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The Influence of Athletes' Psychological Needs on Motivation, Burnout and Well-Being: a Test of Self-Determination Theory

Shannon, S., Brick, N., Prentice, G., & Breslin, G. (Accepted/In press). The Influence of Athletes' Psychological Needs on Motivation, Burnout and Well-Being: a Test of Self-Determination Theory. *Journal of Clinical Sport Psychology*.

Link to publication record in Ulster University Research Portal

Published in:
Journal of Clinical Sport Psychology

Publication Status:
Accepted/In press: 23/06/2023

Document Version
Author Accepted version

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Download date: 17/07/2023

Title: The Influence of Athletes' Psychological Needs on Motivation, Burnout and Well-Being: a Test of Self-Determination Theory.

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Abstract

Sport provides a significant role in the lives of athletes, however both positive and negative mental health effects may occur from sporting experiences, including burnout and/or well-being. A cross-sectional survey was conducted including 685 athletes (*M* age = 23.39, SD = 6.22, 71% = male), testing multiple, complementary, Self-Determination Theory (SDT) hypotheses linked to well-being and burnout. A multi-stage modelling approach encompassing confirmatory factor and path analysis was utilised, with results showing significant variance explained for well-being (R^2=.30) and burnout (R^2=.35). Several direct effects were found in line with SDT, including between; needs-support and needs satisfaction (β= .48), and needs-control and needs-frustration (β= .44); needs-satisfaction and motivational orientation (β= .25); needs-satisfaction and well-being (β= .37), and needs frustration and burnout (β= .25); motivational orientation and burnout (β= -.27), and motivational orientation and well-being (β= .18). Indirect effects were found for well-being and burnout via coach needs-support, needs satisfaction and motivational orientation in sequence (β=.24 and β=-.22, respectively); in addition to burnout via coach needs-control, needs frustration and motivational orientation in sequence (β=-.12). To conclude, coach-based, sporting mental health interventions that promote the utilisation of needs-supportive behaviours, whilst also highlighting the need to minimise needs-controlling behaviours, are recommended for the prevention of burnout and promotion of well-being in athletes.

Keywords: sport; wellness; psychology; health

The Influence of Athletes' Psychological Needs on Motivation, Burnout and Well-Being: a Test of Self-Determination Theory.

Sport participation can provide many mental health benefits for athletes in which social connections are forged, psychological development is positively influenced, and a sense of purpose is realised (Breslin & Leavey, 2019). Yet, increasing evidence has shown negative experiences that sport participation can bring, such as striving for success at the expense of personal well-being, resulting in burnout which can set the scene for more serious psychological consequences including depression and anxiety (Reardon et al., 2019). Related to these contrasting axioms of sporting experience, Keyes (2005) outlined that mental health encompasses two distinct but correlated continuums, namely, ill-being and well-being. Mental health can be measured at global (i.e., day-to-day), contextual (e.g., sport) and situational (i.e., present moment) levels (Lundqvist, 2011; Vallerand, 2007). Applied as an ill-being measure within sporting contexts, burnout is a commonly experienced negative psychological syndrome (Raedeke, 1997), encompassing three clustered symptoms of: (i) emotional and physical exhaustion, (ii) a reduced sense of accomplishment, and (iii) sport devaluation which proports to the development of a cynical attitude towards the once favoured sport. Burnout symptoms have increased progressively over time in athletes of all competitive levels (i.e., elite and non-elite) (Madigan et al., 2022) and deleterious consequences are established for higher burnout levels, including depressed mood, impaired social relationships, and sport withdrawal (Gustafsson et al., 2017). Conversely, subjective vitality (referred to herein as well-being) is an aspect of eudemonic well-being, defined as feelings of positive energy and aliveness (Ryan & Deci, 2008). When examined at the level of competitive sport, subjective vitality is associated with healthy psychological functioning (Adie et al., 2008; Li et al., 2013; Quested et al., 2013). An evidence-based, theoretical understanding of how sport can paradoxically both support and hinder such mental health

outcomes is needed, and represents a contemporary goal among policy makers, practitioners, and researchers (Madigan et al., 2019).

Theoretical frameworks can examine determinants and mediating factors associated with athlete mental health. Self-Determination Theory (SDT; Ryan & Deci, 2000) is one such validated and supported framework in the domain of athlete mental health (Shannon et al., 2019a), and is founded on the core principle that humans require ongoing satisfaction of three innate psychological needs to facilitate optimal mental health (Ryan & Deci, 2017). Specifically, within a mini-theory of SDT, Basic Psychological Needs Theory (BPNT), Ryan & Deci (2008) outline the needs of autonomy (i.e., provision of choice, volitional behaviour), competence (i.e., feelings of effectiveness) and relatedness (i.e., sense of belongingness). These needs are theorised to receive varied levels of support and/or control from significant others (e.g., coaches), resulting in differential needs-satisfactions and needs-frustrations.

A further SDT mini-theory, Organismic Integration Theory (OIT; Deci & Ryan, 2000), specifies the determinants (i.e., needs satisfaction/frustration) and consequences (e.g., well-being) of one's motivational orientation towards behaviours such as sporting participation. In OIT, motivation is hypothesised to exist along a continuum ranging from amotivation to intrinsic motivation, comprising a simplex pattern (Ryan & Deci, 2017). Intrinsic motivation refers to an inherent satisfaction experienced through sports participation, whereas integrated and identified regulations are the perceived personal congruence between one's sense of self and sport, and the personal benefits that sport offers, respectively (Li et al., 2013). Conversely, an athlete experiencing controlled motivational orientations may engage in sport to either seek approval from others (i.e., introjected regulation) or to avoid punishment/achieve rewards (i.e., external motivation). Lastly, an athlete who reports the absence of motivation is experiencing amotivation (Deci & Ryan, 2000). One established statistical method of capturing the above motivational orientations via

the continuum logic is through calculation the Relative Autonomy Index (RAI) (Howard et al., 2020). The RAI allocates a weighting to each motivational orientation, wherein a composite score reflects the degree of relative autonomy experienced, with higher scores reflecting more autonomous motivation, and lower scores reflecting a more controlled orientated motivation (Sheldon et al., 2017).

Combining the theoretical postulates from the above SDT mini-theories in relation to athlete mental health in sport, Ryan and Deci (2000) formally hypothesise that (i) needs satisfaction and needs-frustration are differentially predicted by perceived needs-supportive and needs-controlling behaviours from prominent social agents, such as an athlete's coach; (ii) RAI towards sport is also differentially predicted by the degree of needs satisfaction and needs-frustration experienced in sport, and; (iii) need satisfaction and needs-frustration, in addition to RAI, predict well-being and ill-being mental health outcomes, both directly, and plausibly in sequence with SDT's proposed casual chain(s) (e.g., needs-support > needs satisfaction > +RAI > +mental health, or; needs-control > needs-frustration > -RAI > -mental health). These hypotheses in the context of athletes' coaches determining chain(s) of events for understanding athlete burnout and well-being will be examined in the present study.

Parsing out and connecting the individual SDT hypotheses above to findings in the broad field of sport and exercise psychology, needs-supportive behaviours have reliably correlated with autonomous motivation through needs satisfaction, whereas conversely, controlling behaviours have consistently been associated with controlled motivation through needs frustration (Matosic et al., 2016; Ntoumanis et al., 2021). However, in terms of the consequences of motivational orientation towards sport, while a small number of studies have shown that autonomous motivation is associated with increased psychological well-being (Stenling et al., 2015), and decreased burnout (Isoard-Gautheur et al., 2012), the link with mental health outcomes has been relatively overlooked and represents a key literature gap to

be addressed (Pope & Wilson, 2012; Sheehan et al., 2018a). Independent of motivational orientation, a steady, growing body of literature suggests that when statistically controlled for, needs-satisfactions and needs-frustrations are associated with fewer and elevated athlete burnout symptoms (Shannon et al., 2022) and well-being (Warburton et al., 2020), suggesting unique positive and negative experiences concurrently occur through sport, that result in disparate mental health effects.

While extant SDT research may have begun to establish direct effects of psychological needs and motivation variables on mental health, Ryan and Deci's (2000) meta-theory emphasised that social environments affect outcomes such as health behaviour through indirect mediating mechanisms, as supported by SDT intervention studies (Ntoumanis et al., 2021). In this light, SDT literature focusing on mental health as key outcomes relatively underdeveloped. However, preliminary studies have reported an indirect pathway wherein coach needs-supportive behaviours have predicted higher needs satisfaction and less needs frustration, which has resulted in increased athlete well-being and fewer burnout symptoms (Balaguer et al., 2012; Hancox et al., 2017). Equally however, perceived needs-controlling behaviours by coaches have been linked to higher needs frustration and less needs satisfaction, resulting in subsequent elevated burnout and depleted well-being symptoms (e.g., Bartholomew et al., 2011a; Bartholomew et al., 2011b). Morales-Sánchez et al. (2020) recently showed that among youth athletes, perceptions of needs-controlling behaviours from coaches and needs frustration both directly predicted burnout, but also in sequence. In this case, the effect of needs-controlling coaching styles on burnout was reinforced through needs-frustration, which acted as a modulator.

Indeed, coaches exert a significant role in athletes' lives, including structuring time allocated to training and competition, seeking (or not) input on significant matters, providing feedback on skill and tactical development, and shaping the motivational climate (e.g., ego vs

task orientation) (Bartholomew et al., 2009). Despite such acknowledgements by both athletes and coaches (Rocchi & Pelletier, 2018), there is relatively scant literature on the concurrent role coaches exert in shaping *both* well-being and ill-being experiences in athletes through purported SDT mechanisms. Moreover, and highlighted within a previous SDT meta-analysis on burnout (Li et al., 2013), few burnout studies have simultaneously examined multiple hypotheses from SDT sub-theories outlined above, but rather examined sub-theories in isolation, justifying the need for a more comprehensive SDT-informed assessment. Consequently, a robust testing of Ryan and Deci's (2000) theorising should be multivariate and explore both direct and indirect sequences (e.g., psychological needs-support > needs satisfaction > RAI > burnout/well-being) which are deemed crucial to the understanding of psychosocial influences on athlete mental health (Ryan & Deci, 2017). Testing such hypotheses allows for a more nuanced approach to the design and implementation of mental health interventions for athletes, and/or surveillance of prominent factors during competitive seasons (Breslin et al., 2020).

Hence, the aim of the present study was to test an SDT model as specified in Figure 1, examining associations between athletes' psychological needs, RAI, burnout, and well-being. As sex (i.e., male/female) and sporting factors (e.g., competitive level, individual/team athlete) have been linked with athlete mental health (Gustafsson et al., 2017; Lonsdale et al., 2009) the model specified statistical controls. This study utilised a novel and comprehensive approach to concurrently test multiple SDT mini-theories towards understandings athlete mental health through contrasting hypotheses related to psychological needs and motivation, and as such, will inform advancement of SDT-informed mental health studies.

1.2 Hypotheses tested

Integrating extant research (e.g., Ntoumanis et al., 2021), we hypothesised that perceptions psychological needs-support from coaches would positively relate to needs-satisfaction, and

negatively relate to needs-frustration (Hypothesis 1, H_{1a}), as would perceptions of psychological needs-control from coaches associate with increased needs-frustration and decreased needs-satisfaction (Hypothesis 1, H_{1b}, See Figure 1). Secondly, and by integrating OIT research (Deci & Ryan, 2000; Hancox et al., 2017; Sheldon et al., 2017) needs-satisfaction and needs-frustration were hypothesised to result in positive and negative associations with RAI, respectively (Hypothesis 2, $H_{2a, b}$). Our third hypotheses were derived from BPNT tenets (Ryan & Deci, 2008) and consisted of a hypothesised positive association between well-being and needs satisfaction (Hypothesis 3, H_{3a}), and negative association between well-being and needs frustration (Hypothesis 3, H_{3b}). Fourthly, it was hypothesised that burnout symptoms would be negatively correlated with needs satisfaction (Hypothesis 4, H_{4a}), but positively correlated needs frustration (Hypothesis 4, H_{4b}). Furthermore, as per findings in Stenling et al. (2015) and Isoard-Gautheur et al.'s (2012), RAI was expected to positively associate with well-being, and negatively associate with burnout (Hypothesis 5, $H_{5a, b,}$ respectively). Then, by integrating multiple and complementary SDT indirect hypotheses (Ryan & Deci, 2017), we expected possible indirect effects of psychological needs-support from coaches on well-being and burnout through (a) needs satisfaction and (b) RAI in sequence (Hypothesis 6, $H_{6a, b}$). Likewise, we expected indirect effects of psychological needs-control from coaches on (c) well-being and (d) burnout through needs frustration and RAI (Hypothesis 6, $H_{6c, d}$). Lastly, indirect effects of needs satisfaction (Hypothesis 7, $H_{7a, b}$) and needs frustration (Hypothesis 7, $H_{7c, d}$) on well-being and burnout through RAI were hypothesised, accordingly.

Please insert Figure 1 here

2.0 Method

2.1 Inclusion criteria, recruitment, procedure and participants

Informed consent was received prior to participants completing the study, only adult athletes (≥18 years old) were included. Data was collected via an online survey using SurveyMonkey (Palo Alto, CA) software, adhering to the Data Protection Act (2018) provisions, and including cyber security policies and quality control checks. Recruitment strategies involved sending an email invitation to sports clubs across Ireland and the United Kingdom, survey links distributed on Twitter and social media outlets, and SMS/WhatsApp messages to sports team coaches, captains, and players to forward (i.e., snowball sampling). Participants confirmed their athlete status through an item consistent with the definition of sport, 'are you an athlete involved in a structured, competitive physical activity?' (Rejeski & Brawley, 1988). The online survey took approximately nine minutes to complete, and comprised demographic questions (i.e., sex, age) and sporting factors (i.e., sport type, average training and competition hours per-week, level of participation [i.e., elite, sub-elite, amateur]; Lonsdale et al., 2009), alongside psychometric scales (see below).

A total of 685 athletes took part (mean age = 23.39, SD = 6.22, 71% = male) with 92% of the sample engaging in interactive team sports, while 8% participated in individual sports. Participants competed at amateur level (72.9%; i.e., local/county leagues), semi-elite (25.90%; i.e., semi-professional, regional or country representative), and elite (1.20%; i.e., professional, international). The mean average hours of training was 6.74 (SD = 2.42) per-week and of competition was 2.84 (SD = 1.91) per-week. A total of 9.8% reported a recent injury.

2.2 Outcome variables

Needs-support and needs-control

Athletes' perceptions of their 'main coach's' needs-supportive and controlling behaviours was measured through the psychometrically validated 24-item Interpersonal Behaviours Questionnaire (IBQ; Rocchi et al., 2017), previously confirmed through factor analysis in

athlete burnout studies (Shannon et al., 2021). The IBQ included distinct items for each psychological need supported/controlled, for example; '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). Six four-item subscales were scored on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). Composite needs-support and needs-control variables were estimated via calculation of average scores and standard deviations, with a higher score reflective of increased perceptions of needs-support and needs-control (Rocchi et al., 2017).

Psychological needs satisfaction and frustration

The robust and validated 18-item Need Satisfaction and Frustration Scale (NSFS; Longo et al., 2016), successfully confirmed through factor analysis in athletes (Shannon et al., 2021) was assessed. Two examples included: 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). All items were scored on a 7-point Likert scale, with six 3-item subscales for each psychological need satisfied/frustrated. Responses ranged from strongly disagree (1) to strongly agree (7). Composite scores were created for needs satisfaction and needs frustration via calculation of average scores and standard deviations, with higher scores corresponding to increased levels (Longo et al., 2016).

RAI

The Sports Motivation Scale II (SMS-II; Pelletier et al., 2013) measured SDT's motivational continuum (Ryan & Deci, 2000), comprising six 3-item subscales for each respective regulatory style (i.e., amotivation, intrinsic and external motivation, introjected, identified, and integrated regulation). The SMS-II has undergone comprehensive validity assessments and is cross-culturally validated (Li et al., 2018). Items were scored on a 7-point Likert scale ranging from 'not at all true' (1) to 'very true (7). Relative weights were applied to items

among each regulatory style (e.g., intrinsic motivation ×3; integrated regulation ×2; identified regulation ×1; introjected regulation ×-1; extrinsic motivation×-2; amotivation ×- 3) (Sheldon et al., 2017). To produce the relative autonomy index (RAI) during path analysis specification (described later), a compositive RAI score was calculated by adding each regulatory style together using retained factor loadings from CFA analysis (see below). For descriptive purposes, average scores and standard deviations were calculated wherein higher SMS-II scores reflect a more autonomously-orientated motivation, whereas lower scores are reflective of a more controlled-orientated motivation (Pelletier et al., 2013).

Athlete burnout

Athlete burnout was assessed through the 15-item Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). The ABQ is internally consistent and well validated among athletes (Gerber et al., 2018). Clustered burnout symptoms of 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") are included (Raedeke & Smith, 2001). Items were scored on a 5-point Likert scale ranging from almost never (1) to almost always (5). A composite average burnout score was calculated, with higher scores reflecting increased burnout symptomology (Gerber et al., 2018).

Well-being

The Subjective Vitality Scale (SVS; Ryan & Frederick, 1997), captured perceptions of positive affect and energy available to the self, and represented well-being. An example item includes: "(During sport) I feel energised". The 6-item scale used a 7-point Likert scoring system ranging from not at all (1) to very true (7). A one-factor model has been confirmed across several validation studies, wherein higher scores are indicative of enhanced well-being (Ryan & Frederick, 1997). An average score and standard deviation were calculated.

2.3 Data management and statistical analysis

Raw data were transferred from SurveyMonkey software (Palo Alto, CA) into the Statistical Package for Social Sciences (SPSS, Version 25; IBM Corp, NY). Two members of the research team cleaned the data for possible false responses, assessed univariate (z-score method of above or below 3.29) and then confirmed that no outliers were present, and all variables displayed acceptable skewness and kurtosis statistics. Data was missing at random (Little's MCAR =p >.05), justifying the use of the Expectation Maximisation (EM) algorithm with intercorrelated items to estimate missing data (Field, 2013). Following estimation, descriptive statistics were calculated via construct mean and standard deviation scores, and all variables were estimated in a correlations (r) matrix.

Considering there were a total of 80 questionnaire items spanning six latent constructs, each with unique error variances, and 18 directional hypotheses tested, we opted for a multistage modelling approach, rather than full structural equation model (SEM). Multistage approaches perform comparably with, and represent a methodologically sound proxy of full SEM, whilst having the advantages of minimising estimation difficulties (Devlieger et al., 2016). We followed the guidance of McNeish and Wolf (2020) by firstly estimating measurement models of latent constructs in stage one, saving construct scores subsequently calculated by saving factor scores in line with model parameters that preserved latent covariance(s) and/or structural paths, along with error. Thereafter, scores in stage two, and calculating proxy latent variables for later specification as observed variables in path analysis.

Five Confirmatory Factor Analysis (CFA) measurement models corresponding to each questionnaire were assessed in Amos (version 25), including: (i) individual needs-supportive and needs-controlling latent dimensions loading onto their respective covaried global perceptions of needs-supportive and needs-controlling coach behaviours, (ii)

individual needs-satisfaction and needs-frustration latent dimensions loading onto their respective covaried global needs-satisfactions and needs-frustrations, (iii) six covaried motivational orientations with specified regulatory weights (see above), (iv) higher-order burnout model with a general factor and three sub-factors, and, (v) unitary subjective vitality model. Goodness-of-fit indices recommended by Hu and Bentler (1999) were used to assess the adequacy of the latent factors. The comparative fit index (CFI) and the Tucker-Lewis Index (TLI), with values of >.90 deemed satisfactory, and >.95 as good-to-excellent. The root mean square error of approximation (RMSEA) was reported, with values of close to <0.08 considered acceptable model fit. We also included the Chi-Square (χ^2) statistic but approached with caution given sample size sensitivities.

Following some revisions (described below), proxy latent variables were treated as observed variables in a path analysis model in AMOS (version 25), and specified in line with Figure 1. The variables, sex (i.e., male/female), level of participation (i.e., elite, sub-elite, amateur), and sport type (i.e., individual/team) (Lonsdale et al., 2009) were included as statistical controls, and regressed onto the dependent variables of burnout and well-being. The aforesaid model fit statistics, as outlined by Hu and Bentler (1999) were calculated to assess the adequacy of the structural model. Figure 2 was produced specifying standardised beta (β) coefficient values for each direct path, and R^2 values related to the proportion of total variance explained on the dependent variables. The Mahalanobis distance (d-squared) value was calculated to detect the presence/non-presence of multivariate outliers. A total of 84 cases displayed a Mahalanobis d probability value of <.05, and were subsequently removed from analysis for improved effect size accuracy (Field, 2013). Lastly, Bollen-Stine bootstrapping was conducted with 5000 samples to examine indirect effects, and improve precision of parameter estimates and fit indices (Byrne, 2001).

3.0 Results

3.1 Descriptive statistics

Descriptive statistics and the correlation matrix are shown in Table 1. Cronbach's alpha values ranged from .72 (SMS-II) to .94 (IBQ: needs-support from coaches). From a total possible mean scale averaged score of 7, the sample mean of 5.13 (SD = 1.04) for needs-support was relatively high, meaning that most athletes agreed-to-strongly agreed with statements suggesting their coach provided needs-supportive behaviours. Also, from a total possible mean scale averaged score of score of 7, perceived needs-control from coaches was relatively low (M=2.88; SD = 1.02), suggesting that most athletes disagreed with statements indicating needs-controlling behaviours from their coach. Total mean scale averaged scores for needs-satisfaction and needs-frustration were, respectively, above and slightly below the mid-points of a possible score of 3.50, suggesting most athletes felt relatively high needs-satisfaction and moderate-to-low needs frustration (see Table 1). Mean scale averaged sample scores for well-being and RAI were, accordingly, close to, or below the mid-way points of 3.50, suggesting moderate levels (see Table 1). Lastly, burnout levels were 2.49 and below the mid-way total score of 3.50, indicating the sample, on average, experienced burnout between 'almost never' to 'sometimes'.

Correlations ranged from moderate-to-strong throughout. The largest correlation pertained to expectantly, needs-support and needs-control (-.80). However, RAI and burnout (-.78) displayed a notably large correlation. Given all specified associations were statistically significant, the study hypotheses had preliminary support prior to specification of the path model.

Insert Table 1 here

3.3 Confirmatory Measurement Models

Results from the CFA measurement models are provided in Table 2. In stage 1, five of confirmatory factor analysis (CFA) measurement models displayed good-to-excellent goodness-of-fit indices as per the recommended cut-off points outlined by Hu and Bentler (1999) (TLI & CFI all >. 90; RMSEA all < 0.08). However, measurement model 3 (RAI) initially showed inadequate fit and was inspected for revisions. Specifically, one item per each of the three controlled motivational orientations (i.e., introjected regulations, extrinsic regulation, amotivation) displayed notably low factor loadings (< .40). In accordance with conventional measurement specification recommendations (Byrne, 2001), these items were removed, and model fit was found to be good-to-excellent. Following these revisions, in stage 2, CFA findings justified saving construct scores for calculation of the following proxy latent variables to be analysed in a path analysis model, including: (i) covaried needs-support and needs-control; (ii) covaried needs-satisfaction and needs-frustration; (iii) a relative autonomy index (RAI) comprising a composite motivational index produced via adding each adjusted dimension together; (iv) unitary burnout construct, and; (v) unitary subjective vitality construct.

Insert Table 2 here

3.4 Path Analysis Model

The path model displayed a good fit to the data (χ^2= 114.706 [23, 591], p < .05; TLI = 0.91; CFI = 0.95; RMSEA = 0.08), with no revisions required. Significant variance was explained for the study outcomes of well-being (R^2=.30) and burnout (R^2=.35), with significant support for study hypotheses, presented in Figure 2. Among the statistical controls, level of participation (β= -.16, p < 0.05), and sex (β= -.13, p < 0.05) were significantly associated with burnout; level of participation (β= .12, p < 0.05) and sex (β= .09, p < 0.05) were associated with well-being. Findings indicated that female and higher elite participants were more likely to report elevated burnout and reduced well-being.

Direct effects

Both H_{1a} and H_{1b} had some support, as needs-support was positively associated with needs satisfaction (β= .48, $p < 0.001$) and needs-control was positively associated with needs frustration (β= .44, $p < 0.001$). The reverse was not the case however, as needs-control did not relate to needs satisfaction, nor did needs-support relate to needs frustration.

H_{2a} was supported as needs satisfaction, but not needs frustration (H_{2b}), positively related with RAI (β= .25, $p < 0.001$). Well-being was positively associated with needs satisfaction (β= .37, $p < 0.001$, H_{3a}), but not with needs frustration (H_{3b}). Burnout was positively linked with needs frustration (β=.25, $p < 0.001$, H_{4b}), and inversely with needs satisfaction (β= -.20, $p < 0.001$, H_{4a}). RAI was negatively associated with burnout (β= -.27, $p < 0.01$, H_{5b}), and positively linked with well-being (β=.18, $p < 0.001$, H_{5a}).

Indirect effects

An indirect positive association was observed on well-being by needs-support through needs satisfaction and RAI in sequence (β=.25, $p < 0.01$, H_{6a}), and inversely on burnout through the same pathway (β= -.22, $p < 0.001$, H_{6b}). Indirect effects were also found on burnout (β=.12, $p < 0.01$) and well-being (β=-.07, $p < 0.01$), through needs-control, needs frustration and RAI in sequence ($H_{6c,d}$).

Lastly, indirect effects on burnout (H_{7b}), and well-being (H_{7a}), were found via needs satisfaction and RAI in sequence (β= -.07 and β= .05, $p < 0.05$, respectively), but not between needs-frustration and the remaining variables outlined in $H_{7c,d}$.

Insert Figure 2 here

4.0 Discussion

4.1 Overview of findings

The current study advanced testing of SDT (Ryan & Deci, 2000) and broader theoretical research on burnout (Madigan et al., 2022) through testing several, complementary, hypotheses that assessed links between psychological needs, motivational orientation (RAI), and sport-specific mental health outcomes among a large and demographically representative sporting sample. Results highlighted the differential, orthogonal, effect of how coaches may (i) improve well-being through brighter, synergistic experiences of psychological needs-support, needs satisfaction and autonomous motivational orientations, whilst also (ii) increasing the likelihood of darker experiences of burnout through psychological needs-control, needs frustration and controlled motivational orientations (Isoard-Gautheur et al., 2012; Stenling et al., 2015). Independent of the role of coaches, needs-satisfaction and needs-frustration directly related to burnout and/or well-being, and motivational orientation linked to fewer burnout symptoms and increased well-being, in addition to exerting a partial mediation association on both mental health variables from needs-satisfaction (Bartholomew et al., 2011a; Bartholomew et al., 2011b). Overall, we foremostly propose that practitioners and researchers consider interventions that promote coach-based, needs-supportive communication, whilst also limiting needs-controlling communication, during competitive sporting seasons where psychological changes invariably occur (Hancox et al., 2017).

Despite the mental health benefits and risks associated with facilitation or hinderance of the SDT needs-based and motivational variables tested in the present study (Gustafsson et al., 2017), it is important to note that descriptive data analysis provided a largely positive image of the athletes' psychological experiences. Compared to the scale mid-points, most individuals reported high needs-support and needs-satisfaction, low burnout, needs-control and needs-frustration, and moderate levels of well-being, and relative autonomous

motivational orientations. Among the statistical controls included in the analysis, level of participation and gender were related to both well-being and burnout, albeit associations were small. While a recent meta-analysis showed that athletes' level of participation did not exert a significant effect on burnout (Madigan et al., 2022), we found a small positive association for more elite athletes relative to amateur, and non-elite athletes. The effect may be linked to factors including continuous performance evaluations, excessive/ over-training, financial/career implications, and negative consequences of injury and deselection (Gustafsson et al., 2017). Female participants, both athletes and non-athletes, typically score less favourably on mental health outcomes than males, and therefore this finding was unsurprising (Breslin & Leavey, 2019).

Applying a two-stage approach to measurement and path model specification (McNeish & Wolf, 2020), independent CFA analyses largely supported the latent structure of the constructs, with only minor revisions required. While a full SEM is considered statistically 'purer' by extension of working directly with 'true' latent scores (Devlieger et al., 2016), we considered the extensive number of items, constructs, and hypotheses to present untoward risks to model misspecification. Therefore, saving construct scores as proxy latent variables in the path analysis helped retain a significant degree of error control (McNeish & Wolf, 2020), whilst assessing multiple, complementary, SDT hypotheses that have received limited, concurrent, testing in extant literature.

Findings from the path analysis model supported Ryan and Deci's (2000) theorising on differential mental health effects of social environments, and in the context of athletes, underscored the importance of coaches' interpersonal behaviours on athletes' psychological needs satisfactions and frustrations. Specifically, and consistent with extant research (e.g., Bartholomew et al., 2011a), needs-support from coaches directly related to needs-satisfactions. This association suggests that athletes felt greater psychological needs

satisfaction when, for example, their coach provided increased opportunity for input or a rationale for tasks (i.e., autonomy-support), encouragement to improve skills (i.e., competence-support), and took an interest in their well-being (i.e., relatedness-support) (Ntoumanis et al., 2018). Relatedly, the present study found a comparable orthogonal negative effect of controlling coaching behaviours of athletes' psychological needs frustrations (e.g., Bartholomew et al., 2011b). The findings infer that those coaches who, for example, denigrated athletes' ability (e.g., competence-control), restricted player input (e.g., autonomy-control), and approached athletes with a socially cold/distant demeanour (e.g., relatedness-control) are likely to frustrate athletes' psychological needs.

Notably, the findings that coach needs-control did not directly relate to needs satisfaction, and needs-support did not directly link to needs frustration, reinforces assertions that both variables, and their reciprocally valenced needs-satisfactions and needs-frustrations, are distinct constructs (Bhavsar et al., 2020; Hancox et al., 2017). Specifically, the data implies that the absence of a coach's needs-supportive behaviour is distinct from the presence of needs-controlling behaviours, and both have differential effects on needs-satisfaction and needs frustration (Rocchi et al., 2017). As such, during a competitive season, a coach may display low levels of both needs-supportive and needs-controlling behaviours and, in turn, an athlete may feel dissatisfied with the extent to which their needs are being met by their coach, but also not perceive that their needs are being actively frustrated (Shannon et al., 2021; Warburton et al., 2020).

The finding that needs satisfaction was directly and positively associated with RAI is also in line with the predictions of OIT (Deci & Ryan, 2000) and extant research (e.g., Quested et al., 2013), suggesting that greater needs satisfaction leads to an internalisation and integration of aspects of an individual's sporting participation, and consequently, facilitates more autonomous forms of sport motivation (Felton & Jowett, 2013). A further finding was

that needs frustration did not directly relate to RAI, whereas needs satisfaction did (Longo et al., 2016). Given our motivational variable represented a collapsed continuum of various autonomous and controlled motives, having one's needs met may both enhance autonomous motives and reduce controlled motives, whereas having one's needs frustrated may presumably not affect the totality of motivational orientations (Bechter et al., 2018). In this regard, a study deriving needs-based latent profiles (Warburton et al., 2020) showed that needs-satisfaction can have a protective effect and potentially counter the maladaptive role of needs-frustration on negative outcomes such as controlled motivations. Such findings are interpreted as an asymmetrical link, to the extent that low needs-satisfaction does not necessarily equate to high needs-frustration, but high needs-frustration likely involves experiences of low needs-satisfaction (Vansteenkiste & Ryan, 2013). Future research may consider further exploring the likely nuanced relationships between needs-satisfactions/frustrations and individual motivational orientations (Emm-Collison et al., 2020) to maximise motivational construct relevant information (Howard et al., 2020).

Examining the mental health variables in our model, data showed that, independent of any indirect role, higher scores of RAI were negatively associated with burnout, and positively related to well-being, which is consistent with past meta-analytic (Li et al., 2013) and cross-sectional research (Lonsdale et al., 2009; Adie et al., 2008). Such findings infer that burnout risk can be reduced in circumstanced where the athlete is participating primarily for autonomous, rather than controlled motives (Rodrigues et al., 2021). Moreover, and again underscoring the contribution of coaches as key social agents in facilitating such processes, needs-support/control from coaches, along with needs-satisfaction/frustration and RAI, indirectly linked to burnout and well-being. Independent of the role of coaches, needs-satisfaction and RAI together indirectly associated with decreased burnout and enhanced well-being. Therefore, our findings partially support Vallerand's (2007) hierarchical model

wherein motivational orientation is proposed to mediate the relationship between needs-satisfaction and mental health outcomes.

Well-being and/or burnout were directly associated with needs-satisfaction and needs-frustration, yet effects were comparatively larger from need-satisfaction to well-being, and needs-frustration to burnout, and vice-versa. The indirect associations also somewhat supported the above pattern such that relatively speaking, well-being was more strongly related to the positively valenced pathway of needs-support, needs satisfaction and RAI in sequence than burnout (i.e., β=.25 in comparison to β=-.22), and burnout was more strongly associated with the negatively valenced pathway of needs-control, needs frustration and RAI (i.e., β=.12 in comparison to β=-.07) (Rodrigues et al., 2021). Ryan and Deci (2008) argue that needs-satisfaction and needs-frustration are individually and collectively important for well-being and ill-being, and model findings and extant studies support this presupposition (e.g., Bartholomew et al., 2011a; Shannon et al., 2021). However, longitudinal change score studies (Cordeiro et al., 2016; Gunnell et al., 2013; Sheehan et al., 2018b) demonstrate evidence that as per our findings, needs-satisfaction and needs-frustration more closely relate to their corresponding positive and negative indices of mental health.

4.2 Practical implications

In an applied sense, our study highlights the need for those involved in athletes' social context to promote needs-supportive behaviours whilst limiting needs-controlling behaviours (Ntoumanis et al., 2018). Given Delrue et al. (2019) and Cheon et al. (2018) have found that athletes can differentiate and identify distinct controlling coaches' practices (e.g., domineering, demanding), interventions could raise awareness of, and identify non-optimal communication practices alongside supportive, compassionate, needs-supportive techniques (see Bartholomew et al., 2009 for a review). To provide practical, evidence-based examples, seeking athlete input on sporting matters and providing a degree of choice over training

schedules may enhance autonomy-support; provision of individualised and group-based constructive feedback centred on development may improve competence-support; whereas an open and non-threating environment encouraging collective rapport can provide relatedness-support (Balaguer et al., 2012; Ntoumanis et al., 2018). Given the present study findings assuming such techniques will have the added benefit of minimising needs-controlling behaviours may not always materialise. Therefore, clarifying the rationale behind difficult decisions, depersonalising issues such as team selection, and using non-dictatorial language, may minimise perceptions of needs-control, leading to reduced needs-frustration and burnout (Shannon et al., 2021).

4.3 Limitations and future directions

Key strengths of this study were the testing of multiple SDT sub-theories and the recruitment of a large and diverse representative athlete sample. However, future studies could address the cross-sectional design limitation of our study by utilising two or more measurement timepoints whilst determining which stage the athletes' competitive season was at the time of surveying (e.g., pre, mid or off season), especially given burnout symptoms are likely affected by competition and training load (Gustafsson et al., 2017). Furthermore, inclusion of linked self-reports from coaches alongside athletes would provide additional information pertaining to the relative influence of needs-satisfying and needs-frustrating sources (Ntoumanis et al., 2020). Lastly, the two-stage approach to measurement and path model specification helped retain a significant degree of error control (McNeish & Wolf, 2020), whilst calculating multivariate mechanisms. However, future research could consider a more comprehensive full SEM model and directly model 'true' latent scores (Devlieger et al., 2016).

4.4 Conclusions

The present study addressed gaps within SDT and broader athlete mental health research by testing concurrent, complementary, SDT hypotheses related to positive and negative athletic experiences, controlling for several demographic and sporting factors. Findings established that coaches may facilitate positive, synergistic experiences of need satisfaction, autonomous motivation, and well-being foremostly through provision of needs-supportive behaviours. However, coaches' needs-controlling behaviours may have a negative influence that manifests in needs-frustration and burnout. The independent benefits of needs-satisfaction and healthy autonomous motivational orientations were supported, as direct and indirect links with burnout and well-being were found. Contrastingly, needs-frustration related to increased burnout. Taken collectively, we recommend SDT-informed, communication interventions for athlete mental health. Such programmes may seek to use recent guidance (Ntoumanis et al., 2021) by identifying and promoting the utilisation of needs-supportive behaviours, whilst also highlighting the characteristics of, and need to minimise, needs-controlling behaviours. Evidence shows that the success of such programmes will likely be predicated on ensuring meaningful athlete input and choice, provision of constructive feedback centred on development, and a social environment characterised by compassion and collective rapport (Ntoumanis et al., 2018). Future research may advance the present study by gathering matched athlete and coach data whilst including additional data collection timepoints.

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Figure 1: Hypothesised path analysis model predicting burnout and well-being from psychological needs and motivation variables

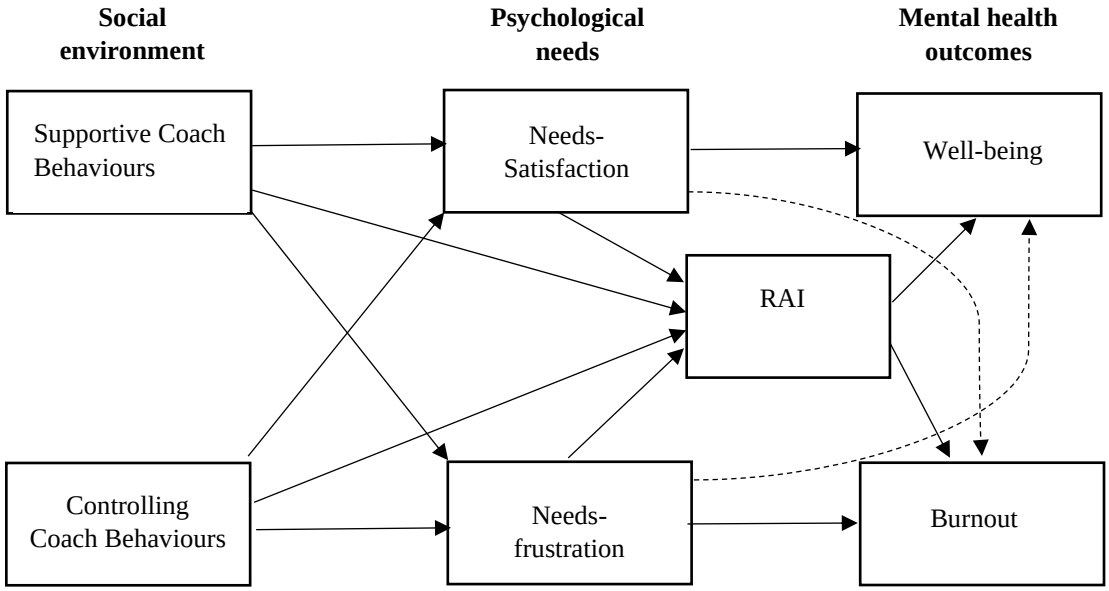
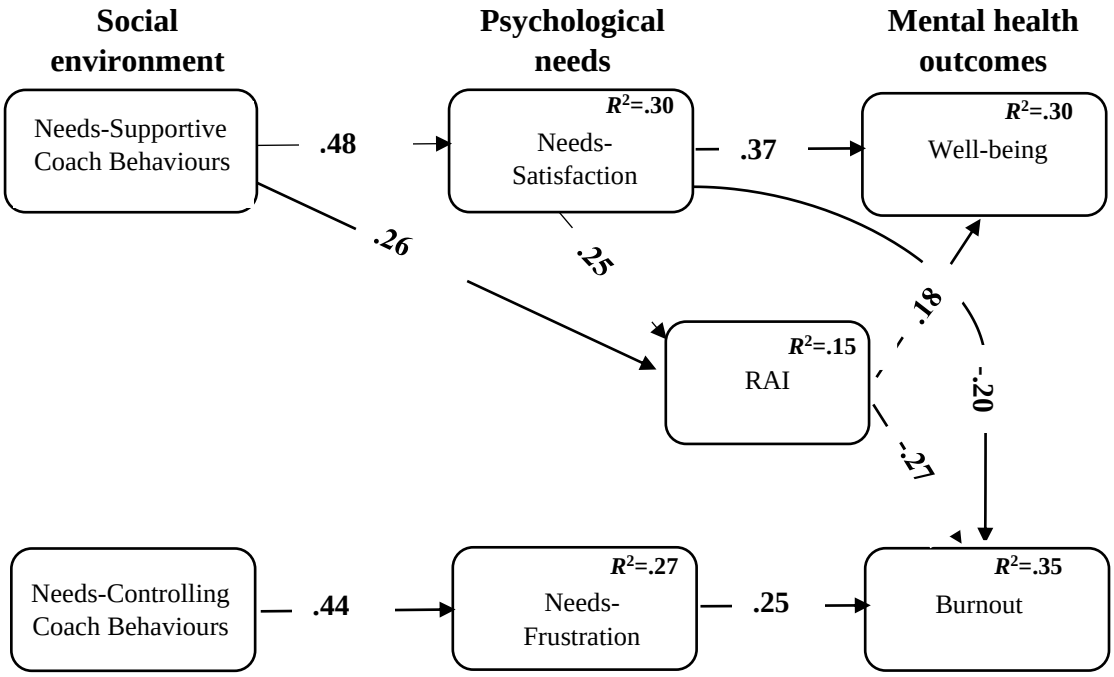


Figure 2: Path analysis model findings displaying associations between burnout and well-being from psychological needs and motivation variables



Note: only statistically significant direct associations are included in the figure. Statistical controls, indirect effects, covariance values, and error terms are not included for visual clarity. See results section for further information.

Table 1: Descriptive statistics and correlations matrix for the study variables

Variable	*α*	*M*	*SD*	1	2	3	4	5	6	7
1. Needs-support	.94	5.13	1.04	1						
2. Needs-control	.91	2.88	1.02	-.80*	1					
3. Needs satisfaction	.83	5.05	0.80	.59*	-.48*	1				
4. Needs frustration	.81	3.34	0.92	-.46*	.55*	-.61*	1			
5. RAI	.72	2.37	1.30	.56*	-.53*	.57*	-.44*	1		
6. Well-being	.83	3.57	0.63	.43*	-.37*	.51*	-.40*	.57*	1	
7. Burnout	.89	2.49	0.60	-.47*	.48*	-.52*	.54*	-.78*	-.53*	1

Note: α = Cronbach's alpha; M = mean; SD= standard deviation; * refers to significant association at $p < .05$.

Table 2: Fit statistics for the study variables prior to specification in path analysis

Model		χ^2 (p)	df	CFI	TLI	RMSEA [99% CI's]
1	Interpersonal Behaviours	826.432, p<.001	237	.955	.947	.061 [.06, .07]
2	Psychological Needs	577.998, p<.001	120	.927	.907	.075 [.07, .08]
3	Relative Autonomy Index*	334.379, p<.001	75	.941	.917	.072 [.09, .10]
4	Burnout	455.479, p<.001	87	.917	.900	.079 [.07, .09]
5	Well-Being	24.696, p<.001	4	.986	. 965	.088 [.01, .12]

Note: *Required revisions via removal of three items with factor loadings <.40. All construct scores were saved for calculation as proxy latent variables in the path analysis model