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Dimensions of Coaching Behavior, Need Satisfaction, and the Psychological and
Physical Welfare of Young Athletes

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Abstract

Grounded in self-determination theory (Deci & Ryan, 2000), the purpose of this study was to examine the relationship of dimensions of coaching behavior to intrinsic need satisfaction and indices of psychological and physical well-being among male adolescent athletes. Participants were 265 British soccer and cricket players (M age = 16.44). Structural equation modeling analysis, using maximum likelihood robust method, showed athletes' perceptions of autonomy support, mastery focus, and social support from the coach to predict their satisfaction of the needs for autonomy, competence and relatedness respectively. The satisfaction of the need for competence emerged as the most important predictor of psychological and physical well-being. The findings suggest that particular aspects of the social environment may be salient for fostering particular psychological needs. The results also underline the importance of perceived competence for the psychological and physical welfare of adolescents in team sports.

Dimensions of Coaching Behavior, Need Satisfaction, and the Psychological and Physical Welfare of Young Athletes

In today's world of sport, pain rather than pleasure is often presented as the hallmark of what the motivated young athlete should feel. In quest of "the right body", many athletes starve themselves to be lighter or thinner, or inflate their body size via banned substances. Over-training in the pursuit of higher performance, although often leading to burnout and overuse injuries, is part of the sport experience for a number of sport participants (Gould, Udry, Tuffey, & Loehr, 1996). The literature suggests that the different social contexts manifested in sporting programs and, in particular, the behavior and interpersonal style of the coach, can play a major role in shaping the potential psychological, emotional, and physical effects (both positive and negative) of sport involvement (Duda, 2001; Smoll & Smith, 2002).

One theoretical approach that may shed light on the potential implications of different aspects of the social environment in sport on the well-being of athletes is self-determination theory (SDT) (Deci & Ryan, 1985, 2000). Recently a sub-theory within SDT, termed basic needs theory (BNT) (Ryan & Deci, 2002), has been formalized to clarify the meaning of the concept of basic needs and their relevance to mental and physical health. BNT assumes three needs to be essential for the nurturance and growth of the human psyche: namely the psychological needs for autonomy, competence, and relatedness. The satisfaction of the need for autonomy involves the experience of choice and the feeling that one is the initiator of one's own actions (deCharms, 1968). The satisfaction of the need for competence is fulfilled by the experience that one can effectively bring about desired effects and outcomes (White, 1959). Satisfaction of the relatedness need pertains to feeling that one is securely connected to and understood by others (Baumeister & Leary, 1995). According to SDT, variations in need satisfaction

will directly predict differences in psychological and physical well-being (Deci & Ryan, 2000).

Current research on well-being has been derived from two general perspectives. The first one, the hedonic approach, focuses on happiness and defines well-being in terms of pleasure attainment and pain avoidance. The second is the eudaimonic approach, which focuses on meaning and self-realization and defines well-being in terms of the degree to which a person is fully functioning and engaged (e.g., experiencing personal growth and development) (Waterman, 1993). SDT (Deci & Ryan, 2001) embraces the concept of eudaimonia as a central definitional aspect of well-being and attempts to specify both what it means to actualize the self as well as how that can be accomplished. The present study utilized two measures of well-being described by Waterman (1993) to be essential to the experience of eudaimonia (subjective vitality and intrinsic satisfaction/interest in the activity) and one measure of ill-being (self-reported physical symptoms).

What is particularly attractive about the concept of need satisfaction is that it allows researchers to identify the conditions under which the three needs should be satisfied and, in turn, promote well-being. One key social environmental factor in the self-determination framework assumed to nurture the fundamental need for autonomy is autonomy support (Deci & Ryan, 1987). Autonomy support refers to the readiness of an individual in a position of authority (e.g., a coach) to take the other's (e.g., the athlete's) perspective, provide appropriate and meaningful information, offer opportunities for choice, while at the same time minimize external pressures and demands (Black & Deci, 2000).

Studies conducted in the sport setting have provided support for the basic tenets of

SDT with respect to the relationship of autonomy support to need satisfaction (see Vallerand, 2001, for a review). For example, research by Blanchard and Vallerand (1996, cited in Vallerand & Losier, 1999), on basketball players, revealed that the more the coach was perceived as autonomy supportive by his or her athletes, the more autonomous the athletes felt. In a study by Standage, Duda, and Ntoumanis (2003) in the context of physical education (PE), perceptions of an autonomy-supportive climate were strong positive predictors of students' perceptions of autonomy.

An important feature of the present research is that it tests the proposed social environment → need satisfaction → outcomes sequence with respect to other facets of the social context besides autonomy support; namely the degree to which the social agent of concern centers on mastery (or task) goals (Ames, 1992; Nicholls, 1989) and provides social support. A dimension of the sport environment, which may particularly satisfy the need for competence is the emphasis placed by the coach on athletes' self-referent improvement, mastery, and effort. According to Duda (2001), a mastery environmental focus should foster perceptions of competence, because the self-referenced criteria (e.g., effort) underlying competence judgments and ensuing feelings of success are more controllable and achievable compared to normative criteria (e.g., winning). In a study by Ntoumanis (2001), perceptions of the PE teachers' emphasis on self-referent improvement were found to be a strong predictor of competence among PE students.

Finally, another facet of the social environment which should have implications for the quality of individuals' experiences within achievement settings is social support. In this study, social support was defined as people's perceptions that they are loved, valued and esteemed by others (Pierce, Sarason, & Sarason, 1992). Grounded in SDT, Ryan and Solky (1996) argue that the positive psychological effects of social support on individuals' physical and mental welfare may derive from the capacity of social support

systems to satisfy one or more of the basic psychological needs, the need for relatedness in particular. In line with the suggestions that the team atmosphere created mainly by the coach has a strong influence on the social reality of athletes (Roberts & Treasure, 1992), the current research focuses on athletes' perceptions of the social support on their team as spear-headed by the coach.

BNT is hypothesized to be applicable across contexts, age, gender and cultures (Deci & Ryan, 2000). Although the means through which needs are satisfied, as well as the relative importance of the three needs may vary in different contexts, the underlying processes by which need satisfaction promote health-related outcomes and well-being are assumed to be invariant (Ryan & Deci, 2002). No studies to date have tested the hypothesized motivational sequence between perceptions of the social environment, need satisfaction, and well-being in the context of sport as proposed in SDT, despite the strong theoretical and empirical support for this sequence in other life contexts (e.g., Deci, et al., 2001). Given the number of children and adolescents who regularly take part in adult-organized sport, the understanding and enhancement of their motivation and the quality of their involvement in such sport programs takes on particular significance (Treasure, 2001). Also, by providing preliminary support for BNT in the domain of sport, it is hoped that the present study could further strengthen the relevance of the theory to diverse contexts.

In sum, the major purpose of the present study was to examine the links between three facets of the social environment perceived to be engineered by the coach (i.e., autonomy support, mastery focus, and social support) to need satisfaction and indices of psychological and physical well-being among male adolescent athletes. It was hypothesized that autonomy support² from the coach would predict perceptions of autonomy in sport, mastery focus would predict perceived competence, and perceived

social support from the coach would predict perceptions of relatedness. The model proposed that fulfillment of the psychological needs would relate positively to indicators of well-being and negatively to the index of ill-being.

Method

Participants and Procedures

Two hundred and sixty five British adolescent (M age = 16.44; SD = 1.32) male soccer and cricket players participated in this study. In terms of ethnicity breakdown, 51.3 % reported to be white English, 24.2 % Asian, 5.7 % Afro-Caribbean, and 4.5 % mixed. Thirty-eight participants did not state their ethnic background. Secretaries and coaches of the teams that had agreed to take part were contacted and received a letter explaining the purpose of the study. All athletes under the age of eighteen also received informed consent forms that were signed by their parents/guardians. None of the athletes were denied permission to participate. A multi-section questionnaire, also containing other variables that are not reported here, was administered by the principal investigator either before or after a normal practice in a team clubhouse or a classroom. At all meetings, instructions on how to fill in the questionnaire were given, emphasizing that they do so as personally and honestly as possible, that there were no right or wrong answers, and that their responses would be kept confidential. On average, the questionnaire required approximately 25 minutes to complete.

Measures

Environmental Factors

To assess the sporting environment created by the coach, participants were asked to think about what the environment is like on their team in general. To measure athletes' perceptions of *coach autonomy support*, seven items were drawn and adapted to sport

from the Health-Care Climate Questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996). In line with the work of Kasser and Ryan (1999), the chosen items focused exclusively on the coach's support for self-determination (e.g., "the coach provides players with choices and options"). The perceived focus of the coach on *mastery* and improvement was assessed using the effort/improvement subscale (e.g., "players feel successful when they improve") of the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton, Duda, & Yin, 2000). Based on the work of Sarason and colleagues (Sarason, Sarason, Shearin, & Pierce, 1987), the short form of the Social Support Questionnaire (SSQ6; Sarason et al., 1987) was slightly adapted for the sport context to tap athletes' perceptions of the degree of *social support* available on their team as provided by their coach (e.g., "players can really count on the coach to be there when they need help"). Perceived support rather than objective social support was tapped, because the former generally seems to yield the strongest associations with health and adjustment criteria (Sarason, Sarason, & Pierce, 1994). All responses (except mastery focus, which was scored on a 5-point scale; Newton et al., 2000) were indicated on a 7-point scale ranging from strongly disagree (1) to strongly agree (7).

Basic Needs

To assess the satisfaction of the need for *autonomy* in sport, six items (e.g., "I have a say in what happens and I can voice my opinion") were modified for the sport setting from the Need Satisfaction at Work Scale (Deci et al., 2001). The five-item perceived ability sub-scale of the Intrinsic Motivation Inventory (McAuley, Duncan & Tammen, 1989) was used to determine the satisfaction of the need for *competence* (e.g., "I am pretty skilled at soccer"). Satisfaction of the need for *relatedness* in sport (e.g., "On my team I feel valued") was tapped with the five-item Acceptance subscale of the Need for Relatedness Scale (Richer & Vallerand, 1998). All responses were indicated on a 7-

point Likert scale, except in the case of the relatedness subscale, which was scored on a 5-point scale.

Well-being Variables

Subjective vitality (e.g., “In soccer I feel alive and vital”) was measured using the 6-item version of the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997). Responses were indicated on a 7-point Likert scale anchored by not at all true (1) and very true (7). Participants’ degree of intrinsic satisfaction with and *interest in sport* (e.g., “I usually have fun when I play soccer”) was assessed by the five-item Satisfaction/Interest in Sport Scale (Duda & Nicholls, 1992). Responses were indicated on a 5-point Likert scale anchored by strongly disagree (1) to strongly agree (5). To measure *physical symptoms*, participants completed the 9-item physical symptom checklist (Emmons, 1991) on which they indicated the degree to which they had experienced symptoms such as runny nose, headaches, stomach-ache/pain, in the past two weeks. Responses were indicated on a 7-point Likert scale anchored by not at all (1) to very much (7). Because of the participants’ age, the acne/pimples symptom was not assessed in the present study as pilot work suggested this item might be personally sensitive for adolescents. The eight categories were combined into a composite symptom measure.

Alpha coefficients for all scales ranged from .73 to .89 and were deemed acceptable on the basis of Nunnally’s (1978) criterion of .70 for the psychological domain.

Data Analyses

Structural Equation Modeling (SEM) utilizing EQS 5.7 (Bentler, 1995) was employed to test the hypothesized model. Because the normalized estimate of Mardia’s coefficient was relatively large (multivariate kurtosis = 18.33), the data were analyzed

using robust maximum likelihood analysis, as recommended by Bentler (1995). This analysis adjusts the chi-square statistic (χ^2) and the standard errors under conditions of non-normality to protect from Type I error. To examine the hypothesized model, we followed the two-step approach recommended by Anderson and Gerbing (1988). Firstly, confirmatory factor analyses (CFA) were performed in regard to the hypothesized measurement model to determine whether the indicators were related to the latent factors in a satisfactory manner. Secondly, after a satisfactory fit was achieved for the measurement model, we tested the fit of the structural model which linked the latent factors.

The fit of the measurement and the structural model was examined using various indices of fit provided by EQS. First, the Satorra-Bentler's scaled χ^2 (used with robust maximum likelihood analysis) was considered. Traditionally, a good factor structure is inferred when the χ^2 likelihood ratio is non-significant. However, given the sensitivity of the χ^2 statistic to sample size (Hu & Bentler, 1999), we complemented this with other goodness-of-fit-measures. These were the Robust Comparative Fit Index (RCFI), the Bentler-Bonnet Nonnormed Fit Index (NNFI), the Root Mean Square Error of Approximation (RMSEA) with its 90% confidence interval (CI), and the Standardized Root Mean Square Residual (SRMR). A good fit of a specified model to the data is generally indicated when the RCFI and the NNFI indices are close to .95, and the RMSEA and the SRMR are less than .06 and .08, respectively (Hu & Bentler, 1999). Moreover, a close fit of the model to the intended population is implied when the lower bound of the 90% CI of the RMSEA includes the value of .05 (Browne & Cudeck, 1993).

Results

Table 1 presents the means and standard deviations of, and correlations between

the variables used in the study. Pearson product moment correlations revealed that the dimensions of coach behavior were significantly and positively related among themselves as well as to the three needs and the well-being variables (subjective vitality and intrinsic satisfaction). The three psychological needs were positively and moderately inter-correlated. Positive and significant relationships emerged between the need satisfaction variables and the well-being variables. The three need satisfaction variables were negatively correlated with reported physical symptoms.

CFA of Measurement Model

Prior to testing the hypothesized model, we examined the factorial structure of each of the model's components (see Table 2). Results showed that some of the scales had a poor model fit indicating that the factorial structure of some of the scales should be revised. Examination of the modification indices provided by EQS (Lagrange Multiplier and Wald Test) suggested the elimination of some items. These items were removed one at a time, and each time the model fit was reevaluated. This procedure is considered a justifiable process in measurement evaluation as it preserves the general structure of the initially hypothesized factor model, but with only the best available indicators (Hoffmann, 1995). For the autonomy support scale, two items were removed (i.e., "the coach makes sure all players understand what they need to do and why" and "the coach encourages players to ask questions"). The item "players are encouraged to work on their weaknesses" was removed from the coach emphasis on effort/improvement scale. In the need for autonomy scale, the item "I feel free to do things my own way" was omitted. The final scales had moderate to high factor loadings ranging from .58 to .90 (median factor loading = .79). It is important to note that beyond a statistical rationale, the deletion of problematic items could be substantiated on conceptual grounds as well. For example it could be argued that the content of the two eliminated autonomy items reflected aspects

of coach behavior that might enhance athletes' competence more than their sense of volition and choice. The internal consistencies of the scales were reassessed after the elimination of the above items. Results indicated that the removal of these items did not compromise the internal consistency (autonomy support $\alpha = .83$, before, $\alpha = .84$ after; effort/improvement $\alpha = .73$ before, $\alpha = .69$ after; need for autonomy $\alpha = .83$ before $\alpha = .82$ after) of the three scales in question.

Structural Model

Next, the structural model was tested. The testing of a comprehensive theoretical model with SEM may necessitate the reduction of the number of indicators per latent factor, especially when the sample size is not very large compared to the number of variables in the model (Marsh, Richards, Johnson, Roche, & Tremayne, 1994). Marsh and associates (1994) suggested the use of item pairs (or "parcels") instead of individual items because they are more reliable and tend to be more normally distributed. MacCallum (MacCallum, Widaman, Zhang, & Hong, 1999) indicated that an advantage of "parcelling", when compared to full-item models, is the reduced probability that the residuals will be correlated. Drawing on these arguments, it was decided to combine the item indicators into pairs. More specifically, the first two items in each subscale were averaged to form the first item pair, and then the second two items were averaged to form the second item pair, and so on.

The indices of fit revealed that although the hypothesized model fit the data reasonably well, there was room for improvement: scaled $\chi^2 (198) = 341, p < 0.001$, RCFI = .93; NNFI = .91; RMSEA = .06 (CI .05 - .07); SRMSR = .07. The hypothesized paths from perceived autonomy to physical symptoms, as well as the paths from perceived relatedness to subjective vitality, intrinsic satisfaction/interest and physical symptoms were not significant and were therefore dropped. Furthermore, based upon

theoretical arguments (Deci & Ryan, 2000) and empirical findings showing the basic needs to be associated with each other (Sheldon & Bettencourt, 2002; Standage et al., 2003), the disturbance terms of the three needs were allowed to correlate. We correlated the disturbance terms of the three needs rather than the three needs themselves because dependent variables cannot be correlated in SEM. The indices of fit showed that the revised model ¹ (see Figure 2) fit the data well: scaled $\chi^2 (195) = 306, p < 0.001$, RCFI = .95; NNFI = .93; RMSEA = .05 (CI .05 - .06); SRMSR = .07. The structural model is illustrated in Figure 1. As can be seen, moderate to strong paths linked the three dimensions of coaching behavior with the three basic needs. The need for autonomy was a weak to moderate predictor of the two indicators of psychological well-being in sport. The need for competence was a strong predictor of both indices of psychological well-being and also a negative predictor of physical ill-being. The need for relatedness did not predict any of the well-being/ill-being variables.

Discussion

Grounded in SDT (Deci & Ryan, 2000) the purpose of this study was to test a model that considered how three dimensions of the social environment embedded within the SDT, achievement goal (Ames, 1992; Nicholls, 1989) and social support (Burlinson, Albrecht, & Sarason, 1994) literatures would predict need satisfaction and indices of mental/physical welfare among a sample of team sport participants. Overall, the results were supportive of the proposed pattern of sequences in the model.

Dimensions of Coaching Behavior

Moderate to strong paths connected the three dimensions of autonomy support, improvement, and social support with satisfaction of the three basic needs of autonomy, competence and relatedness. Athletes' perceptions of the coach as autonomy supportive were positively related to their perceptions of autonomy. This finding is consistent with

previous research in the education (Black & Deci, 2000; Ryan & Grolnick, 1986), sport (Blanchard and Vallerand, 1996, cited in Vallerand & Losier, 1999; Pelletier, Fortier, Vallerand, & Brière, 2001), PE (Ntoumanis, 2001; Standage et al., 2003), and exercise (Wilson & Rogers, in press) domains showing autonomy support to foster feelings of autonomy. An environment low in its controlling features (e.g., a situation where coaches give athletes responsibilities, offer choices and options) is more likely to foster feelings of personal causation and facilitate the perception of oneself as an origin of one's behavior (deCharms, 1968).

Drawing from the achievement goal literature (Nicholls, 1989), perceptions that the coach was mastery focused emerged as a positive predictor of athletes' perceptions of competence. This facet of the social environment could be considered one of the most crucial dimensions of a task-involving motivational climate (Ames, 1992; Newton, et al., 2000). This result is consonant with work conducted in physical education (e.g., Ntoumanis, 2001), academic (e.g., Ames, 1992), and sport (e.g., Kavussanu & Roberts, 1996) settings, showing perceptions of a task-involving environment to be positively associated with perceived competence. Demonstrating improvement and effort are probably more controllable sources of competence evaluation and may, thus, make it easier for individuals to feel good about their abilities in achievement contexts such as sport.

The athletes' perceptions that the coach provided assistance and emotional support to players on the team was a strong positive predictor of athletes' sense of relatedness within their team. This result is congruent with SDT (Deci & Ryan, 2000; Ryan & Solky, 1996) which suggests that showing care for and valuing someone (in this case the athlete) as a person without any attached contingencies (such as basing one's

support on the level of the athlete's performance) should lead to individuals feeling more valued and attached to others in the setting at hand.

Need Satisfaction and Well-being

In line with our hypothesis, the need for autonomy emerged as a positive, albeit weak, predictor of subjective vitality and intrinsic satisfaction/interest in sport. Both of these latter variables are considered to be positive indicators of eudaimonic well-being (Waterman, 1993). This positive prediction is aligned with Ryan and Frederick's (1997) argument that autonomy should play an important role with regard to feelings of being vital. According to Ryan and Frederick (1997), only those with an internal locus of causality will experience their energy as "their own" and as emanating from the self. As a result, they should report higher levels of subjective vitality. For example, athletes who feel powerless and compelled in their participation, may perceive less energy available to themselves compared to those athletes who feel that they practice their sport autonomously and wholeheartedly. Perceptions of autonomy were also a positive predictor of intrinsic interest in sport. According to Deci and Ryan (1985), intrinsic interest and satisfaction are emotions assumed to characterize intrinsic motivation. Thus, this finding further supports the notion that fulfillment of the need for autonomy is essential for self-determined goal-directed behavior.

In contrast to our hypothesis, the need for autonomy did not emerge as a negative predictor of reported physical symptoms in the SEM analyses. Findings by Reis et al. (2000) showed that daily experiences, but not general levels, of self-determination were a significant negative predictor of reported physical symptoms. Thus, it could be that autonomy was measured at a too general level to significantly predict this indicator of ill-being. Conversely, as suggested by Sheldon and Bettencourt (2002), it could also be

possible that particular need satisfaction constructs may be somewhat more relevant to the presence of positive outcomes than to the absence of negative outcomes.

The need for competence was most strongly linked to the two indices of psychological well-being. This finding is consistent with previous research in physical education (Ferrer-Caja & Weiss, 2000; Ntoumanis, 2001; Standage et al., 2003) where perceived competence has emerged as a crucial construct in predicting self-determined motivation. Deci and Ryan (1985) argue that the relative impact of each psychological need will vary depending on the functional significance of the situation. According to Feltz (1988), perceived competence plays a crucial role in all forms of physical activity engagement. The present findings suggest that sport participants who perceive themselves to possess high physical skills, may find their sport participation more intrinsically interesting, enjoyable, and energy enhancing.

The current findings, showing the need for autonomy to be a significant predictor of both intrinsic interest and subjective vitality, also seem to lend support to the idea that eudaimonic well-being cannot be witnessed by feeling competent alone. Although feeling competent with respect to either autonomous or controlled actions may lead to hedonic well-being (e.g., feeling content and pleased with oneself), eudaimonic well-being cannot be experienced if a person perceives her/his behavior to be controlled. That is, eudaimonic well-being is held to also require satisfaction of the need for autonomy (Nix, Ryan, Manly, & Deci, 1999; Ryan & Deci, 2001; Waterman, 1993).

Contrary to our hypothesis, and findings by Reis et al. (2000) and Sheldon and Bettencourt (2002), perceptions of relatedness did not predict any of the indicators of positive or negative well-being. Deci and Ryan (2000) have suggested that the need for relatedness may play a more distal role in the maintenance of intrinsic motivation and, thereby, any ensuing ramifications of peoples' welfare. From a statistical point of view, it

is also important to keep in mind the observed interdependencies between the three needs, which have been found in other studies (e.g., Sheldon & Bettencourt, 2002). Because the regression path coefficients of the three need satisfaction variables to the dependent variables represent the unique effect of each predictor, this may have possibly reduced the predictive validity of relatedness. Nevertheless, it seems perhaps more plausible that the relative importance of the three needs depends on the functional significance of the situation as well as the nature of the activity, and that perceptions of competence, in contrast to autonomy and relatedness, may perhaps play a more essential role with respect to well-being among sport participants. In line with the suggestions by Standage et al. (2003), although limited feelings of relatedness and/or autonomy may be disadvantageous to the quality of athletes' experiences in sport, it is unlikely that the thwarting of these needs would bring out the same level of aversive feelings or discontent associated with the public demonstration of lack of physical ability in this domain. More research is needed to better understand the relative relevance of the three needs to athletes' well-being.

A few notes of caution ought to be coupled with the interpretation of the current findings. First, the data were correlational in nature and collected at one point in time, which limits the interpretation with regard to causality and the direction of the processes involved. Longitudinal and experimental work is therefore warranted. Second, this study was limited to adolescent male athletes involved in team sport. Basic needs are assumed to be universal, and thus the relation between need satisfaction and well-being should apply across ages and genders as well as different types of sport. However, this generalizability should be empirically determined. Further, all measures in this study were self-reported. The attainment of more objective evaluations of coach behaviors and

athletes' mental and physical health status, in addition to subjective ratings, would also be an important and interesting consideration for future research.

Conclusions and Practical Implications

The present study tested and found preliminary support for Deci and Ryan's (2000) basic needs theory in the context of sport. Our findings tentatively suggest that a social environment which is autonomy supportive, emphasizes improvement and effort, and is socially supportive may help maximize the satisfaction of athletes' basic needs which in turn may possibly foster eudaimonic well-being among adolescent sport participants.

Coaches are assumed to play a very active role in training and competition. They spend a lot of time interacting with athletes, trying to motivate them and providing instruction and feedback. Therefore, it makes sense to investigate the psychological environment/climate they create (Ames, 1992), and how that environment corresponds to the quality of athletes' sport experience and subjective well-being. Coaches can foster the satisfaction of the need for autonomy by giving athletes' choices and options, providing rationales for requested behaviors, and encouraging self-regulation. For example, they may provide athletes with the necessary information to solve a problem or learn a new skill or strategy, while encouraging them to solve the problem or develop the skill/strategy in their own way. To promote athletes' sense of competence, coaches might develop evaluation criteria based on self-referenced improvement and the degree to which effort is exerted in training and competition. They could also encourage athletes to develop internalized performance standards and help them learn to self-monitor. Finally, to satisfy the need for relatedness, coaches may do well in accepting, caring for, and valuing players as people, not just as performing athletes.

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Table 1

Descriptive Statistics and Zero-Order Correlations Among the Study Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Autonomy Support	4.54	1.21								
2. Improvement/Effort	4.13	.51	.32**							
3. Social Support	4.54	1.25	.70**	.38**						
4. Need for Autonomy	3.88	1.36	.56**	.15*	.41**					
5. Need for Competence	5.69	.93	.12*	.19**	.13*	.20**				
6. Need for Relatedness	3.74	.75	.47**	.29**	.52**	.47**	.29**			
7. Subjective Vitality	5.04	1.18	.22**	.30**	.26**	.24**	.41**	.27**		
8. Satisfaction/Interest	4.54	.64	.14*	.23**	.17**	.17**	.36**	.23**	.65**	
9. Physical Symptoms	4.13	1.06	-.14*	-.06	-.18**	-.06	-.16**	-.12	-.14*	-.14*

* $p < .05$ ** $p < .01$

Table 2

Goodness of Fit Indices for the Subscales Used

Model	Scaled χ^2	df	NNFI	RCFI	SRMR	RMSEA (90% CI)
Autonomy Support (5 items)	6.22	5	.99	1.00	.03	.04 (.00 - .10)
Effort/Improvement (6 items)	6.73	9	1.02	1.00	.03	.00 (.00 - .06)
Social Support	30.57**	14	.94	.97	.04	.10 (.07 - .13)
Need for Autonomy (5 items)	24.91**	5	.92	.97	.05	.12 (.08 - .17)
Need for Competence	2.01	5	1.00	1.00	.01	.00 (.00 - .07)
Need for Relatedness	8.92	5	.97	.99	.03	.08 (.03 - .13)
Subjective Vitality	20.60**	9	.94	.98	.04	.11 (.07 - .15)
Intrinsic Satisfaction	4.20	5	.98	.1.00	.03	.06 (.00 - .11)
Physical Symptoms	27.00**	14	.89	.95	.05	.08 (.05 - .11)
Hypothesized Model	341.07**	198	.91	.93	.07	.06 (.05 - .07)
Revised Model	306.80**	195	.93	.95	.06	.05 (.05 - .06)

** $p < .01$

Figure Captions

Figure 1. Revised model of social environmental factors, need satisfaction, and indices of psychological and physical well-being. All paths are significant.

Note: The correlations of the disturbances were as follows: $r_{\text{autonomy-competence}} = .30$;

$r_{\text{competence-relatedness}} = .33$; $r_{\text{autonomy-relatedness}} = .47$.

Footnotes

¹ Two competing alternative models were also tested. The first one was based on Ryff's theory of well-being (Ryff & Singer, 1998). Ryff poses an interesting alternative to SDT arguing that the needs for autonomy, competence and relatedness are in themselves valid definitions/measures of eudaimonic well-being (Ryff & Singer, 1998). In contrast, SDT argues that the three needs are the principal factors that foster well-being and that they serve as mediators with respect to potential social environment influence on outcomes. Based on Ryff's argument, we therefore tested an alternative rival model in which the environmental coaching factors were assumed to be positive predictors of indices of psychological well-being (subjective vitality, intrinsic interest/satisfaction) physical ill-being (physical symptoms) as well as the three basic needs. No paths between the need satisfaction and outcome variables were specified. Similar to the original model, we also correlated the error terms of the three needs. The indices of fit showed that the alternative model based on Ryff's thinking did not fit the data well: scaled χ^2 (206) = 1099, $p < 0.001$, RCFI = .57; NNFI = .64; RMSEA = .12 (CI .12 - .13); SRMSR = .63.

Because the perception of coaches' behaviors and attitudes, and athletes' perceived degree of need satisfaction was assessed simultaneously, there could be a possibility that athletes' perceived need satisfaction may possibly have directly influenced the way they perceived the attitudes and behaviors of the coaches. In turn these perceived environmental factors may have influenced athlete's self-reported well-being. Therefore, we tested a second alternative rival model in which need satisfaction were positive predictors of perceptions of the coach created environment, which in turn predicted indices of psychological well-being and physical ill-being. The indices of fit

showed that this second alternative model did not fit the data well: scaled χ^2 (194) = 446, $p < 0.001$, RCFI = .88; NNFI = .85; RMSEA = .08 (CI .07 - .09); SRMSR = .08.

To examine possible interactions between the environmental coaching dimensions and the three need satisfaction variables, we performed a series of hierarchical moderated regression analyses (Aiken & West, 1991). In each regression, the three independent variables (main effects) were entered in step one, the three possible 2-way (or first-order) interaction terms (e.g., coach autonomy support x coach focus on effort/improvement) in step two, and finally the 3-way (or second-order) interaction term (i.e., coach autonomy support x coach focus on effort/improvement x social support) was entered in the last step. None of the interaction terms reached significance.

² It should be noted that Deci and Ryan (2000) argue that autonomy support also entails the valuing of and demonstration of confidence in the other person, and is thus theorized to facilitate feelings of relatedness and competence as well. We do by no means disagree with this; however, using such an omnibus definition (and corresponding assessment tool) makes it difficult to determine which specific environmental facets particularly promote each of the three needs. In an attempt to tease this out, we only employed items reflecting the perception of the coach's support for self-determination (e.g., providing choice, involving athletes in decision making) when tapping the autonomy-supportive features of the coaching behavior.