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## Abstract

**Objective:** Grounded in self-determination theory, the present study examined the cultural invariance of a model that hypothesized sport performers' well-being will be predicted by both their perceptions of motivation and the quality of the relationship held with their coach.

**Method:** Participants (N = 756), originating from five countries (British, Chinese, Greek, Spanish, and Swedish), completed a questionnaire that measured perceived coach-athlete relationship quality, basic psychological need satisfaction, self-determined motivation, and well-being. Structural equation modelling (SEM) was employed to analyze the data.

**Results:** Analysis revealed that athletes who perceived a high quality relationship experienced heightened levels of basic need satisfaction. Need satisfaction positively predicted self-determined motivation, which, in turn, linked to enhanced well-being. Moreover, mediation analyses supported the explanatory roles of need satisfaction and self-determined motivation within the model. Lastly, multi-sample SEM invariance testing revealed the model to be largely invariant across cultures.

**Conclusions:** The results support the universal application of self-determination theory and the central role interpersonal relationships play in promoting well-being.

**Key words:** Coach-athlete relationships, self-determination, basic psychological needs, motivation, optimal functioning.

## Motivational processes in the coach-athlete relationship:

### A multi-cultural self-determination approach

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) has been applied extensively in sport research to study the *social influences* (e.g., coach behaviors) associated with the motivational processes underpinning athletes' well-being (e.g., Adie & Bartholomew, 2013; Taylor, 2015). It is, therefore, surprising that the SDT-based literature has rarely considered the role of *social relationships* relevant to the motivation and optimal functioning of competitive sport participants (e.g., Felton & Jowett, 2013b). Across the world of sport, the coach-athlete dyad is viewed as a fundamental relationship for determining the motivation and well-being of sport performers (e.g., Jowett, 2007). Drawing from SDT (Ryan & Deci, 2002; Vallerand, 2007), and in extending the motivational model of coach-athlete relationships (Magaueu & Vallerand, 2003), the current study provided a comprehensive test of the motivational processes involved in how perceived coach-athlete relationship quality links to athletes' well-being. Secondly, the cross-cultural invariance of this model was examined across five different countries.

### Self-Determination Theory and Well-Being in Sport

Aligned with an SDT approach (e.g., Deci & Ryan, 2008), we define well-being as the self-realization of an individual (athlete) that is optimally functioning, and meaningfully engaged in pursuing their potential in a designated context (sport). To this end, the Basic Psychological Needs Theory (Ryan & Deci, 2002; Taylor, 2015) and the Hierarchical Model of Intrinsic and Extrinsic

1 Motivation (HMIEM; Vallerand, 2007) are two prominent SDT frameworks applied to enhance our  
2 understanding of coaching behaviors relevant to the motivational processes underpinning the  
3 well-being of athletes. .

4 A key assumption of BPNT and the HMIEM is that humans have three innate psychological  
5 needs essential for motivation and well-being (Ryan & Deci, 2002; Vallerand, 2007): *autonomy*, is  
6 fulfilled when individuals assume personal control over their decision-making and choices  
7 (DeCharms, 1968); *competence*, is fulfilled when individuals feel a sense of being effective in the  
8 context at hand (White, 1959); and *relatedness*, is fulfilled when individual's feel a sense of  
9 belongingness to and by significant others (Baumeister & Leary, 1995).

10 According to BPNT, the fulfilment of the three psychological needs is assumed to result in  
11 enhanced well-being, whereas frustration of one or more of these needs is expected to result in  
12 ill-being. Basic need satisfaction is not viewed as an automated process; it requires ongoing support  
13 from the social influence of significant others (Ryan & Deci, 2000). In particular, the coach has  
14 emerged as a proximal contact in sport settings for influencing the motivation and optimal  
15 functioning of athletes (e.g., Jowett & Shanmugam, 2016; Mallet, 2005). Many BPNT-based sport  
16 studies have tested the implications of different perceived coaching behaviors (autonomy support  
17 and control) on the motivational processes associated with athletes' well-/ill-being (see Adie &  
18 Bartholomew, 2013; Taylor, 2015 for reviews).

19 Despite Deci and Ryan's (2000) assertion that all three psychological needs are essential for

1 for optimal growth and health to occur; each psychological need has not always independently and  
2 consistently predicted indices of well- and ill-being in sport research (e.g., Adie et al., 2012;  
3 Quested & Duda, 2010). Such findings may suggest that one need may have a greater functional  
4 significance than another in any given setting (Deci & Ryan, 1985; Felton & Jowett, 2013a;  
5 Reinboth, Duda & Ntoumanis, 2004). Alternatively, it may also suggest that other motivational  
6 processes, in addition to need satisfaction, may be at play in determining athletes' well-being.

7       The hierarchical model of intrinsic and extrinsic motivation (HMIEM; Vallerand, 2007), a  
8 four-stage sequence (social factors → basic need satisfaction → motivation regulations →  
9 consequences), has also been applied to provide a comprehensive examination of the motivational  
10 mechanisms accounting for how coaching behaviors influence athlete well-being (e.g., Álvarez,  
11 Balaguer, Castillo & Duda, 2009). According to the HMIEM (Vallerand, 2001), the motivation of an  
12 individual (in this case, athlete) is regulated by the degree to which their behavior is more or less  
13 self-determined (Ryan & Deci, 2002, 2007). At the highest end of the self-determination continuum  
14 is *intrinsic motivation* which represents the inherent satisfaction and enjoyment derived from  
15 performing an activity (Deci & Ryan, 1985). *Extrinsic motivation* is regulated by behavior that is  
16 concerned with obtaining a separate outcome other than participating in the activity itself (Ryan &  
17 Deci, 2000). It is a multi-dimensional construct represented by: *integrated* (e.g., participating in a  
18 behavior that is congruent with one's sense of self), *identified* (e.g., engaging in an activity because  
19 the underlying value of it has been accepted), *introjected* (e.g., participating in an activity out of

1 internal pressures), and *external* (e.g., feeling controlled by external pressures to participate in an  
2 activity) forms of regulation (Ryan & Deci, 2007). Finally, *amotivation* reflects the complete  
3 absence of self-determination in an activity (Deci & Ryan, 2000).

4 In accordance with the HMIEM, the motivational regulations have been found to have  
5 different antecedents and consequences in the extant sport literature (Vallerand, 2007). The majority  
6 of research in the sport domain has found support for the supposition that satisfaction of the  
7 psychological needs is essential for experiencing more self-determined motivation, whereas  
8 frustrating one or more of the psychological needs has resulted in less self-determined motivation or  
9 amotivation (e.g., Pope & Wilson, 2012; Sarrazin et al., 2002). Aligned with theoretical postulates,  
10 sport research has also found more self-determined types of motivation (i.e., intrinsic, integrated,  
11 identified regulations) to be associated with adaptive consequences (e.g., Álvarez et al., 2009;  
12 Pelletier, Fortier, Vallerand & Brière, 2001), whereas for less self-determined types of motivation  
13 (i.e., introjected, external regulations), and amotivation, they have been maladaptive (e.g., Calvo et  
14 al., 2010; Kowal & Fortier, 1999).

15 In summarizing the extant sport literature that has used both these frameworks, partial support  
16 has been evidenced for BPNT (see Adie & Bartholomew, 2013). Research has emerged to suggest  
17 that psychological need satisfaction may not only predict the well-being of competitive athletes  
18 directly (Quested et al., 2013), but also indirectly via self-determined motivation (e.g., Álvarez et al.  
19 2009). Therefore, the HMIEM provides a comprehensive examination of the potential motivational

1 mechanisms accounting for variance in the well-being of athletes.

2 Collectively, the findings in the sport literature, guided by these two theoretical frameworks,  
3 also point towards key coaching behaviors (e.g., autonomy-supportive, task-involving climates) that  
4 have consistently been shown to support basic need satisfaction (and self-determined motivation)  
5 for the experience of athlete well-being (e.g., Adie & Bartholomew, 2013; Gagné et al., 2003).

6 Although this line of work holds important implications for theory and practice, it is limited to  
7 investigating coach behaviors. A handful of studies (e.g., Felton & Jowett, 2013a; 2013b) have  
8 tested the proposition that the coach-athlete relationship may have the potential to explain  
9 motivational processes and well-being in sport settings (see La Guardia & Patrick, 2008).

## 10 **An Extended Motivational Model of Coach-Athlete Relationships and Well-Being**

11 The significance of the coach-athlete relationship for athletes' motivation was emphasized by  
12 Mageau and Vallerand (2003). In their motivational model of coach-athlete relationships, three  
13 facets of coach behavior (i.e., perceived autonomy support, structure, and involvement) are assumed  
14 to predict basic need satisfaction and, in turn, self-determined motivation. The tenets of this model  
15 have been empirically supported in the extant literature (Pope & Wilson, 2012). Nevertheless, these  
16 three coaching behaviors are not entirely reflective of the interdependent nature of quality  
17 coach-athlete relationships where not only behavioral but also cognitive and affective facets are  
18 involved (see Jowett & Shanmugam 2016). Thus, the application of this model in understanding the  
19 nature and function of coach-athlete relationships and their links to basic need satisfaction and

1 self-determined motivation is limited. It is therefore necessary to consider an *extended motivational*  
2 *model of coach-athlete relationships* that is conceptualized holistically and can be readily integrated  
3 with SDT principles.

4       The coach-athlete relationship is defined as a state in which a coach's and an athlete's thoughts  
5 of commitment, feelings of closeness, and complementarity behaviors are mutually interdependent  
6 (Jowett, 2007). Commitment refers to the intent of the coach and athlete to form a close and healthy  
7 longstanding partnership. Closeness defines the emotional kinship experienced between the dyad  
8 members and is characterized by appreciation, trust, and respect for one another. Complementarity  
9 reflects the level of co-operation between the coach and athlete and incorporates behaviors such as  
10 friendliness, responsiveness, and willingness as well as the key roles each member undertakes in the  
11 dyad. The 3Cs model has received empirical support with athletes and coaches of different ages,  
12 genders, and levels of performance (e.g., Jowett & Nezlek, 2012), different types of sport (e.g.,  
13 Rhind, Jowett & Yang, 2012), personality traits (Yang, Jowett, & Chan, 2015), and different cultural  
14 groups (e.g., Yang & Jowett, 2013).

15       The 3Cs model of the coach-athlete relationship (see Jowett & Shanmugam, 2016), is assumed  
16 to hold theoretical implications for athletes' motivation and psychological well-being (Jowett, 2007).  
17 To date, seldom sport research exists linking coach-athlete relationship variables to motivational  
18 processes and subsequent well-being. This is surprising given Jowett (2005, 2007) has posited that  
19 the coach-athlete relationship is a medium in which dyad members' (basic psychological) needs can

1 be expressed and fulfilled. Although still in its infancy, SDT research has emerged to find that  
2 perceived coach-athlete relationship quality (as operationalized by the 3 C's), serves as important  
3 determinants of basic need satisfaction (Choi et al., 2013, Felton & Jowett, 2013b; Riley & Smith,  
4 2011), self-determined motivation (Riley & Smith, 2011), and well-being (Felton & Jowett, 2013b).

5 Riley and Smith (2011) are credited as the first researchers to test Mageau and Vallerand's  
6 (2003) model incorporating a relationship perspective. They found the three psychological needs to  
7 mediate the positive association between perceived coach-athlete relationship quality (as defined by  
8 the 3 C's) and self-determined motivation among young sport participants. In testing BPNT, Felton  
9 and Jowett (2013a, 2013b, 2015) conducted a series of studies demonstrating the predictive utility  
10 of social relationships in sport (i.e., secure coach-attachment, perceived coach-athlete relationship  
11 quality) for satisfaction of the basic psychological needs and subsequent well-being among adult  
12 athletes. One novel contribution of this work, in following the approach of relationship researchers  
13 in SDT (e.g., La Guardia et al., 2000; Patrick et al., 2007), is that the findings are based on need  
14 satisfaction within one's relationship. On the basis that coaches' contribution is instrumental in  
15 organized sport, and the quality of the relationship they develop with their athletes forms a platform  
16 for experiencing basic need satisfaction, we too deemed it necessary to study relationship need  
17 satisfaction. Guided by and extending past research (e.g., Jowett & Felton, 2013b; Riley & Smith,  
18 2011), our study aimed to provide a more comprehensive model of the motivational processes  
19 associated with perceived coach-athlete relationship quality and well-being. Drawing from



1 Vallerand's work specifically (e.g., Mageau & Vallerand, 2003; Vallerand, 2007), this study is the  
2 first to test the full sequence of associations between perceived coach-athlete relationships,  
3 relationship need satisfaction, motivation and well-being in sport among competitive athletes.

#### 4 **The Universality Concept of SDT**

5 According to SDT (Ryan & Deci, 2002), the basic psychological needs are postulated to be  
6 universal regardless of age, gender, setting or culture. In the sport domain, there have been very  
7 limited cross-cultural studies testing this universality concept. Quested *et al.* (2013) conducted and  
8 found support for invariance of a model predicting basic need satisfaction, enjoyment and intention  
9 to drop out of sport among youth soccer players across 5 European countries. Taylor and Lonsdale  
10 (2010) also found invariance of a BPNT model predicting vitality and effort across Chinese and UK  
11 physical education students. To date, no studies have tested the assumed cross-cultural invariance in  
12 the hypothesized relationships between perceived coach-athlete relationships, relationship need  
13 satisfaction, motivation, and well-being among competitive athletes. In addressing this gap in the  
14 literature our cross-cultural study is the first to test the motivational processes associated with the  
15 links between perceived coach-athlete relationship quality and well-being among athletes across  
16 five countries. It may generate understanding concerning how the relationship with one's coach, and  
17 not merely the influence of their coaches' behaviour, could potentially impact the motivational  
18 processes linked to well-being regardless of the cultural background of the athlete. This could  
19 suggest the universal importance of developing quality coach-athlete relationships in order to foster

1 meaningful participation and optimal functioning in competitive sport.

## 2 **The Present Study: Aims and Hypotheses**

3 In proposing an extended motivational model of coach-athlete relationships (Jowett, 2007,  
4 Magaeu & Vallerand, 2003) in the form of the HMIEM (Vallerand, 2007), the first aim of the study  
5 was to test a hypothesized model with a four stage sequence: coach-athlete relationship quality →  
6 relationship psychological needs → self-determined sport motivation → well-being among  
7 multi-national sport participants. Based on the tenets of the HMIEM (Vallerand, 2007), and guided  
8 by past research (e.g., Riley & Smith, 2011; Felton & Jowett, 2013a, 2013b), perceived  
9 coach-athlete relationship quality was theorized to positively predict athletes' basic need satisfaction  
10 within their relationship. Relationship need satisfaction was expected to positively correspond to  
11 self-determined motivation, which in turn, would lead to enhanced well-being.

12 The second aim of the study was to test the mediational role of relationship need satisfaction  
13 and self-determined motivation in the hypothesized model across the five countries. Drawing from  
14 the HMIEM (Vallerand, 2007), and guided by past sport research (e.g., Álvarez et al., 2009; Riley  
15 & Smith, 2011), it was proposed that relationship need satisfaction would directly mediate the link  
16 between perceived coach-athlete relationship quality and self-determined motivation. Based on  
17 BPNT (Ryan & Deci, 2002) and also the HMIEM (Vallerand, 2007), the present study also aimed to  
18 discern whether relationship need satisfaction functions as a direct, or indirect (via self-determined  
19 motivation), mediator in the association between perceived coach-athlete relationship quality and

1 the optimal functioning of athletes.

2 A final aim of the study was to test the cultural invariance of the hypothesized model. Ryan  
3 and Deci (2002) assert that whilst the needs themselves are hypothesized to be universal, and the  
4 relations between the psychological needs, self-determined motivation, and well-being should apply  
5 across cultures (Deci, et al., 2001; Taylor & Lonsdale, 2010), the means through which the  
6 psychological needs are satisfied may vary as a function of culture (Ryan & Deci, 2000). Based on the  
7 assumption that the coach-athlete relationship, as evidenced by the 3 C's, is also assumed to be a  
8 universal phenomenon (Jowett & Yang, 2012), we also expected high quality coach-athlete  
9 relationships to positively predict relationship need satisfaction, although the amount of variance  
10 explained in this outcome may differ across cultures. Furthermore, despite potential differences in  
11 mean levels, perceived support for relationship psychological needs fulfilled by high quality  
12 coach-athlete relationships should be positively associated with both optimal motivation and  
13 well-being in all cultures, particularly given that needs do not have to be valued explicitly within a  
14 particular culture to have functional import (Doyal & Gough, 1991). In sum, we expected our  
15 hypothesized mediational model to remain invariant for competitive athletes from different cultural  
16 backgrounds.

## 17 **Methods**

### 18 **Participants and Procedures**

19 Elite athletes from 5 countries, including China (N = 143; Mean age = 19.09 (*SD* = 3.16);

1 50.30% male), Greece (N = 168; Mean age = 19.84 (*SD* = 5.78); 76.8% male), Spain (N = 137;  
2 Mean age = 23.46 (*SD* = 4.67); 80.9% male), Sweden (N= 171; Mean age = 16.78 (*SD* = 1.04);  
3 61.4% male), and UK (N = 137; Mean age = 22.45 (*SD* = 4.53); 62.00% male), voluntarily  
4 participated in this study. Athletes competed in 40 different sporting events (length of participation  
5 = 7.84 years; *SD* = 4.63), and received training (mean training hours = 11.79 per week; *SD* = 6.29)  
6 regularly from their coaches (mean length of relationship = 2.07 years; *SD* = 2.52). Before data  
7 collection, approval was obtained from the lead authors' University Ethics Committee. After  
8 obtaining informed consent , participants were asked to complete a multi-section questionnaire  
9 measuring relationship quality, relationship need satisfaction, motivation, and well-being.

## 10 **Measures**

11 **Coach-Athlete Relationship Questionnaire (CART-Q).** The CART-Q (Jowett & Ntoumanis,  
12 2004) assesses athletes' perceptions of the quality of the relationship they have with their coaches  
13 within three aspects: closeness ("I trust my coach"; 4 items); commitment ("I am committed to my  
14 coach"; 3 items); and complementarity ("I am responsive to his/her efforts"; 4 items). These 11  
15 items were responded to on a 7-point Likert-scale with anchors ranging from "strongly agree" (7) to  
16 "strongly disagree" (1). We adopted the translated versions of the scale for Chinese, Greek, Spanish  
17 and Swedish participants. Psychometric tests from previous studies supported the validity and  
18 reliability of the CART-Q across these countries (e.g., Yang & Jowett, 2012; Balduck, Jowett, &  
19 Buelens, 2011), and the internal reliability of the closeness ( $\alpha = .86 - .93$ ), commitment ( $\alpha = .74$

1 - .89), and complementarity ( $\alpha = .79 - .88$ ) subscales was good in the present study. Given the  
2 strong inter-correlations between the 3C's (Jowett & Ntoumanis, 2004), and aligned with past SDT  
3 research (Riley & Smith, 2011; Jowett & Felton, 2013a,b), we simplified our model by using an  
4 overall measure of coach-athlete relationship quality, as indicated by the three CART-Q dimensions.

5 **Basic Need Satisfaction in Relationship Questionnaire (BNRSQ).** The BNSRQ (La Guardia  
6 et al., 2000) measures the satisfaction of the 3 basic psychological needs within a particular  
7 relationship (in this case, the coach-athlete relationship). The stem used in the questionnaire was  
8 “when I am with my coach” and athletes responded to 9 items, 3 competence items (“I feel like a  
9 competent person”), 3 autonomy items (“I feel free to be who I am”), and 3 relatedness items (“I  
10 feel loved and cared about”). Respondents reported how true the items were on a 7-point  
11 Likert-scale ranging from “Very true” (7) to “Not true at all” (1). The scale has previously  
12 demonstrated sound discriminant and predictive validity as well as good reliability. Following  
13 Hambleton's (2005) recommendations, the original scale was translated into Chinese, Greek,  
14 Spanish, and Swedish for athletes of these countries to complete. The autonomy ( $\alpha = .74 - .88$ ),  
15 competence ( $\alpha = .71 - .81$ ), and relatedness ( $\alpha = .62 - .83$ ) subscales demonstrated acceptable levels  
16 of internal reliability. On the basis that the three needs are inter-related constructs (Deci & Ryan,  
17 2000) and in line with past research (e.g., Quested et al., 2013), we formed a single composite  
18 variable of relationship need satisfaction using the three subscales as indicators.

19 **Behavioral Regulations in Sport Questionnaire (BRSQ).** The BRSQ (Lonsdale, Hodge &

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1 Rose, 2008) assesses each of the behavioral regulations on SDT's self-determination continuum by  
2 asking why participants (athletes) participate in their sport. Each item started with a common stem  
3 "I participate in my sport..." and participants rated how true the items were for them on a 7-point  
4 Likert-scale ranging from "Very true" (7) to "Not true at all" (1). The 6 dimensions of the BRSQ  
5 include intrinsic motivation ("because it's fun";  $\alpha = .77 - .94$ ), integrated regulation ("because what  
6 I do in my sport is an expression of who I am";  $\alpha = .71 - .86$ ), identified regulation ("because the  
7 benefits of sport are important to me";  $\alpha = .67 - .84$ ), introjection ("because I would feel guilty if I  
8 quit";  $\alpha = .79 - .85$ ), external regulation ("because people push me to play";  $\alpha = .78 - .86$ ), and  
9 amotivation ("but I question why I continue";  $\alpha = .81 - .91$ ) and are assessed by 24 items (4 items for  
10 each dimension). The BRSQ was originally developed in English and has been shown to have  
11 robust psychometric properties (Lonsdale et al., 2008). A Chinese translated version of the scale has  
12 also demonstrated good reliability in previous studies (Chan, Hagger, & Spray, 2011). Thus the  
13 English and Chinese versions of the scale were adopted and the scale was translated into Greek,  
14 Spanish and Swedish following the aforementioned procedure. To reduce the complexity of the  
15 model, we computed a relative autonomy index (RAI) from the scores of the 5 BRSQ dimensions  
16 which represented athletes' overall levels of self-determined motivation. This approach has been  
17 widely used in SDT-based sport research (Álvarez et al., 2009). Moreover, Sheldon and colleagues  
18 (2015) confirmed the validity of the RAI as a suitable assessment of self-determination levels.  
19 Therefore, following the guidelines outlined by Lonsdale et al. (2009), we assigned different

1 weightings to each type of motivation: intrinsic motivation (+2), integrated motivation (+1),  
2 identified motivation (+1), introjection (-1), and external motivation (-2). The RAI was  
3 subsequently computed by summing the weighted-item-scores. Four RAI indicators were derived  
4 from the 20 BRSQ items.

5 **Warwick-Edinburgh Mental Well-being Scale (WEMWBS).** The WEMWBS (Tennant et  
6 al., 2007) was developed to measure well-being, a key indicator of mental health. The 14-item  
7 measure assesses the following well-being dimensions: affective-emotional (“I’ve been feeling  
8 good about myself”), cognitive-evaluative (“I’ve been dealing with problems well”) and  
9 psychological functioning (“I’ve had energy to spare”). Participants rated how often they  
10 experienced the feeling or emotion described in the statement on a 5 point Likert-scale ranging from  
11 “All the time” (5) to “None of the time” (1). The original scale was translated into Chinese, Greek,  
12 Spanish, and Swedish so that athletes of these countries could complete the multi-section  
13 questionnaire. Consistent with the evidence of the convergent validity provided during the scales  
14 validation, the reliability indices of the WEMWBS were high ( $\alpha = .84 - .92$ ) in the present study. To  
15 reduce the complexity of the model, the items were parceled to form 5 well-being indicators.

## 16 **Analysis**

17 Covariance-based structural equation modeling (SEM) using EQS 6.1 (Bentler, 2004) was  
18 employed in the present study. Robust maximum likelihood was used to estimate the goodness of fit  
19 and paths of the models (Satorra & Bentler, 1988). The goodness of fit was acceptable when the

1 root-mean square error of approximation (RMSEA) and standardized root-mean square residual  
2 (SRMR) were lower than .08 (Hu & Bentler, 1999). Comparative fit index (CFI) and Tucker Lewis  
3 index (TLI) greater than .95 was indicative of very good fit (Hu & Bentler), with values greater  
4 than .90 interpreted as adequate fit (Bentler, 1990).

5 Initially, a confirmatory factor analysis (CFA; a saturated SEM model with full covariates  
6 between the latent factors) was tested to examine the factor structure and reliability of measurement  
7 across the data drawn from the 5 countries. After ensuring the measurement models demonstrated a  
8 good fit to the data, single-group structural models were employed (various factor-to-factor paths  
9 were inputted for hypotheses testing). Finally, multi-group SEMs were carried out to examine the  
10 invariance of the measurement model and structural model across the 5 countries.

11 **Single-group SEM.** For the data set from each country, we freely estimated the factor  
12 paths in the hypothesized model (i.e., coach-athlete relationship quality → psychological need  
13 satisfaction → self-determined motivation → well-being). We also investigated whether mediation  
14 existed in the hypothesized associations. Specifically, the following indirect effects were examined:  
15 (a) coach-athlete relationship quality on self-determined motivation via need satisfaction (b) need  
16 satisfaction on well-being via self-determined motivation and (c) coach-athlete relationship quality  
17 on well-being via both need satisfaction and self-determined motivation. Mediation was evidenced  
18 when (a) the independent variable (coach-athlete relationship) and the mediator (motivational  
19 processes) had significant direct effects on the dependent variable (well-being), (b) the direct effect



1 of the independent variable on the dependent variable was not significant after controlling the effect  
2 of the mediator (Baron & Kenny, 1986), and (c) the indirect effect of the independent variable on  
3 the dependent variable was significant (Zhao, Lynch & Chen, 2010).

4 **Multi-group SEM.** First, a baseline multi-group model with factor paths and loadings freely  
5 estimated across the 5 countries was tested. Once the model demonstrated an acceptable fit to the  
6 data, we further tested the invariance of the hypothesized model by systematically constraining the  
7 factor loadings and then the factor paths to be equal across the 5 countries (Byrne, 2006). When the  
8 constraints decreased the model fit by a CFI value of more than .010, it was concluded that the  
9 hypothesized model was not invariant across culture. In addition, the Lagrange Multiplier test (LM  
10 test) was employed to examine if certain constraints were responsible for the decrease of model fit.  
11 If the decrease of the model fit became less than .010 after releasing the paths indicated by the LM  
12 test, we concluded that the hypothesized model was partially invariant.

## 13 **Results**

### 14 **Preliminary Analysis**

15 The data sets from the 5 countries were screened and there appeared to be no significant  
16 multivariate and univariate outliers ( $p > .05$ ) nor an apparent pattern of missing data (<1%).  
17 Therefore, the missing values were replaced using the expectation maximization algorithm. CFA of  
18 the 5 data sets yielded satisfactory goodness of fit (CFI > .92, TLI > .90, RMSEA  $\leq$ .08, SRMR  
19 = .08; full model fit indices are presented in Table 1), which supported the factor structure and

1 convergent validity of the measures used in the study. The correlation matrix and descriptive  
2 statistics are displayed in Table 2.

### 3 **Single-group SEM**

4       Apart from the Chinese sample (CFI = .904, TLI =.882, RMSEA = .101, SRMR = .093) which  
5 demonstrated a mediocre fit, the hypothesized model fitted the data acceptably well for all other  
6 countries (CFI > .921, TLI >.903, RMSEA <.071 , SRMR < .088; full model fit indices are  
7 presented in Table 1). The structural path estimates were in line with our hypothesis across the 5  
8 data sets: positive associations were observed in the relationships between (a) coach-athlete  
9 relationship quality and need satisfaction, (b) need satisfaction and self-determined motivation, and  
10 (c) autonomous motivation and well-being (all  $p < .05$ ; details are displayed in Table 3). Mediation  
11 analyses also supported the explanatory role of need satisfaction and self-determined motivation  
12 within the hypothesized model, however partial mediations presented in some of the data sets which  
13 implied that the independent variables involved in these mediations were likely to have both direct  
14 and indirect effects on the dependent variables (see Table 4).

### 15 **Multi-group SEM**

16       The baseline multi-group model as well as the models with constrained factor paths and  
17 loadings all demonstrated a satisfactory fit to the data. Constraining the factor loadings resulted in a  
18 change in the CFI value of .009 and further constraining the structural paths led to a reduction in the  
19 CFI of .006 (see Table 5). Therefore, we concluded that the measurement and structural model were

1 invariant across culture.

## 2 **Discussion**

3 The aim of the study was to examine the cultural invariance of an integrated coach-athlete  
4 relationship and motivational model predicting the well-being of athletes from different nations.

5 Drawing from the HMIEM (Vallerand, 2007), the findings provided strong support for a model in  
6 which perceived coach-athlete relationship quality positively predicted athletes' basic need

7 satisfaction within their relationship. Furthermore, relationship need satisfaction predicted higher

8 levels of self-determined motivation, which in turn, led to enhanced well-being. Mediation analyses

9 provided partial support for the explanatory roles of need satisfaction and self-determined

10 motivation within the hypothesized model. Finally, given the multi-national nature of competitive

11 sport, the integrated model was shown to be invariant across the five nations examined. These

12 results provide support for the universal application of self-determination theory and corroborate the

13 integration of a coach-athlete relationship and motivational model.

### 14 **Beyond Perceptions of Coach Behavior**

15 In line with the tenets of the HMIEM (Vallerand, 2007) and past research (e.g., Felton &

16 Jowett, 2013a,b, 2015; Riley & Smith, 2011), perceived coach-athlete relationship quality positively

17 predicted athletes' basic need satisfaction within their relationship. Whilst limited previous research

18 has examined the impact of closeness, commitment, and complementarity on motivation (e.g., Riley

19 & Smith, 2011) and well-being (Felton & Jowett, 2015), the present study is the first to link

1 coach-athlete relationship quality as defined by the 3C's, to SDT-based motivational regulations and  
2 provides support for the notion that interpersonal relationships have motivational significance in  
3 this context cross-culturally. Using the 3C's model to examine athletes' perceptions of the mutual  
4 and causal interconnections between themselves and their coach's feelings, thoughts, and behaviors  
5 (Jowett, 2007), this study extends previous SDT-based research beyond simply examining the  
6 impact of coach behaviors (see Adie & Bartholomew, 2013). The focus on what one person does to  
7 another may not accurately reflect what goes on between coaches and their athletes (Jowett, 2005,  
8 2007) and the generated findings provide evidence that the quality of the coach-athlete relationship  
9 characterized by care, commitment, and collaboration are strong predictors of motivation and  
10 well-being via the satisfaction of psychological needs. Furthermore, it is recognized that successful  
11 coach-athlete relationships can take many different forms that of adaptability, flexibility and  
12 accessibility as what one athlete wants and needs from a coach can be very different to what another  
13 athlete wants or needs (Jowett & Shanmugam, 2016). Ultimately, coach-athlete relationships must  
14 be meaningful at the personal and cultural level if they are to promote optimal motivational  
15 processes and well-being (Jowett & Yang, 2012).

16 The present findings provide novel cross-cultural support for Jowett's (2005; Jowett &  
17 Shanmugam, 2016) proposition that the coach-athlete relationship is a medium through which the  
18 needs of dyad members' can be expressed and, in turn, fulfilled. On average, athletes' perceptions of  
19 overall relationship quality were high and equivalent across all five nations. However, whilst

1 athletes' perceptions of the coach-athlete relationship explained a large amount of the variation in  
2 perceptions of need satisfaction among Greek, Swedish and Spanish sub-samples, a smaller amount  
3 of variance was explained in Chinese and British sub-samples. Future research should attempt to  
4 explain these differing findings by examining the separate components of closeness, commitment,  
5 and complementarity in the coach-athlete relationship in order to examine their independent effects  
6 on need satisfaction across culture. For example, it may be that perceptions of commitment and  
7 closeness play a key role in supporting the psychological needs of Greek athletes and  
8 complementarity plays a key role in explaining the variance in need satisfaction scores among  
9 Swedish athletes (cf. Jowett & Yang, 2012). In addition, examining the impact of coach-athlete  
10 relationship quality on each of the three needs separately may offer further insight into this  
11 relationship. For example, Jowett and Felton (2013b) found that British athletes' perceptions of  
12 quality coach-athlete relationship predicted levels of competence but not autonomy or relatedness. Is  
13 this link a reflection of the purposeful task-focused nature of the coaching relationship (Jowett &  
14 Shanmugam, 2016) or a cultural effect: Would this finding hold across countries or would it be  
15 specific to some? Would closeness be a stronger predictor of relatedness need satisfaction while  
16 complementarity a stronger predictor of competence across cultures or within one particular culture  
17 (Greece and Sweden respectively). Thus, future research looking at the individual dimensions of the  
18 3 C's and needs satisfaction in relation to athlete motivation is warranted.

### 19 **The Universal Application of SDT**

1 In line with SDT, relationship need satisfaction was expected to positively correspond to  
2 self-determined motivation, which in turn, was hypothesized to lead to enhanced well-being. In line  
3 with previous research (e.g., Gagné et al., 2003; Kowal & Fortier, 1999), the present findings  
4 supported this model in each national sub-sample however variations among the size of the  
5 pathways and the amount of variance explained in the outcome variables were observed. For  
6 example, basic psychological need satisfaction explained a large amount of the variance in  
7 self-determined motivation among Chinese athletes, a moderate amount among Greek and Swedish  
8 athletes, and a small amount among Spanish and British athletes. As mentioned earlier future research  
9 should distinguish between the three psychological needs in order to examine whether one has greater  
10 functional significance for motivation and well-being in a given culture (e.g., relatedness in  
11 collectivistic cultures). Furthermore, whilst higher levels of self-determined motivation predicted  
12 well-being across the board, relative autonomy only explained a moderate (among Chinese, Greek,  
13 Swedish athletes) to low (among Spanish and British athletes) amount of the variance in this  
14 outcome.

15 SDT views concerning the universal significance of autonomously regulated behaviors have  
16 been much debated. For example, Oishi (2000) argued that greater autonomy only yields benefits to  
17 people inside a few highly individualistic Western nations where autonomy is valued (e.g., Sweden,  
18 Britain). Similarly, Miller (1999) argued that lack of autonomy is not likely to be detrimental within  
19 cultures based in authority or tradition (e.g., China, Greece). In contrast, the current findings

1 indicated that self-determined motivation had a greater influence on well-being among Chinese and  
2 Greek athletes and a smaller impact on the well-being of Spanish and British athletes. Whilst this  
3 apparent reversal in terms of what would ordinarily be expected among collectivistic and  
4 individualistic cultures is interesting (see Hofstede, 2001), it is important to note that the present  
5 findings support previous research (e.g., Sheldon et al, 2004; Taylor & Lonsdale, 2010) and indicate  
6 that self-determined motivation is associated with well-being in all of the countries and cultures  
7 examined.

8       Thus, our findings provide strong support for the universal nature of the psychological needs  
9 and the motivational processes outlined in SDT. However, researchers and theorists continue to  
10 debate the cross-cultural importance of autonomy and these arguments often center on the way in  
11 which 'autonomy' is interpreted (Kagitcibasi, 1996). It is likely that the arguments proposed by  
12 Oishi (2000) and Miller (1999) are based upon an interpretation of autonomy as individualism or  
13 independence (Chirkov, Ryan & Willness, 2005). It is, therefore, important to note that SDT  
14 explicitly differentiates autonomy (being volitional or endorsing one's goals and actions) from  
15 individualism (cultures which focus on the needs of the individual rather than the needs of the  
16 collective) and independence (being separate from others). Thus, one can be autonomously  
17 interdependent. This is important given that the coach-athlete relationship is defined as a state in  
18 which coaches' and athletes' feelings, thoughts and behaviors via the 3Cs are mutually  
19 interdependent (Jowett, 2007). Interdependence Theory (Kelley & Thibaut, 1978) explains that

1 good quality interpersonal relationships are associated with rewards (satisfaction and gratification)  
2 and poor quality relationships with costs (dissatisfaction and punishment), while SDT views  
3 interdependence (mutual/shared dependence) as lying between two extremes of dependence  
4 (complete reliance on the other) and independence (complete separation from other). The notion of  
5 interdependence provides an opportunity to nurture one's autonomy in the knowledge that there is  
6 always a trustworthy partner nearby to support when need be. It would appear that athletes who find  
7 themselves in interdependent or good quality coaching relationships, act with a sense of volition,  
8 experience an elevated well-being irrespective of cultural and personal preferences.

9       Given the postulates of SDT (Ryan & Deci, 2002) and the HMIEM (Vallerand, 2007), another  
10 reason for the relatively low explanatory power of self-determined motivation could be because the  
11 psychological needs also have a direct effect on well-being and thus explain some of the variation in  
12 this outcome (Adie et al., 2012). Support for this argument comes from the results of the mediation  
13 analysis in which the direct effect of relationship need satisfaction was consistently stronger than the  
14 indirect effect of the needs via self-determined motivation. Furthermore, mediational evidence  
15 observed in the current study indicated that need satisfaction had a direct and indirect effect on  
16 well-being in Greek and Spanish samples. In line with previous research (e.g., Álvarez et al., 2009;  
17 Balaguer et al., 2012), this finding provided support for the proposition that self-determined  
18 motivation serves as a proximal mediator, and need satisfaction in one's relationship acts as a distal  
19 mediator, in the association between relationship quality and well-being (see Vallerand, 2007).



1        Need satisfaction was also expected to mediate the link between coach-athlete relationship  
2        quality and self-determined motivation. However, whilst this hypothesis was supported among  
3        Chinese, Spanish, and Swedish athletes, need satisfaction only partially mediated the link between  
4        relationship quality and self-determined motivation in British and Greek sub-samples. These partial  
5        mediations indicated that the coach-athlete relationship had a direct influence on well-being as well  
6        as impacting on it indirectly via self-determination. Furthermore, partial mediations also indicated  
7        that perceived coach-athlete relationship quality had direct and indirect effects on athlete well-being  
8        (Chinese, Greek, and Spanish). These findings highlight the influential role of the coaching  
9        relationship in performance environments (Jowett 2005; Jowett & Shanmugam, 2016).

10        The third and final study aim was to test the cultural invariance of the hypothesized  
11        mediational model. Based on the universality hypotheses (Ryan & Deci, 2002) and past research  
12        (Jowett & Yang, 2012; Taylor & Lonsdale, 2010), it was hypothesized that the proposed model  
13        would remain equivalent across cultures. Invariance testing supported this expectation and revealed  
14        that the factor loadings (the measurement model) and structural paths (the structural model)  
15        remained equivalent across culture. Thus, regardless of culture, the more athletes' perceive the  
16        coach-athlete relationship to support their basic psychological needs, the more self-determined their  
17        motivation, and the greater their well-being. These findings provide substantial support for SDT's  
18        prediction that the impact of need support is universally positive for optimal functioning and  
19        well-being because it fits with the intrinsic growth tendencies inherent in human nature (Grolnick,

1 2003; Ryan & Deci, 2002). Thus, the current research has supported the integration of a  
2 coach-athlete relationship and motivational model which has universal appeal and can, therefore,  
3 generate research findings that should be generalizable across cultures and countries.

#### 4 **Practical Applications**

5 The current research has the potential to supply key stakeholders including coaches and sport  
6 psychology consultants with sound theoretical knowledge and empirical evidence to assess the  
7 quality of a key relationship in an increasingly multi-cultural coaching context (Gill, 2007).  
8 Furthermore, the current findings suggest that the coach-athlete relationship has important links to  
9 athlete motivation and well-being which are equivalent across cultures. A major advantage of the  
10 3C's model is its emphasis on the bidirectional nature of the relationship which is manifested  
11 through the construct of co-orientation (Jowett, 2007; Jowett & Lorimer, 2013). This construct  
12 contains two sets of interpersonal perceptions: direct perceptions (I trust my coach/athlete) and  
13 meta-perceptions (My coach/athlete trusts me). The measurement of the 3C's and co-orientation can,  
14 therefore, be used to analyze coach-athlete dyads and identify areas of dissimilarity or disagreement  
15 across the closeness, commitment, and complementarity dimensions. Thus, future research and  
16 applied practice should consider obtaining both athletes and coaches direct and meta-perceptions of  
17 the coach-athlete relationship. This will enable problem areas to be identified and should result in  
18 improvements in the way that coaches and athletes relate, communicate, and interact with each  
19 other. According to the findings of the present research, this, in turn, could lead to improvements in

1 motivation and well-being among athletes of all nationalities.

## 2 **Limitations and Additional Future Directions**

3       Whilst the current research provides new insight into how perceptions of coach-athlete  
4 relationship quality affect SDT-based motivational processes and athlete well-being, it is important  
5 to acknowledge some limitations. First, the cross-sectional nature of the study limits our ability to  
6 infer causal relations between the variables. It is possible, therefore, that athletes' well-being  
7 influences how they perceive their relationship with their coach. Thus, whilst there is theoretical  
8 and empirical support in the SDT literature for the present study's proposed sequence (e.g., La  
9 Guardia & Patrick, 2008; Jowett & Felton, 2013b), research adopting a longitudinal design with the  
10 opportunity to investigate changes in the coach-athlete relationship over time and both within- and  
11 between-subject relations is an important direction for future research. Second, whilst the exclusive  
12 use of self-report measures was primarily predetermined by the nature of the variables included in  
13 the theoretical model, the use of more objective indicators of well-being would definitely benefit  
14 future research (Bartholomew et al., 2011b). Third, our study was limited to predicting the  
15 well-being of athletes. It is also important that future research examines how coach-athlete  
16 relationship quality is related to ill-being among athletes (e.g., overtraining and burnout). Adopting  
17 direct measures of psychological need thwarting (Costa, Ntoumanis, & Bartholomew, 2015) may be  
18 particularly helpful in this respect.

19       Fourth, we used the RAI (see Ryan & Connell, 1989) to form a single variable representing

1 self-determined behavior in the present study. Despite supporting our hypothesized model across  
2 culture, it is possible that using the RAI may have masked over the unique predictive effects of the  
3 different motivational regulations that make-up the full self-determination continuum. In light of  
4 this debate (see Chemolli & Gagné, 2014), future studies may consider replicating our model using  
5 each of the motivational regulations. Fifth, and drawing parallels to the work by Quested et al.  
6 (2013), there was over-representation of males in our sample except for one country (China). To  
7 help verify past and present findings, we propose that future studies testing the cultural invariance  
8 postulate in SDT recruit more homogenous samples (e.g., age, gender, sport) across different  
9 countries. Sixth and finally, our claims of universality may have been confounded by constructs  
10 derived from a theory of Western origins (SDT; Deci & Ryan, 1985). Complementary studies in  
11 which indigenously derived constructs are developed and employed would significantly add to our  
12 understanding of culturally specific social-psychological processes and may better account for  
13 variation in the functioning of athletes around the world.

14 In sum, the current findings suggest that aspects of the interpersonal relationship between  
15 coaches and their athletes are aligned with athletes' perceptions of SDT-based motivational  
16 processes relevant to their well-being. Thus, good quality coach-athlete relationships can play a key  
17 role in creating sport environments which support athletes realizing their potential without  
18 compromising their health and well-being. Furthermore, the fact that these processes appear to  
19 operate in a similar fashion across different countries and cultures provides a basis through which

- 1 we can develop cross-cultural competencies relevant to all coaches who are interested in creating
- 2 athletic partnerships that have a positive impact on the athletes' psychological growth.

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