*
4 *Exercise Psychology, 36*, 619-630. doi:10.1123/jsep.2014-0040
- 5 Division 47 (Exercise and Sport Psychology) of the American Psychological Association.
6 (2017). *Defining the practice of sport and performance psychology*. Retrieved from
7 <http://www.apadivisions.org/division-47/about/resources/index.aspx>
- 8 Edwards, D. J., & Edwards, S. D. (2012). The evaluation of a psychological skills training
9 programme for rugby players. *African Journal for Physical, Health Education,*
10 *Recreation & Dance, 18*, 525-534.
- 11 Ellenberg, J. H. (1994). Selection bias in observational and experimental studies. *Statistics in*
12 *Medicine, 13*, 557-567. doi:10.1002/sim.4780130518
- 13 Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical
14 perspective on thriving through relationships. *Personality and Social Psychology*
15 *Review, 19*, 113-147. doi:10.1177/1088868314544222
- 16 Fletcher, D., & Sarkar, M. (2012). A grounded theory of psychological resilience in Olympic
17 champions. *Psychology of Sport and Exercise, 13*, 669-678.
18 doi:10.1016/j.psychsport.2012.04.007
- 19 Fletcher, D., & Sarkar, M. (2017). Mental fortitude training: An evidence-based approach to
20 developing psychological resilience for sustained success. *Journal of Sport*
21 *Psychology in Action, 7*, 135-157. doi:10.1080/21520704.2016.1255496
- 22 Ford, M. T., Cerasoli, C. P., Higgins, J. A., & Decesare, A. L. (2011). Relationships between
23 psychological, physical, and behavioural health and work performance: A review and
24 meta-analysis. *Work & Stress: An International Journal of Work, Health &*
25 *Organisations, 25*, 185-204. doi:10.1080/02678373.2011.609035

- 1 Freeman, P., Coffee, P., & Rees, T. (2011). The PASS-Q: The Perceived Available Support
2 in Sport Questionnaire. *Journal of Sport & Exercise Psychology, 33*, 54-74.
3 doi:10.1123/jsep.33.1.54
- 4 Freeman, P., & Rees, T. (2009). How does perceived support lead to better performance? An
5 examination of potential mechanisms. *Journal of Applied Sport Psychology, 21*, 429-
6 441. doi:10.1080/10413200903222913
- 7 Galli, N., & Reel, J. J. (2012). 'It was hard, but it was good': A qualitative exploration of
8 stress-related growth in Division I intercollegiate athletes. *Qualitative Research in*
9 *Sport, Exercise and Health, 4*, 297-319. doi:10.1080/2159676X.2012.693524
- 10 Gestsdóttir, S., & Lerner, R. M. (2007). Intentional self-regulation and positive youth
11 development in early adolescence: Findings from the 4-H study of positive youth
12 development. *Developmental Psychology, 43*, 508-521. doi:10.1037/0012-
13 1649.43.2.508
- 14 Gucciardi, D. F., Jackson, B., Hodge, K., Anthony, D. R., & Brooke, L. E. (2015). Implicit
15 theories of mental toughness: Relations with cognitive, motivational, and behavioral
16 correlates. *Sport, Exercise, and Performance Psychology, 4*, 100-112.
17 doi:10.1037/spy0000024
- 18 Gucciardi, D. F., & Jones, M. I. (2012). Beyond optimal performance: Mental toughness
19 profiles and developmental success in adolescent cricketers. *Journal of Sport &*
20 *Exercise Psychology, 34*, 16-36. doi:10.1123/jsep.34.1.16
- 21 Gucciardi, D. F., Stamatis, A., & Ntoumanis, N. (2017). Controlling coaching and athlete
22 thriving in elite adolescent netballers: The buffering effect of athletes' mental
23 toughness. *Journal of Science and Medicine in Sport, 20*, 718-722.
24 doi:10.1016/j.jsams.2017.02.007
- 25 Hardy, L., Roberts, R., Thomas, P. R., & Murphy, S. M. (2010). Test of Performance

- 1 Strategies (TOPS): Instrument refinement using confirmatory factor analysis.
2 *Psychology of Sport and Exercise*, 11, 27-35. doi:10.1016/j.psychsport.2009.04.007
- 3 Harris, M., Myhill, M., & Walker, J. (2012). Thriving in the challenge of geographical
4 dislocation: A case study of elite Australian footballers. *International Journal of*
5 *Sports Science*, 2, 51-60. doi:10.5923/j.sports.20120205.02
- 6 Hosseini, S. A., & Besharat, M. A. (2010). Relation of resilience with sport achievement and
7 mental health in a sample of athletes. *Procedia Social and Behavioral Science*, 5, 633-
8 638. doi:10.1016/j.sbspro.2010.07.156
- 9 IBM. (2013). IBM SPSS Statistics (Version 22.0.0.1) [Computer software]. Meadville, PA:
10 IBM.
- 11 Jones, G., Hanton, S., & Connaughton, D. (2002). What is this thing called mental
12 toughness? An investigation of elite sport performers. *Journal of Applied Sport*
13 *Psychology*, 14, 205-218. doi:10.1080/10413200290103509
- 14 Jones, M. I., Dunn, J. G. H., Holt, N. L., Sullivan, P. J., & Bloom, G. A. (2011). Exploring
15 the '5Cs' of positive youth development in sport. *Journal of Sport Behavior*, 34, 250-
16 267.
- 17 Jones, M. I., & Lavalley, D. (2009). Exploring the life skills needs of British adolescent
18 athletes. *Psychology of Sport and Exercise*, 10, 159-167.
19 doi:10.1016/j.psychsport.2008.06.005
- 20 Kalisch, R., Müller, M., & Tüscher, O. (2015). A conceptual framework for the
21 neurobiological study of resilience. *Behavioral and Brain Science*, 38, e92.
22 doi:10.1017/S0140525X1400082X
- 23 Keller, A. C., Igc, I., Meier, L. L., Semmer, N. K., Schaubroeck, J. M., Brunner, B., &
24 Elfering, A. (2017). Testing job typologies and identifying at-risk subpopulations
25 using factor mixture models. *Journal of Occupational Health Psychology*, 22, 503-

- 1 517. doi:10.1037/ocp0000038
- 2 Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in
3 life. *Journal of Health and Social Behavior*, *43*, 207-222. doi:10.2307/3090197
- 4 Keyes, C. L. M. (2003). Complete mental health: An agenda for the 21st century. In J. Haidt
5 (Ed.), *Flourishing* (pp. 293-312). Washington, DC: American Psychological
6 Association.
- 7 Kipp, L. E., & Weiss, M. R. (2013). Social influences, psychological need satisfaction, and
8 well-being among female adolescent gymnasts. *Sport, Exercise, and Performance
9 Psychology*, *2*, 62-75. doi:10.1037/a0030236
- 10 Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York, NY:
11 McGraw-Hill.
- 12 Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY:
13 Springer.
- 14 Lerner, R. M., Dowling, E. M., & Anderson, P. M. (2003). Positive youth development:
15 Thriving as a basis of personhood and civil society. *Applied Developmental Science*,
16 *7*, 172-180. doi:10.1207/S1532480XADS0703_8
- 17 Levy, A. R., Nicholls, A. R., & Polman, R. C. J. (2011). Pre-competitive confidence, coping,
18 and subjective performance in sport. *Scandinavian Journal of Medicine & Science in
19 Sports*, *21*, 721-729. doi:10.1111/j.1600-0838.2009.01075.x
- 20 Lindwall, M., Weman-Josefsson, K., Sebire, S. J., & Standage, M. (2016). Viewing exercise
21 goal content through a person-oriented lens: A self-determination perspective.
22 *Psychology of Sport and Exercise*, *27*, 85-92. doi:10.1016/j.psychsport.2016.06.011
- 23 Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a
24 normal mixture. *Biometrika*, *88*, 767-778. doi:10.1093/biomet/88.3.767
- 25 Lonsdale, C., Hodge, K., & Rose, E. (2009). Athlete burnout in elite sport: A self-

- 1 determination perspective. *Journal of Sports Sciences*, 27, 785-795.
2 doi:10.1080/02640410902929366
- 3 Louvet, B., Gaudreau, P., Menaut, A., Genty, J., & Deneuve, P. (2007). Longitudinal patterns
4 of stability and change in coping across three competitions: A latent class growth
5 analysis. *Journal of Sport & Exercise Psychology*, 29, 100-117.
6 doi:10.1123/jsep.29.1.100
- 7 Lubke, G. H., & Muthén, B. (2005). Investigating population heterogeneity with factor
8 mixture models. *Psychological Methods*, 10, 21-39. doi:10.1037/1082-989X.10.1.21
- 9 Lubke, G., & Muthén, B. O. (2007). Performance of factor mixture models as a function of
10 model size, covariate effects, and class-specific parameters. *Structural Equation*
11 *Modeling: A Multidisciplinary Journal*, 14, 26-47. doi:10.1080/10705510709336735
- 12 Mageau, G. A., & Vallerand, R. J. (2003). The coach-athlete relationship: A motivational
13 model. *Journal of Sports Sciences*, 21, 883-904. doi:10.1080/0264041031000140374
- 14 Mahoney, M. J., Gabriel, T. J., & Perkins, T. S. (1987). Psychological skills and exceptional
15 athletic performance. *The Sport Psychologist*, 1, 181-199. doi:10.1123/tsp.1.3.181
- 16 Mangelsdorf, J., & Eid, M. (2015). What makes a thriver? Unifying the concepts of
17 posttraumatic and postecstatic growth. *Frontiers in Psychology*, 6.
18 doi:10.3389/fpsyg.2015.00813
- 19 Martinet, G., & Nicolas, M. (2016). A latent profile transition analysis of coping within
20 competitive situations. *Sport, Exercise, and Performance Psychology*, 5, 218-231.
21 doi:10.1037/spy0000062
- 22 McGregor, H. A., & Elliot, A. J. (2002). Achievement goals as predictors of achievement-
23 relevant processes prior to task engagement. *Journal of Educational Psychology*, 94,
24 381-395. doi:10.1037/0022-0663.94.2.381
- 25 Morin, A. J. S., & Marsh, H. W. (2015). Disentangling shape from level effects in person-

- 1 centered analyses: An illustration based on university teachers' multidimensional
2 profiles of effectiveness. *Structural Equation Modeling: A Multidisciplinary Journal*,
3 22, 39-59. doi:10.1080/10705511.2014.919825
- 4 Morin, A. J. S., & Wang, J. C. K. (2016). A gentle introduction to mixture modeling using
5 physical fitness performance data. In N. Ntoumanis & N. D. Myers (Eds.), *An*
6 *introduction to intermediate and advanced statistical analyses for sport and exercise*
7 *scientists* (pp. 183-209). Chichester, UK: Wiley.
- 8 Mouratidis, A., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008). The motivating role of
9 positive feedback in sport and physical education: Evidence for a motivational model.
10 *Journal of Sport & Exercise Psychology*, 30, 240-268. doi:10.1123/jsep.30.2.240
- 11 Muthén, L. K., & Muthén, B. O. (2015a). Mplus (Version 7.4) [Computer software]. Los
12 Angeles, CA: StatModel.
- 13 Muthén, L. K., & Muthén, B. O. (2015b). *Mplus user's guide* (7th ed.). Los Angeles, CA:
14 Muthén & Muthén.
- 15 Ng, J. Y. Y., Lonsdale, C., & Hodge, K. (2011). The Basic Needs Satisfaction in Sport Scale
16 (BNSSS): Instrument development and initial validity evidence. *Psychology of Sport*
17 *and Exercise*, 12, 257-264. doi:10.1016/j.psychsport.2010.10.006
- 18 O'Leary, V. E., & Ickovics, J. R. (1995). Resilience and thriving in response to challenge: An
19 opportunity for a paradigm shift in women's health. *Women's Health*, 1, 121-142.
- 20 Park, C. L. (1998). Stress-related growth and thriving through coping: The roles of
21 personality and cognitive processes. *Journal of Social Issues*, 54, 267-277.
22 doi:10.1111/0022-4537.651998065
- 23 Pastor, D. A., Barron, K. E., Miller, B. J., & Davis, S. L. (2007). A latent profile analysis of
24 college students' achievement goal orientation. *Contemporary Educational*
25 *Psychology*, 32, 8-47. doi:10.1016/j.cedpsych.2006.10.003

- 1 Pensgaard, A. M., & Duda, J. L. (2003). Sydney 2000: The interplay between emotions,
2 coping, and the performance of Olympic-level athletes. *The Sport Psychologist, 17*,
3 253-267. doi:10.1123/tsp.17.3.253
- 4 Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in
5 social science research and recommendations on how to control it. *Annual Review of*
6 *Psychology, 63*, 539-569. doi:10.1146/annurev-psych-120710-100452
- 7 Porath, C., Spreitzer, G., Gibson, C., & Garnett, F. G. (2012). Thriving at work: Toward its
8 measurement, construct validation, and theoretical refinement. *Journal of*
9 *Organizational Behavior, 33*, 250-275. doi:10.1002/Job.756
- 10 Rees, T., Hardy, L., Güllich, A., Abernethy, B., Côté, J., Woodman, T., . . . Warr, C. (2016).
11 The Great British medalists project: A review of current knowledge on the
12 development of the world's best sporting talent. *Sports Medicine, 46*, 1041-1058.
13 doi:10.1007/s40279-016-0476-2
- 14 Reinboth, M., Duda, J. L., & Ntoumanis, N. (2004). Dimensions of coaching behavior, need
15 satisfaction, and the psychological and physical welfare of young athletes. *Motivation*
16 *and Emotion, 28*, 297-313. doi:10.1023/B:MOEM.0000040156.81924.b8
- 17 Reivich, K. J., Seligman, M. E. P., & McBride, S. (2011). Master resilience training in the
18 U.S. Army. *American Psychologist, 66*, 25-34. doi:10.1037/a0021897
- 19 Rocchi, M., Pelletier, L., Cheung, S., Baxter, D., & Beaudry, S. (2017). Assessing need-
20 supportive and need-thwarting interpersonal behaviours: The Interpersonal
21 Behaviours Questionnaire (IBQ). *Personality and Individual Differences, 104*, 423-
22 433. doi:10.1016/j.paid.2016.08.034
- 23 Rumbold, J. L., Fletcher, D., & Daniels, K. (2012). A systematic review of stress
24 management interventions with sport performers. *Sport, Exercise, and Performance*
25 *Psychology, 1*, 173-193. doi:10.1037/a0026628

- 1 Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic
2 motivation, social development, and well-being. *American Psychologist*, *55*, 68-78.
3 doi:10.1037/0003-066X.55.1.68
- 4 Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in*
5 *motivation, development, and wellness*. New York, NY: Guilford Press.
- 6 Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality
7 as a dynamic reflection of well-being. *Journal of Personality*, *65*, 529-565.
8 doi:10.1111/j.1467-6494.1997.tb00326.x
- 9 Ryan, R. M., Huta, V., & Deci, E. L. (2013). Living well: A self-determination theory
10 perspective on eudaimonia. In A. Delle Fave (Ed.), *The exploration of happiness* (pp.
11 117-139). Dordrecht, Netherlands: Springer.
- 12 Sarkar, M. (2014). *The assessment of psychological resilience in sport performers* (Doctoral
13 thesis, Loughborough Univeristy, UK).
- 14 Sarkar, M., & Fletcher, D. (2014a). Ordinary magic, extraordinary performance:
15 Psychological resilience and thriving in high achievers. *Sport, Exercise, and*
16 *Performance Psychology*, *3*, 46-60. doi:10.1037/spy0000003
- 17 Sarkar, M., & Fletcher, D. (2014b). Psychological resilience in sport performers: A review of
18 stressors and protective factors. *Journal of Sports Sciences*, *32*, 1419-1434.
19 doi:10.1080/02640414.2014.901551
- 20 Scales, P. C., Benson, P. L., Leffert, N., & Blyth, D. A. (2000). Contribution of
21 developmental assets to the prediction of thriving among adolescents. *Applied*
22 *Developmental Science*, *4*, 27-46. doi:10.1207/S1532480XADS0401_3
- 23 Schwartz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, *6*, 461-
24 464. doi:10.1214/aos/1176344136
- 25 Sheldon, K. M., & Filak, V. (2008). Manipulating autonomy, competence, and relatedness

- 1 support in a game-learning context: New evidence that all three needs matter. *British*
2 *Journal of Social Psychology*, 47, 267-283. doi:10.1348/014466607x238797
- 3 Spreitzer, G., & Porath, C. (2014). Self-determination as a nutriment for thriving: Building an
4 integrative model of human growth at work. In M. Gagné (Ed.), *The Oxford handbook*
5 *of work engagement, motivation, and self-determination theory* (pp. 245-258). New
6 York, NY: Oxford University Press.
- 7 Spreitzer, G., Sutcliffe, K., Dutton, J., Sonenshein, S., & Grant, A. M. (2005). A socially
8 embedded model of thriving at work. *Organization Science*, 16, 537-549.
9 doi:10.1287/orsc.1050.0153
- 10 Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). London,
11 UK: Pearson.
- 12 Thoits, P. (1995). Stress, coping, and social support processes. Where are we? What next?
13 *Journal of Health and Social Behavior*, 35, 53-79.
- 14 Thompson, E. R. (2007). Development and validation of an internationally reliable short-
15 form of the Positive and Negative Affect Schedule (PANAS). *Journal of Cross-*
16 *Cultural Psychology*, 38, 227-242. doi:10.1177/0022022106297301
- 17 Tomaka, J., Blascovich, J., Kelsey, R. M., & Leitten, C. L. (1993). Subjective, physiological,
18 and behavioral effects of threat and challenge appraisal. *Journal of Personality and*
19 *Social Psychology*, 65, 248-260. doi:10.1037/0022-3514.65.2.248
- 20 Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic
21 psychological need satisfaction and need frustration as a unifying principle. *Journal of*
22 *Psychotherapy Integration*, 23, 263-280. doi:10.1037/a0032359
- 23 Vermunt, J. K. (2010). Latent class modeling with covariates: Two improved three-step
24 approaches. *Political Analysis*, 18, 450-469. doi:10.1093/pan/mpq025
- 25 Weinberg, R. S., Seabourne, T. G., & Jackson, A. (1981). Effects of visuo-motor behavior

- 1 rehearsal, relaxation, and imagery on karate performance. *Journal of Sport*
- 2 *Psychology*, 3, 228-238. doi:10.1123/jsp.3.3.228

3

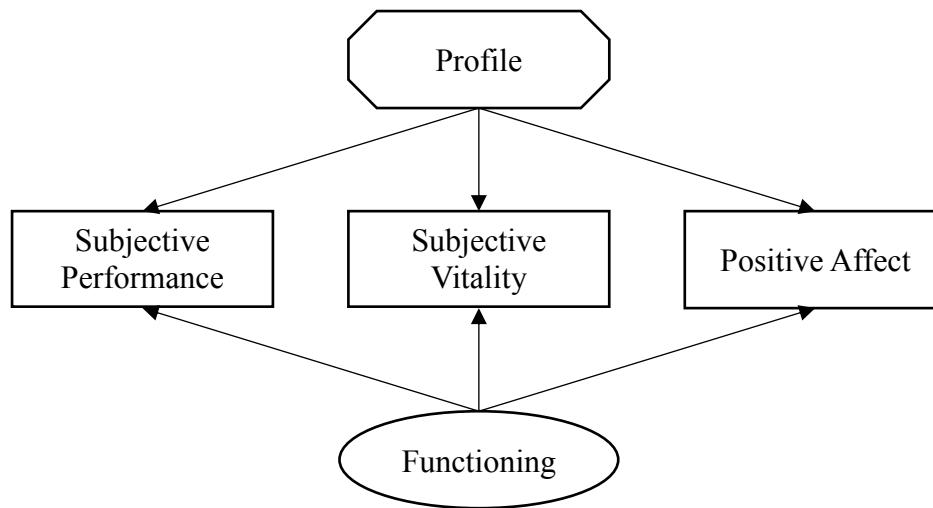
ACCEPTED VERSION

1 Footnotes

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

5 ² Additional analyses examining the predictive effects of the enabler and process variables in
6 isolation are available in the Electronic Supplementary Material Appendix S2 for
7 interested readers.

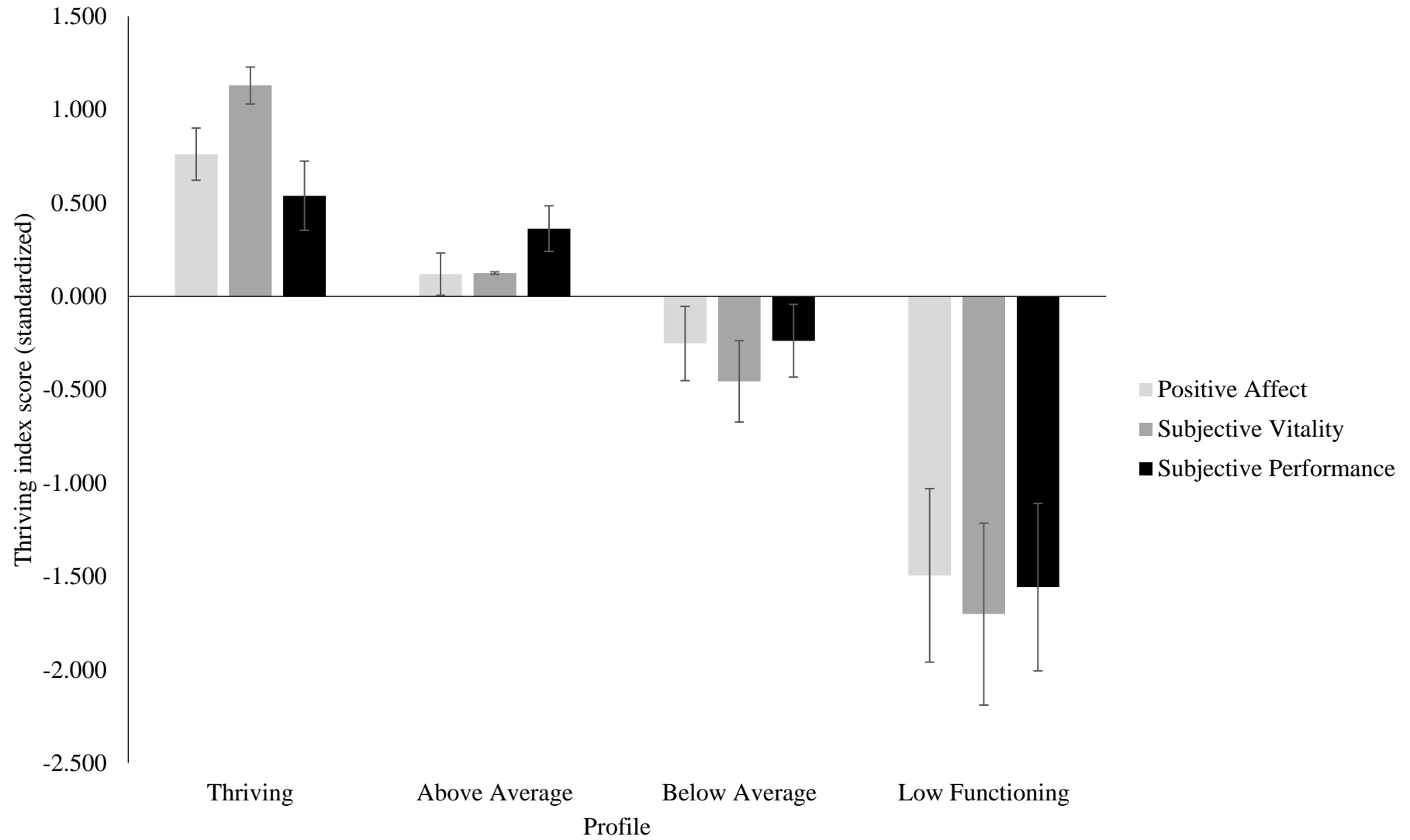
ACCEPTED VERSION



1

2 *Figure 1.* An illustration of the factor mixture analysis with a continuous latent factor (i.e.,
3 functioning) and a categorical latent variable (i.e., profile).

ACCEPTED VERSION



1

2 *Figure 2.* Factor mixture analysis solutions for the four-profile model. Error bars = 90% confidence intervals.

1 Table 1

2 *Descriptive Statistics and Correlations between Thriving Indices, Enablers, and Process Variables.*

	<i>M</i>	<i>SD</i>	1	2	3
<i>Thriving Indices</i>					
1 Subjective vitality (1 – 6)	4.80	.76	—		
2 Positive affect (1 – 5)	4.13	.46	.75*	—	
3 Subjective performance (0 – 10)	6.66	1.72	.50*	.44*	—
<i>Enablers</i>					
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	.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*
<i>Process Variables</i>					
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	.73	.44*	.47*	.42*
Basic psychological need frustration (1 – 7)	2.78	.98	-.36*	-.27*	-.37*

3 *Note.* The range for scores on each of the variables are indicated in parentheses. Mean values for indices, enabler, and process variables are scale
4 means. Correlations between functioning indices based on the single-item subjective performance variable, and the subjective vitality and
5 positive affect latent constructs (using structural equation modelling). Correlations between indices, enablers, and process variables assessed
6 using Spearman's correlation in SPSS.

7 * $p < .001$

1 Table 2

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

Model	LL	#fp	Scaling	BIC	SSA-BIC	Entropy	LMR
1 profile	-2024.466	9	1.3464	4105.284	4076.716	—	—
2 profile	-1955.135	16	1.1663	4010.454	3959.667	.651	< .001
3 profile	-1860.214	23	1.1227	3864.441	3791.434	.866	< .001
4 profile	-1812.842	30	1.1664	3813.530	3718.302	.823	.006
5 profile ^a	-1795.407	37	1.1768	3822.490	3705.043	.832	.14
6 profile ^b	-1784.323	44	0.0112	3844.152	3704.485	.851	< .001

3 *Note.* LL = model log-likelihood; #fp = number of free parameters; scaling = scaling factor associated with MLR log-likelihood estimator; BIC =
 4 Bayesian information criteria; SSA-BIC = sample size-adjusted BIC; LMR = *p* value for Adjusted Lo-Mendell-Rubin likelihood ratio test.

5 ^aA negative residual variance was returned for ZPA in latent profile 4. This suggests that the model converged on an improper solution, possibly
 6 due to overparameterization in the number of latent profile requested or allowing too many parameters to differ over profiles (Chen, Bollen,
 7 Paxton, Curran, & Kirby, 2001). Hence, more parsimonious models may be superior. ^bOne or more parameters were fixed to avoid singularity of
 8 the information matrix. A number of negative residual variances were returned, therefore more parsimonious models may be superior.

9
10

1 Table 3

2 *Description of the Four Latent Profiles based on Standardized Thriving Index Scores*

Thriving indices	Profile 1	Profile 2	Profile 3	Profile 4
Positive affect	.762***	.120	-.252*	-1.495***
Subjective vitality	1.130***	.125***	-.455**	-1.702***
Subjective performance	.539***	.363***	-.238*	-1.558***

3 *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
 4 = 38, 7.3%) = low functioning; Counts based on participants' most likely latent profile membership.

5 * $p < .05$, ** $p < .01$ *** $p < .001$

6

7

1 Table 4

2 *Results from the Multinomial Logistic Regressions for the Effects of Enabler Variables on Profile Membership*

	Latent profile 2 vs. 1		Latent profile 3 vs. 1		Latent profile 4 vs. 1	
	Coef. (SE)	OR	Coef. (SE)	OR	Coef.(SE)	OR
Resilient qualities	-.813 (.186)***	0.444	-1.171 (.200)***	0.310	-1.137 (.328)**	0.321
Psychological skills use	-.220 (.186)	0.803	-.415 (.193)*	0.660	-1.038 (.328)**	0.354
Social support	-.110 (.176)	0.896	-.017 (.192)	0.983	-.382 (.318)	0.682
Coach need support	-.264 (.210)	0.768	-.221 (.221)	0.802	-.432 (.373)	0.649
Coach need thwart	-.310 (.216)	0.733	.165 (.193)	1.179	.239 (.284)	1.270

3 *Note.* Calculations based on the Factor Mixture Model with 4 classes ($N = 458$). Profile 1 = thriving; Profile 2 = above average. Profile 3 =
4 below average; Profile 4 = low functioning. Odds ratios below 1 correspond to a negative logistic regression coefficient and suggest that the
5 likelihood of membership in the target profile is reduced. Ratios over 1 suggest the likelihood of membership in the target profile is increased.

6 Coef. = regression coefficient; SE = standard error; OR = odds ratio.

7 * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5

Results from the Multinomial Logistic Regressions for the Effects of Process Variables on Profile Membership

	Latent profile 2 vs. 1		Latent profile 3 vs. 1		Latent profile 4 vs. 1	
	Coef. (SE)	OR	Coef. (SE)	OR	Coef. (SE)	OR
Challenge appraisal	-.045 (.213)	0.956	-.434 (.230)	0.648	-1.001 (.375)**	0.368
Threat appraisal	-.200 (.181)	0.819	-.164 (.183)	0.849	.301 (.327)	1.351
Basic psychological need satisfaction	-1.103 (.266)***	0.332	-1.225 (.288)***	0.294	-2.018 (.384)***	0.133
Basic psychological need frustration	.178 (.246)	1.195	.814 (.272)**	2.257	.474 (.340)	1.606

Note. Calculations based on the Factor Mixture Model with 4 classes ($N = 521$). Profile 1 = thriving; Profile 2 = above average. Profile 3 = below average; Profile 4 = low functioning. Odds ratios below 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. Ratios over 1 suggest the likelihood of membership in the target profile (i.e., profiles 2, 3, or 4) is increased. Coef. = regression coefficient; SE = standard error; OR = odds ratio.

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