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Athletes' Psychological Needs and Coaches' Interpersonal Behaviors: A Within-Person Latent Profile Analysis

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Basic psychological needs theory is limited by variable-centered studies focused on linear relationships between perceived needs-supportive/controlling coach behaviors. Therefore, latent profile analysis was used to determine if heterogenous profiles emerged from the interactive effects of needs-supportive and -controlling coach behaviors and the subsequent association with sport-specific mental health outcomes (i.e., burnout and subjective vitality). A total of 685 athletes took part (age = 23.39 years, male = 71%), and the latent profile analysis revealed five novel, diverse profiles, labeled as "supportive-developmental," "needs-indifferent," "overly critical," "harsh-controlling," and "distant-controlling" coaches. The profiles predicted significant mental health variance (adjusted R^2 = .15–.24), wherein the "supportive-developmental" profile scored most favorably on 90% of the outcomes. The largest mean differences were observed against the "harsh-controlling" (n = 5), "overly critical" (n = 3), and "distant controlling" (n = 2) profiles. Overall, latent profile analysis revealed substantial nuance in athletes' social contexts, predicting variance in mental health. Needs-supportive interventions are needed for "overly critical," "harsh controlling," and "distant controlling" athlete profiles.

Keywords: burnout, mental health, need frustration, need satisfaction, self-determination theory, well-being

A two-continua model (Keyes, 2005) and sport-sensitive definition (Breslin et al., 2019) outline that mental health is not merely the absence of ill-being (e.g., emotional difficulties) but a state of well-being in which athletes realize their purpose and potential and can cope with competitive sport demands and life stressors, act autonomously, make a contribution to their community, and seek support. Recent consensus statements (Breslin, et al., 2019; Moesch et al., 2018; Reardon et al., 2019; Schinke, Stambulova, Si, & Moore, 2018) outlined that competitive sport can sometimes hinder athletes' mental health due to the unique stressors encountered. For example, performance expectations (e.g., playing through injury, intense physical training), personal matters (e.g., constrained friendship or family life), and organizational issues (e.g., travel, finance) manifest in both elite (Rice et al., 2016) and nonelite athletes (Breslin et al., 2017). As such, athletes are as likely as, and sometimes, during injury or transition, more likely than, nonathletes to struggle with mental illnesses including anxiety and depression (Belz et al., 2018; Foskett & Longstaff, 2018; Rice et al., 2016; Reardon et al., 2019). Contrastingly, however, sporting participation can foster meaningful social connections and psychological well-being, be a source of health-enhancing physical activity, and allow for the delivery of awareness messages conducive to mental well-being (Breslin & Leavey, 2019). Therefore, sport can potentially influence adaptive and maladaptive markers of athlete mental health (Breslin, et al., 2019).

There are global (i.e., day-to-day), contextual (e.g., within sport), and situational (i.e., here and now) measurement levels to mental health (Vallerand, 2001). Couched within a eudemonic and hedonic perspective (Ryan & Deci, 2008), subjective vitality is defined as feelings of positive energy toward oneself in sport (Adie, Duda, & Ntoumanis, 2008), and it represents a sports-specific marker of well-being linked to sports enjoyment, autonomous motivation, and positive affect (Adie et al., 2008; Quested et al., 2013; Li et al., 2013). Conversely, athlete burnout can be conceptualized as a sports-specific marker of ill-being (Gustafsson et al., 2017; Reardon et al., 2019), defined as a negative psychological syndrome that occurs over time (Raedeke, 1997) and is associated with depressed mood, injury, and sport withdrawal (Madigan et al., 2019). Although the conceptual debate on burnout continues (Gerber et al., 2018), it is largely agreed that athlete burnout is represented by three persistent symptoms: (a) emotional and physical exhaustion, (b) a reduced sense of accomplishment, and (c) the development of a cynical attitude toward the once favored sport (Gerber et al., 2018). To effectively understand how sporting environments impact such athlete mental health outcomes, studies and interventions based on sound theoretical foundations are required (Breslin et al., 2017; Breslin & Leavey, 2019).

Theorists postulate psychosocial determinants and mediating factors that directly or indirectly affect athlete mental health outcomes (Hagger & Weed, 2019), and research has established that sporting social environments can play a significant positive and negative role in athlete well-being and the etiology of burnout symptomology (Lundqvist, 2011). One theory that has received empirical support for the prediction of both positive and negative facets of athletes' mental health is self-determination theory (SDT; Ryan & Deci, 2000). The SDT is a metatheory of human behavior and health, encompassing several mini-theories that are unified by the position that humans have three innate psychological needs essential to mental health (Ryan & Deci, 2017). Specifically, within basic psychological needs theory (BPNT; Ryan & Deci, 2008) and supported by evidence from several research centers (Balaguer et al., 2012; Hancox, Quested,

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Ntoumanis, & Duda, 2017), when an individual's psychological need for autonomy (i.e., provision of choice), competence (i.e., feelings of effectiveness), and relatedness (i.e., sense of belongingness) *are all* supported in a social context (e.g., from a coach in sport), they experience psychological needs satisfaction and positive mental health (see Figure 1). Equally, an athlete's psychological needs can be controlled in a sporting context, for example, when a coach purposely isolates athletes from others (i.e., relatedness control), forces or pressures athletes to behave in accordance with their motives (i.e., autonomy control), and points out that the athlete will fail (i.e., competence control). A number of studies show that controlling environments are linked to needs frustration (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011) and ill-being outcomes, including burnout (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Hancox et al., 2017).

While the above studies have advanced our understanding of how needs-supportive and controlling environments and their salutary and detrimental outcomes are distinct, a notable limitation of existing research is the sole reliance on variable-centered analyses (Hancox et al., 2017). Specifically, researchers using the variable-centered approach (e.g., linear regression) assume a homogenous population, and how relative to the population's mean, higher or lower scores on independent variable(s), explains variance in mediators and outcomes (Magnusson, 1998). To provide an example, the hypothesized covariance pathway between needs-support and needs-control in Figure 1 indicates that, compared with the average, athletes who perceive high levels of needs-support from their coach are more likely to experience less controlling behaviors from their coach (and vice versa) and subsequent needs-satisfaction/frustration and mental health outcomes (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Hancox et al., 2017). Contrastingly, a person-centered analysis focuses on the relationships between people on the aforesaid interactions between needs-supportive and needs-controlling perceptions (Myers, Ntoumanis, Gunnell, Gucciardi, & Lee, 2018). Using latent profile analysis (LPA), the interaction effects in Figure 1 are calculated in a mixture model to extract unobserved latent populations who are quantitatively and qualitatively distinct from others (Magnusson, 1998). The addition of more or fewer latent profiles to the data is determined through the comparison of numerous model fit statistics and entropy classifications, wherein the best-fitting model can be retained for theoretical interpretation and advancement (Magnusson, 1998).

To provide an illustration, and hypothesized in line with variable-centered study findings (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011), an "optimal" athlete profile would concurrently report high levels of needs-support and low levels of needs-control for all three needs, whereas a "non-optimal" profile would simultaneously report low levels of needs-support and high levels of needs-control for one or more psychological needs (Hancox et al., 2017). However, given that LPA has increased its statistical sensitivity to capture nuance in the needs-supportive and needs-controlling interactions (Myers et al., 2018), there are both intuitive and theoretical reasons to expect the emergence of a "need-indifferent" profile whose needs may be relatively overlooked (Cheon et al., 2019), displaying moderate scores across all needs-support and needs-control variables or, indeed, unique profile(s) who receive varied support and control for one or more basic psychological needs (e.g., a largely autonomy-controlling, but competence-promoting, coach) (Neubauer, Voss, & Ditzen, 2018). Several emerging SDT studies have demonstrated the contribution of LPA in profiling individuals through synergistic effects of motivational regulations in exercise or sport (e.g., Lindwall et al., 2017; Bechter, Dimmock, Howard, Whipp, & Jackson, 2018; Gustafsson, Carlin, Podlog, Stenling, & Lindwall, 2018); however, all have analyzed psychological needs as study outcomes.

Given that psychological needs-support and control variables represent modifiable socioenvironmental factors (Fortier, Duda, Guerin, & Teixeira, 2012), LPA may obtain advanced theoretical knowledge and applicable information to athletes that motivational or variable-centered studies could not. Moreover, a further advantage of LPA is its ability to convert to a hybrid approach to hypotheses testing, as the uniqueness of an athlete's membership of a profile can be used to better understand and explain relationships between predictor (i.e., social environment) and outcome variables (i.e., mental health; Lindwall et al., 2017). To this end, while variable-level evidence could infer clear differences between "optimal" an "nonoptimal" profiles on mental health outcomes, it is unclear how "needs-indifferent" or "mixed" profiles would translate to such comparisons (Myers et al., 2018).

Hence, with the increasing recognition that theory-based studies are needed to advance athlete mental health research and practice (Breslin et al., 2017; Breslin & Leavey, 2019; Shannon

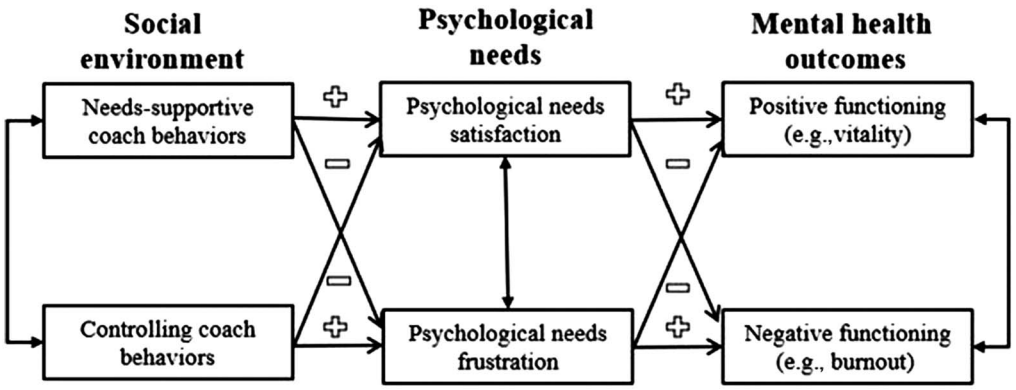

Figure 1 — Process variable-centered model informed by basic psychological needs theory (Ryan & Deci, 2008) explaining the hypothesized positive and negative effects of the coach-led social environment on athletes' psychological needs satisfaction/frustration and positive and negative forms of functioning. *Note.* Symbol (+) refers to hypothesized positive relationships; symbol (–) refers to hypothesized negative relationships; double-headed arrows represent covariance pathways; single-headed arrows represent hypothesized direct effects.

et al., 2019), a hybrid approach of extracting latent profiles of athletes based on their coaches' interpersonal style and testing how profile membership may relate to mental health outcomes is warranted. Therefore, the aim of the present study was twofold: (a) to identify if latent profiles of athletes emerge based on the interaction effects of needs-supportive and needs-controlling coach behaviors, and (b) to determine if latent profile membership is related to the satisfaction/frustration of psychological needs, burnout, and subjective vitality.

Hypotheses Tested

Reflective of the hybrid person and variable-centered study aims, our hypotheses consisted of Sections A and B. In Section A, our LPA hypothesis was exploratory in nature, given that LPA on athletes' perceptions of needs-supportive/controlling behaviors is yet to be tested. However, in accordance with BPNT (Ryan & Deci, 2008) and published covariances between needs-support and needs-control constructs in extant variable-centered research (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Hancox et al., 2017), we hypothesized that distinct optimal (Hypothesis 1, H1a) and nonoptimal profiles (Hypothesis 2, H2a) would emerge. The optimal profile was expected to be characterized by a more to less ratio of needs-supportive and controlling coach behaviors, whereas the nonoptimal profile was hypothesized to present the reverse. We also expected there to be at least one profile displaying a "needs-indifferent" profile (Hypothesis 3, H3a), one displaying moderate needs-support/control, and one novel profile (Hypothesis 4, H4a) that displayed an overlap in the levels of psychological needs support/control perceived.

In Section B, when applying profile membership as a predictor of mental health outcomes, we hypothesized that, relative to other profiles, the profiles of athletes who displayed lower levels of perceived coach controlling behavior and higher levels of coach needs-support would display the following: reduced burnout symptoms (Hypothesis 1, H1b), lower psychological needs frustration scores (Hypothesis 2, H2b), higher psychological needs satisfaction (Hypothesis 3, H3b), and enhanced subjective vitality (Hypothesis 4, H4b). In addition, we controlled for several variables linked with athlete mental health, including gender, competitive athlete level, and seasonal stage (Lonsdale, Hodge, & Rose, 2009; Gustafsson et al., 2017).

Methods

Inclusion Criteria, Recruitment, Procedure, and Participants

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

The data were collected via an online survey from May 2018 to May 2019 using SurveyMonkey (Palo Alto, CA) software, adhering to the Data Protection Act (SurveyMonkey, LLC, 2012) provisions, including cyber security policies and quality control checks. To achieve a broad representation (i.e., level, gender, sport type) of athletes, an e-mail invitation was sent to several sports clubs, interest groups, and national governing bodies across Ireland and the United Kingdom. Those participating distributed survey links on Twitter, e-mail lists, and SMS/WhatsApp messages to team coaches, captains, and players. The survey was composed of a description of the study aims, a consent form, participant demographics (i.e., gender, age) and sporting factors (i.e., sport type, average training, and competition hours per week), level of competition (i.e., elite, semi-elite, amateur), stage of season (i.e., early season, midseason, end season, off-season; Lonsdale et al., 2009), and psychometric scales (described below). The survey was voluntary and took the participants approximately 9 min to complete.

Psychometric Scales

Coaches' Interpersonal Behaviors. The 24-item Interpersonal Behaviors Questionnaire (IBQ; Rocchi, Pelletier, & Desmarais, 2017) was used to measure the athletes' perceptions of their main coaches' needs-supportive and controlling behaviors. The IBQ includes four-item subscales for each respective psychological need supported/controlled, all scored on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*; Rocchi, Pelletier, Cheung, Baxter, & Beaudry, 2017). Two example items include "My coach gives me the freedom to make my own decisions" (i.e., autonomy support) and "My coach imposes their decisions on me" (i.e., autonomy control). Consistent with prior research (Rocchi, Pelletier, & Desmarais, 2017), a robust six-factor model, $\chi^2 = 826.432$ (237) $p < .001$; comparative-fit index = .955; Tucker–Lewis index = .947; goodness-of-fit index = .906; root mean square error of approximation = .061, was calculated that outperformed a comparative unidimensional model (see Supplementary Tables 1–10 [available online] for further detail). Cronbach's alpha ranged from .86 (competence–support) to .93 (relatedness–control) in the present sample.

Psychological Needs Satisfaction and Frustration. The 18-item Need Satisfaction and Frustration Scale (Longo, Gunz, Curtis, & Farsides, 2016) was adapted to measure the athletes' perceptions of psychological needs satisfaction and frustration in their sport. The Need Satisfaction and Frustration Scale was composed of six 3-item subscales for each psychological need satisfied/frustrated and scored from 1 (*strongly disagree*) to 7 (*strongly agree*). Two examples include "In my sport . . . I feel very close and connected with other people" (i.e., relatedness satisfaction) and "I feel a bit alone when with other people" (i.e., relatedness frustration). A six-factor model with covariance paths has previously been found in educational contexts (Longo, Alcaraz-Ibáñez, & Sicilia, 2018; Longo et al., 2016). However, given that the Need Satisfaction and Frustration Scale has not been tested among athletes, we conducted a confirmatory factor analysis, and acceptable to good fit indices were found, $\chi^2 = 598.405$ (120) $p < .001$; comparative-fit index = .926; Tucker–Lewis index = .906; goodness-of-fit index = .909; root mean square error of approximation = .076, which substantially exceeded a comparative unidimensional model (see Supplementary Table 1 [available online]). Cronbach's alpha values ranged from .72 (autonomy frustration) to .90 (competence satisfaction).

Athlete Burnout. The Athlete Burnout Questionnaire (Raedeke & Smith, 2001) included three 5-item subscales for emotional and physical exhaustion (e.g., "I feel overly tired from my sports 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 scoring system was used, ranging from 1 (*almost never*) to 5 (*almost always*).

Excellent psychometric properties have been found for the Athlete Burnout Questionnaire among several athlete populations (Gerber et al., 2018; Gustafsson et al., 2017). Cronbach's alpha ranged from .82 (reduced accomplishment) to .83 (sport devaluation).

Subjective Vitality. Subjective vitality was assessed using an adapted version of Ryan and Frederick's (1997) 6-item scale, using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very true*). An example item includes "(During sport) I feel energized." Several studies have shown sound psychometric properties for a one-factor subjective vitality model in athletes (Li, 2010; Ryan & Deci, 2017). Cronbach's alpha was .84.

Data Management

The raw data were transferred into SPSS (version 25.0; IBM Corp., Armonk, NY), and two of the research team checked each individual item and inspected for outliers and nonnormality for quality assurance. Across all values, skewness (highest = 1.648) and kurtosis (highest = 3.169) were within acceptable ranges for parametric testing. Based on available information, through applying the expectation maximization algorithm using intercorrelated scale items (Field, 2013), Little's Missing Completely at Random test ($p > .05$) indicated that the null hypothesis and the missing data were missing completely at random cannot be rejected, suggesting it is unlikely that the missing data in the raw data set are missing not at random.

Statistical Analyses

The LPA was conducted using Mplus (version 7.3; Muthén & Muthén, 2012), and a series of models from one to six latent profiles were tested using maximum likelihood estimation with robust standard errors (Magnusson, 1998). We did not include covariates due to the risk of assumption violation in LPA (Marsh, Lüdtke, Trautwein, & Morin, 2009). Model fit solutions were determined through the comparison of several recommended fit statistics (Myers et al., 2018), including the Bayesian information criterion (BIC), sample size-adjusted BIC, Akaike information criterion, Vuong–Lo–Mendell–Rubin Likelihood Ratio Test (LRT), and Lo–Mendell–Rubin adjusted LRT. Lower Akaike information criterion, BIC, and sample size-adjusted BIC values signify a better fitting model. To illustrate, an elbow plot outlining changes (Δ) in information criterion for Profiles 2–6 were calculated in Figure 2. The LRT values indicate whether the model fits significantly better ($p < .05$) than a solution with one fewer profile; however, statistical sensitivity was considered (Henson et al., 2007). The entropy criterion (values of >0.80 indicate acceptable model fit) was reported, with higher entropy scores suggesting improved model fit. Individuals were then assigned to respective profiles based on average posterior probabilities. The aforesaid fit indices were reported alongside the percentages of the sample within each profile in Table 1. Finally, interpretation value, theoretical meaningfulness, and profile sample size were considered when choosing the final model (Lindwall et al., 2017). To support an interpretation of the final model, figurative labels were applied to the retained profiles, and the profile total mean scores were reported in Table 2 and then standardized as z scores and inputted into a bar chart (Figure 3).

Following LPA, we assessed whether profile membership predicted variance in study outcomes of psychological needs-satisfaction/frustration variables, burnout dimensions, and subjective vitality using a multivariate analysis of covariance using SPSS (version 25.0; IBM Corp.). Profile memberships were applied as the independent variable, with gender, level of participation (i.e., elite, semi-elite, amateur), and season stage (i.e., pre-, early, mid-, or end season) included as fixed controlling factors. Partial eta squared (η_p^2) was reported to determine the strength of effects, with the values of .01, .06, and ≥.14 interpreted as small, medium, and large effects, respectively (Field, 2013). Adjusted R^2 values were reported for the total proportion of variance predicted for each outcome, and after revealing significant multivariate effects based on $p < .05$, we used a Bonferroni post hoc test to assess comparisons between retained latent profiles. The

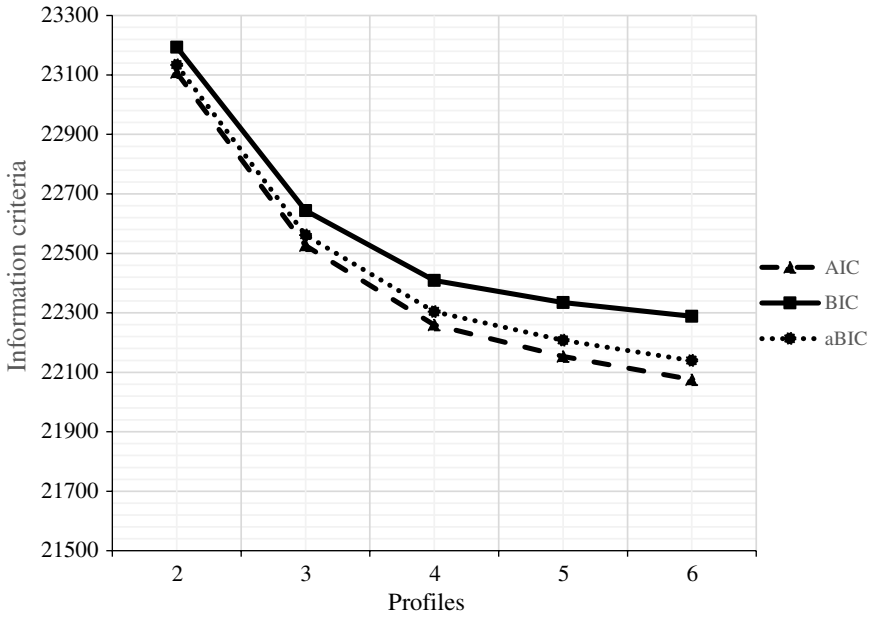

Figure 2 — Elbow plot outlining changes in information criteria for profiles 2-6 in the latent profile analysis. Note: The flattest angle on the elbow plot can be seen between profiles 5 and 6, indicating a level of diminishing returns for the inclusion of further profiles. AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = sample-size-adjusted BIC.

Table 1 Results of Latent Profile Analysis Including Model Fit Indices and Comparisons

Model fit	One profile	Two profiles	Three profiles	Four profiles	Five profiles	Six profiles
AIC	24,516.062	23,107.644	22,525.770	22,259.296	**22,153.264**	22,075.465
BIC	24,570.415	23,193.703	22,643.535	22,408.767	**22,334.440**	22,288.348
aBIC	24,532.313	23,133.375	22,560.981	22,303.987	**22,207.435**	22,139.116
Entropy	n/a	0.934	0.876	0.888	**0.904**	0.901
Vuong–LRT	n/a	0.0000*	0.0000*	0.2125	**0.0131***	0.3285
aLRT	n/a	0.0000*	0.0000*	0.2175	**0.0141***	0.3352
Profile classification probabilities	n/a	.95, .99	.92, .97, .95	.95, .92, .92, .95	**.93, .94, .95, .97, .91**	.91, .92, .94, .93, .99, .86
Sample percentage for profile(s)						
Profile 1	100%	18%	29%	54%	**28%**	6%
Profile 2	—	82%	14%	28%	**53%**	27%
Profile 3	—	—	57%	14%	**8%**	51%
Profile 4	—	—	—	4%	**4%**	8%
Profile 5	—	—	—	—	**7%**	2%
Profile 6	—	—	—	—	—	6%

Note. Bold highlighted text indicates the best-fitting model. AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = sample-size-adjusted BIC; Vuong–LRT = p value for Vuong–Lo–Mendell–Rubin likelihood ratio test; aLRT = p value for adjusted likelihood ratio test.
*Statistical significance at $p < .05$.

Table 2 Total Mean Scores for the Retained Profiles and Full Sample for Subscales Measured Through the IBQ

Variable subscale within the IBQ	Sample	Profile 1: *"Supportive developmental coach"*	Profile 2: *"Needs-indifferent coach"*	Profile 3: *"Overly critical coach"*	Profile 4: *"Harsh controlling coach"*	Profile 5: *"Distant controlling coach"*
Autonomy-support	19.74 (4.510)	23.524 (0.294)	19.591 (0.185)	16.715 (0.783)	10.462 (1.207)	14.753 (0.637)
Autonomy-control	14.53 (4.953)	10.709 (0.421)	14.998 (0.240)	17.803 (0.669)	22.532 (0.718)	17.657 (0.757)
Competence-support	22.30 (4.458)	25.808 (0.219)	22.511 (0.159)	19.389 (0.693)	12.456 (1.051)	15.849 (1.081)
Competence-control	08.77 (4.668)	5.327 (0.182)	8.118 (0.146)	16.423 (0.766)	21.663 (0.883)	10.815 (0.902)
Relatedness-support	19.56 (5.078)	24.642 (0.279)	19.449 (0.184)	16.466 (0.463)	7.593 (0.578)	10.660 (0.731)
Relatedness-control	11.38 (4.961)	6.568 (0.237)	11.495 (0.194)	15.239 (0.603)	23.559 (0.782)	18.125 (0.587)

Note. Each scale includes four items scored on Likert scale of 1–7, and total scores range from a possible 4–28, with 14 representing midpoint. IBQ indicates Interpersonal Behaviors Questionnaire.

profile total mean scores and unstandardized mean score comparisons were reported in Table 3.

Results

Descriptive Statistics

A total of 685 athletes took part (mean age = 23.39 years, $SD = 6.22$, male = 71%), with 90.50% of the sample in "early" to "midseason," while 4.70% were in "pre-" or "end season," and 4.90% in "off-season." A total of 92% of the sample took part in interactive team sports, while 8% participated in coactive sports. Over half, 58.40%, reported they competed at the amateur level (i.e., local/county leagues), 25.90% at semi-elite (i.e., semi-professional, regional, or country representative), 1.20% elite (i.e., professional, international), and 14.50% recreational (i.e., primary purpose of the sport is participation). On average, the participants took part in 5.95 ($SD = 2.53$) and 2.25 ($SD = 1.41$) hr of training and competition per week, respectively. A correlations matrix and further descriptive statistics for the study outcomes, split by demographic and sporting factors, are presented in Supplementary Tables 9 and 10 (available online).

Latent Profile Analyses

Model fit statistics for the iterative profile extraction process are reported in Table 1. The elbow plot (see Figure 2) showed that, with the addition of more profiles, the Δ in Akaike information criterion, BIC, and sample size-adjusted BIC decreased. However, the flattest

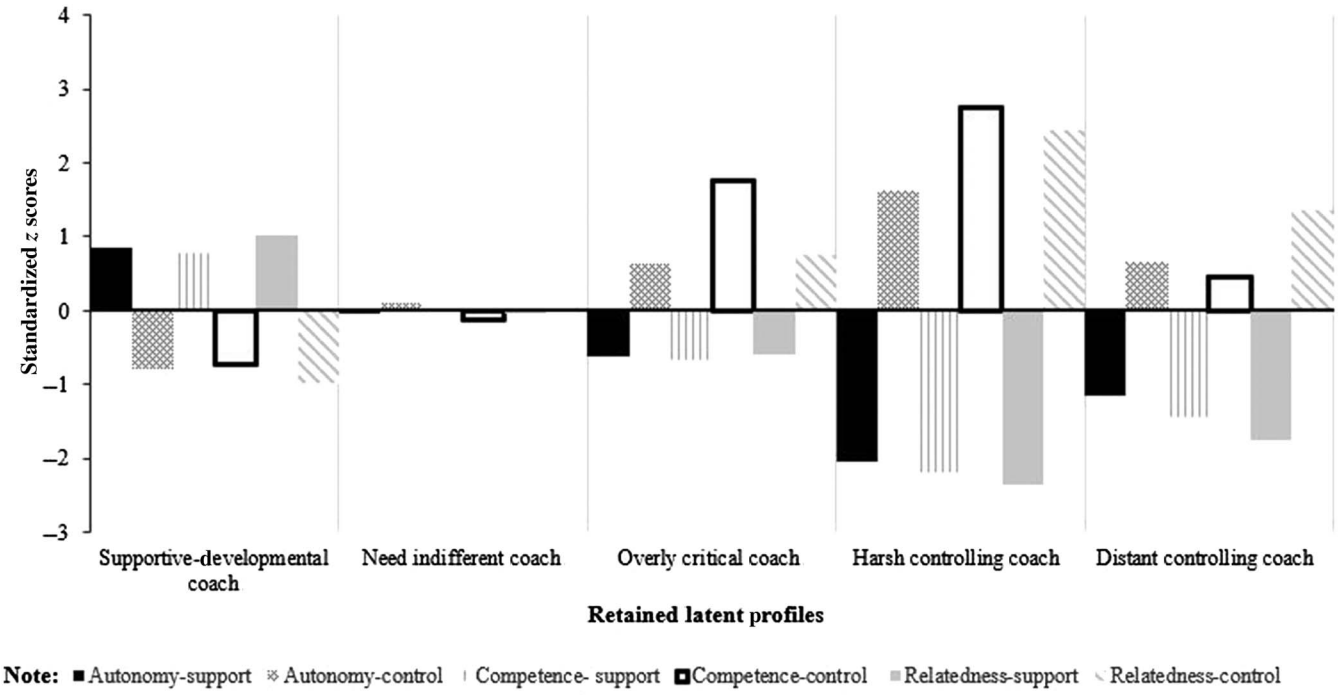

Figure 3 — Standardized construct *z* scores for Interpersonal Behaviors Questionnaire variables among the five retained profiles with corresponding figurative labels.

Δ angle occurred between Profiles 5 and 6, demonstrating a level of diminishing returns after five profiles. The LRT ratio tests showed that both two and three profiles were a significantly better ($p < .001$) fit than one fewer profile, but four profiles were not significantly better than three ($p > .05$). However, five profiles were a significantly better fit than four ($p < .05$), and supporting the information criterion changes, six profiles were not significantly better than five ($p > .05$). Entropy was highest at a two-profile solution, followed by a five-profile solution. Taken collectively, the five-profile solution was retained as the best-fitting model, and it displayed a quantitatively and qualitatively sound model with sufficient theoretical interpretability and parsimony. The five distinct profiles were further supported by consistently high posterior probability classification values of .93, .94, .95, .97, and .91.

Retained Five-Profile Solution

The mean total IBQ scores for the five retained latent profiles are presented in Table 2. Relative to the sample total mean, Profile 1 ($n = 191$, 27%) displayed high levels of needs-supportive behaviors and the lowest levels of controlling behaviors, and thus supported H1a, labeled as "supportive-developmental coach," focused on athlete well-being and psychological growth. Supporting H3a, Profile 2 ($n = 366$, 53%) showed moderate levels across all IBQ variables and was thus labeled as a "needs-indifferent coach" to denote a lack of strong interpersonal behaviors in either direction. Conversely, Profiles 3–5 displayed similar patterns of lower needs-supportive behaviors and higher controlling behaviors. However, both within and across profiles, the separations between support and control over each need were most pronounced in Profile 4 ($n = 28$, 4%), henceforth labeled as a "harsh-controlling coach," supporting H2a. Profiles 3 ($n = 52$, 8%) and 5 ($n = 48$, 7%) indicated that, while all variables were higher or lower than the sample total means in an undesirable direction, the largest separations occurred for competence-control (Profile 3) and relatedness-control (Profile 5). Those profiles were not expected and were respectively labeled as "overly critical coach" and "distant coach." No support for H4a was found, as no profile displayed overlapping high needs control and needs support. Figure 3 illustrates the balance between needs-supportive and needs-controlling behaviors for the five retained profiles through *z* score values in a bar graph. Overall, Section A of the study hypotheses had support, as both optimal (i.e., supportive-developmental), nonoptimal (i.e., harsh controlling), and moderate (i.e., needs indifferent) profiles emerged. However, we did not predict the emergence of the "overly critical coach" and "distant coach," and thus displays novel latent groupings of athletes.

Profile Membership as a Predictor of Mental Health Outcomes

After adjustment for covariate effects (see Supplementary Table 9 [available online]), the corrected model revealed a significant effect for profile membership on the three burnout dimensions of emotional and physical exhaustion, $F(5, 680) = 13.140$, $p < .01$, $\eta_p^2 = .18$, $R^2 = .17$, reduced accomplishment, $F(5, 680) = 18.687$, $p < .01$, $\eta_p^2 = .22$, $R^2 = .22$, and sport devaluation, $F(5, 680) = 17.628$, $p < .01$, $\eta_p^2 = .16$, $R^2 = .15$, yielding large effects. A further multivariate effect was found for competence frustration, $F(5, 680) = 8.802$, $p < .01$, $\eta_p^2 = .12$, $R^2 = .10$, and satisfaction, $F(5, 680) = 16.904$, $p < .01$, $\eta_p^2 = .14$, $R^2 = .13$; relatedness frustration, $F(5, 680) = 12.083$, $p < .01$, $\eta_p^2 = .17$, $R^2 = .15$, and satisfaction $F(5, 680) = 21.532$, $p < .01$, $\eta_p^2 = .13$, $R^2 = .12$, and autonomy frustration, $F(5, 680) = 13.129$, $p < .01$, $\eta_p^2 = .25$, $R^2 = .19$, and satisfaction, $F(5, 680) = 27.330$, $p < .01$, $\eta_p^2 = .27$, $R^2 = .25$, yielding moderate to large effects. Finally, profile membership revealed a significant effect on

Table 3 Retained Profile Total Mean Scores and Unstandardized Total Mean Score Comparisons Through Bonferroni-Adjusted Post Hoc Comparisons

Outcome variable	Profile 1 (supportive–developmental coach)	Profile 2 (need-indifferent coach)	Profile 3 (overly critical coach)	Profile 4 (harsh controlling coach)	Profile 5 (distant controlling coach)	Profile 1 vs. 2	Profile 1 vs. 3	Profile 1 vs. 4	Profile 1 vs. 5	Profile 2 vs. 3	Profile 2 vs. 4	Profile 2 vs. 5	Profile 3 vs. 4	Profile 3 vs. 5	Profile 4 vs. 5
Autonomy satisfaction	16.83 (2.74)	14.50 (2.50)	13.82 (2.78)	10.95 (3.52)	12.80 (2.73)	2.33*	3.01*	5.88*	4.03*	0.68	3.55*	1.70*	2.87*	1.02	−1.85*
Autonomy frustration	09.18 (4.05)	11.83 (2.64)	12.80 (2.81)	14.04 (3.46)	12.07 (2.90)	−2.65*	−3.62*	−4.86*	−3.52*	−0.97	−2.21*	−0.87	−1.24	0.100	1.34
Competence satisfaction	16.15 (3.10)	14.51 (2.56)	13.39 (2.75)	14.37 (4.23)	13.53 (2.59)	1.64*	2.76*	1.78*	2.62*	1.12	0.14	0.98	−0.98	−0.14	0.84
Competence frustration	08.63 (4.28)	10.35 (3.33)	12.14 (3.08)	11.08 (4.03)	10.88 (3.93)	−1.72*	−3.51*	−2.45*	−2.25*	−1.79*	−0.73	−0.53	1.06	1.26	0.20
Relatedness satisfaction	17.38 (2.95)	15.64 (2.61)	15.07 (3.13)	13.66 (4.29)	13.45 (3.73)	1.74*	2.31*	3.72*	3.93*	0.57	1.98*	2.19*	1.41	1.62*	0.21
Relatedness frustration	06.92 (3.88)	08.92 (3.05)	10.55 (4.15)	11.93 (5.07)	10.06 (3.86)	−2.00*	−3.63*	−5.01*	−3.14*	−1.63*	−3.01*	−1.14	−1.38	0.49	1.87
Exhaustion	11.05 (3.61)	13.21 (3.44)	14.27 (3.06)	13.79 (3.7)	13.02 (3.61)	−2.16*	−3.22*	−2.74*	−1.97*	−1.06	−0.58	0.19	0.48	1.25	0.77
Accomplishment	11.74 (3.55)	13.62 (2.94)	15.31 (3.56)	16.39 (3.08)	15.71 (2.89)	−1.88*	−3.57*	−4.65*	−3.97*	−1.69*	−2.77*	−2.09*	−1.08	−0.40	0.68
Devaluation	09.45 (3.69)	11.29 (3.95)	13.31 (4.44)	14.46 (4.76)	13.98 (3.76)	−1.84*	−3.86*	−5.01*	−4.53*	−2.02*	−3.17*	−2.69*	−1.15	−0.67	0.48
Vitality	28.98 (4.24)	26.10 (3.92)	24.21 (4.38)	24.37 (5.26)	23.51 (5.11)	2.88*	4.77*	4.61*	5.47*	1.89*	1.73	2.59*	−0.16	0.70	0.86

Note. Values are presented as mean (*SD*).
*Statistically significant unstandarized mean differences.

subjective vitality, $F(5, 680) = 18.771$, $p < .01$, $R^2 = .16$, with a large effect size ($\eta_p^2 = .19$).

Bonferroni post hoc comparisons revealed support for Section B of the study hypotheses, to the extent that the "supportive-developmental" profile was the most likely to score favorably on all of the study outcomes (H1b, 2b, 3b, 4b; see Table 3). Further hypotheses support was shown in that the largest unstandardized mean differences were between the "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 with 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 behaviors in profiles, the "needs-indifferent" profile scored more favorably on nine of 10 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 behaviors 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 the highest levels of competence frustration, although 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 with the "overly critical" coach profile. Finally, 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 (see Supplementary Tables 1–10 [available online] for further detail).

Discussion

This study advanced BPNT by combining a traditional variable-centered approach (e.g., Balaguer et al., 2012; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Li et al., 2013), with a person-centered LPA approach, extracting latent profiles of athletes from the interactive effects of perceived need-supportive and need-controlling coach behaviors. 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 found the emergence of a "supportive-developmental" profile, delineated by a coach focused on athlete well-being and displaying the most positive mental health outcomes (H1b, 2b, 3b, 4b). However, three diverse profiles, reflective of a more needs-controlling coach, emerged and showed increased burnout symptomology and deleterious levels of needs-satisfaction and frustration. Collectively, the findings provide novel advancements to BPNT (Ryan & Deci, 2008), to the extent that substantial nuance was highlighted in athletes' social context, likely uncaptured by existing variable-centered studies. The retained profiles highlighted the subsequent mental health effects of such environments, wherein profiles characteristic of needs-controlling or needs-indifferent coaches could be targeted for interventions to promote needs-supportive coaching communication (Hancox et al., 2017).

Latent Profile Analysis

The composition of the five retained profiles supported Ryan and Deci's (2008) characterization of social environments reflecting varying degrees of needs-supportive and -controlling coach behaviors ($H_{1a,2a,3a,4a}$; Bhavsar et al., 2019). Existing covariance values in BPNT studies supported the emergence of the "supportive-developmental" and "harsh-controlling" profiles, displaying inverse relationships between needs-controlling and needs-supportive behaviors, and are evident educational, athlete, and physical activity samples (Esdar, Gorges, & Wild, 2016; Haerens et al., 2018; Jaakkola, Wang, Soini, & Liukkonen, 2015; Matosic, & Cox, 2014). However, the extraction of "needs-indifferent,""distant controlling," and "overly critical" coach profiles are novel contributions to the BPNT literature.

Specifically, the relative lack of direction of perceived needs-support/control in either way suggests a "needs-indifferent" profile of athletes who may feel their needs are not actively thwarted or supported, but perhaps overlooked by their coach (Bhavsar et al., 2019). In an educational context, Cheon et al. (2019, p687) were the first to describe need-indifferent teachers who "in tone, content, and interpersonal behaviour . . . pays little or no attention to the student's needs, goals, or concerns, usually because the teacher pays so much attention to his or her own needs, goals, and concerns." However, it is important to highlight that "need-indifferent" coach behaviors were not explicitly assessed, and further work will need to differentiate the factor structure of the construct (Costa, Ntoumanis, & Bartholomew, 2015). The additional retained profiles, labeled as "distant controlling" and "overly critical" coaches, showed unique and novel features to athletes' social environments, likely uncaptured by a variable-centered analysis (e.g., linear regression; Myers et al., 2018). Supporting the SDT position that some coaches give preferential treatment to one or more needs (Ryan & Deci, 2000), the "distant controlling" profile displayed elevated levels of relatedness frustration and low relatedness satisfaction, and the "overly critical" profile reported low levels of competence satisfaction and high levels of competence frustration. A further examination of the profile total mean values (Table 3) indicates that the "overly critical" profile's relatedness satisfaction/frustration and the "distant controlling" profile's competence satisfaction/frustration were relatively close to the sample total means.

The high prevalence (i.e., 72%) of the less optimal profiles (i.e., excluding the "supportive-developmental") underscores the need for interventions designed to increase sport coaches' adoption of needs-supportive principles (Hancox et al., 2017). In order to practically address such issues, evidence suggests that individuals can be receptive to their coach's modified interpersonal style through the use of SDT-informed behavior change techniques and communication strategies (Ntoumanis, Quested, Reeve, & Cheon, 2018). Such examples include the provision of activity choice and participant input (Shannon et al., 2018), acknowledgement of barriers and conflict (Fin, Moreno-Murcia, León, Baretta, & Júnior, 2019), use of open-ended questions (Cheon, Reeve, Lee, & Lee, 2015), and positive instructional feedback (Ntoumanis, ThøgersenNtoumani, Quested, & Hancox, 2017). Equally, Delrue et al. (2019) suggested that athletes can identify controlling coaches' practices (e.g., domineering, demanding) that are detrimental to well-being, and preliminary evidence suggests that individuals can differentiate indifferent instructor styles (Cheon et al., 2019). Therefore, coach education programs could raise an awareness of, and identify nonoptimal communication practices to discourage, controlling or impersonal coach behaviors (see Bartholomew, Ntoumanis, & Thorgersen-Ntoumani, 2009 for a review).

Profile Membership as a Predictor of Mental Health Outcomes

The contribution of extracting latent profiles was further supported in the variable-centered results, which emphasized how unique needs-supportive/controlling contexts may have adaptive and maladaptive effects on athlete mental health outcomes. This position is strengthened by our analysis, which included several statistical controls that have been linked with athlete mental health, including gender, seasonal stage, and competitive levels, (Gustafsson et al., 2017; Lonsdale et al., 2009). Specifically, and with statistically significant comparisons with all respective groups, the "supportive-developmental" profile yielded the highest psychological needs-satisfaction (H_{3b}) and subjective vitality (H_{4b}) scores and the lowest levels of psychological needs frustration (H_{2b}) and two burnout dimensions of accomplishment and sports devaluation (H_{1b}). Contrastingly, the "harsh-controlling" profile scored the highest in the two burnout dimensions of accomplishment and sports devaluation, autonomy and relatedness frustration, and lowest in autonomy satisfaction, whereas the "distant-controlling" and "overly critical" profiles yielded the highest or lowest total mean values in an undesirable direction for the remaining variables. Taken collectively, our study supports a growing body of research indicating the influential role of needs-supportive social environments on sports-specific markers of athlete mental health (Balaguer et al., 2012; Hancox et al., 2017; Langan, Toner, Blake, & Lonsdale, 2015).

Considered within an SDT process framework (see Figure 1), the predictive role of the "supportive-developmental" and "harsh-controlling" profile membership on both needs satisfaction (H_{3b}) and needs frustration (H_{2b}) supports a corpus of literature supporting SDT hypotheses across domains and cultural contexts (Ryan & Deci, 2017). However, a novel contribution was how consistent with the figurative labels applied, the "overly critical" coach profile displayed the lowest levels of competence satisfaction and the highest levels of competence frustration, and the "distant controlling" coach profile reported the lowest levels of relatedness satisfaction. These findings suggest an undesired effect if the differential support/control is exerted over one or more psychological needs (Ryan & Deci, 2017).

Importantly, the athletes' and coaches' agreements/disagreements regarding their coaches' behaviors are significant for the relative prediction of needs satisfaction/frustration (Rocchi & Pelletier, 2018). As such, both athletes and coaches may benefit from participating in needs-supportive communication interventions (Ntoumanis et al., 2018). Furthermore, of all the needs-satisfaction/thwarting variables, profile membership predicted the largest proportion of variance for autonomy satisfaction and the least for competence frustration. These results are consistent with a recent review of 20 studies examining the relative influence of social agents on athletes' psychological needs, in which coaches exerted the largest effect on autonomy, but peers were more influential regarding competence (Chu & Zhang, 2019). Therefore, further BPNT research may consider examining the co-occurrence of needs-supportive/controlling behaviors from both coaches and peers, which may explain more variance in athletes' psychological needs (Jõesaar, Hein, & Hagger, 2012; Quested et al., 2013). Understanding the influence of needs-indifferent behaviors is also likely to explain more variance in needs-satisfaction/frustration (Bhavsar et al., 2019).

The finding that "harsh-controlling" scored the highest in burnout dimensions (H_{1b}) supports a recent meta-analysis that revealed negative associations with social support and burnout and direct relationships between negative social interactions and burnout (Pacewicz, Mellano, & Smith, 2019). Research suggests that controlling coach behaviors can result in an increased probability of athlete preoccupation with concern about mistakes, avoidance of failure, and subsequent devaluation and cynicism about their sport (Lonsdale et al., 2009; Gustafsson et al., 2017). Finally, the large effect explained by profile membership (H_{4b}) on subjective vitality is consistent with several athlete mental health studies (Adie et al.,, 2008; Adie, Duda, & Ntoumanis, 2012; Balaguer et al., 2012; Hancox et al., 2017). This finding adds to the view that athletes feel more energy during their sport when they feel their needs are supported by their coach.

Limitations and Future Directions

While the present study extended the testing of BPNT in sport, there are some limitations. For instance, we employed a cross-sectional design, and therefore, causal inferences cannot be drawn. An additional sample in our study would have determined profile consistency, or indeed, longitudinal prospective research could help determine temporal patterns of profile membership(s) over the course of a competition season (Lindwall et al., 2017; Myers et al.,, 2018). In terms of further exploring the effect of psychological needs on athlete mental health, further research may consider measuring global mental health constructs beyond the sports-related outcomes assessed in the present study (see Vallerand, 2001). Further, assessing need-indifferent behaviors (Bhavsar et al., 2019) will be important, in addition to the needs-supportive/controlling role of peers, who are likely implicated in athlete mental health. Finally, future testing of BPNT in longitudinal and intervention studies may consider assessing if needs-satisfaction/frustration exerts a mediating role in motivational components (e.g., amotivation, intrinsic motivation), which were not present in the current analyses.

Summary and Conclusions

Promoting athlete mental health within sport is an important goal for researchers, practitioners, and policy makers (Breslin & Leavey, 2019), and therefore, an understanding of influential psychosocial factors is valuable. As such, this study simultaneously employed LPA to profile athletes based on the interaction effects between perceived needs-supportive and controlling coach behaviors, and; applied profile membership as a predictor of mental health outcomes. The study hypotheses were largely supported and revealed the emergence of profiles characteristic of a more needs-supportive, needs-indifferent, or controlling social contexts, with the novel additions of athlete profiles displaying differential mistreatment for their competence and relatedness needs. The predictive role of profile membership on mental health outcomes was also in line with BPNT tenets (Ryan & Deci, 2008) to the extent that the "supportive-development" profile characteristic of a more needs-supportive social context reported improved needs satisfaction and subjective vitality (Quested et al., 2013; Rocchi, & Pelletier, 2018), whereas the "harsh-controlling" profile was linked to maladaptive outcomes, including psychological needs-frustration and athlete burnout (Hancox et al., 2017; Pacewicz et al., 2019). A key finding of this study is the 72% prevalence rate within less optimal athlete profiles, who may, therefore, benefit from interventions designed to promote mental health through needs-supportive communication (Gustafsson et al., 2017; Hancox et al., 2017). Evidence-based strategies such as increasing athlete choice and input while

acknowledging barriers and conflict could be considered in intervention program development (Ntoumanis et al., 2018). From a research and theoretical perspective, further longitudinal prospective and controlled intervention studies are required, in which the consistency and temporal patterns of profile membership are examined (Lindwall et al., 2017). Such research may consider modelling additional SDT components, including need-indifferent behaviors, motivational regulations, and needs-support from other social agents, such as peers (Li et al., 2013).

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