Testing a sequence of relationships from interpersonal coaching styles to rugby performance, guided by the coach–athlete motivation model

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This study was designed to test a four stage sequence of relationships derived from the coach–athlete motivation model (CAMM; [Mageau, G. A., & Vallerand, R. J. (2003). The coach-athlete relationship: A motivational model. *Journal of Sport Sciences*, *21*, 883–904. doi: 10.1080/0264041031000140374]) from interpersonal coaching styles to athletes' basic psychological needs, to self-determined motives, and finally rugby performance. Participants were 221 Canadian Interuniversity Sport (CIS) female rugby players who ranged from 16 to 33 years of age and reported playing rugby for an average of six years. The athletes completed a self-report questionnaire which included demographics, interpersonal coaching styles, basic psychological needs, self-determined motivation, and performance. An analysis of the structural model yielded the following fit index scores; (χ^2 (157) = 328.00, p = .000; Comparative Fit Index = .95; Incremental Fit Index = .95; Root Mean Square Error of Approximation = .07; Standardised Root Mean Square Residual = .09. The interpersonal coaching styles of autonomy support (β = .66), structure (β = .35), and involvement (β = .44) positively predicted the athletes corresponding needs. However, only autonomy significantly (β = .60) predicted self-determined motivation, while competence (β = .01) and relatedness (β = .07) did not. Finally, self-determined motivation moderately predicted rugby performance (β = .35). These findings provide initial support for propositions offered in the CAMM that the structure and involvement provided by coaches are positively associated with optimising the athletic experience. Furthermore, this study contributes to the existing literature by attempting to replicate previous studies that have examined at least one of the relationships examined in the present investigation using a varied population of female rugby players.

Keywords: basic psychological needs; coaching behaviours; self-determined motivation; self-determination theory; sport

Introduction

Motivation has been recognised as a fundamental element of sport which may differentiate "good" athletes from "great" athletes (Paskevich, Dorsch, McDonough, & Crocker, 2007). Within the context of sport, the coach–athlete relationship has been identified as a critical determinant of athlete motivation. Thus, understanding the specific coaching behaviours that produce optimal athlete performance, development, and experiences is an important research pursuit for both researchers and coaches, alike (Amorose, 2007).

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Motivation

One theoretical framework that is centrally concerned with human motivation is self-determination theory (SDT; Deci & Ryan, 1985). According to Deci and Ryan (1985), SDT follows an integrated organismic dialectical framework thereby suggesting that humans have an innate tendency towards active engagement and development, in the attempt to maximise their potential. Furthermore, social-contextual factors, such as significant others within the environment, either facilitate or thwart this innate tendency towards human development (Deci & Ryan, 1985). At the heart of SDT is human motivation, which according to Deci and Ryan exists in six forms along a continuum that differ in degree to which they are self-determined. Deci and Ryan (2002) have specified that intrinsic motivation and two forms of extrinsic motivation (integrated regulation and identified regulation) exist on the self-determined side of the continuum. Athletes that are intrinsically motivated participate in sport because of the interest, enjoyment, and satisfaction they experience from engaging in the sport itself (Deci & Ryan, 2002). Athletes that are regulated by integrated reasons engage in sport because it is part of who they are or is in line with personally endorsed values such as perseverance (Deci & Ryan, 2002). Finally, athletes that participate in sport for identified reasons do so because it is personally important (Deci & Ryan, 2002). In general, SDT researchers posit that self-determined forms of motivation (intrinsic motivation, integrated regulation, and identified regulation) lead to optimal behavioural, cognitive, and affective consequences (Deci & Ryan, 2002). A large body of research, across many domains has confirmed this claim indicating that self-determined forms of motivation tend to optimise psychological health, performance, and long-term persistence (Deci & Ryan, 2008).

Basic psychological needs

Deci and Ryan (1985) stated that one's basic psychological needs are a central concern of SDT. Basic psychological needs are viewed as innate, essential, universal necessities that humans require for a healthy psyche which are labelled *competence*, *autonomy*, and *relatedness* (Deci & Ryan, 2002). In the sports environment, competent athletes feel as though they can take on challenges and effectively perform their sport (Deci & Ryan, 2002). Autonomous athletes feel like they have choices, and are the initiator of their own actions (Deci & Ryan, 2002). Finally, athletes that experience relatedness feel a sense of mutual care and belongingness in their sporting environment (Deci & Ryan, 2002). Basic psychological needs are conceptualised to serve as contextual factors that facilitate versus thwart motivation, performance, and well-being across life domains (Deci & Ryan, 2002). In the context of sport, research has consistently supported Deci and Ryan's contentions that greater fulfilment of athletes' basic psychological needs positively predicted their self-determined motives (Hollembeak & Amorose, 2005; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008; Pope & Wilson, 2012). In general, an athletes' perceived autonomy has emerged as a moderate to large predictor of motivation, while competence and relatedness have served as small to moderate positive predictors (Amorose & Anderson-Butcher, 2007; Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009; McDonough & Crocker, 2007; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002). Considering the impact an athlete's basic psychological need fulfilment may have on their overall sporting experience, understanding the mechanisms that foster need satisfaction is an important research endeavour. Deci and Ryan (2002) have postulated that from the dialectical viewpoint, clear, and specifiable social-contextual factors exist that enhance/support one's basic psychological needs and self-determined motives.

Interpersonal coaching styles

In the context of sport, the interpersonal coaching styles of *autonomy support*, *structure*, and *involvement* have been identified as important influential agents following the SDT-based

conceptual model of the coach–athlete motivation model (CAMM; Mageau & Vallerand, 2003). The CAMM is a four-stage motivational model which links specific coaching parameters to the perceived autonomy support, structure, and involvement provided by the coach, then to the perceived fulfilment of athletes' psychological needs and finally to athletes' intrinsic and self-determined extrinsic motivation. At the core of the CAMM is the interpersonal coaching style of autonomy support which concerns coaches providing athletes with choices and opportunities to initiate and be in control of their behaviours while minimising the pressure and demands they place upon them (Deci & Ryan, 2002). Structure refers to coaches offering appropriate instruction and feedback while ensuring the athletes have a clear understanding of how and why they are expected to carry out behaviours (Deci & Ryan, 2002). Finally, involvement reflects a coach displaying an interest in the athlete's well-being while addressing the athlete's concerns in/or outside of sport (Deci & Ryan, 2002).

A literature review studying athletes' perceptions of coaches' interpersonal styles reported 17 studies that measured at least 1 of the 3 styles (Wilson, Gregson, & Mack, 2009). Of the studies, over half measured only autonomy support, while four measured all three interpersonal coaching styles (Wilson et al., 2009). An examination of the studies that have been conducted since the review was published has rendered a similar trend. Research has generally indicated that athletes' perceptions of the autonomy support provided by the coach was positively correlated to all three basic psychological needs, with autonomy emerging as the most strongly predicted need (Amorose & Anderson-Butcher, 2007; Banack, Sabiston, & Bloom; 2011; Gagné, Ryan, & Bargmann, 2003; Ntoumanis & Standage, 2009). In contrast, substantially less research has investigated the perceived structure and involvement of a coaching staff in relation to athletes' perception of their own basic psychological need fulfilment (Wilson et al., 2009). Studies have reported weak non-significant to strong correlation scores between perceived coach involvement and structure with the perceived fulfilment of athletes' basic psychological needs (Coatsworth & Conroy, 2009; Curran, Hill, & Niemiec, 2013; Gagné et al., 2003; Mouratidis et al., 2008). These findings yielded initial support for the link from perceptions of structure and involvement provided by the coach to the fulfilment of the athletes' three basic psychological needs. However, far more research must be conducted in order to understand if and how coaches' provisions of structure and involvement are related to the fulfilment of athletes' basic psychological needs, and in turn, motivation.

The aforementioned studies have provided support for the final three stages of the CAMM, although most have only investigated two stages at a time. A study conducted by Amorose and Anderson-Butcher (2007) examined all three stages of the CAMM from autonomy support to basic psychological needs, then to motivation regulation. As expected, perceived coach autonomy support most strongly predicted the athletes' feelings of autonomy of the three basic psychological needs. Autonomy emerged as the strongest predictor of the athletes' motivation, and all three basic psychological needs were reported as significant mediators between autonomy support and motivation. This study added to the literature in that it was the first to indicate that autonomy support predicted all three needs as well as athletes motivation. Based on these results, Amorose and Anderson-Butcher recommended that researchers examine all three interpersonal coaching styles in order to provide a more complete understanding of the role sport coaches play in athlete development.

Pope and Wilson (2012) extended upon Amorose and Anderson-Butcher's study by examining a four-stage motivational sequence across two time points. Interpersonal coaching styles were reported to strongly predict basic psychological needs, which strongly predicting autonomous motives, and autonomous motivation strongly predicting effort in the sample of female and male rugby players. Despite the contributions of this four-stage study, the compression of the three interpersonal coaching styles and basic psychological needs into their respective single

latent factors limited the conclusions that could be drawn from the study. The present study sought to extend upon Pope and Wilson's study by examining each interpersonal coaching styles and basic psychological need independently.

Justification for the present study

Based on existing study findings in combination with the limitations noted by Pope and Wilson (2012), the present study examined three stages of the CAMM sequence, including; perceived interpersonal coaching styles (autonomy support, structure, and involvement), basic psychological needs (competence, autonomy, and relatedness), and self-determined motives[1] (intrinsic motivation, integrated regulation, and identified regulation) in addition to the motivational outcome of performance. This study made two primary contributions to the existing literature. The first contribution concerned the inclusion of all three interpersonal coaching styles, independently of one another. Self-determination theorists have advocated for the inclusion of all three interpersonal coaching styles, as these styles are proposed to be mutually supportive and independent, and are conceptualised to foster a corresponding need (autonomy support to autonomy, structure to competence, and involvement to relatedness; Reeve, 2002). Amorose (2007) has further offered that the combination of all three interpersonal styles would provide a more accurate and complete understanding of select athlete psychological factors. Despite the recommendations of these self-determination theorists and several scholars (Amorose & Anderson-Butcher, 2007; Pope & Wilson, 2012), a study had yet to be published which examined all three interpersonal coaching styles independently, in relation to the basic psychological needs. This study therefore addressed this caveat in the literature and contributed to our understanding of the relationship between each interpersonal coaching style and its corresponding need.

Second, this study added to the literature by replicating previous studies that have examined at least one of the relationships under investigation. Specifically, we sought to conduct conceptual replication which replicates a hypothesis or results from previous research with varied methods (Schmidt, 2009). Schmidt stated that the confirmatory power of replication increases with every difference introduced. The differences of the present study included the use of new/minimally used instruments and a new population of Canadian Interuniversity Sport (CIS) female rugby players.[2] Replication—an essential foundation of science that is overlooked in the social science area—is of particular importance as it provides evidence that the study under investigation reflects a phenomenon that can be differentiated from circumstances (Schmidt, 2009). Therefore, if the results of the present study replicate that of previous literature, it will provide further support for the findings of earlier work and for the guiding framework (CAMM).

The purpose of this study was to test the four-stage sequence of relationships between coaches' perceived interpersonal coaching styles, to athletes' basic psychological needs, self-determined motives, and performance. Three hypotheses were formulated for this study. First, following the framework of the CAMM and existing literature (Amorose & Anderson-Butcher, 2007; Curran et al., 2013; Gagné et al., 2003) we anticipated that each of the interpersonal coaching styles would significantly and positively predict its corresponding need. Second, autonomy was hypothesised to be the strongest predictor of self-determined motives, followed by competence and relatedness as per existing study findings (Adie, Duda, & Ntoumanis, 2008; McDonough & Crocker, 2007). Third, we anticipated that athletes' self-determined motives would positively predict rugby performance, following the guiding theoretical framework of SDT and existing literature (Halvari, Ulstad, Bagøien, & Skjesol, 2009; Mouratidis et al., 2008).

Methods

Participants

Participants included 221 CIS female rugby players that ranged in age from 16 to 33 ($M = 20.1$; SD = 2.26) years, and reported playing organised rugby between 1 and 15 ($M = 5.9$; SD = 2.31) years. The highest level of rugby participants had played outside of CIS rugby ranged from high school to the national level, with club representing the most frequently reported level ($n = 82$). Participants varied considerably on the amount of hours a week they spent training for rugby in pre-season ($M = 9.4$; SD = 5.37; Range = 0-26), in-season ($M = 12.3$; SD = 4.54; Range = 1-30), and post-season ($M = 7.6$; SD = 4.09; Range = 0-20). Finally, participants identified themselves as being a starter ($n = 112$) more frequently than a non-starter, or sometimes started/sometimes did not start.

Instruments

Interpersonal coaching styles. The Coach Interpersonal Scale (Pelletier et al., 1995) was used to measure athletes' perceptions of the interpersonal coaching styles provided by the coaches of their CIS team. The subscales of the Coach Interpersonal Scale each contained four items and were labelled autonomy support (example item: "My coach provides me with lots of opportunities to make personal decisions in what I do"), caring (example item: "I feel that my coach sincerely cares about me"), and competence feedback (example item: "The feedback I get from my coach takes the form of useless criticism"). In order to ensure consistency with Mageau and Vallerand's (2003) model, the subscales of competence feedback and caring were alternatively referred to as structure and involvement for the remainder of the paper. All 12 items were measured on a 7-point Likert scale anchored by 1 (*never*) and 7 (*always*). The five negatively worded items (one involvement and four structure items) were reverse coded. The initial publication of the instrument reported Cronbach alpha coefficient scores of .76 for autonomy support, .79 for involvement, and .80 for structure (Pelletier et al., 1995).

Basic psychological needs. Athletes' perceptions of their feelings and experiences in CIS rugby were assessed using the Basic Needs Satisfaction in Sport Scale (BNSSS; Ng, Lonsdale, & Hodge, 2011). Specifically, the BNSSS was designed to measure athletes perceptions of their basic psychological needs of competence (five items; example item: "I have the ability to perform well in rugby"), relatedness (five items; example item: "In rugby I feel close to other people") and three subscales of autonomy, including choice (four items; example item: "in my sport, I get opportunities to make choices"), volition (three items; example item: "I feel I participate in my sport willingly"), and internal perceived locus of causality[3] (IPLOC; three items, example item: "In my sport, I feel I am doing what I want to be doing"). Participants were guided by instructions to refer to their current CIS rugby season using a scale that ranged from 1 (*not at all true*) to 7 (*very true*). The factorial validity of the five-factor confirmatory factor analysis (CFA) model and Cronbach alpha coefficient scores were reported in the initial development of the BNSSS; competence ($\alpha = .77$), autonomy-choice ($\alpha = .82$), autonomy-IPLOC ($\alpha = .76$), autonomy-volition ($\alpha = .61$), and relatedness ($\alpha = .77$; Ng et al., 2011).

Self-determined motivation. Athletes' perceived self-determined motivation was measured with three of the six subscales from the Behavioural Regulation in Sport Questionnaire (BRSQ; Lonsdale, Hodge, & Rose, 2008). The BRSQ asked participants about the reasons they engaged in CIS rugby, including statements pertaining to intrinsic motivation (example

item: " … because I enjoy it"), integrated regulation (example item: " … because it's a part of who I am"), and identified regulation (example item: " … because I value the benefits of rugby"). Participants were provided with a 7-point Likert scale anchored by 1 (*not at all true*) and 7 (*very true*). Results from the initial development of the BRSQ provided support for the validity and reliability of the instrument, reporting Cronbach alpha coefficient scores ranging from .77 to .91 and interclass coefficient scores that ranged from .73 to .90 (Lonsdale et al., 2008).

Performance. A revised version of the seven-item Game Performance Assessment Instrument (GPAI; Oslin, Mitchell, & Griffin, 1998) was used to measure performance in rugby. The instrument was initially designed to provide teachers and researchers with an assessment tool to code game performance through seven components of sport performance, including; base, adjust, cover, mark, skill execution, decisions-made, and support (Oslin et al., 1998). The items were modified from the original GPAI items to be specific to the sport of rugby (example item: "I make appropriate decisions about what to do with the ball during the game"). Participants were asked to rank their performance in CIS rugby since the beginning of their current season on a 5-point Likert scale anchored at the ends by 1 (*very weak performance*) and 5 (*very effective performance*). Therefore, each participant was asked to assess their performance for each of the seven GPAI performance components (using a single item for each component) with the 5-point Likert scale that accompanied each item. Test-retest reliability scores on the initial instrument were reported to range from .85 to .97 between raters (Oslin et al., 1998).

Procedure

After attaining ethical approval from the university, all head coaches of English-speaking CIS rugby teams were contacted to request their permission to approach the athletes on their team. Athletes were then contacted either in person or via e-mail and were afforded the opportunity to participate in the study by completing the corresponding pen and paper or online questionnaire. To be included in the study, participants were required to read the letter of information, provide informed consent, and complete the questionnaire. Participants were asked to respond to each scale in accordance to their present CIS team across the current season.

Data analysis

Data analysis proceeded in five iterative stages. First, data were screened for missing (Little, 1988) and incomplete data. Second, descriptive statistic scores (mean, standard deviation, skewness, and kurtosis) were computed to identify any out of range scores. Third, internal consistency reliability scores (Cronbach α) were examined for each construct included in the study (see Table 1 for the list of constructs). Fourth, bivariate correlation scores (Pearson correlation r) were calculated between all constructs. Fifth, Structural Equation Modelling was employed using Amos, version 20, whereby a full measurement model and structural model were examined.

In both structural equation modelling (SEM) procedures, items were fixed to load on their latent factor and all latent factors were free to correlate. Additionally, latent factor residuals were fixed to correlate between all three basic psychological needs. For each model, standardised regression weight scores, the standardised residual correlation coefficient scores, and five global fit indices were inspected. The number of standardised residual correlation coefficient scores that exceeded |1.96| were reported (Brown, 2006). The five fit indices were selected as they are recommended for use when the sample is small and likely deviates from normality—likelihood ratio chi-square (χ^2), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Root Mean Square

Table 1. Means, standard deviations, skewness and kurtosis values.

Construct	Scale range	M	SD	Skewness	Kurtosis
Structure	1-7	5.85	1.22	−1.42	1.51
Autonomy support	1-7	4.94	1.16	−0.56	0.10
Involvement	1-7	5.52	1.14	−0.91	0.41
Competence	1-7	5.67	0.82	−0.36	−0.29
Autonomy	1-7	5.99	0.83	−0.98	0.62
Relatedness	1-7	6.07	0.88	−1.16	1.36
Intrinsic motivation	1-7	6.37	0.84	−1.70	3.00
Integrated regulation	1-7	5.47	1.11	−0.85	0.99
Identified regulation	1-7	5.74	0.97	−1.03	1.93
Self-determined motives	1-7	5.86	0.83	−0.99	1.19
Performance	1-5	3.68	0.50	−0.16	0.30

Error of Approximation (RMSEA) and the 90% confidence interval surrounding the RMSEA point estimate, and Standardised Root Mean Square Residual (SRMR). In general, CFI and IFI values greater than 0.90 and 0.95 denote acceptable and excellent fit (Hu & Bentler, 1999), RMSEA scores below .05 or above 0.10 (Browne & Cudeck, 1993) denote the boundaries of excellent and unacceptable fit, and SRMR values less than or equal to 0.05 represent excellent fit while Hu and Bentler (1999) identify values around 0.08 to be acceptable. However, it must be noted that these threshold values concerning the degree of model fit using SEM remain controversial (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004), and are merely guidelines.

Results

We began the data screening process by inspecting the initial data set ($N = 236$) and removing participants that failed to provide consent ($n = 1$) or respond to the survey ($n = 14$), therefore resulting in a final sample of 221 participants Little's (1988). Missing completely at random (MCAR) test was then employed to test the nature of the missing data for the eight constructs in the data set. MCAR scores reported no significant patterns, χ^2 (3194) = 3301.83, $p = .09$, thereby indicating the data could be considered MCAR. Expectation maximisation scores were computed for all variables in the data set and replaced using the transformation process in statistical package for social sciences.

Descriptive statistics

Inspection of the descriptive statistic scores (Table 1) demonstrated that on average, this sample perceived that their coaches frequently provided structure, autonomy support, and involvement. Participants responses exceeded the midpoint for all response scales, indicating that all basic psychological needs were perceived to be highly fulfilled, they engaged in rugby for intrinsic and self-determined extrinsic purposes, and on average they believed that they were moderate to effective rugby players.

Bivariate correlations

Examination of the bivariate correlation scores between all constructs in the present study as well as the Cronbach alpha coefficient scores for each subscale is displayed in Table 2. Of the three interpersonal coaching styles, athletes' perception of the autonomy support and involvement

Table 2.   Bivariate correlation and internal consistency coefficient scores.

	Struc	AS	Inv	Com	Aut	Rel	IM	ITG	IDE	SDM	Per
Struc	*.85*										
AS	.56	*.80*									
Inv	.64	.71	*.82*								
Com	.24	.41	.39	*.84*							
Aut	.38	.60	.51	.58	*.87*						
Rel	.25	.44	.43	.51	.57	*.85*					
IM	.43	.39	.40	.38	.58	.42	*.92*				
ITG	.20	.42	.34	.43	.55	.39	.53	*.84*			
IDE	.19	.31	.25	.28	.48	.36	.55	.67	*.76*		
SDM	.31	.44	.39	.43	.63	.46	.79	.89	.88	–	
Per	.11	.24	.15	.56	.41	.32	.17	.33	.18	.27	*.81*

Note: All bivariate correlation scores are significant at $p = .01$ with the exception of the correlation between performance and structure ($p > .05$), and between performance and involvement ($p < .05$). Internal consistency reliability scores are italicised and are presented on the diagonal line.
Struc, structure; AS, autonomy support; Inv, involvement; Com, competence; Aut, autonomy; Rel, relatedness; IM, intrinsic motivation; ITG, integrated regulation; IDE, identified regulation; SDM, self-determined motives; Per, performance.

provided by their coaches were more strongly correlated with all three basic needs than structure. Correlation scores between athletes' basic psychological needs and intrinsic, integrated, and identified regulation were moderate in strength, with autonomy emerging as the strongest correlate of the three basic psychological needs. Finally, self-determined motivation, as a composite score, was weakly and positively associated with performance.

Measurement and structural model output

The final stage of the data analysis process consisted of two steps proposed by Anderson and Gerbing (1988). Step 1 entailed examining a full CFA measurement model while step 2 consisted of employing a structural model that contained the eight constructs. Item parcelling was utilised as the sample fell below the desired number of participant to number of parameters ratio of 5:1 (Bentler & Chou, 1987). Specifically, random sampling was employed such that two parcels were used for perceived structure, autonomy support, involvement, competence, and relatedness, and three parcels were used for performance. Domain representative parcelling (parcels which consist of items from different subscales within an overarching concept; Little, Cunningham, Shahar, & Widaman, 2002)[4] was used to create three parcels for autonomy and four parcels for self-determined motives. Parcelling has been used in many other studies with similar complex models (Standage, Gillison, Ntoumanis, & Treasure, 2012) and has been reported to be ideal when the intent of the study is to understand the relationship between latent factors (Little et al., 2002). The full measurement model reported standardised factor loading scores that ranged from .74 to .97 ($M = .84$; SD = 0.07), with .01% (1/160) of the standardised residual correlation coefficient scores exceeding |1.96|. The fit indices reported for the full measurement model were as follows; χ^2 (142) = 221.84, $p = .000$; CFI = .97; IFI = .98; RMSEA = .05; SRMR = .04.

Finally, 14.38% (23/160) of standardised residual correlation coefficient scores were greater than |1.96|. The fit indices for the structural model were; χ^2 (157) = 328.00, $p = .000$; CFI = .95; IFI = .95; RMSEA = .07 (90% CI = .060-.081); SRMR = .09. Strong bivariate correlation coefficient scores were reported between the three interpersonal coaching styles; autonomy support to structure (.74), autonomy support to involvement (.90), and structure to involvement (.80).

Similarly, the bivariate correlation coefficient scores between the basic psychological needs residuals were also strong (competence-autonomy, .58; autonomy-relatedness, .61; and relatedness to competence, .49). The three interpersonal coaching styles each moderately to strongly predicted athletes' corresponding basic psychological need. Of the three basic psychological needs, only autonomy significantly predicted self-determined motives, while self-determined motives moderately predicted performance. See Figure 1 to view the structural model.

Discussion

The purpose of this study was to examine the four-stage sequence of relationships from athletes' perceptions of their coaches' interpersonal coaching styles to the evaluation of their own performance. Three hypotheses were tested based upon this purpose. First, we anticipated that each of the perceived interpersonal coaching styles would positively and significantly predict its complimentary need. This hypothesis was supported by the participants' scores in the present study, as autonomy support strongly predicted autonomy, while structure and involvement moderately to strongly predicted competence and relatedness. The significant positive link reported between structure and competence and involvement and relatedness provides preliminary support for the propositions put forth in the CAMM. These findings are similar to previous study results that have investigated the relationship between interpersonal styles and basic psychological needs in the sport (Coatsworth & Conroy, 2009; Mouratidis et al., 2008), education (Reeve, 2006), and parenting (Ratelle, Larose, Guay, & Senécal, 2005) domains.

As expected, athletes' perceptions of their coaches' provisions of autonomy support strongly predicted autonomy, which replicated that of many earlier studies (Amorose & Anderson-Butcher, 2007; Banack et al., 2011; Reinboth, Duda, & Ntoumanis, 2004). Self-determination
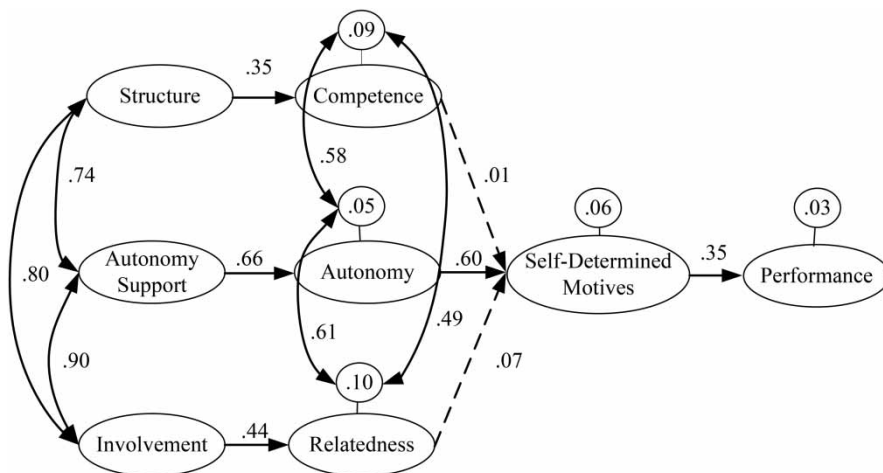

Figure 1. The path model linking interpersonal coaching styles to performance.
Notes: The numerical values surrounding the unidirectional arrows denote bootstrapped standardised regression weights. The numbers inside the circles above the dependent variables represent the bootstrapped standard error scores for that latent variable. The broken lines indicate non-significant standardised pathways ($p > .05$), while the solid lines represent significant ($p < .01$) pathways. The bi-directional arrows indicate bivariate correlations between the constructs of the three interpersonal coaching styles and between the residuals of the basic psychological needs. The residuals of the basic psychological needs were correlated as amos does not allow dependent latent variables to be correlated. Please note that the parcelled items were not included in this diagram in order to increase the clarity of the data presented.

theorists have argued, across domains (e.g. parenting, athletics, and education) that support for autonomy plays a critical role in the fulfilment of basic psychological needs, and optimising self-determined motives, persistence, and engagement (Deci & Ryan, 2002; Reeve, 2006; Tessier, Sarrazin, & Ntoumanis, 2010). Furthermore, it has been suggested that support for autonomy is an essential ingredient for the internalisation of motives and is the basis for people actively transforming values and actions into their own (Deci & Ryan, 2002). In addition, scholars have advocated that autonomy support is a multifaceted and complex set of behaviours (Mageau & Vallerand, 2003). Considering the complex nature of autonomy support and the central role it plays in the internalisation process, it is not surprising that autonomy support continues to serve as a strong determinant in SDT-based research.

Although many studies have reported autonomy support to be a strong predictor of autonomy, some studies have reported only moderate significant (Adie et al., 2008; Almagro, Sáenz-López, & Moreno, 2010; Ntoumanis & Standage, 2009) or non-significant standardised coefficient scores (Coatsworth & Conroy, 2009; Conroy & Coatsworth, 2007). An operational explanation for this inconsistency is the instrument utilised to measure autonomy support. Those studies that reported moderate (Adie et al., 2008; Ntoumanis & Standage, 2009) to strong correlations (Amorose & Anderson-Butcher, 2007; Banack et al., 2011; Reinboth et al., 2004) employed the Health Care Climate Questionnaire (HCCQ) or the Sport Climate Questionnaire (SCQ; deviates only minimally from the HCCQ). In contrast, studies that reported non-significant (Coatsworth & Conroy, 2009; Conroy & Coatsworth, 2007) or slightly lower moderate standardised coefficients (Almagro et al., 2010) used the Autonomy Supportive Coaching Questionnaire (ASSQ). The items drawn from the HCCQ and SCQ are more diverse and represent a broader range of the construct of autonomy support than the ASSQ, which may account for the stronger correlations associated with these instruments. Thus, it may be concluded that the strength of the relationship between coach autonomy support and athletes' autonomy may be highly dependent upon the instrument used.

In contrast to our first hypothesis, our second hypothesis was not completely supported by our results. In fact, only autonomy emerged as a significant predictor of self-determined motives, while competence and relatedness did not. The present study finding of autonomy serving as the strongest predictor of motivation is consistent with the bulk of preceding studies (Amorose & Anderson-Butcher, 2007; Blanchard et al., 2009; Hollembeak & Amorose, 2005; Kipp & Amorose, 2008; Sarrazin et al., 2002). However, on average, the path coefficients from competence and relatedness to motivation have generally been weak to moderate significant scores. Considering the high bivariate correlation scores reported between competence and relatedness, to self-determined motivation, along with the moderate to strong bivariate correlation scores between the basic psychological needs, one may reason that suppression could have played a role in the present studies unexpected findings. Specifically, the large regression coefficient score from autonomy to self-determined motives may have suppressed the pathway coefficient scores from competence and relatedness to self-determined motives as the residuals of the basic needs were correlated in the path model. An addition explanation for this finding may lie in the specific nature of the athlete. Previous researchers (Kipp & Amorose, 2008) have purported that the unexpected low regression coefficient score noted between relatedness and motivation may be a reflection of the specificity of the female athletes in their sample. Given these results, researchers may wish to test these relationships with various samples to see if any trend emerges regarding the participants' characteristics and strength of the relationships from basic psychological needs to self-determined motives.

Finally, in line with arguments put forth by Deci and Ryan (2002) as well as the existing literature (Halvari et al., 2009; Mouratidis et al., 2008), we tested the hypothesis that self-determined motives would positively predict rugby performance. Study results indicated that self-determined

motivation moderately and positively predicted performance, thereby supporting the third hypothesis. Furthermore, examination of the path model indicated that CFI, IFI, RMSEA, and SRMR index scores fell within the adequate to excellent range, thereby indicating that the four-stage sequence of relationships tested in the present study may be a tenable sequence.

Limitations and future directions

Due to the cross-sectional nature of the present study, the causality of the sequence of relationships proposed by Mageau and Vallerand (2003) cannot be inferred. In addition, the specificity of participants included in this research (CIS female rugby athletes) inhibits the breadth by which the study findings can be generalised. Therefore, researchers should consider replicating this study by testing the sequence of relationships outlined in the present study with various groups of athletes that differ by sport, gender, the level of competition, and age. This study was also limited to self-report measures, which may have resulted in social desirability biases. In particular, athletes may have rated their performance more favourably than their actual level of performance. Researchers could address this issue by having the coaching staff evaluate the athletes' performance.

Second, although this study did test three of four stages in the CAMM, the model was not examined in its entirety. Thus, researchers interested in the coach–athlete relationship should explore the antecedents of coach autonomy support outlined in the CAMM (coaches' personal orientation, coaching context, and perceptions of athletes' behaviour and motivation). Empirical research conducted by Stebbings, Taylor, Spray, and Ntoumanis (2012) has provided evidence that contextual factors and psychological factors of the coaches are associated with the interpersonal coaching styles they provide (Stebbings et al., 2012). Although the contextual factors (opportunities for professional development, job security, and work-life conflict) and psychological coaching factors (coaches basic psychological needs and well-being) that they included in their study were not those specifically articulated by Mageau and Vallerand (2003), obvious parallels exist between these lines of research which must be examined further to understand the mechanisms through which perceived interpersonal coaching styles are cultivated.

Finally, research emphasising interpersonal coaching styles would benefit significantly from the development of a psychometrically sound measure of all three interpersonal coaching styles. At present, an instrument does not exist that has rigorously tested items designed to measure the structure or involvement of sport coaches. This is problematic as perceived structure and involvement have been argued to be complex concepts (Ratelle et al., 2005; Reeve, 2006) which may be underrepresented in existing sport-based operalisations. Specifically Reeve (2006) has proposed that providing structure entails (a) clearly communicating the expectations necessary to achieve goals, and (b) providing plans, schedules, standards, directions, expectations, challenges, goals, examples, feedback, rewards, and learning strategies for the individual. Similarly, Ratelle et al. (2005) indicated that an involved environment includes providing (a) emotional resources such as affection, warmth, and sympathy, (b) showing interest and being attentive to ones feelings and ideas, and (c) spending time with the individual. Thus, if researchers wish to further understand interpersonal coaching styles, an important research endeavour would be to create and rigorously test a measure of perceived structure, autonomy support, and involvement provided by coaches.

Conclusion

The primary contribution of this study addressed a caveat in the literature by exploring the association between coach structure and involvement with its corresponding basic psychological need.

Athletes who perceived their coaches to provide clear instructions and feedback as well as an explanation of how and why to perform an activity reported high levels of competence in rugby. Similarly, athletes who indicated their coaches cared for them and displayed an interest in their well-being were more likely to feel they belonged, and were connected to others in their sporting environment. The findings of this study added to the literature by further testing a number of relationships that have been previously tested (e.g. each of the basic needs to self-determined motivation) in an attempt to replicate such findings with a different population. The comparison between the present and previous study findings rendered some inconsistencies pertaining to the strength of the following relationships; autonomy support to autonomy, and competence and relatedness to self-determined motives. Such inconsistencies may be a product of the operationalisation of the constructs under investigation or the population of the sample.

The findings of this study are relevant for coaches and sporting organisations as it highlights three coaching styles that are associated with athletes' optimal psychological (e.g. self-determined motives), and performance factors that coaches/organisations are interested in developing. Coaches could provide structure by (a) giving athletes clear and concise expectations as to how to complete a task, (b) offering timely, constructive, and positive non-controlling feedback, and (c) ensuring that tasks are challenging, yet attainable. Coaches could increase the autonomy support they afford by (a) asking for athletes' input when planning a practice, (b) offering choices when possible (e.g. giving the athletes an option between two drills that addresses the same skill set), and (c) clearly outlining how certain roles are decided upon in order to increase the athletes feeling of control (e.g. informing athletes of what they must do to become a starter). Finally, coaches could become more involved by (a) asking questions about the athletes, and getting to know them at a personal level, (b) showing concern for the athletes' feelings, and (c) providing a comfortable environment which allows the athletes to discuss any concerns they may have either in their sporting or personal life.

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Notes

1. This study included only athletes' self-determined motives (intrinsic, integrated, and identified regulation) in order to be consistent with the CAMM. Mageau and Vallerand (2003) rationalised that the self-determined motives are necessary for optimal functioning while non self-determined motives are associated with less desirable outcomes.
2. This convenience-based sample of CIS female rugby players differed from the existing research as most studies have included samples of both genders (Amorose & Anderson-Butcher, 2007; Curran et al., 2013), and either more than one sport (Adie et al., 2008; Hollembeak & Amorose, 2005), or individual-based sports (Coatsworth & Conroy, 2009; Gagné et al., 2003).
3. Two BNSSS measurement models were analysed to determine if the basic psychological needs were better represented as five factors (competence, IPLOC, volition, choice, and relatedness) as per the BNSSS or the theoretically based three factors (competence, autonomy, and relatedness) put forth by Deci and Ryan (2002). Results from the standardised factor loading and further inspection of

bootstrapped confidence interval (CI) indicated that volition and IPLOC were highly correlated (r = .93), and the upper boundary of the CI exceeded 1.00. These results therefore informed us that volition and IPLOC were not distinctly different, thus failing to support the use of the five factor model, which grounded our decision to use three factors in the path model.

4.   Domain representative parcelling was selected for the multidimensional constructs as it allowed us to reflect all of the faucets/subscales of a construct within one parcel, such that each parcel was an individual representation of the overall construct (Little et al., 2002).

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