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Autonomy-supportive coaching and self-determined motivation in high school and college athletes: A test of self-determination theory

Anthony J. Amorose[a,*], Dawn Anderson-Butcher[b]

[a]*School of Kinesiology and Recreation, Illinois State University, 227L Horton Fieldhouse, Normal, IL 61790-5120, USA*
[b]*The Ohio State University, USA*

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Abstract

Objectives: Using self-determination theory as a framework, this study tested whether perceived competence, autonomy, and relatedness mediated the relationship between perceived autonomy-supportive coaching and athletes' motivational orientation.
Design: A cross-sectional, survey study conducted during a regularly schedule training session.
Method: Male and female high school and college athletes ($N = 581$) completed questionnaires assessing the key variables of interest.
Results: Structural equation modeling revealed support for a mediational effect. Specifically, results indicated that the degree to which athletes perceived their coaches to be autonomy-supportive significantly predicted the athletes' perceived competence, autonomy, and sense of relatedness, which, in turn, each predicted their motivational orientation. This pattern of relationships was invariant across gender and level of competition.
Conclusions: Results support self-determination theory and highlight the motivational benefits of autonomy-supportive coaching behaviors.

Keywords: Significant others; Intrinsic and extrinsic motivation; Needs; Sport

*Corresponding author. Tel.: +1 309 438 8590.
E-mail address: ajamoro@ilstu.edu (A.J. Amorose).

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Introduction

The way in which coaches structure practices and training, their decision making style, and the quantity and quality of the feedback they provide to their athletes are all behaviors with important motivational implications (Horn, 2002). Despite the general acknowledgement that coaches play a crucial role in motivating athletes, surprisingly little research has specifically tested the processes by which various coaching behaviors influence motivation (Amorose, in press). The goal of this study is to examine the link between perceived coaching behaviors—namely the degree to which athletes perceive their coaches to exhibit an autonomy-supportive interpersonal style—and athletes' motivational orientation using self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000, 2002) as a framework.

Motivation according to SDT

In their presentation of SDT, Deci and Ryan (1985), Ryan and Deci (2000, 2002) argue the reasons why individuals choose to participate, exert effort, and persist in an activity can be classified along a continuum of self-determination. The most self-determined form of behavioral regulation involves intrinsic motivation, which is defined as engaging in an activity for the pleasure and satisfaction derived from the activity itself. On the opposite end of the continuum is amotivation, which generally reflects a lack of intention and motivation. Situated between amotivation and intrinsic motivation is extrinsic motivation, which involves engaging in an activity for instrumental reasons or as a means to some end. According to SDT, there are four types of extrinsic motivation that range on a continuum from lower to higher levels of self-determined behavior, including external regulation, introjected regulation, identified regulation, and integrated regulation, respectively.

People participate in voluntary activities such as sport for multiple reasons, and likely include a combination of intrinsic and extrinsic reasons (Anderson-Butcher, Newsome, & Ferrari, 2003; Weiss & Ferrer-Caja, 2002). The primary or central reasons for participation reflect one's *motivational orientation* toward that activity. People who engage primarily for the enjoyment inherent in the task (intrinsic motivation) and/or because they value the activity (identified regulation) reflects the possession of a more self-determined motivational orientation. Conversely, doing the activity to avoid feelings of guilt or for ego-enhancement (introjected regulation) or because of some external demand or reward contingency (external regulation) would reflect a non-self-determined motivational orientation.

The degree to which people possess a more or less self-determined motivational orientation is important given the strong evidence that engaging in activities for more self-determined reasons is associated with positive cognitive, affective, and behavioral outcomes (Ryan & Deci, 2002; Vallerand & Losier, 1999; Vallerand & Ratelle, 2002; Weiss & Ferrer-Caja, 2002). For example, people are more likely to choose to participate and work hard when extrinsic rewards and reinforcements are not available, they experience lower levels of performance-related anxiety, and exhibit greater levels of skill learning when their motives are more self-determined in nature (see Ryan & Deci, 2002; Vallerand & Losier, 1999; Vallerand & Ratelle, 2002; Weiss & Ferrer-Caja, 2002). Given these findings, identifying factors related to the promotion and development of a

more self-determined motivational orientation is an important goal for those working with others, such as teachers and coaches.

One of the central tenets of SDT (Ryan & Deci, 2000, 2002) is that self-determined motivation is affected by the extent to which the fundamental human needs for competence, autonomy, and relatedness are fulfilled or satisfied. The need for competence reflects the need to perceive our behavior as effective and feel that we have adequate ability. The need for autonomy represents the need to perceive we are the origins of our own behavior and that we control our own actions. Finally, the need for relatedness represents the need to feel a secure sense of belongingness or connections to others. SDT states that individuals will seek out activities and experiences to satisfy these three fundamental needs, and people will engage in activities that provide support for these needs for more self-determined reasons (Ryan & Deci, 2002). Ultimately, then, anything that impacts the needs of competence, autonomy, and relatedness can therefore impact the motivational orientation one develops toward an activity.

The motivational influence of the coach

SDT research has demonstrated the link between numerous social-contextual events, such as rewards, feedback, imposed deadlines, competition, surveillance, and interpersonal styles on people's need satisfaction and subsequent motivation (Deci, Koestner, & Ryan, 2001; Henderlong & Lepper, 2002; Ryan & Deci, 2002; Vallerand & Losier, 1999). The importance of the coaches is apparent here because they are able to influence most of the factors identified as affecting motivational outcomes. For example, coaches are in the position to provide performance-related feedback, to give out rewards, and to involve athletes in the decision-making process. Recently, Mageau and Vallerand (2003) suggested that the actions of coaches might be one of the more critical motivational influences in the sport setting.

Research has provided support for this assertion in that athletes' perceptions of various behaviors exhibited by their coaches are associated with the athletes' motivation (see Amorose, in press; Horn, 2002; Mageau & Vallerand, 2003; Vallerand & Losier, 1999). For example, Amorose and Horn (2000) found that college athletes who perceived their coaches to exhibit a leadership style that emphasized training and instruction and was high in democratic behavior and low in autocratic behavior reported higher levels of intrinsic motivation. Further, high levels of intrinsic motivation were associated with the perception that coaches provided frequent positive and informationally based feedback (i.e., technical instruction) and low frequencies of punishment-oriented feedback and ignoring behaviors.

Furthermore, consistent with SDT (Ryan & Deci, 2000, 2002), as well as Vallerand's (1997) hierarchical model of motivation, a few studies have provided specific evidence that the relationship between coaching behaviors and motivation is mediated by the needs for competence, autonomy, and relatedness (e.g., Hollembeak & Amorose, 2005; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002). That is, the behaviors exhibited by coaches influence athletes' perceptions of competence, sense of autonomy, and feelings of relatedness, which, in turn, influences the athletes' motivation. For instance, a series of structural models tested in Hollembeak and Amorose (2005) revealed that the perceived leadership styles of coaches were associated with college athletes' intrinsic motivation through their influence on the athletes' needs. Athletes, for example, who perceived their coaches possessed an autocratic decision-making style felt lower

levels of autonomy and relatedness, and subsequently reported less intrinsic motivation. Athletes who perceived their coach to have a democratic decision-making style, conversely, reported high levels of autonomy and intrinsic motivation.

While many dimensions of a coach's behavior may affect athletes' motivation, one that would appear particularly relevant is the extent to which athletes perceive their coach to be autonomy-supportive versus controlling in their interactions with the athletes (Mageau & Vallerand, 2003). An authority figure, such as a coach, who is autonomy-supportive engages in behaviors that acknowledge their subordinates' thoughts and feeling, encourages choice, self-initiation, and regulation of people's own behavior, and minimizes the use of pressure and demands to control others (Deci & Ryan, 1985, 1987). Conversely, pressuring others to think, feel and act in a way consistent with the needs and wants of the authority figure characterizes a controlling interpersonal style. Basically, then, authority figures who are autonomy-supportive help to satisfy the needs of those with whom they work, whereas controlling behaviors serve to diminish need satisfaction and subsequent self-determined motivation (see Mageau & Vallerand, 2003).

In a coaching context, Mageau and Vallerand (2003) have specified some of the key behaviors that in combination contribute to an autonomy-supportive interpersonal style. Specifically, they argue that autonomy-supportive coaches will: (a) provide choice to their athletes within specific limits and rules, (b) provide athletes with a meaningful rationale for the activities, limits, and rules, (c) ask about and acknowledge the athletes' feelings, (d) provide the opportunity for athletes to take initiative and act independently, (e) provide non-controlling performance feedback, (f) avoid overt control, guilt-induced criticism, controlling statements, and limit the use of tangible rewards, and (g) minimize behaviors which promote ego-involvement. Athletes who participate for coaches who demonstrate these behaviors are likely to develop a general sense or feeling that their coach is supportive of their needs for competence, autonomy, and relatedness, and thus believe their coach has a more autonomy-supportive interpersonal style.

Considerable research outside the physical domain has shown an autonomy-supportive interpersonal style is an extremely effective motivational technique (e.g., Baard, 2002; Reeve, 2002). A growing body of research has also shown the motivational implications of perceived autonomy support in physical education settings (e.g., Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Standage, Duda, & Ntoumanis, 2003, 2005, 2006). For example, using structural equation modeling, Standage and colleagues (2006) tested the relationships among perceived autonomy support from teachers, students' need satisfaction and motivational orientation, and the teachers' ratings of the students' motivated behavior. Results with this sample of 11–14 year-old students provided strong support for the pattern of relationships predicted by SDT. Specifically, results showed that students' perceptions of autonomy support demonstrated by their teachers positively predicted the students' perceived competence, autonomy, and relatedness, which in turn, each positively related to the students' motivational orientation for physical education. Further, the degree to which the students reported more self-determined motivation positively related to the amount of effort and persistence they demonstrated as indicated by their physical education teacher.

While research in physical education clearly shows that autonomy support from a teacher affects students' motivation (see Standage, in press), there has unfortunately only been a few studies that have specifically assessed athletes' perceptions of their coaches' autonomy-supportive interpersonal style and the resultant outcomes associated with those perceptions (Mageau &

Vallerand, 2003). These studies, nevertheless, have similarly found positive outcomes associated with more autonomy-supportive coaching styles. For example, Reinboth, Duda, and Ntoumanis (2004) found that adolescent soccer and cricket players who perceived their coaches to be autonomy-supportive (i.e., provided athletes with choices and options), promoted a mastery motivational climate, and provided social support, positively influenced the athletes' perceptions of autonomy, competence, and relatedness, respectively. In turn, perceived competence and autonomy positively related to the athletes' psychological and physical well-being.

Research has also supported the link between perceived autonomy support from coaches and athletes' motives for participating (e.g., Gagné, Ryan, & Bargmann, 2003; Pelletier, Fortier, Vallerand, & Briére, 2001; Pelletier et al., 1995). Gagné and colleagues, for example, found that gymnasts who perceived their coaches and parents be autonomy-supportive and involved in their participation generally reported more self-determined motivation for gymnastics. Similarly, Pelletier and colleagues (2001) found positive associations between perceived autonomy support and self-determined forms of motivation, whereas controlling coaching behaviors related to less self-determined forms of motivation in a sample of 13–22 year-old swimmers.

Despite the clear evidence that an autonomy-supportive interpersonal style is associated with positive cognitive, affective, and behavioral outcomes (Mageau & Vallerand, 2003), a number of questions still remain to be addressed in terms of the effectiveness of this style of coaching athletes. First, few of the studies examining the relationship between perceived autonomy support and athletes' motives for participating have considered how this element of a coaches' behavior relates to each of the three needs identified by SDT. For example, Reinboth et al. (2004) only tested the link between autonomy support and perceived autonomy. However, an autonomy-supportive interpersonal style, as conceptualized in this study, should relate to all three needs identified in SDT. Second, the research examining the link between autonomy support from coaches and athletes' motivational orientation (e.g., Gagné et al., 2003; Pelletier, Fortier, Vallerand, & Briére, 2001; Pelletier et al., 1995) has not specifically tested SDT's prediction that this relationship is *mediated* by the needs for competence, autonomy, and relatedness. Finally, few studies examining the influence of coaching behavior on athletes' motivation have specifically examined whether the pattern of relationships are similar across diverse groups of athletes (e.g., gender, competitive level). The major goal of the present study is to further our understanding of the motivational implications of an autonomy-supportive coaching styles by addressing these issues.

The primary purpose of the study is to determine whether the relationship between perceived autonomy support and athletes' motivation orientation is mediated by the three needs identified in SDT. To do so, we tested and compared a series of structural models representing various patterns of relationships among athletes' perceptions of their coaches' autonomy-supportive behaviors, their level of perceived competence, autonomy, and relatedness, and the athletes' motivational orientation. The main test of the mediational effect is the comparison of two model presented in Fig. 1. We expected all relationships identified in both models to be positive. However, consistent with SDT, the pattern of relationships identified in Fig. 1b (Hypothesized Mediational Model) is expected to provide the best overall fit to the data. That is, we expected the link between perceived autonomy support and athletes' motivational orientation would be mediated by the three needs identified in SDT. The second purpose was to test whether the pattern of relationships among the set of variables was similar for different groups of athletes, specifically

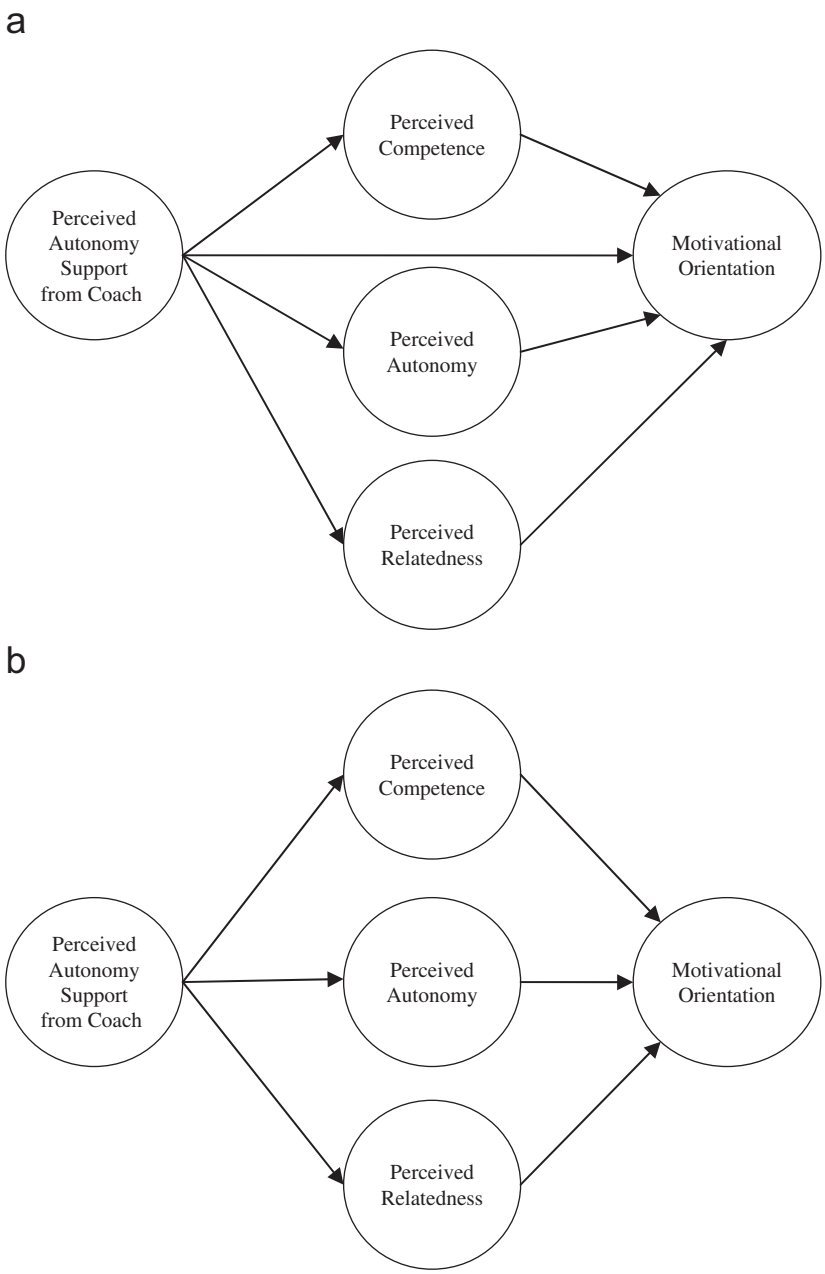

Fig. 1. (a) Non-mediational Model. (b) Hypothesized Mediational Model.

males vs. females and high school vs. college athletes. Given that Deci and Ryan (1985) and Ryan and Deci (2000, 2002) argue the tenants of SDT are essentially universal, we expected that hypothesized pattern of relationships would be invariant across gender and competitive level.

Methods

Participants

The participant sample ($N = 581$) was comprised of male ($n = 263$) and female ($n = 318$) athletes from a variety of individual and team sports from the Midwestern portion of the United States. Participants ranged in age from 13 to 25 years ($M = 17.50$, SD = 2.30), and included both high school ($n = 335$) and college athletes ($n = 246$). The average number of years of participation in the athletes' respective sport was 7.85 (SD = 4.09). The average number of seasons on their current team was 2.12 (SD = 1.42), and the average years playing with their current coach was 1.82 (SD = 1.43). Most athletes identified themselves as Caucasian (84.90%).

Measures

Autonomy-supportive coaching: Athletes' perception of the autonomy-supportive behaviors exhibited by their coaches was assessed using the short version of the Sport Climate Questionnaire (SCC).[1] Athletes were asked the extent to which they agree with each of six items (e.g., "I feel that my coach provides me choices and options"; "My coach conveys confidence in my ability to do well at athletics"; "I feel understood by my coach") on a 7-point scale. Response options range from *strongly disagree* to *strongly agree*, with higher scores indicating a more autonomy-supportive coaching style. The items in the SCC are items essentially identical to those included in the Health Care Climate Questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996), the Learning Climate Questionnaire (Williams & Deci, 1996), and the Work Climate Questionnaire (Baard, Deci, & Ryan, 2004), with the exception of who is being identified as the key individual in the supervisory role (i.e., physician, instructor, manager, coach). Consistent with the other versions of the climate questionnaires, and the physical education version recently used by Standage et al. (2006), the items do not reflect the specific autonomy-supportive behaviors exhibited by the coach, but rather the general perception on the part of the athlete that the coach demonstrates an interpersonal style that is supportive of the athletes' needs. Research using the various versions of the climate questionnaire have providing evidence that the items reflecting an autonomy-supportive interpersonal style are reliable and valid (e.g., Standage et al., 2006; Williams & Deci, 1996; Williams et al., 1996).

Fundamental human needs: We assessed the athletes' perceptions of competence, autonomy, and relatedness using the same measures employed by Hollembeak and Amorose (2005). *Perceived competence* was assessed using three items originally developed by Amorose (2003). The items (e.g., "How good do you think you are at your sport?") ask respondents to indicate how they feel about their ability in their current sport on a 5-point scale (e.g., *not good at all* to *very good*), with higher scores reflecting higher or more positive perceptions of competence. The participants' sense of *autonomy* was assessed using a 6-item scale developed by Hollembeak and Amorose. Consistent

[1]The Sport Climate Questionnaire is described in detail and is available on the self-determination theory web site hosted by the University of Rochester, Department of Psychology: http://www.psych.rochester.edu/SDT/measures/auton_sport.html. The specific authors responsible for the development of the scale are not identified in the description.

with Deci and Ryan (1985), autonomy was specified as the degree to which the respondents perceive they have a choice in their behavior. The measure asks respondents to indicate the amount of choice or control they have when it comes to participating in their current sport (e.g., "I have a say in what I do when participating in my sport"). Response options for each item ranged from *not at all true for me* to *completely true for me*, and are scored on a 5-point scale, with higher scores reflecting greater autonomy. Finally, the athletes' sense of *relatedness* was assessed using a sport-oriented version of Richer and Vallerand's (1998) Feelings of Relatedness Scale. This scale asks respondents the extent to which they agree with a series of 10 adjectives (e.g., "supported", "attached to them") describing their relationships with the members of their sport team, (i.e., coaches, teammates). The response options ranged from *do not agree at all* to *very strongly agree,* and were scored on a 7-point scale with higher scores reflecting a greater sense of relatedness. Hollembeak and Amorose (2005) demonstrated these three scales possess adequate reliability and validity with athletes.

Motivational orientation: The Sport Motivation Scale (Pelletier et al., 1995) assessed the athletes' motivation for participating in their sport. This 28-item measure taps the constructs of amotivation, three forms of extrinsic motivation (external, introjected, and identified regulation), as well as three types of intrinsic motivation (to know, to accomplish, to experience stimulation) by asking athletes to indicate why they are presently practicing their sport (e.g., "For the excitement I feel when I am really involved in the activity"). Response options range from *does not correspond at all* to *corresponds exactly* on a 7-point Likert-type scale.

The subscales tapping each of the different forms of motivation can be used separately or in combination to form a summary score, the self-determination index (SDI). The SDI reflects the extent to which the athletes' overall motivational orientation is more or less self-determined in nature (see Vallerand & Fortier, 1998). For this study, we calculated the SDI using the procedures employed in Sarrazin, Vallerand, Guillet, Pelletier, and Cury (2002). First, scores for the three forms of intrinsic motivation (i.e., to know, to accomplish, to experience stimulation) were averaged to form a single intrinsic motivation subscale. Next, subscale scores for each form of motivation were weighted based on their position on the self-determination continuum (i.e., the weight of intrinsic motivation $= +2$; identified regulation $= +1$; external and introjected regulation $= -1$; and amotivation $= -2$), and then a sum of all subscales was computed. Thus, higher scores on the SDI reflect a more self-determined motivational orientation.

Procedures

We collected the data at one of the athletes' regularly scheduled practices. Standard Institutional Review Board procedures were followed in terms of securing assent/consent from parents/guardians, coaches, and athletes. Once parent/guardian consent was given, if needed, one of the principal investigators or a trained research assistant provided the athletes with a verbal and written explanation of the study. Athletes who agreed to participate then completed the survey, which took 15 min. Coaches were asked to leave the area while questionnaires were being completed, and the athletes were reassured that their answers would remain anonymous and confidential.

Results

Descriptive statistics

Table 1 presents the descriptive statistics and correlations for the study variables using subscale scores. In an absolute sense, the athletes reported moderate to high scores on all study variables, and all correlations were in the expected directions. Although not presented in Table 1, estimates of the skewness and kurtosis values suggest that the responses for each of the variables were reasonably normally distributed, with scores ranging from −.98 to −.12 and .84 to −.69, respectively. Further, the internal consistency estimates (α) for the subscales ranged from .70 to .96, indicating acceptable reliability of the measures.

In an attempt to describe the data further, we conducted a MANOVA to explore group differences in terms of gender and competitive level (high school vs. college). The dependent variables included all five variables. Results revealed a significant gender effect, Wilk's λ (5, 573) = .90, $p < .05$, $\eta^2 = .10$, and a significant competitive level effect, Wilk's λ (5, 573) = .89, $p < .05$, $\eta^2 = .11$, although the gender by competitive level interaction was non-significant ($p > .05$). Univariate F values indicated that male and female participants differed on feelings of autonomy, F (1, 580) = 18.59, $p < .01$, $\eta^2 = .03$, relatedness, F (1, 580) = 23.16, $p < .01$, $\eta^2 = .04$, and on motivational orientation, F (1, 580) = 24.54, $p < .01$, $\eta^2 = .04$. Compared to males, the female athletes reported a greater sense of autonomy, feelings of relatedness, and a more self-determined motivational orientation. Univariate F values indicated that high school and college athletes differed in their perceptions of their coaches' autonomy-supportive style, F (1, 580) = 5.94, $p < .01$, $\eta^2 = .01$, and perceived competence, F (1, 580) = 55.18, $p < .01$, $\eta^2 = .09$. In particular, college athletes perceived their coaches were less autonomy supportive, but felt greater perceptions of competence compared to those in high school.

Table 1
Descriptive statistics for study variables using subscale scores

Variable	1.	2.	3.	4.	5.
1. Autonomy Support	1.00	.21	.85	.51	.51
2. Perceived Competence	.19	1.00	.29	.24	.38
3. Perceived Autonomy	.58	.19	1.00	.42	.67
4. Perceived Relatedness	.43	.21	.28	1.00	.45
5. Motivational Orientation	.47	.34	.46	.38	1.00
M (SD) Total sample ($N = 581$)	4.45 (1.47)	3.85 (.62)	3.32 (.70)	5.50 (1.31)	1.34 (1.16)
M (SD) Males ($n = 263$)	4.32 (1.44)	3.91 (.66)	3.18 (.68)	5.23 (1.37)	1.09 (1.02)
M (SD) Females ($n = 318$)	4.56 (1.48)	3.80 (.59)	3.43 (.69)	5.73 (1.21)	1.54 (1.23)
M (SD) High School ($n = 335$)	4.59 (1.44)	3.68 (.63)	3.36 (.69)	5.54 (1.30)	1.33 (1.19)
M (SD) College ($n = 246$)	4.27 (1.49)	4.07 (.54)	3.25 (.71)	5.46 (1.32)	1.35 (1.13)

Note: The mean (*M*) and standard deviation (SD) statistics and the bivariate correlations presented in the lower diagonal are based on subscale scores. Correlations in the upper diagonal reflect the completely standardized relationships among the latent factors. All correlations are significant at $p < .05$.

Main analyses

We tested the main research questions with structural equation modeling using LISREL 8.3 (Jöreskog & Sörbom, 1996). The data were input using the covariance matrix, and maximum likelihood estimation procedures were used. Multiple fit indices were employed to evaluate the adequacy of the estimated models. Specifically, the significance of χ^2, the root mean square error of approximation (RMSEA), the non-normed fit index (NNFI), the incremental fit index (IFI), the comparative fit index (CFI), and the goodness of fit index (GFI) were all used to evaluate the fit of the model. A non-significant ($p > .05$) χ^2value indicates a good fit of the model to the data, as does a RMSEA $< .5$. For all other fit indices, a value $> .90$ indicates a good fit of the model.

Both the measurement and structural portions of models were estimated in all cases. Random aggregates of items were used as observed variables in the measurement portion of the modeling. For example, the 10 items from the scale representing feelings of relatedness were split into two item-aggregates, each representing the average score of 5 random items from the original scale. These two item-aggregates were then used as observed variables in the data analyses. Creating two item-aggregates using this basic procedure was used for all of the key variables, except perceived competence where all three original items were used as observed variables. Thus, in all, 11 observed variables were used to represent 5 latent constructs. We used random aggregates of items given their tendency to be more reliable and normally distributed, and because random aggregates decrease the ratio of number of subjects to the number of measured variables (see Marsh, Richards, Johnson, Roche & Tremayne, 1994).

Testing for mediation: The first step in testing for mediation required establishing that the predictor variable (i.e., perceived autonomy support from coaches), the mediating variables (i.e., perceived competence, autonomy, relatedness), and the outcome variable (i.e., motivational orientation) were related (see Baron & Kenny, 1986; Frazier, Tix, & Baroon, 2004; Holmbeck, 1997). Thus, we tested a model which freely estimated the correlations among all five of the latent variables. The overall fit of this model was acceptable, $\chi^2 = 97.17$, $df = 34$, $p = .00$, RMSEA = .05, NNFI = .98, IFI = .99, CFI = .99, GFI = .97. The relationships among the latent variables are presented in the upper diagonal of Table 1 in completely standardized form. All coefficients were positive and significant ($p < .05$) as expected. Importantly, perceived autonomy support was significantly related to the athletes' motivational orientation ($r = .51$) and to their perceived competence ($r = .21$), autonomy ($r = .85$), and relatedness ($r = .51$), thus supporting the preconditions necessary for testing for a mediational effect.

The main test of mediation involved comparing the fit of 2 models—one specifying both direct and indirect effects of perceived autonomy support on athletes' motivational orientation (see Fig. 1a: Non-mediational Model) and a second model specifying only an indirect effect of autonomy support on motivational orientation (see Fig. 1b: Hypothesized Mediational Model). If the fit of the Hypothesized Mediational Model, where the direct effect of perceived autonomy support on motivational orientation is constrained to zero, is not significantly different that the Non-mediational Model, mediation is supported (Frazier, Tix, & Baroon, 2004).

Results showed that the overall fit of the Non-mediational Model, $\chi^2 = 110.65$, $df = 37$, $p = .00$, RMSEA = .06 (90% CI = .04–.07), NNFI = .97, IFI = .98, CFI = .98, GFI = .97, and the Hypothesized Mediational Model, $\chi^2 = 113.89$, $df = 38$, $p = .00$, RMSEA = .06 (90% CI = .04–.07), NNFI = .97, IFI = .98, CFI = .98, GFI = .97, were both acceptable. Importantly,

Table 2
Completely standardized loadings and uniquenesses from measurement portion of the model

Variable	Factor loading	Uniqueness
Perceived autonomy support		
Autonomy support 1 (3 items)	= .93	.13
Autonomy support 2 (3 items)	.87	.24
Perceived competence		
Perceived competence 1	= .80	.36
Perceived competence 2	.73	.46
Perceived competence 3	.88	.22
Perceived autonomy		
Perceived autonomy 1 (3 items)	= .59	.65
Perceived autonomy 2 (3 items)	.65	.58
Perceived relatedness		
Perceived relatedness 1 (5 items)	= .87	.24
Perceived relatedness 2 (5 items)	.73	.46
Motivational orientation		
Self-determined motivation index 1	= .92	.15
Self-determined motivation index 2	.91	.18

Notes: " = " sign indicates parameter was initially fixed (at 1) for identification purposes. All values as significant at $p < .05$.

constraining the direct effect of perceived autonomy support on athletes' motivational orientation to zero freed 1 d*f* and resulted in a non-significant decrease in fit ($\Delta\chi^2 = 3.24$), thus supporting mediation.

The specific results for the Hypothesized Mediational Model, which was deemed a more parsimonious and appropriate representation of the data, are presented in Table 2 and Fig. 2. Table 2 shows the results of the measurement portion of the model, whereas Fig. 2 illustrates the structural relationships. All parameter estimates are in completely standardized form. As seen in Fig. 2, each of the three needs was a significant positive predictor of the athletes' motivational orientation. Further, the latent variable representing perceived autonomy support was a significant positive predictor of each of the needs. Together, the direct effect of the needs and the indirect effect of autonomy support accounted for 45% of the variance (1—residual variance) in the athletes' motivational orientation. The total effect of perceived autonomy support was significant at $p < .05$ (standardized total effect = .55). The unique indirect effects of perceived autonomy support through each of the needs were calculated by multiplying the path coefficient from perceived autonomy support to a specific need by the path coefficient from that need to the athletes' motivational orientation. The resulting standardized indirect effects of perceived autonomy support through perceived competence, perceived autonomy, and perceived relatedness are .05, .39, and .10, respectively.[2]

[2]While SDT predicts that the three needs serve to mediate the relationship between perceived autonomy support and athletes' motivational orientation, a reviewer astutely offered an alternative hypothesis where perceived competence, autonomy, and relatedness may serve to moderate this relationship. That is, athletes who perceive their needs have been satisfied may be more likely to interpret their coaches' behavior as autonomy-supportive, and therefore respond with a more self-determined motivational orientation. To test this, we conducted a hierarchical regression analysis using the

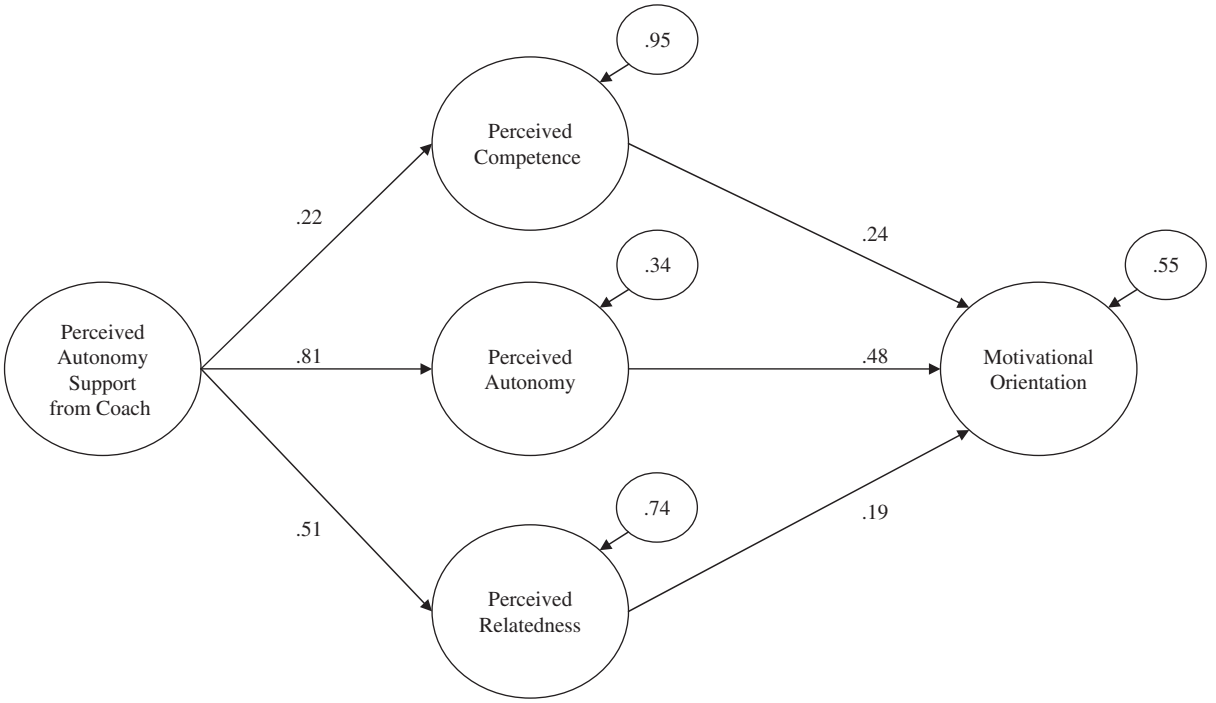

Fig. 2. Completely standardized relationships for the structural portion of the Hypothesized Mediational Model. All paths are significant at $p < .05$.

Testing for invariance across groups: We also examined a series of additional multi-group structural models to determine whether the pattern of results found in the Hypothesized Mediational Model was similar across gender and competitive level. Both models tested specified complete group invariance with the exception of the observed variable error terms. While each model produced a significant χ^2 value, the additional fit indices suggested that the pattern of relationships was reasonably similar for males and females ($\chi^2 = 136.85$, d$f = 49$, $p = .00$, RMSEA = .08 (90% CI = .06–.09), NNFI = .95, IFI = .98, CFI = .98), and for high school and college athletes ($\chi^2 = 110.40$, d$f = 49$, $p = .00$, RMSEA = .06 (90% CI = .04–.08), NNFI = .97, IFI = .99, CFI = .99).

(*footnote continued*)
observed subscales scores to predict motivational orientation. Perceived autonomy support and the three needs were entered on Step 1 of the hierarchical regression, followed by the interactions of perceived autonomy support and each of the three needs on Step 2. Consistent with the recommendations of Aiken and West (1991), the predictor variables were centered and the interaction terms were formed as the cross-product of the centered variables. The results of this analysis did not support a moderating effect. Perceived autonomy support, perceived competence, autonomy, and relatedness were significant predictors of the athletes' motivational orientation in Step 1, $F(4,576) = 78.82$, $p < .01$, $R^2 = .35$. However, the interaction terms entered on Step 2 did not meaningfully add to the prediction of the athletes' motivational orientation above and beyond the independent effects ($\Delta R^2 = .01$).

Discussion

The purpose of the study was to examine the how perceived autonomy-supportive coaching behaviors related to athletes' motivation. In particular, the main goal of this study was to test the prediction of SDT (Ryan & Deci, 2000, 2002) that the athletes' perceptions of competence, autonomy, and relatedness mediated the relationship between perceived autonomy support and athletes' motivational orientation.

The results of the study provided strong support for our hypotheses and SDT. First, all three of the needs were positive predictors of the athletes' motivational orientation. In other words, the more the athletes felt competent, autonomous, and senses of relatedness, the more their reasons for participating were self-determined in nature. Furthermore, the degree to which the athletes perceived their coaches to be autonomy-supportive in their interactions positively related to each of the three needs, as well as demonstrating a significant indirect effect on the athletes' motivational orientation. These general relationships are consistent with previous research in the sport domain, where perceived autonomy support has been linked to positive motivational outcomes (e.g., Gagné et al., 2003; Pelletier et al., 1995, 2001; Reinboth et al., 2004). However, the results extend the sport literature by specifically demonstrating the mediating effect of the needs on the relationship between autonomy support and the degree to which athletes' motivation is more or less self-determined. Specifically, the direct comparison of the structural models tested provided statistical evidence that the mediational model was a better representation of the data. A direct test of the mediational effect of the needs has not typically been conducted in the previous research, and therefore adds additional support for SDT predictions.

Based on the preliminary analyses, there were some mean level differences between male and female athletes and high school and college athletes on a few of the study variables. For instance, consistent with previous studies (e.g., Amorose & Horn, 2000; Pelletier et al., 1995) female athletes tended to report more positive motivational profiles. Further, the high school athletes were more likely to perceive their coaches to be autonomy supportive. These findings are consistent with Horn (2002), who proposed that a variety of personal and situational factors influence how coaches treat different athletes and how these athletes perceive their coaches treat them. Even though the effect sizes of the differences in this study were rather small in magnitude, future studies should continue to explore these factors as they may help add to our understanding of coaching effectiveness and motivation in sport.

Despite the group differences that emerged, the results of the multi-group analyses in this study suggest that the *patterns of relationships* between perceived autonomy support, athletes' perceptions of competence, autonomy, relatedness, and their motivational orientation were similar across all groups of athletes. In other words, the manner in which perceived autonomy support is associated with athletes' motivation was consistent for males and females and for high school and college athletes. Few studies exploring SDT have tested for invariance in the pattern of relationships across diverse groups. Thus, our results make a meaningful contribution to the literature in that the findings provide evidence that the predictions of SDT are relatively robust.

Beyond the general pattern of results, there are a few other noteworthy aspects of the findings. First, results indicated that perceived autonomy support was most strongly related to feelings of autonomy ($\beta = .81$), followed by the athletes' sense of relatedness ($\beta = .51$) and perceived competence ($\beta = .22$), respectively. This may not be surprising given that an autonomy-supportive

interpersonal style is generally conceptualized in the literature as provision of choice and control (e.g., Reinboth et al., 2004). However, the assessment of the autonomy support construct in this study was designed to tap not only the degree to which the coach helped to satisfy the athletes' need for autonomy, but all three of the fundamental needs identified in SDT (Ryan & Deci, 2000, 2002). There have been a limited number of studies, particularly in sport, which have simultaneously examined the relationships between perceived autonomy support and all three of the needs, and therefore it is difficult to determine if this is truly a unique finding. However, other studies have not shown such a differentiated effect. For instance, an unpublished study by Blanchard and Vallerand (1996, cited in Vallerand, 1997) found that the relationships between perceived autonomy support and basketball players' perceived competence ($\beta = .30$), autonomy ($\beta = .26$), and relatedness ($\beta = .19$) were all quite similar in strength. Future research may consider exploring whether this is simply a function of the measures used to tap the perceived autonomy support construct or whether the most salient motivational consequence of an autonomy-supportive interpersonal style is on one's autonomy.

Along this same line, future research should consider exploring which elements of an autonomy-supportive interpersonal style affect different motivational outcomes. An excellent starting point would be to look at the various dimensions of an autonomy-supportive coaching style outlined in a recent conceptual paper by Mageau and Vallerand (2003). As noted, these scholars have expanded on the behaviors that, in combination, reflect a high degree of autonomy support (e.g., provide choice to their athletes within specific limits and rules; ask about and acknowledge the athletes' feelings; provide the opportunity for athletes to take initiative and act independently). Perhaps exploring autonomy support from this more differentiated perspective may help to clarify the motivational consequences of coaches' behaviors and to understand how the various dimensions differentially help to satisfy the athletes' needs. Importantly, this type of information could be extremely valuable to coaches and others working to facilitate athletes' motivation. Our results suggest adopting an autonomy-supportive interpersonal style is effective; however, identifying the specific behaviors that lead athletes to perceive their coaches are supporting their needs will make it easier to help coaches adopt these behaviors.

Further, while this study focused on the degree to which athletes perceived their coaches to be autonomy-supportive, future research should consider how multiple coaching behavior dimensions influence athletes' motivation in combination. For instance, Mageau and Vallerand (2003) suggest in their recent motivational model of the coach-athlete relationship that autonomy-supportive behaviors should only have positive effects on one's motivation when accompanied by adequate structure and support on the part of the coach. Thus, the combination of these coaching behaviors should provide the most accurate and complete understanding of athletes' motivation. Our study focused only on perceived autonomy support, and thus these predictions will require further study.

Another interesting finding from the present study was that feelings of autonomy were the strongest predictor of the athletes' motivational orientation. The relative strength of the three needs in predicting the various forms of motivation identified by SDT (Ryan & Deci, 2000, 2002) has been somewhat inconsistent in the few sport studies that have examined all three needs simultaneously (e.g., Hollembeak & Amorose, 2005; Ntoumanis, 2001; Reinboth et al., 2004; Sarrazin et al., 2002). Further, recent studies in physical education (e.g., Standage et al., 2006) suggest perceived competence, not autonomy, has the strongest relationship with students' motivational orientation. Future research may consider exploring how and why the relative influence of the needs vary across individuals and contexts.

Furthermore, from a conceptual standpoint, future studies should explore how the needs for competence, autonomy, and relatedness function together to impact athletes' motivational orientations. In the original formulation of cognitive evaluation theory, a sub-theory within the larger SDT, Deci and Ryan (1985) argued that increased perceptions of competence will only facilitate intrinsic motivation when an individual feels a sense of autonomy. However, Markland (1999) found, contrary to theoretical predictions, that variations in perceived competence positively influenced intrinsic motivation for exercise only under conditions of low autonomy. Attempting to clarify how the needs for competence and autonomy work together, along with feelings of relatedness, should provide important theoretical information regarding the determinants of athletes' motivational orientation.

One of the more obvious limitations of the current study involves the cross sectional design. Despite suggesting a pattern of influence where a coach's behaviors affect athletes' need satisfaction, which in turn influences the athletes' motivational orientation, it would be inappropriate to conclude this was the sequence of events accounting for the relationships given that all of the data was collected on the same occasion. The possibility remains that sequence of influence occurs in some other fashion. For instance, the athletes' motivational orientation might have affected the degree to which their coaches were autonomy-supportive in their interactions, rather than the reverse pattern, as we have suggested. Pelletier and colleagues (Pelletier, Séguin-Lévesque, & Legault, 2002; Pelleiter & Vallerand, 1996) have found evidence of this behavioral confirmation effect in instructional/teaching situations. Thus, it will be important for future research to employ longitudinal designs to help provide a more complete understanding of the motivational processes functioning.

In summary, the results of this study demonstrate that an autonomy-supportive interpersonal style may be an effective motivational tool. Interestingly, research has indicated that many authority figures, such as teachers and coaches, tend to rely on a more controlling interpersonal style (Mageau & Vallerand, 2003). Further, authority figures who engage in controlling behaviors are in many cases perceived to be more effective (see Boggiano, Flink, Shields, Seelbach, & Barrett, 1993). Consequently, convincing coaches to adopt an autonomy-supportive leadership style might be a difficult task. Nevertheless, we need to find ways to encourage coaches to exhibit behaviors that helps to satisfy athletes' needs for competence, autonomy, and relatedness, as this should help to promote self-determined motivation in their athletes.

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