



## Athletes' Psychological Needs and Coaches' Interpersonal Behaviours: a Within-Person Latent Profile Analysis

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1 **Title: Athletes' Psychological Needs and Coaches' Interpersonal Behaviours: a Within-**  
2 **Person Latent Profile Analysis**

3 **1.1 Background**

4  
5 A two-continua model (Keyes, 2005) and sport-sensitive definition (Breslin et al., 2020)  
6 outlines that mental health is not merely the absence of ill-being (e.g., emotional difficulties),  
7 but a state of well-being in which athletes realize their purpose and potential, can cope with  
8 competitive sport demands and life stressors, act autonomously, make a contribution to their  
9 community, and seek support. Recent consensus statements (Schinke, Stambulova, Si &  
10 Moore, 2018; Moesch et al., 2018; Reardon et al., 2019; Breslin et al., 2019) outline that  
11 competitive sport can sometimes hinder athletes' mental health due to the unique stressors  
12 encountered. For example, performance expectations (e.g., playing through injury, intense  
13 physical training), personal matters (e.g., constrained friendship or family life), and  
14 organisational issues (e.g., travel, finance) manifest in both elite (Rice et al., 2016), and non-  
15 elite athletes (Breslin, Shannon, Haughey, Donnelly & Leavey, 2017). As such, athletes are  
16 as likely, and sometimes during injury or transition, more likely than non-athletes to struggle  
17 with mental illnesses including anxiety and depression (Rice et al., 2016; Beltz, Kleinhart,  
18 Ohlert, Rau & Allrogen, 2018; Foskett & Longstaff, 2018; Reardon et al., 2019).  
19 Contrastingly however, sporting participation can foster meaningful social connections and  
20 psychological well-being, be a source of health-enhancing physical activity, and allow for the  
21 delivery of awareness messages conducive to mental well-being (Breslin & Leavey, 2019).  
22 Therefore, sport can potentially influence adaptive and maladaptive markers of athlete mental  
23 health (Breslin et al., 2020).

24       There are global (i.e., day-to-day), contextual (e.g., within sport) and situational (i.e.,  
25 here and now) measurement levels to mental health (Vallerand, 1997). Couched within a  
26 eudemonic and hedonic perspective (Ryan & Deci, 2008), subjective vitality is defined as  
27 feelings of positive energy towards oneself in sport (Adie, Duda & Ntoumanis, 2008), and  
28 represents a sports-specific marker of well-being linked to sports enjoyment, autonomous  
29 motivation and positive affect (Adie, Duda & Ntoumanis, 2008; Quested et al., 2013; Li,  
30 Wang & Kee, 2013). Conversely, athlete burnout can be conceptualised a sports-specific  
31 marker of ill-being (Gustafsson, Madigan & Lundkvist, 2016; Reardon et al., 2019), defined  
32 as a negative psychological syndrome that occurs over time (Radeake, 1997), and is  
33 associated with depressed mood, injury and sport withdrawal (Madigan et al., 2019).

34 Although conceptual debate on burnout continues (Gerber et al., 2018), it is largely agreed  
35 that athlete burnout is represented by three persistent symptoms; (i) emotional and physical  
36 exhaustion, (ii) reduced sense of accomplishment, and (iii) development of a cynical attitude  
37 towards the once favoured sport (Gerber et al., 2018). To effectively understand how sporting  
38 environments impact upon such athlete mental health outcomes, studies and interventions  
39 based on sound theoretical foundations are required (Breslin et al., 2017; Breslin and Leavey,  
40 2019).

41 Theorists postulate psychosocial determinants and mediating factors that directly or  
42 indirectly affect athlete mental health outcomes (Hagger & Weed, 2019), and research has  
43 established that sporting social environments can play a significant positive and negative role  
44 in athlete well-being, and the aetiology of burnout symptomology (Lundqvist, 2011). One  
45 theory that has received empirical support for the prediction of both positive and negative  
46 facets of athletes' mental health is Self-Determination Theory (SDT; Ryan & Deci, 2000).  
47 SDT is a meta-theory of human behaviour and health, encompassing several mini-theories  
48 that are unified by the position that humans have three innate psychological needs essential to  
49 mental health (Ryan & Deci, 2017). Specifically, within Basic Psychological Needs Theory  
50 (BPNT; Ryan & Deci, 2008) and supported by evidence from several research centres  
51 (Balaguer et al., 2012; Hancox, Quested, Ntoumanis, & Duda, 2017), when an individual's  
52 psychological needs for autonomy (i.e., provision of choice), competence (i.e., feelings of  
53 effectiveness) and relatedness (i.e., sense of belongingness) *are all* supported in a social  
54 context (e.g., from a coach in sport), they experience psychological needs satisfaction and  
55 positive mental health (see Figure 1). Equally, an athlete's psychological needs can be  
56 controlled in a sporting context, for example, when a coach purposely isolates athletes from  
57 others (i.e., relatedness control), forces or pressures athletes to behave in accordance with  
58 their motives (i.e., autonomy control), and points out that the athlete will fail (i.e.,  
59 competence control). A number of studies show that controlling environments are linked to  
60 needs frustration (Bartholomew, Ntoumanis, Ryan, Bosch & Thøgersen-Ntoumani, 2011) and  
61 ill-being outcomes, including burnout (Bartholomew, Ntoumanis, Ryan & Thøgersen-  
62 Ntoumani, 2011; Hancox, Quested, Ntoumanis, & Duda, 2017).

63 *Please insert Figure 1: Process model informed by BPNT (Ryan & Deci, 2008)*  
64 *explaining the hypothesised positive and negative effects of the coach-led social*  
65 *environment on athletes' psychological needs satisfaction/frustration and positive and*  
66 *negative forms of functioning.*

67           While the above studies have advanced our understanding of how needs-supportive  
68 and controlling environments, and their salutary and detrimental outcomes are distinct, a  
69 notable limitation of existing research is the sole reliance on variable-centred analyses  
70 (Hancox, Quested, Ntoumanis, & Duda, 2017). Specifically, researchers using the variable-  
71 centred approach (e.g., linear regression) assume a homogenous population, and how relative  
72 to the population's mean, higher or lower scores on independent variable(s) explain variance  
73 in mediators and outcomes (Magnusson, 1998). To provide example, the hypothesised  
74 covariance pathway between needs-support and needs-control in Figure 1 indicates that,  
75 compared to the average, athletes who perceive high levels of needs-support from their coach  
76 are more likely to experience less controlling behaviours from their coach (and vice versa),  
77 and subsequent needs-satisfaction/frustration, and mental health outcomes (Bartholomew,  
78 Ntoumanis, Ryan & Thøgersen-Ntoumani, 2011; Hancox, Quested, Ntoumanis, & Duda,  
79 2017). Contrastingly, a person-centred analyses focuses on the relationships between people  
80 on the aforesaid interactions between needs-supportive and needs-controlling perceptions  
81 (Myers, Ntoumanis, Gunnell, Gucciardi & Lee, 2018). Using Latent Profile Analysis (LPA),  
82 the interaction effects in Figure 1 are calculated in a mixture model to extract unobserved  
83 latent populations who are quantitatively and qualitatively distinct from others (Magnusson,  
84 1998). The addition of more or fewer latent profiles to the data is determined through  
85 comparison of numerous model fit statistics and entropy classifications, wherein the best-  
86 fitting model can be retained for theoretical interpretation and advancement (Magnusson,  
87 1998).

88           To provide illustration, and hypothesised in line with variable-centred study findings  
89 (e.g., Bartholomew, Ntoumanis, Ryan, Bosch & Thøgersen-Ntoumani, 2011) an 'optimal'  
90 athlete profile would concurrently report high levels of needs-support and low levels of  
91 needs-control for all three needs, whereas a 'non-optimal' profile would simultaneously  
92 report low levels of needs-support and high levels of needs-control for one or more  
93 psychological needs (Hancox, Quested, Ntoumanis, & Duda, 2017). However, given LPA has  
94 increased statistical sensitivity to capture nuance in the needs-supportive and needs-  
95 controlling interactions (Myers, Ntoumanis, Gunnell, Gucciardi & Lee, 2018), there are both  
96 intuitive and theoretical reasons to expect the emergence of a 'need-indifferent' profile whose  
97 needs may be relatively overlooked (Cheon et al., 2018) displaying moderate scores across all  
98 needs-support and needs-control variables, or indeed; unique profile(s) who receive varied  
99 support and control for one or more basic psychological needs (e.g., a largely autonomy-

100 controlling, but competence-promoting coach) (Neubauer, Voss & Ditzen, 2018). Several  
101 emerging SDT studies have demonstrated the contribution of LPA in profiling individuals  
102 through synergistic effects of motivational regulations in exercise or sport (e.g., Lindwall et  
103 al., 2017; Bechter et al., 2018; Gustafsson, Carlin, Podlog, Stenling, & Lindwall, 2018),  
104 however, all have analysed psychological needs as study outcomes.

105         Given psychological needs-support and control variables represent modifiable socio-  
106 environmental factors (Fortier et al., 2012), LPA may obtain advanced theoretical knowledge,  
107 and applicable information to athletes that motivational or variable-centred studies could not.  
108 Moreover, a further advantage of LPA is its ability to convert to a hybrid approach to  
109 hypotheses testing, as the uniqueness of an athlete's membership of a profile can be used to  
110 better understand and explain relationships between predictor (i.e., social environment) and  
111 outcome variables (i.e., mental health) (Lindwall et al., 2017). To this end, while variable-  
112 level evidence could infer clear differences between 'optimal' an 'non-optimal' profiles on  
113 mental health outcomes, it is unclear how 'needs-indifferent' or 'mixed' profiles would  
114 translate to such comparisons (Myers, Ntoumanis, Gunnell, Gucciardi & Lee, 2018).

115         Hence, with the increasing recognition that theory-based studies are needed to  
116 advance athlete mental health research and practice (Breslin et al., 2017; Breslin & Leavey,  
117 2019; Shannon et al., 2019), a hybrid approach of extracting latent profiles of athletes based  
118 on their coaches' interpersonal style and testing how profile membership may relate to mental  
119 health outcomes is warranted. Therefore, the aim of the present study was twofold: (i) to  
120 identify if latent profiles of athletes emerge based on the interaction effects of needs-  
121 supportive and needs-controlling coach behaviours, and; (ii) to determine if latent profile  
122 membership is related to the satisfaction/ frustration of psychological needs, burnout, and  
123 subjective vitality.

## 124 **1.2 Hypotheses tested**

125 Reflective of the hybrid person and variable-centred study aims, our hypotheses consisted of  
126 sections A and B. In section A, our LPA hypotheses was exploratory in nature given LPA on  
127 athletes' perceptions of needs-supportive/controlling behaviours has yet to be tested.  
128 However, in accordance with BPNT (Ryan & Deci, 2008) and published covariances between  
129 needs-support and needs-control constructs in extant variable-centred research (e.g.,  
130 Bartholomew, Ntoumanis, Ryan & Thøgersen-Ntoumani, 2011; Hancox, Quested,  
131 Ntoumanis, & Duda, 2017), we hypothesised that distinct optimal (Hypothesis 1, H<sub>1a</sub>) and

132 non-optimal profiles (Hypothesis 2, H<sub>2a</sub>) would emerge. The optimal profile was expected to  
133 be characterised by a more-to-less ratio of needs-supportive and controlling coach  
134 behaviours, whereas the non-optimal profile was hypothesised to present the reverse. We also  
135 expected there to be at least one profile displaying ‘needs-indifferent’ profile (Hypothesis 3,  
136 H<sub>3a</sub>), displaying moderate needs-support/control, and one novel profile (Hypothesis 4, H<sub>4a</sub>)  
137 that displayed overlap in the levels of psychological needs support/control perceived.

138 In section B, when applying profile membership as a predictor of mental health  
139 outcomes, we hypothesised that relative to other profiles, profiles of athletes who displayed  
140 lower levels of perceived coach controlling behaviour and higher levels of coach needs-  
141 support, would display the following: reduced burnout symptoms (Hypothesis 1, H<sub>1b</sub>); lower  
142 psychological needs frustration scores (Hypothesis 2, H<sub>2b</sub>); higher psychological needs  
143 satisfaction (Hypothesis 3, H<sub>3b</sub>), and enhanced subjective vitality (Hypothesis 4, H<sub>4b</sub>).  
144 Additionally, we controlled for several variables linked with athlete mental health including  
145 gender, competitive athlete level, and seasonal stage (Lonsdale, Hodge & Rose, 2009;  
146 Gustafsson, DeFreese, & Madigan, 2017).

## 147 **2.0 Methods**

### 148 *2.1 Inclusion criteria, recruitment, procedure and participants*

149 Ethical approval was granted by Ulster University (May, 2018). Inclusion criteria was based  
150 on informed consent, being over the age of 18, and responding ‘yes’ to the following self-  
151 report question consistent with the definition of sport, ‘are you an athlete involved in a  
152 structured, competitive physical activity?’ (Rejeski & Brawley, 1988).

153 Data was collected via an online survey from May 2018 to May 2019 using  
154 SurveyMonkey (Palo Alto, CA) software, adhering to the Data Protection Act (2018)  
155 provisions, including cyber security policies and quality control checks. To achieve a broad  
156 representation (i.e., level, gender, sport type) of athletes, an email invitation was sent to  
157 several sports clubs, interest groups, and national governing bodies across Ireland and the  
158 United Kingdom. Those participating distributed survey links on Twitter, email lists, and  
159 SMS/WhatsApp messages to team coaches, captains and players. The survey comprised a  
160 description of the study aims, a consent form, and participant demographic (i.e., gender, age)  
161 and sporting factors (i.e., sport type, average training and competition hours per-week), level  
162 of competition (i.e., elite, semi-elite, amateur) and stage of season (i.e., early-season, mid-  
163 season, end-season, off-season); (Lonsdale, Hodge & Rose, 2009), and psychometric scales

164 (described below). The survey was voluntary and took participants approximately nine  
165 minutes to complete.

## 166 *2.2 Psychometric scales*

### 167 *Coaches' interpersonal behaviours*

168 The 24-item Interpersonal Behaviours Questionnaire (IBQ; Rocchi, Pelletier & Desmarais,  
169 2017) was used to measure athletes' perceptions of their main coaches' needs-supportive and  
170 controlling behaviours. The IBQ includes four-item subscales for each respective  
171 psychological need supported/controlled, all scored on a 7-point Likert scale ranging from  
172 strongly disagree (1) to strongly agree (7) (Rochhi et al., 2017). Two example items include;  
173 'My coach gives me the freedom to make my own decisions' (i.e., autonomy support), and  
174 'My coach imposes their decisions on me' (i.e., autonomy control). Consistent with prior  
175 research (Rocchi, Pelletier & Desmarais, 2017), a robust six-factor model ( $\chi^2= 826.432$  (237)  
176  $p<.001$ ; CFI=.955; TLI=.947; GFI=.906; RMSEA=.061) was calculated that outperformed a  
177 comparative unidimensional model (see Supplementary Table 1). Cronbach's alpha ranged  
178 from .86 (Competence-Support) to .93 (Relatedness-Control) in the present sample.

### 179 *Psychological needs satisfaction and frustration*

180 The 18-item Need Satisfaction and Frustration Scale (NSFS; Longo, Gunz, Curtis & Farsides,  
181 2016) was adapted to measure athletes' perceptions of psychological needs satisfaction and  
182 frustration in their sport. NSFS comprised six 3-item subscales for each psychological need  
183 satisfied/frustrated and scored from strongly disagree (1) to strongly agree (7). Two examples  
184 include: In my sport... 'I feel very close and connected with other people' (i.e., relatedness  
185 satisfaction), and 'I feel a bit alone when with other people' (i.e., relatedness frustration). A  
186 6-factor model with covariance paths has previously been found in educational contexts  
187 (Longo, Gunz, Curtis & Farsides, 2016; Longo, Alcaraz-Ibáñez & Sicilia, 2018). However,  
188 given the NSFS has not been tested among athletes, we conducted a Confirmatory Factor  
189 Analysis (CFA) and acceptable-to-good fit indices were found ( $\chi^2= 598.405$  (120)  $p<.001$ ;  
190 CFI=.926; TLI=.906; GFI=.909; RMSEA=.076), which substantially exceeded a comparative  
191 unidimensional model (see Supplementary Table 1). Cronbach's Alpha values ranged from  
192 .72 (Autonomy Frustration) to .90 (Competence Satisfaction).

### 193 *Athlete burnout*

194 The Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) included three five-item  
195 sub-scales for emotional and physical exhaustion (e.g., “I feel overly tired from my sports  
196 participation”), reduced sense of accomplishment (e.g., “I’m not achieving much in sport”) and sport devaluation (e.g., “I have negative feelings towards sport”). A 5-point Likert  
197 scoring system was used, ranging from 1 (Almost never) to 5 (Almost Always). Excellent  
198 psychometric properties have been found for the ABQ among several athlete populations  
199 (Gustafsson, Madigan & Lundkvist, 2016; Gerber et al., 2018). Cronbach’s Alpha ranged  
200 from .82 (Reduced Accomplishment) to .83 (Sport Devaluation).  
201

### 202 *Subjective vitality*

203 Subjective vitality was assessed using an adapted version Ryan and Frederick’s (1997) 6-item  
204 scale, using 7-point Likert scaling ranging from “not at all” (1) to “very true” (7). An  
205 example item includes: “(During sport) I feel energised”. Several studies have shown sound  
206 psychometric properties for a one-factor subjective vitality model in athletes (Ryan & Deci,  
207 2017; Li, 2010). Cronbach’s Alpha was .84.

### 208 *2.3 Data management*

209 Raw data was transferred into SPSS (Version 25; IBM Corp, NY), and two of the research  
210 team checked each individual item and inspected for outliers and non-normality for quality  
211 assurance. Across all values, Skewness (highest= 1.648) and Kurtosis (highest = 3.169) were  
212 within acceptable ranges for parametric testing (Kim, 2013). Based on available information,  
213 through applying the Expectation Maximisation (EM) algorithm using intercorrelated scale  
214 items (Field, 2013), Little’s Missing Completely at Random test ( $p > .05$ ) indicated that the  
215 null hypothesis that the missing data were missing completely at random (MCAR) cannot be  
216 rejected, suggesting it is unlikely that the missing data in the raw dataset are missing not at  
217 random.

### 218 *2.3 Statistical analyses*

219 LPA was conducted using Mplus version 7.3 (Muthén & Muthén, 2012), and a series of  
220 models from one to six latent profiles were tested using maximum likelihood estimation with  
221 robust standard errors (MLR) (Magnusson, 1998). We did not include covariates due to the  
222 risk of assumption violation in LPA (Marsh et al., 2009). Model fit solutions were determined  
223 through comparison of several recommended fit statistics (Myers, Ntoumanis, Gunnell,  
224 Gucciardi & Lee, 2018), including; the Bayesian information criterion (BIC), sample-size-  
225 adjusted BIC (aBIC), Akaike information criterion (AIC), Vuong–Lo–Mendell–Rubin



226 Likelihood Ratio Test (LRT), and Lo–Mendell–Rubin adjusted LRT (aLRT). Lower AIC,  
227 BIC, and aBIC values signify a better fitting model. To illustrate, an elbow plot outlining  
228 changes ( $\Delta$ ) in information criterion for profiles 2 through to 6 were calculated in Figure 3.  
229 LRT values indicate whether the model fits significantly better ( $p < .05$ ) than a solution with  
230 one fewer profile, however statistical sensitivity was considered (Henson, Reise & Kim,  
231 2007). The entropy criterion (values of  $> 0.80$  indicate acceptable model fit) was reported,  
232 with higher entropy scores suggesting improved model fit. Individuals were then assigned to  
233 respective profiles based on average posterior probabilities. The aforesaid fit indices were  
234 reported alongside the percentages of the sample within each profile in Table 1. Lastly,  
235 interpretation value, theoretical meaningfulness, and profile sample size were considered  
236 when choosing the final model (Lindwall et al., 2017). To support interpretation of the final  
237 model, figurative labels were applied to retained profiles, and profile total mean scores were  
238 reported in Table 2, then standardised as z-scores and inputted into a bar chart (Figure 2).

239         Following LPA, we assessed whether profile membership predicted variance in study  
240 outcomes of psychological needs-satisfaction/frustration variables, burnout dimensions, and  
241 subjective vitality using a multivariate analysis of covariance (MANCOVA) using SPSS  
242 (version 25). Profile memberships was applied as the independent variable, with gender, level  
243 of participation (i.e., elite, semi-elite, amateur) and season stage (i.e., pre, early, mid or end  
244 season) included as fixed controlling factors. Partial Eta Squared ( $\eta_p^2$ ) was reported to  
245 determine the strength of effects with values of .01, .06 and  $\geq .14$  interpreted as small,  
246 medium and large effects, respectively (Field, 2013). Adjusted  $R^2$  values were reported for  
247 the total proportion of variance predicted for each outcome, and after revealing significant  
248 multivariate effects based on  $p < .05$ , we used a Bonferroni post-hoc test to assess  
249 comparisons between retained latent profiles. Profile total mean scores and unstandardized  
250 mean score comparisons were reported in Table 3.

## 251 **3.0 Results**

252

### 253 *3.1 Descriptive statistics*

254 A total of 685 athletes took part (mean age = 23.39, SD = 6.22, 71% = male) with 90.50% of  
255 the sample in ‘early’ to ‘mid-season’, while 4.70% were in ‘pre’ or ‘end-season’, and 4.90%  
256 in ‘off-season’. Ninety two percent of the sample took part in interactive team sports, while  
257 8% participated in co-active sports. Over half, 58.40%, reported they competed at amateur

258 level (i.e., local/county leagues), 25.90% at semi-elite (i.e., semi-professional, regional or  
259 country representative), 1.20% elite (i.e., professional, international), and 14.50%  
260 recreational (i.e., primary purpose of the sport is participation). On average, participants took  
261 part in 5.95 (SD: 2.53) and 2.25 (SD: 1.41) hours of training and competition per-week,  
262 respectively. A correlations matrix and further descriptive statistics for the study outcomes,  
263 split by demographic and sporting factors are presented in Supplementary Tables 9 and 10.

### 264 *3.2 Latent profile analyses*

265 Model fit statistics for the iterative profile extraction process are reported in Table 1. The  
266 elbow plot (see Figure 3) showed that with the addition of more profiles the  $\Delta$  in AIC, BIC,  
267 and aBIC decreased. However, the flattest  $\Delta$  angle occurred between profiles five and six,  
268 demonstrating a level of diminishing returns after five profiles. LRT ratio tests showed that  
269 both two and three profiles were a significantly better ( $p < .001$ ) fit than one fewer profile, but  
270 four profiles were not significantly better than three ( $p > .05$ ). However, five profiles were a  
271 significantly better fit than four ( $p < .05$ ), and supporting the information criterion changes,  
272 six profiles were not significantly better than five ( $p > .05$ ). Entropy was highest at a 2-  
273 profile solution, followed by a 5-profile solution. Taken collectively, the 5-profile solution  
274 was retained as the best-fitting model, and displayed a quantitatively and qualitatively sound  
275 model with sufficient theoretical interpretability and parsimony. The five distinct profiles  
276 were further supported by consistently high posterior probability classification values of:  
277 0.93, 0.94, 0.95, 0.97 and 0.91.

278 ***Please insert Table 1, and Figure 3***

279

### 280 *3.3 Retained 5-Profile Solution*

281 Mean total IBQ scores for the five retained latent profiles are presented in Table 2. Relative  
282 to the sample total mean, Profile 1 (n= 191, 27%) displayed high levels of needs-supportive  
283 behaviours, and lowest levels of controlling behaviours, and thus supported H<sub>1a</sub>, labelled as  
284 ‘Supportive-Developmental Coach’ focused on athlete well-being and psychological growth.  
285 Supporting H<sub>3a</sub> Profile 2 (n=366, 53%) showed moderate levels across all IBQ variables and  
286 was thus labelled as a ‘Needs-Indifferent Coach’ to denote a lack of strong interpersonal  
287 behaviours in either direction. Conversely, Profiles 3-5 displayed similar patterns of lower  
288 needs-supportive behaviours and higher controlling behaviours. However, both within and  
289 across profiles, the separations between support and control over each need were most

290 pronounced in Profile 4 (n=28, 4%), henceforth labelled as a ‘Harsh Controlling Coach’,  
 291 supporting H<sub>2a</sub>. Profiles 3 (n= 52, 8%) and 5 (n=48, 7%) indicated that while all variables  
 292 were higher or lower than the sample total means in an undesirable direction, the largest  
 293 separations occurred for competence-control (Profile 3) and relatedness-control (Profile 5).  
 294 Those profiles were not expected, respectively labelled as: ‘Overly Critical Coach’ and  
 295 ‘Distant Coach’. No support for H<sub>4a</sub> was found as no profile displayed overlapping high  
 296 needs-control and needs-support. Figure 2 illustrates the balance between needs-supportive  
 297 and needs-controlling behaviours for the five retained profiles through z-score values in a bar  
 298 graph. Overall, Section A of the study hypotheses had support as both optimal (i.e.,  
 299 Supportive-Developmental), non-optimal (i.e., Harsh Controlling) and moderate (i.e., Needs  
 300 Indifferent) profiles emerged. However, we did not predict the emergence the ‘Overly  
 301 Critical Coach’ and ‘Distant Coach’, and thus displays novel latent groupings of athletes.

302 *Please insert Table 2 and Figure 2*

303

#### 304 *3.4 Profile membership as a predictor of mental health outcomes*

305 After adjustment for covariate effects (see Supplementary Table 9), the corrected model  
 306 revealed a significant effect for profile membership on the three burnout dimensions of  
 307 emotional and physical exhaustion (F (5, 680) =13.140,  $p < 0.01$ ,  $\eta^2 = .18$ ,  $R^2 = .17$ ), reduced  
 308 accomplishment (F (5, 680) =18.687,  $p < 0.01$ ,  $\eta^2 = .22$ ,  $R^2 = .22$ ) and sport devaluation (F (5,  
 309 680) =17.628,  $p < 0.01$ ,  $\eta^2 = .16$ ,  $R^2 = .15$ ), yielding large effects. A further multivariate effect  
 310 was found for competence frustration (F (5, 680) =8.802,  $p < 0.01$ ,  $\eta^2 = .12$ ,  $R^2 = .10$ ) and  
 311 satisfaction (F (5, 680) =16.904,  $p < 0.01$ ,  $\eta^2 = .14$ ,  $R^2 = .13$ ); relatedness frustration (F (5,  
 312 680) =12.083,  $p < 0.01$ ,  $\eta^2 = .17$ ,  $R^2 = .15$ ) and satisfaction (F (5, 680) =21.532,  $p < 0.01$ ,  
 313  $\eta^2 = .13$ ,  $R^2 = .12$ ), and; autonomy frustration (F (5, 680) =13.129,  $p < 0.01$ ,  $\eta^2 = .25$ ,  $R^2 = .19$ )  
 314 and satisfaction (F (5, 680) =27.330,  $p < 0.01$ ,  $\eta^2 = .27$ ,  $R^2 = .25$ ), yielding moderate-to-large  
 315 effects. Lastly, profile membership revealed a significant effect on subjective vitality (F (5,  
 316 680) =18.771,  $p < 0.01$ ,  $R^2 = .16$ ) with a large effect size ( $\eta^2 = .19$ ).

317 Bonferroni post-hoc comparisons revealed support for section B of the study  
 318 hypotheses, to the extent that the ‘Supportive-Developmental’ profile was the most likely to  
 319 score favourably on all of the study outcomes (H<sub>1b, 2b, 3b, 4b</sub>; see Table 3). Further hypotheses  
 320 support was shown in that the largest unstandardized mean differences were between the  
 321 ‘Supportive-Developmental’ and ‘Harsh-Controlling’ profiles for five outcomes, followed by

the ‘Supportive-Developmental’ and ‘Overly Critical’ profiles for three outcomes, and the  
 ‘Supportive-Developmental’ and ‘Distant Controlling’ profiles for two outcomes. Moreover,  
 all unstandardized mean differences between the ‘Supportive-Developmental’ and ‘Needs-  
 Indifferent’ profiles were notably smaller in size when compared to differences between the  
 ‘Supportive-Development’ and ‘Harsh-Controlling’ or ‘Distant Controlling’ or ‘Overly  
 Critical’ coach profiles.

Showing a somewhat linear manner in the relative balance of needs-supportive to  
 needs-controlling coach behaviours in profiles, the ‘Needs-Indifferent’ profile scored more  
 favourably on nine of ten study outcomes (albeit many did not reveal statistical significance),  
 when compared to the ‘Harsh-Controlling’, ‘Distant Controlling’ and ‘Overly Critical’ coach  
 profiles. The remaining profile comparisons were between those reflective of higher needs-  
 controlling behaviours and demonstrated some novel findings. Specifically, and consistent  
 with the figurative labels applied, the ‘Overly Critical’ coach profile displayed the lowest  
 levels of competence satisfaction, and highest levels of competence frustration; albeit, the  
 differences were not statistically significant. Moreover, the ‘Distant Controlling’ coach  
 profile reported the lowest levels of relatedness satisfaction, which was statistically different  
 when compared to the ‘Overly Critical’ coach profile. Lastly, the ‘Harsh Controlling’ profile  
 displayed the lowest levels of autonomy satisfaction (among other outcomes), with  
 significant differences between both the ‘Overly Critical’ and ‘Distant Controlling’ coach  
 profiles.

*Please insert Table 3*

#### **4. 0 Discussion**

This study advanced BPNT by combining traditional variable-centred approach (e.g.,  
 Balaguer et al., 2012; Li, Wang, & Kee, 2013; Bartholomew, Ntoumanis, Ryan & Thøgersen-  
 Ntoumani, 201), with a person-centred LPA approach, extracting latent profiles of athletes  
 from the interactive effects of perceived need-supportive and need-controlling coach  
 behaviours. The iterative LPA extraction process revealed five novel, and quantitatively and  
 qualitatively distinct profiles, wherein profile membership subsequently predicted significant  
 variance in mental health outcomes. Indeed, we find the emergence of a ‘Supportive-  
 Developmental’ profile delineated by a coach focused on athlete well-being and displaying  
 the most positive mental health outcomes (H<sub>1b,2b,3b,4b</sub>). However, three diverse profiles  
 reflective of a more needs-controlling coach emerged and showed increased burnout

354 symptomology and deleterious levels of needs-satisfaction and frustration. Collectively, the  
355 findings provide novel advancements to BPNT (Ryan & Deci, 2008), to the extent that  
356 substantial nuance was highlighted in athletes' social context, likely uncaptured by existing  
357 variable-centred studies. The retained profiles highlight the subsequent mental health  
358 effects of such environments, wherein profiles characteristic of needs-controlling or needs-  
359 indifferent coaches could be targeted for interventions to promote needs-supportive coaching  
360 communication (Hancox, Quested, Ntoumanis, & Duda, 2017).

#### 361 *4.1 Latent profile analysis*

362 The composition of the five retained profiles supported Ryan & Deci's (2008)  
363 characterisation of social environments reflecting varying degrees of needs-supportive and  
364 controlling coach behaviours ( $H_{1a,2a,3a,4a}$ ; Bhavsar et al., 2019). Existing covariance values in  
365 BPNT studies supported the emergence of the 'Supportive-Developmental' and 'Harsh-  
366 Controlling' profiles, displaying inverse relationships between needs-controlling needs-  
367 supportive behaviours, and are evident educational, athlete and physical activity samples  
368 (Jaakkola, Wang, Soini & Liukkonen, 2015; Esdar, Gorges & Wild, 2016; Matosic, & Cox,  
369 2014, Haerens et al., 2018). However, the extraction of 'Needs-Indifferent', 'Distant  
370 Controlling' and 'Overly Critical' coach profiles are novel contributions to the BPNT  
371 literature.

372 Specifically, the relative lack of direction of perceived needs-support/control in either  
373 way suggests a 'Need-Indifferent' profile of athletes who may feel their needs are not  
374 actively thwarted or supported, but perhaps overlooked by their coach (Bhavsar et al., 2019).  
375 In an educational context, Cheon et al. (2018, p687) were the first to describe need-  
376 indifferent teachers who: 'in tone, content, and interpersonal behaviour...pays little or no  
377 attention to the student's needs, goals, or concerns, usually because the teacher pays so much  
378 attention to his or her own needs, goals, and concerns'. However, it's important to highlight  
379 that 'need-indifferent' coach behaviours were not explicitly assessed, and further work will  
380 need to differentiate the factor structure of the construct (Costa, Ntoumanis & Bartholomew,  
381 2015). The additional retained profiles labelled as 'Distant Controlling' and 'Overly Critical'  
382 coaches, showed unique and novel features to athletes' social environments, likely  
383 uncaptured by a variable-centred analysis (e.g., linear regression) (Myers, Ntoumanis,  
384 Gunnell, Gucciardi & Lee, 2018). Supporting the SDT position that some coaches give  
385 preferential treatment to one or more needs (Ryan & Deci, 2000) the 'Distant Controlling'

386 profile displayed elevated levels of relatedness frustration and low relatedness satisfaction,  
387 and the ‘Overly Critical’ profile reported low levels of competence satisfaction and high  
388 levels of competence frustration. Further examination of profile total mean values (Table 3)  
389 indicates that the ‘Overly Critical’ profile’s relatedness satisfaction/frustration, and the  
390 ‘Distant Controlling’ profile’s competence satisfaction/frustration were relatively close to the  
391 sample total means.

392         The high prevalence (i.e., 72%) of the less-optimal profiles (i.e., excluding the  
393 ‘Supportive-Developmental’) underscores the need for interventions designed to increase  
394 sport coaches’ adoption of needs-supportive principles (Hancox, Quested, Ntoumanis, &  
395 Duda, 2017). In order to practically address such issues, evidence suggests that individuals  
396 can be receptive to their coach’s modified interpersonal style through the use of SDT-  
397 informed behaviour change techniques and communication strategies (Ntoumanis, Quested,  
398 Reeve & Cheon, 2018). Such examples include: provision of activity choice and participant  
399 input (Shannon et al., 2018); acknowledgement of barriers and conflict (Fin et al., 2019); use  
400 of open-ended questions (Cheon, Reeve, Lee & Lee, 2015), and; positive instructional  
401 feedback (Ntoumanis, ThøgersenNtoumani, Quested & Hancox, 2017). Equally, Delrue et al.,  
402 (2019) suggests that athletes can identify controlling coaches’ practices (e.g., domineering,  
403 demanding) that are detrimental to well-being, and preliminary evidence suggests individuals  
404 can differentiate indifferent instructor styles (Cheon et al., 2018). Therefore, coach education  
405 programmes could raise awareness of, and identify non-optimal communication practices to  
406 discourage controlling or impersonal coach behaviours (see Bartholomew, Ntoumanis, &  
407 Thøgersen-Ntoumani, 2009 for a review).

#### 408 *4.2 Profile membership as a predictor of mental health outcomes*

409 The contribution of extracting latent profiles was further supported in the variable-centred  
410 results, which emphasised how unique needs-supportive/controlling contexts may have  
411 adaptive and maladaptive effects on athlete mental health outcomes. This position is  
412 strengthened by our analysis which included several statistical controls that have been linked  
413 with athlete mental health, including gender, seasonal stage, and competitive levels,  
414 (Lonsdale, Hodge & Rose, 2009; Gustafsson, DeFreese, & Madigan, 2017). Specifically, and  
415 with statistically significant comparisons with all respective groups, the ‘Supportive-  
416 Developmental’ profile yielded the highest psychological needs-satisfaction (H<sub>3b</sub>) and  
417 subjective vitality (H<sub>4b</sub>) scores, and lowest levels of psychological needs-frustration (H<sub>2b</sub>),

418 and two burnout dimensions of accomplishment and sports devaluation (H<sub>1b</sub>). Contrastingly,  
419 the ‘Harsh-Controlling’ profile scored the highest in the two burnout dimensions of  
420 accomplishment and sports devaluation, autonomy and relatedness frustration, and lowest  
421 autonomy satisfaction, whereas the ‘Distant-Controlling’ and ‘Overly Critical’ profiles  
422 yielded the highest or lowest total mean values in an undesirable direction for the remaining  
423 variables. Taken collectively, our study supports a growing body of research indicating the  
424 influential role of needs-supportive social environments on sports-specific markers of athlete  
425 mental health (Langan, Toner, Blake, & Lonsdale, 2015; Balaguer et al., 2012; Hancox,  
426 Quested, Ntoumanis, & Duda, 2017).

427         Considered within an SDT process framework (see Figure 1), the predictive role of  
428 the ‘Supportive-Developmental’ and ‘Harsh-Controlling’ profile membership on both needs  
429 satisfaction (H<sub>3b</sub>) and needs frustration (H<sub>2b</sub>) supports a corpus of literature supporting SDT  
430 hypotheses across domains and cultural contexts (Ryan & Deci, 2017). However, a novel  
431 contribution was how, consistent with the figurative labels applied, the ‘Overly Critical’  
432 coach profile displayed the lowest levels of competence satisfaction, and highest levels of  
433 competence frustration, and the ‘Distant Controlling’ coach profile reported the lowest levels  
434 of relatedness satisfaction. These findings suggest an undesired effect if differential  
435 support/control is exerted over one or more psychological needs (Ryan & Deci, 2017).  
436 Importantly, athletes’ and coaches’ agreements/disagreements regarding their coaches’  
437 behaviours are significant for the relative prediction of needs satisfaction/frustration (Rocchi  
438 & Pelletier, 2018). As such, both athletes and coaches may benefit from participating in  
439 needs-supportive communication interventions (Ntoumanis, Quested, Reeve & Cheon, 2018).  
440 Furthermore, of all the needs-satisfaction/thwarting variables, profile membership predicted  
441 the largest proportion of variance for autonomy satisfaction, and the least for competence  
442 frustration. These results are consistent with a recent review of 20 studies examining the  
443 relative influence of social agents on athletes’ psychological needs, in which coaches exerted  
444 the largest effect on autonomy, but peers were more influential regarding competence (Chu &  
445 Zhang, 2019). Therefore, further BPNT research may consider examining the co-occurrence  
446 of needs-supportive/controlling behaviours from both coaches and peers, which may explain  
447 more variance in athletes’ psychological needs (Jõesaar, Hein & Hagger, 2012; Quested et  
448 al., 2013). Understanding the influence of needs indifferent behaviours is also likely to  
449 explain more variance in needs-satisfaction/ frustration (Bhavsar et al., 2019).

450           The finding that the ‘Harsh-Controlling’ scored the highest in burnout dimensions  
451 (H<sub>1b</sub>) supports a recent meta-analysis that revealed negative associations with social support  
452 and burnout, and direct relationships between negative social interactions and burnout  
453 (Pacewicz, Mellano, & Smith, 2019). Research suggests that controlling coach behaviours  
454 can result in an increased probability of athlete preoccupation with concern about mistakes,  
455 avoidance of failure, and subsequent devaluation and cynicism about their sport (Lonsdale,  
456 Hodge & Rose, 2009; Gustafsson, DeFreese & Madigan, 2017). Lastly, the large effect  
457 explained by profile membership (H<sub>4b</sub>) on subjective vitality is consistent with several athlete  
458 mental health studies (Adie, Duda, & Ntoumanis, 2008; Adie, Duda, & Ntoumanis, 2012;  
459 Balaguer et al., 2012; Hancox, Quested, Ntoumanis, & Duda, 2017). This finding adds to the  
460 view that athletes feel more energy during their sport when they feel their needs are  
461 supported by their coach..

#### 462 *4.3 Limitations and future directions*

463       While the present study extended the testing of BPNT in sport, there are some limitations. For  
464 instance, we employed a cross-sectional design and therefore causal inferences cannot be  
465 drawn. An additional sample in our study would have determined profile consistency, or  
466 indeed longitudinal prospective research could help determine temporal patterns of profile  
467 membership(s) over the course of a competition season (Lindwall et al., 2017; Myers,  
468 Ntoumanis, Gunnell, Gucciardi & Lee, 2018). In terms of further exploring the effect of  
469 psychological needs on athlete mental health, further research may consider measuring global  
470 mental health constructs beyond the sports-related outcomes assessed in the present study  
471 (see Vallerand, 1997). Further, assessing need indifferent behaviours (Bhavsar et al., 2019)  
472 will be important, and to examine the role of peers, that are likely implicated in athlete mental  
473 health. Lastly, future testing of BPNT in longitudinal and intervention studies may consider  
474 assessing if needs-satisfaction/frustration exerts a mediating role in motivational components  
475 (e.g., amotivation, intrinsic motivation) which were not present in the current analyses.

#### 476 *4.5 Summary and Conclusions*

477       Promoting athlete mental health within sport is an important goal for researchers,  
478 practitioners and policy makers (Breslin & Leavey, 2019), and therefore an understanding of  
479 influential psychosocial factors is valuable. As such, this study simultaneously employed  
480 LPA to profile athletes based on the interaction effects between perceived needs-supportive  
481 and controlling coach behaviours, and; applied profile membership as a predictor of mental



482 health outcomes. Study hypotheses were largely supported and revealed the emergence of  
 483 profiles characteristic of a more needs-supportive, needs-indifferent or controlling social  
 484 contexts, with the novel additions of athlete profiles displaying differential mis-treatment for  
 485 their competence and relatedness needs. The predictive role of profile membership on mental  
 486 health outcomes was also in line with BPNT tenets (Ryan & Deci, 2008) to the extent that the  
 487 ‘Supportive-Development’ profile characteristic of a more needs-supportive social context  
 488 reported improved needs-satisfaction and subjective vitality (Rocchi, & Pelletier, 2018;  
 489 Quested et al., 2013); whereas the ‘Harsh-Controlling’ profile was linked to maladaptive  
 490 outcomes including psychological needs-frustration and athlete burnout (Hancox, Quested,  
 491 Ntoumanis & Duda, 2017; Pacewicz, Mellano & Smith, 2019). A key finding of this study is  
 492 the 72% prevalence rate within less-optimal athlete profiles, who may therefore benefit from  
 493 interventions designed to promote mental health through needs-supportive communication  
 494 (Gustafsson, DeFreese, & Madigan, 2017; Hancox, Quested, Ntoumanis, & Duda, 2017).  
 495 Evidence-based strategies such as increasing athlete choice and input, whilst acknowledging  
 496 barriers and conflict could be considered in intervention programme development  
 497 (Ntoumanis, Quested, Reeve & Cheon, 2018). From a research and theoretical perspective,  
 498 further longitudinal prospective and controlled intervention studies are required, in which the  
 499 consistency and temporal patterns of profile membership is examined (Lindwall et al., 2017).  
 500 Such research may consider modelling additional SDT components including need-  
 501 indifferent behaviours, motivational regulations and needs-support from other social agents  
 502 such as peers (Li, Wang & Kee, 2013).

503 **References**

- 504 Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction  
 505 and the optimal functioning of adult male and female sport participants: A test of basic  
 506 needs theory. *Motivation and Emotion*, 32(3), 189-199.
- 507 Adie, J. W., Duda, J. L., & Ntoumanis, N. (2012). Perceived coach-autonomy support, basic  
 508 need satisfaction and the well-and ill-being of elite youth soccer players: A longitudinal  
 509 investigation. *Psychology of Sport and Exercise*, 13(1), 51-59.
- 510  
 511 Arnold, R., & Fletcher, D. (2012). A research synthesis and taxonomic classification of the  
 512 organizational stressors encountered by sport performers. *Journal of Sport and Exercise  
 513 Psychology*, 34(3), 397-429.
- 514 Balaguer, I., González, L., Fabra, P., Castillo, I., Mercé, J., & Duda, J. L. (2012). Coaches'  
 515 interpersonal style, basic psychological needs and the well-and ill-being of young soccer  
 516 players: A longitudinal analysis. *Journal of Sports Sciences*, 30(15), 1619-1629.

- 517 Bartholomew, K. J., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2009). A review of  
 518 controlling motivational strategies from a self-determination theory perspective:  
 519 Implications for sports coaches. *International Review of Sport and Exercise Psychology*,  
 520 2(2), 215-233.
- 521 Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., & Thøgersen-Ntoumani, C. (2011).  
 522 Psychological need thwarting in the sport context: Assessing the darker side of athletic  
 523 experience. *Journal of Sport and Exercise Psychology*, 33(1), 75-102.
- 524 Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., Bosch, J. A., & Thøgersen-Ntoumani, C.  
 525 (2011). Self-determination theory and diminished functioning: The role of interpersonal  
 526 control and psychological need thwarting. *Personality and Social Psychology Bulletin*,  
 527 37(11), 1459-1473.
- 528 Belz, J., Kleinert, J., Ohlert, J., Rau, T., & Allroggen, M. (2018). Risk for Depression and  
 529 Psychological Well-Being in German National and State Team Athletes—Associations  
 530 With Age, Gender, and Performance Level. *Journal of Clinical Sport Psychology*, 12(2),  
 531 160-178.
- 532 Bechter, B. E., Dimmock, J. A., Howard, J. L., Whipp, P. R., & Jackson, B. (2018). Student  
 533 motivation in high school physical education: A latent profile analysis approach. *Journal of*  
 534 *Sport and Exercise Psychology*, 40(4), 206-216.
- 535 Bhavsar, N., Ntoumanis, N., Quested, E., Gucciardi, D. F., Thøgersen-Ntoumani, C., Ryan, R.  
 536 M., & Bartholomew, K. J. (2019). Conceptualizing and testing a new tripartite measure of  
 537 coach interpersonal behaviors. *Psychology of Sport and Exercise*.
- 538 Breslin, G. Smith, A. Donohue, B. Donnelly, P. Shannon, S. Haughey, T. Vella, S. Swann, C.  
 539 Cotterill, S. MacIntyre, T. Rogers, T. & Leavey G (in press). International Consensus  
 540 Statement on Psychosocial and Policy-Related Approaches to Mental Health Awareness  
 541 Programmes in Sport. *BMJ Open Sport & Exercise Medicine*.
- 542 Breslin, G., Shannon, S., Haughey, T., Donnelly, P., & Leavey, G. (2017). A systematic  
 543 review of interventions to increase awareness of mental health and well-being in athletes,  
 544 coaches and officials. *Systematic Reviews*, 6(1), 177.
- 545 Breslin, G., Shannon, S., Haughey, T., Sarju, N., Neill, D., Leavey, G., & Lawlor, M. (In  
 546 press). Athlete and non-athlete Intentions to Self-Manage Mental Health: Applying the  
 547 Integrated Behaviour Change Model to the State of Mind Programme. *Journal of Applied*  
 548 *Sport Psychology*.
- 549 Breslin, G., and Leavey, G. (2019). *Mental Health and Well-being Interventions in Sport:*  
 550 *Research, Theory and Practice*. Routledge, London.
- 551 Cheon, S. H., Reeve, J., Lee, J., & Lee, Y. (2015). Giving and receiving autonomy support in  
 552 a high-stakes sport context: A field-based experiment during the 2012 London Paralympic  
 553 Games. *Psychology of Sport and Exercise*, 19, 59-69.
- 554 Cheon, S. H., Reeve, J., Lee, Y., Ntoumanis, N., Gillet, N., Kim, B. R., & Song, Y.-G. (2019).  
 555 Expanding autonomy psychological need states from two (satisfaction, frustration) to three  
 556 (dissatisfaction): a classroom-based intervention study. *Journal of Educational Psychology*,  
 557 11, 685-702. doi: 10.1037/edu0000306

- 558 Chu, T. L., & Zhang, T. (2019). The roles of coaches, peers, and parents in athletes' basic  
 559 psychological needs: A mixed-studies review. *International Journal of Sports Science &*  
 560 *Coaching*, 1747954119858458.
- 561 Costa, S., Ntoumanis, N., & Bartholomew, K. (2015). Predicting the brighter and darker sides  
 562 of interpersonal relationships: Does psychological need thwarting matter?. *Motivation*  
 563 *and Emotion*, 39, 11-24. doi: 10.1007/s11031-014-9427-0
- 564 Cramer, D. & Howitt, D. (2004). *The Sage dictionary of statistics: a practical resource for*  
 565 *students in the social sciences*. Thousand Oaks: Sage, London.
- 566 Delrue, J., Reynders, B., Broek, G. V., Aelterman, N., De Backer, M., Decroos, S., & Haerens,  
 567 L. (2019). Adopting a helicopter-perspective towards motivating and demotivating  
 568 coaching: A circumplex approach. *Psychology of Sport and Exercise*, 40, 110-126.
- 569 Esdar, W., Gorges, J., & Wild, E. (2016). The role of basic need satisfaction for junior  
 570 academics' goal conflicts and teaching motivation. *Higher Education*, 72(2), 175-190.
- 571 Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage, London.
- 572 Fin, G., Moreno-Murcia, J. A., León, J., Baretta, E., & Júnior, R. J. N. (2019). Interpersonal  
 573 autonomy support style and its consequences in physical education classes. *PloS one*,  
 574 14(5), e0216609.
- 575 Felton, L., & Jowett, S. (2013). "What do coaches do" and "how do they relate": Their effects  
 576 on athletes' psychological needs and functioning. *Scandinavian Journal of Medicine &*  
 577 *Science in Sports*, 23(2), e130-e139.
- 578 Fortier, M. S., Duda, J. L., Guerin, E., & Teixeira, P. J. (2012). Promoting physical activity:  
 579 development and testing of self-determination theory-based interventions. *International*  
 580 *Journal of Behavioral Nutrition and Physical Activity*, 9(1), 20.
- 581 Foskett, R. L., & Longstaff, F. (2018). The mental health of elite athletes in the United  
 582 Kingdom. *Journal of Science and Medicine in Sport*, 21(8), 765-770.
- 583 Gerber, M., Gustafsson, H., Seelig, H., Kellmann, M., Ludyga, S., Colledge, F., & Bianchi, R.  
 584 (2018). Usefulness of the Athlete Burnout Questionnaire (ABQ) as a screening tool for the  
 585 detection of clinically relevant burnout symptoms among young elite athletes. *Psychology*  
 586 *of Sport and Exercise*, 39, 104-113.
- 587 Gustafsson, H., DeFreese, J. D., & Madigan, D. J. (2017). Athlete burnout: Review and  
 588 recommendations. *Current Opinion in Psychology*, 16, 109-113.
- 589 Gustafsson, H., Carlin, M., Podlog, L., Stenling, A., & Lindwall, M. (2018). Motivational  
 590 profiles and burnout in elite athletes: A person-centered approach. *Psychology of Sport and*  
 591 *Exercise*, 35, 118-125.
- 592 Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G., Goris,  
 593 W. & Aelterman, N. (2018). Different combinations of perceived autonomy support and  
 594 control: identifying the most optimal motivating style. *Physical Education and Sport*  
 595 *Pedagogy*, 23(1), 16-36.

- 596 Hagger, M. S., & Weed, M. (2019). DEBATE: Do interventions based on behavioral theory  
 597 work in the real world? *International Journal of Behavioral Nutrition and Physical*  
 598 *Activity*, 16(1), 36.
- 599 Hancox, J. E., Quested, E., Ntoumanis, N., & Duda, J. L. (2017). Teacher-created social  
 600 environment, basic psychological needs, and dancers' affective states during class: A diary  
 601 study. *Personality and Individual Differences*, 115, 137-143.
- 602 Jaakkola, T., Wang, C. J., Soini, M., & Liukkonen, J. (2015). Students' perceptions of  
 603 motivational climate and enjoyment in Finnish physical education: A latent profile analysis.  
 604 *Journal of Sports Science & Medicine*, 14(3), 477.
- 605 Jõesaar, H., Hein, V., & Hagger, M. (2012). Youth athletes' perception of autonomy support  
 606 from the coach, peer motivational climate and intrinsic motivation in sport setting: One-  
 607 year effects. *Psychology of Sport and Exercise*, 13, 257-262.
- 608 Keyes, C. L. (2005). Mental illness and/or mental health? Investigating axioms of the  
 609 complete state model of health. *Journal of Consulting and Clinical Psychology*, 73(3), 539.
- 610 Langan, E., Toner, J., Blake, C., & Lonsdale, C. (2015). Testing the effects of a self-  
 611 determination theory-based intervention with youth Gaelic football coaches on athlete  
 612 motivation and burnout. *The Sport Psychologist*, 29(4), 293-301.
- 613 Li, C. H. (2010). Predicting subjective vitality and performance in sports: The role of passion  
 614 and achievement goals. *Perceptual and Motor Skills*, 110(3\_suppl), 1029-1047.
- 615 Lindwall, M., Ivarsson, A., Weman-Josefsson, K., Jonsson, L., Ntoumanis, N., Patrick, H., &  
 616 Teixeira, P. (2017). Stirring the motivational soup: within-person latent profiles of  
 617 motivation in exercise. *International Journal of Behavioral Nutrition and Physical Activity*,  
 618 14(1), 4.
- 619 Longo, Y., Gunz, A., Curtis, G. J., & Farsides, T. (2016). Measuring need satisfaction and  
 620 frustration in educational and work contexts: The Need Satisfaction and Frustration Scale  
 621 (NSFS). *Journal of Happiness Studies*, 17(1), 295-317.
- 622 Longo, Y., Alcaraz-Ibáñez, M., & Sicilia, A. (2018). Evidence supporting need satisfaction  
 623 and frustration as two distinguishable constructs. *Psicothema*, 30(1), 74-81.
- 624 Lonsdale, C., Hodge, K., & Rose, E. (2009). Athlete burnout in elite sport: A self-  
 625 determination perspective. *Journal of Sports Sciences*, 27(8), 785-795.
- 626 Lundqvist, C. (2011). Well-being in competitive sports—The feel-good factor? A review of  
 627 conceptual considerations of well-being. *International Review of Sport and Exercise*  
 628 *Psychology*, 4(2), 109-127.
- 629 Magnusson, D. (1998). The logic and implications of a person-oriented approach. In R. B.  
 630 Cairns, L. R. Bergman, & J. Kagan (Eds.). *Methods and models for studying the individual*  
 631 (pp. 33-64). Thousand Oaks, CA: Sage Publications, Inc.
- 632 Matosic, D., & Cox, A. E. (2014). Athletes' motivation regulations and need satisfaction  
 633 across combinations of perceived coaching behaviors. *Journal of Applied Sport*  
 634 *Psychology*, 26(3), 302-317.

- 635 Marsh, H.W., Lüdtke, O., Trautwein, U., & Morin, A.J.S. (2009). Classical latent profile  
 636 analysis of academic self-concept dimensions: Synergy of person- and variable-centered  
 637 approaches to theoretical models of self-concept. *Structural Equation Modeling*, 16, 191-  
 638 225.
- 639 Moesch, K., Kenttä, G., Kleinert, J., Quignon-Fleuret, C., Cecil, S., & Bertollo, M. (2018).  
 640 FEPSAC position statement: mental health disorders in elite athletes and models of service  
 641 provision. *Psychology of Sport and Exercise*, 38, 61-71.
- 642 Muthén, L. K., & Muthén, B. O. (2012). MPlus: statistical analysis with latent variables--  
 643 User's guide.
- 644 Myers, N. D., Ntoumanis, N., Gunnell, K. E., Gucciardi, D. F., & Lee, S. (2018). A review of  
 645 some emergent quantitative analyses in sport and exercise psychology. *International*  
 646 *Review of Sport and Exercise Psychology*, 11(1), 70-100.
- 647 Neubauer, A. B., Voss, A., & Ditzen, B. (2018). Exploring need dynamics within and across  
 648 days in everyday life: A three-level analysis. *Journal of Research in Personality*, 77, 101-  
 649 112.
- 650 Ntoumanis, N., Quested, E., Reeve, J., & Cheon, S. H. (2018). Need supportive  
 651 communication: Implications for motivation in sport, exercise, and physical activity. In  
 652 *Persuasion and communication in sport, exercise, and physical activity*, 155-169,  
 653 Abingdon, UK: Routledge.
- 654 Ntoumanis, N., Thøgersen-Ntoumani, C., Quested, E., & Hancox, J. (2017). The effects of  
 655 training group exercise class instructors to adopt a motivationally adaptive communication  
 656 style. *Scandinavian Journal of Medicine & Science in Sports*, 27(9), 1026-1034.
- 657 Pacewicz, C. E., Mellano, K. T., & Smith, A. L. (2019). A meta-analytic review of the  
 658 relationship between social constructs and athlete burnout. *Psychology of Sport and*  
 659 *Exercise*.
- 660 Quested, E., Ntoumanis, N., Viladrich, C., Haug, E., Ommundsen, Y., Van Hoye, A., & Duda,  
 661 J. L. (2013). Intentions to drop-out of youth soccer: A test of the basic needs theory among  
 662 European youth from five countries. *International Journal of Sport and Exercise*  
 663 *Psychology*, 11(4), 395-407.
- 664 Raedeke, T. D. (1997). Is athlete burnout more than just stress? A sport commitment  
 665 perspective. *Journal of Sport and Exercise Psychology*, 19(4), 396-417.
- 666 Raedeke, T. D., & Smith, A. L. (2001). Development and preliminary validation of an athlete  
 667 burnout measure. *Journal of sport and exercise psychology*, 23(4), 281-306.
- 668 Reardon, C. L., Hainline, B., Aron, C. M., Baron, D., Baum, A. L., Bindra, A., ... &  
 669 Derevensky, J. L. (2019). Mental health in elite athletes: International Olympic Committee  
 670 consensus statement (2019). *British Journal of Sports Medicine*, 53(11), 667-699.
- 671 Reeve, J., & Lee, W. (2019). A neuroscientific perspective on basic psychological needs.  
 672 *Journal of personality*, 87(1), 102-114.

- 673 Rocchi, M., & Pelletier, L. (2018). How does coaches' reported interpersonal behavior align  
674 with athletes' perceptions? Consequences for female athletes' psychological needs in sport.  
675 *Sport, Exercise, and Performance Psychology*, 7(2), 141-154.  
676 <http://dx.doi.org/10.1037/spy0000116#>
- 677 Rice, S. M., Purcell, R., De Silva, S., Mawren, D., McGorry, P. D., & Parker, A. G. (2016).  
678 The mental health of elite athletes: a narrative systematic review. *Sports Medicine*, 46(9),  
679 1333-1353.
- 680 Rocchi, M., Pelletier, L., & Desmarais, P. (2017). The validity of the Interpersonal Behaviors  
681 Questionnaire (IBQ) in sport. *Measurement in Physical Education and Exercise Science*,  
682 21(1), 15-25.
- 683 Rocchi, M., Pelletier, L., Cheung, S., Baxter, D., & Beaudry, S. (2017). Assessing need-  
684 supportive and need-thwarting interpersonal behaviours: The Interpersonal Behaviours  
685 Questionnaire (IBQ). *Personality and Individual Differences*, 104, 423-433.
- 686 Ryan, R. M., & Deci, E. L. (2000). The "what" and "why" of goal pursuits: Human needs and  
687 the self-determination of behavior. *Psychological inquiry*, 11(4), 227-268.
- 688 Ryan, R. M., & Deci, E. L. (2008). Self-determination theory and the role of basic  
689 psychological needs in personality and the organization of behavior. *Handbook of*  
690 *personality: Theory and research*, 3, 654-678, New York, NY, US: The Guilford Press..
- 691 Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in*  
692 *motivation, development, and wellness*. Guilford Publications, New York.
- 693 Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as  
694 a dynamic reflection of well-being. *Journal of Personality*, 65(3), 529-565.
- 695 Schinke, R. J., Stambulova, N. B., Si, G., & Moore, Z. (2018). International society of sport  
696 psychology position stand: Athletes' mental health, performance, and development.  
697 *International Journal of Sport and Exercise Psychology*, 16(6), 622-639.
- 698 Shannon, S., Brennan, D., Hanna, D., Younger, Z., Hassan, J., & Breslin, G. (2018). The  
699 Effect of a School-Based Intervention on Physical Activity and Well-Being: a Non-  
700 Randomised Controlled Trial with Children of Low Socio-Economic Status. *Sports*  
701 *Medicine-Open*, 4(1), 16.
- 702 Shannon, S., Breslin, G., Haughey, T., Sarju, N., Neill, D., Lawlor, M., & Leavey, G. (2019).  
703 Predicting Student-Athlete and Non-Athletes' Intentions to Self-Manage Mental Health:  
704 Testing an Integrated Behaviour Change Model. *Mental Health & Prevention*, 13, 92-99.
- 705 SurveyMonkey, L. L. C. (2012). SurveyMonkey®. Palo Alto (CA): SurveyMonkey, LLC.
- 706 Vallerand, R. J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and  
707 exercise. *Advances in motivation in sport and exercise*, 2, 263-319.