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A Prospective Study of the Influence of Perceived Coaching Style on Burnout Propensity in High Level Young Athletes: Using a Self-Determination Theory Perspective

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Elite Training Centers

The ability to cope with the demands of excelling in both sport and academia, and with the pressure put on athletes by their coach and parents; is an important success factor for adolescents in elite training centers. In a French survey (i.e., Observatoire régional de la santé, 1996) elite adolescent student-athletes reported lower levels of subjective well-being than other adolescents because they often lacked the necessary psychosocial support. In the context of elite level youth sport, many studies have highlighted the importance of motivational factors. They have also shown that there is an important risk for young elite competitors to lose their motivation, to overreach, and to feel exhausted by their sports life. Due to a total devotion to their goals, unfulfillment of basic psychological needs, excessive training, insufficient recovery and perceived insufficient psychosocial support, the athletes are unable to reach their full athletic potential (Lemyre, Roberts & Stray-Gundersen, 2007). Even though there have been many studies on the motivational antecedents of maladaptive sport participation outcomes such as athlete burnout, these have only looked at a very limited number of motivational factors (e.g., Cresswell & Eklund, 2005, 2006). Thus the purpose of this study is to further investigate motivational antecedents (i.e., coaching style, fundamental psychological needs, and self-determined regulations, based on self-determination theory; Deci & Ryan, 2000) of athlete burnout using a prospective six-month-follow-up.

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Self-Determination Theory

Self-Determination Theory (SDT; Deci & Ryan, 2000) is a theoretical approach that could explain the implications of the social environment (lack of psychosocial support in sport) on the well-being of young athletes. This theoretical framework suggests two distinct styles of coaching, leading to qualitatively different outcomes. A coach is deemed "controlling" when he/she is perceived as authoritarian and coercive and when athletes do not feel autonomous toward making sport related choices. A coach is deemed "autonomy supportive" when he/she is perceived as explaining and justifying his or her decisions, encouraging individuals to participate in said decisions, providing appropriate information, minimizing external pressures and demands, and giving them the opportunity to choose by themselves (Bartholomew, Ntoumanis, & Thogersen-Ntoumani, 2010).

Several studies have shown higher levels of well-being in individuals who evolve in an autonomy supportive context (e.g., Gagné, Ryan & Bargmann, 2003). In the same way, an autonomy supportive coaching style has been associated with well-being in athletes (e.g., Adie, Duda, & Ntoumanis, 2008). In these studies, the authors also found that the coaching style is linked to the well-being of athletes through the satisfaction of the three psychological needs (i.e., competence, autonomy, relatedness). It then appears that the perception of contextual factors will be able to feed the three human basic psychological needs.

According to the SDT, an individual aims to satisfy these three innate needs. The need for autonomy implies that the individual voluntarily decides his actions and that he is the one to perform these actions in a way that is in congruence with him. He can then totally endorse them (Decharms, 1968). The individual's need for competence refers to the feeling of being effective in the interactions with the social environment and experiencing opportunities to exercise and express his capacities (Deci, 1975). Finally, his need for relatedness implies a sense of belonging to a group, and the feeling of being connected to significant others (Baumeister & Leary, 1995). If the fulfillment of these needs is neglected, there will be a negative impact on the individual's psychological development, integrity and well-being. Several studies have shown that the fulfillment of the three basic psychological needs was linked to higher levels of well-being, and that it also influenced well-being through one's level of self-determined motivation (e.g., Reis, Sheldon, Gable, Roscoe & Ryan, 2000; Wilson, Longley, Muon, Rodgers & Murray, 2006).

Deci and Ryan (2000) have postulated the existence of a continuum of self-determination going from intrinsic motivation, which is the most self-determined motivation, to extrinsic motivation (i.e., integrated, identified, introjected and external regulations) and finally to amotivation. Intrinsic motivation means that individuals perform the activity for the pleasure and satisfaction it provides them and for the pleasure of learning something new. Integrated regulation means that individuals joined the activity, in which they are able to fulfill important personal aims; as something consistent with their values and needs. Identified regulation applies to individuals who have identified why they are doing the activity even if it is not interesting in itself: They work for the benefits they may reap from it, they also perceive that the action is initiated by themselves, they do it by choice. Introjected regulation deals with individuals who are doing the activity due to internal pressure such as guilt. External regulation represents behavior regulated

by external factors such as rewards and constraints. Amotivation refers to the case of individuals who do not perceive the links between their behavior and its consequences. It corresponds to a lack of autonomous and controlled motivation, and results of nonrewarding activities, and of feelings of incompetence in the activity.

Deci (1975) suggested that intrinsically motivated behaviors are based on individual needs to feel competent and self-determined. This means that the satisfaction of basic needs leads individuals to experience intrinsic motivation. The fulfillment of basic needs also has an effect on behavior internalization. An individual feeling autonomous, competent and connected to others in a given context is expected to have a more internalized motivation.

Moreover, SDT states that intrinsic motivation and more self-determined forms of extrinsic motivation (i.e., identified and integrated regulations) are associated with adapted consequences (emotional, cognitive and behavioral), while the non self-determined forms of motivation (i.e., introjected and extrinsic regulations) and amotivation are related to maladaptive consequences (Deci & Ryan, 2000). These motivational consequences on well-being are very relevant regarding young athletes in elite training centers because they are exposed to a specific context with multiple demands. Indeed, each year, hundreds of young French athletes are leaving home to join an elite training center to pursue their sporting career and their studies. In this specific context, the perceived coaching style, basic psychological needs and motivational regulations might be linked to athletes' well-being, and more precisely could be associated to the susceptibility to athlete burnout.

Athlete Burnout

Nowadays, burnout is an encompassing subject of interest in the sports domain. Preventing its occurrence has been viewed as an important issue in sport psychology literature. Raedeke (1997) characterizes athlete burnout as a construct composed of three dimensions: (a) emotional and physical exhaustion, which is characterized by feelings of emotional and physical fatigue stemming from psychosocial and physical demands associated with training and competing; (b) reduced sense of accomplishment, which is characterized by feelings of inefficacy and a tendency to evaluate oneself negatively in terms of sport performance and accomplishments, and (c) sport devaluation, which is defined as a negative, detached attitude toward sport, reflected by lack of concern about sport and performance quality. SDT has been assumed to be a powerful theory to explain athlete burnout as it has been widely used to predict well and ill-being in several domains (Cresswell & Eklund, 2005). Several studies have examined the links between the SDT concepts and athlete burnout. Many findings suggest that burnout is linked to motivational issues. Some studies showed that athletes were more at risk to experience burnout when they perceived low social support and a negative coach-athlete relationship (e.g., Raedeke & Smith, 2001). These findings underline the importance of the perceived coaching style on athlete burnout. In earlier presentations of theoretical frameworks regarding the development of athlete burnout, Raedeke (1997) has suggested that a rigid and controlling sport context is a determinant of burnout propensity. More recently, Quested and Duda (2011) have highlighted that dancers'

burnout risk is exacerbated when teachers do not foster and sustain an autonomy supportive learning environment. Furthermore, Perreault, Gaudreau, Lapointe, and Lacroix (2007) have found that a balance in satisfaction of the three basic needs is negatively linked to burnout. In addition, Hodge, Lonsdale and Ng (2008) have found that the non satisfaction of the needs for competence and autonomy was related to burnout, whereas the need for relatedness was only a moderate predictor of burnout. Cresswell and Eklund (2005) have reported a positive link between amotivation and burnout, and a negative link between intrinsic motivation and burnout. Similarly, in a longitudinal study, Lemyre, Treasure and Roberts (2006) found that swimmers experiencing a motivational shift where motivation became less self-determined during a competitive season reported higher scores of burnout at the season's end. However, the links between the different forms of extrinsic regulations and athlete burnout remain unclear. More precisely, studies have shown nonsignificant or moderately correlated relationships between burnout dimensions and external, introjected and identified regulations. Recently, Lonsdale, Hodge and Rose (2009) have found that the autonomous forms of motivation are negatively related to burnout. Furthermore, they stated that the controlled forms of motivation are positively related to athlete burnout, and that the self-determination index mediates the relationships between both competence and autonomy, and feelings of emotional and physical exhaustion.

Following these contemporary findings, associating levels of self-determined motivation to athlete burnout propensity, the first objective of the current study is to assess the relationships between all types of regulations presented in SDT and athlete burnout. In the past, some studies have omitted identified, introjected and external regulation subscales (e.g., Cresswell & Eklund, 2005), or have found that introjected and external regulations have inadequate internal consistency (Raedeke & Smith, 2001) and others have combined the subscales in the self-determination index (Lemyre et al., 2007, 2006; Lonsdale et al. 2009). The second objective of the current study is to test a more complete model of SDT, including the influence of social context as an antecedent of the three psychological needs and their association and mediation influence on the risk of athlete burnout. As of today, no study has examined the relationships between social context, need fulfillment, motivation and athlete burnout in young high level athletes. Finally, the third objective is to use a prospective six-month-follow-up to examine the influence of SDT concepts and burnout over a season, which will allow us to investigate the temporal sequence of the relationships between the concepts. In short, the aim of the current study is to investigate the relationships between coaching style, fundamental needs, self-determined motivation and athlete burnout in young high level athletes. Our hypotheses were that (a) young athletes perceiving a controlling coaching style would feel less competent, less autonomous, less related to teammates and would experience higher levels of burnout than athletes perceiving an autonomy supportive coaching style, (b) young athletes who feel less competent, less autonomous, less related to teammates, would display lower levels of self-determined motivation and higher burnout level than athletes who feel competent, autonomous and related to teammates, (c) finally, athletes who have introjected and/ or external regulations, and/ or amotivation would be more at risk for experiencing burnout symptoms at the end of the season than athletes with intrinsic motivation.

Method

Participants and Procedure

The elite training center in France (i.e., "Pôle Espoir"; PE) is a structure designed to help high school student-athletes train intensively while pursuing their studies. The athletes enrolled in these PEs are expected to excel at both sport and school and those who fail will be asked to leave.

Five hundred and fourteen French handball players from 15 of these elite training centers were approached for this study. The players answered the questionnaires twice during a season in November (time 1, two months after the beginning of the season, where intensity of training and study is light) and in April (time 2, almost the end of the season, where intensity of training and study is heavy). Three hundred and nine players (152 males and 157 females) answered the questionnaires twice. The 205 other players, who answered only once to the questionnaire (i.e., because they were out of the training structure, were injured at the time of measurement or filled in only a few items) were excluded from the analysis. Players trained 11 hr a week (SD = 3.5) on average. Mean age of the participants was 15.4 years (SD = 0.9) and the average handball playing experience was 6.8 years (SD = 2.4). Sixty two percent of the participants were competing at a national level while 37.9% were playing at a regional level. Twenty-seven of the 309 players had already been selected to play in the national junior handball team.

In accordance with the recommendations of the ethics committee (i.e., Comité Consultatif National d'Ethique), a parental consent was asked for underage athletes. Coaches were informed by mail and contacted by phone. An explanation was given before filling in the questionnaire to all the players. They completed the questionnaire after training in full training groups or in small groups, during 30–45 min.

Measures

French validated versions of all the instruments were employed in the current study. In the five first measurement tools, participants responded using 5-point scales (1 = "*not true at all*", 5 = "*very true*").

Perceived Coaching Style. Perception of the coach's style was assessed by an adapted version of the Echelle des Comportements Interpersonnels (ECI; Interpersonal behavior scale; Otis & Pelletier, 2000), with four items measuring the level of autonomy supportive coaching style (e.g., "My coach encourages me find answers to problems I encounter during training"; α = .67) and four items measuring controlling coaching style (e.g., "I feel that my coach did not let me decide for myself in training"; α = .66). A CFA conducted on the scale as represented by the two indicators supported the factor structure of the ECI: χ^2 (19) = 85.22, $NNFI$ = .94, $RMSEA$ = .05, CFI = .95, $SRMR$ = .06.

Competence. To assess perceived handball competence, a questionnaire adapted from the Perceived Competence in Life Domains Scale (PCLDS; Losier, Vallerand, & Blais, 1993) was used. It features four items measuring the perception of competence (e.g., "I consider myself to be a good player"; α = .86).

Autonomy. Participants' feeling of autonomy in handball environment was assessed with a questionnaire adapted from the Perceived Autonomy Toward Life Domains Scale (PALDS; Blais, Vallerand, & Lachance, 1990). It is composed of three items measuring the perception of autonomy (e.g., "When I train, I feel free to express my ideas, my opinions"; $\alpha = .75$)

Relatedness. A questionnaire adapted from the Feelings of Relatedness Scale (FRS; Richer & Vallerand, 1998) was used, including four items to assess perceived handball relatedness (e.g., "I feel close to my teammates"; $\alpha = .90$).

The PCLDS, PALDS and FRS assess one's perceptions of autonomy, competence and relatedness in the sports domain. The psychometric properties of the PCLDS, PALDS and FRS have been supported in previous sport research (e.g., Sarrazin, Guillet & Cury, 2001).

Motivation. Players completed "L'Echelle de Motivation dans les Sports" (EMS; the French version of the Sport Motivation Scale; Briere, Vallerand, Blais & Pelletier, 1995), to assess participants' motivation toward handball. Athletes were asked 'Why do you practice your sport?' 28 items were provided to answer to that question. These items assessed the constructs of amotivation, three types of extrinsic motivation (external, introjected, identified regulations), and three types of intrinsic motivation (i.e., to know, toward accomplishment, to experience stimulation). Cronbach alphas of the six subscales ranged from .66 to .85. Previous studies (see Vallerand & Losier, 1999, for a review) confirmed the factor structure of the scale and revealed satisfactory level of internal consistency as well as adequate test–retest reliability. Preliminary analysis (i.e., factorial analysis) and a previous study (Boiché, Sarrazin, Grouzet, Pelletier & Chanal, 2008) on the EMS items suggested that the intrinsic motivation to know and toward accomplishment were loaded on an unique factor so, in the current study we used a factor aggregating together these two subscales.

Burnout. The athletes' burnout was measured by a French version of the Athlete Burnout Questionnaire (Questionnaire du Burnout Sportif; QBS; Isoard-Gautheur, Oger, Guillet & Martin-Krumm, 2010). The questionnaire consisted of five items measuring a sense of reduced accomplishment (e.g., "It seems that no matter what I do, I don't perform as well as I should"; α at time 1 = .75 and a at time 2 = .78), five items measuring perceived physical and emotional exhaustion (e.g., "I am exhausted by the mental and physical demands of handball"; α at time 1 = .83 and α at time 2 =.87), and five items measuring a devaluation of the sport experience (e.g., "I feel less concerned about being successful in handball than I used to"; α at time 1 = .72 and α at time 2 =.82). Participants responded using a 5-point scale (1 = "*almost never*", 5 = "*almost always*"). Lemyre et al. (2006) have postulated that the three symptoms of burnout might have different antecedents and so we had better study the three dimensions independently than the global score of burnout, to obtain more information on the underlying process that leads to athlete burnout.

Some of the alpha coefficients listed previously may be regarded as problematic by some researchers. However, as noted by Cronbach (1951), given a small number of items, low alphas can underestimate scale item intercorrelations that are the basis for internal consistency. With short scales such as the ones used in

this study, the adequacy of the underlying measurement model is generally more indicative of the quality of construct measurement than the internal consistency (Pedhazur & Schmelkin, 1991).

Data Analysis

Structural Equation Modeling (*SEM*) was used to examine the relationships between perceived coaching style, need satisfaction, motivation, and burnout. In the *SEM* with longitudinal data, it is recommended to include the autoregressive influences of the dependent variable (McCallum & Austin, 2000), and so the path between burnout at time 1 and burnout at time 2 had been examined in all the structural models. The model identifications were achieved by fixing one item's loading per latent variable to 1. Power analyses with STATISTICA 7.1 were performed and revealed an adequate sample size of most of the models regarding the number of latent factors in the analysis (statistical power of the five models comprised between .65 and .94). However, type 2 error of some of these models might be heightened.

In a first stage, a measurement model which corresponds to a confirmatory factor analysis (CFA) was tested. It allowed us to focus on the factor structure underlying the items of each construct. This first analysis also allowed us to test the discriminant validity of factors sharing a common method (e.g., self-report), which would tend to inflate correlations between the measures across constructs (see Perugini & Conner, 2000).

In a second stage, the structural and measurement models were tested simultaneously. It allowed researchers to focus on conceptual connections among the latent factors. The measurement and structural models were tested using maximum likelihood estimation with Lisrel 8.71 (Jöreskog & Sörbom, 2004) considering the fact that skewness and kurtosis are lower than one in absolute value and that Mardia's multivariate skewness and kurtosis are lower than 3.

It is recommended to examine and report a range of fit indices to achieve a comprehensive evaluation of fit (Hu & Bentler, 1999). Based on the suggestions made by several researchers (Hu & Bentler, 1999; MacCallum & Austin, 2000) and to enable comparisons with previous studies, multiple fit indices were therefore chosen to assess model fit: The Bentler-Bonett nonnormed fit index (*NNFI*), the comparative fit index (*CFI*), the root mean square error of approximation (*RMSEA*), and the standardized root mean squared residual (*SRMR*). Values between .90 and .94 for the *CFI* and *NNFI* indicate an acceptable fit, whereas values of .95 and higher indicate a relatively good fit. *RMSEA* values of less than .05 represent a close fit, and a cutoff value close to .08 for *SRMR* indicate an adequate model (Hu & Bentler, 1999) while Kline (2005) assumes that values of .10 and lower are acceptable.

In the current study, we tested mediation using a joint significant test (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002) and according the recommendations of Taylor, MacKinnon and Tein (2008) we tested mediation with multiple mediators. First, we assessed the fit of the direct effect model (which allows to examine total effect between the independent and the dependent variable) and then the fit of the mediation model (which allows the examination of the indirect effects between the independent variable and the mediator, and between the mediator and the dependent variable) and finally the fit of the combined effects model (which

allows the examination of the direct effects of the independent variable on the dependent variable when the mediator is included). For null mediation to be shown, the fit of the mediation models should not be worse than that of the combined effect models. Moreover, the direct effects between the independent variable and the mediators, and the direct effects between the mediators and the dependent variable must all be significant. Furthermore, when mediation exists, the direct effects should be reduced (indicating partial mediation) or nullified (indicating complete mediation) in the combined effects model.

Results

Preliminary Results

Descriptive statistics for perceived coaching style, basic need, self-determination and burnout scores are presented in Table 1. The correlations between perceived coaching style, basic needs, motivation and burnout were all as hypothesized. For most athletes, burnout scores increased during the season. Indeed, 79.61% of the athletes showed an increased sense of reduced accomplishment; 57.60% of the athletes showed an increased feeling of exhaustion; 49.83% of the athletes showed an increase in sport devaluation; and finally 47.25% of the athletes showed an increase in the three dimensions of burnout.

Relationships among Perceived Coaching Style, Basic Needs, Motivation, and Burnout[1]

Structural Equation Modeling. The CFA model was based on 86 observed measures and 17 latent constructs. The latent factors were allowed to correlate freely during assessment of the measurement submodel. The measurement model provided an adequate fit to the data (χ^2 (3433) = 5760.57, *NNFI* = .91, *RMSEA* = .05, *CFI* = .91, *SRMR* = .07). The correlations between latent constructs, were inspected to verify the discriminant validity between the constructs. Thus, results from the confirmatory factor analysis revealed that the measurement model was appropriate (i.e., *CFI* and *NNFI* values between .90 and .94, *RMSEA* value equal to .05, and *SRMR* value lower than .08).

Then, we tested simultaneously the structural and measurement models. The structural model's fit to the data are good, according to most of the fit statistics[2]. The significant path estimates of the full combined effects model (i.e., Model 5[2]) can be seen in Figure 1.

Test of Mediation. The mediation role of needs and motivation was supported (Table 2). Results indicate that autonomy, competence, intrinsic motivation to know and toward accomplishment and identified regulation partially mediated (i.e., the direct effects of the independent variables on the dependant variables in model 1 reduced in model 5[2], but the effects remained significant) the relationship between autonomy supportive coaching style and reduced sense of accomplishment. Moreover external regulation partially mediated the relationship (i.e., the direct effects of the independent variables on the dependant variables in model 2 reduced in model 4[2], but the effects remained significant) between competence and reduced sense of accomplishment. Finally, there were no mediated influences (i.e., no diminution of the

Table 1 Descriptive Statistics and Pearson Correlation Matrix for Burnout, Motivation, Basic Needs and Coaching Style

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Reduce Accomplishment T1	2,56	0,503	1,00										
2. Reduce Accomplishment T2	2,87	0,582	0,57	1,00									
3. Exhaustion T1	2,60	0,691	0,15	0,17	1,00								
4. Exhaustion T2	2,61	0,755	0,13	0,20	0,53	1,00							
5. Sport Devaluation T1	1,69	0,656	0,50	0,26	0,05	0,00	1,00						
6. Sport Devaluation T2	1,90	0,798	0,35	0,43	0,07	0,12	0,60	1,00					
7. IM Knowledge & Accomplisment T1	3,92	0,667	-0,21	-0,08	-0,05	-0,03	-0,26	-0,13	1,00				
8. IM Knowledge & Accomplisment T2	3,96	0,734	-0,19	-0,28	-0,05	-0,03	-0,31	-0,44	0,46	1,00			
9. IM Stimulation T1	4,45	0,637	-0,23	-0,16	-0,13	-0,07	-0,12	-0,11	0,46	0,32	1,00		
10. IM Stimulation T2	4,42	0,720	-0,26	-0,28	-0,09	-0,07	-0,29	-0,44	0,30	0,56	0,50	1,00	
11. EM Identified T1	2,77	0,871	-0,05	-0,16	-0,06	-0,10	0,13	0,09	0,31	0,13	0,28	0,17	1,00
12. EM Identified T2	1,42	0,587	0,17	0,18	0,11	0,03	0,43	0,55	-0,13	-0,26	-0,09	-0,36	0,12
13. EM Introjected T1	2,74	0,728	-0,00	-0,09	-0,02	-0,04	0,12	0,07	0,25	0,11	0,24	0,11	0,56
14. EM Introjected T2	2,89	0,848	-0,10	-0,17	0,02	-0,01	0,04	-0,02	0,20	0,29	0,15	0,22	0,62
15. EM External T1	1,32	0,492	0,19	0,06	0,23	0,06	0,32	0,30	-0,04	-0,12	-0,10	-0,15	0,22
16. EM External T2	2,81	0,763	0,02	-0,08	0,02	-0,02	0,09	0,06	0,10	0,17	0,15	0,17	0,28
17. Amotivation T1	1,33	0,529	0,50	0,36	0,19	0,13	0,52	0,45	-0,21	-0,27	-0,17	-0,30	0,03
18. Amotivation T2	1,43	0,647	0,28	0,45	0,13	0,13	0,30	0,61	-0,14	-0,37	-0,10	-0,45	-0,03
19. Autonomy Supportive Coaching Style T1	2,50	0,761	-0,07	-0,17	0,09	-0,01	-0,09	-0,10	0,18	0,17	0,05	0,08	0,08
20. Autonomy Supportive Coaching Style T2	2,49	0,773	-0,12	-0,28	0,03	0,04	-0,06	-0,17	0,04	0,17	0,05	0,11	0,06
21. Controlling Coaching Style T1	2,00	0,714	0,17	0,20	0,06	0,01	0,26	0,24	-0,11	-0,21	-0,00	-0,10	0,06
22. Controlling Coaching Style T2	2,15	0,736	0,13	0,32	0,08	0,16	0,18	0,31	-0,12	-0,23	-0,04	-0,17	-0,01
23. Competence T1	2,68	0,734	-0,50	-0,42	-0,02	-0,12	-0,08	-0,08	0,16	0,09	0,18	0,16	0,26
24. Competence T2	2,69	0,768	-0,41	-0,60	-0,06	-0,15	-0,04	-0,24	-0,00	0,20	0,20	0,21	0,22
25. Autonomy T1	3,20	0,560	-0,38	-0,35	-0,09	-0,16	-0,21	-0,18	0,18	0,14	0,07	0,10	0,01
26. Autonomy T2	3,23	0,564	-0,26	-0,42	-0,06	-0,17	-0,10	-0,24	0,14	0,25	0,04	0,12	0,10
27. Relatedness T1	3,93	0,798	-0,35	-0,25	0,01	0,01	-0,20	-0,18	0,14	0,12	0,19	0,26	0,22
28. Relatedness T2	3,96	0,821	-0,31	-0,25	0,01	-0,04	-0,22	-0,25	0,16	0,23	0,16	0,33	0,22

Note. IM = intrinsic motivation, EM = extrinsic motivation, T1 = time 1, T2 = time 2.

All correlations larger than .12 are significant at $p < .05$.

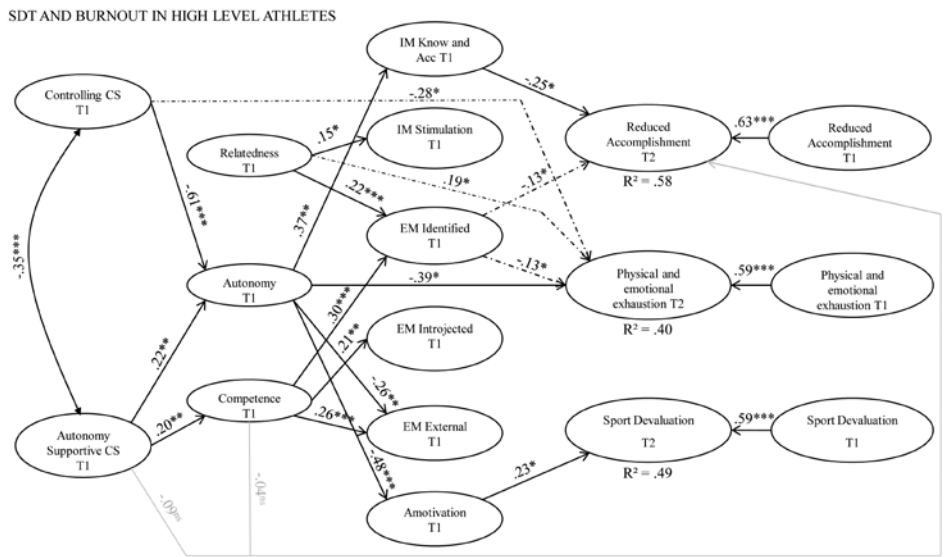

Figure 1 — Structural equation modeling of the relations between coaching style, fundamental needs, motivation and burnout across two measurement waves (Model 5). Only significant relationships are presented: path estimates of the mediation effect model (in black lines), combined effectspaths of significant partial mediation (in gray lines) and paths were suppression is suspected (in doted lines). Completely standardized robust maximum likelihood parameter estimates. CS = coach style; IM = intrinsic motivation; EM = extrinsic motivation; T1 = November 2007; T2 = April 2008. * $p < .05$. ** $p < .01$. *** $p < .001$. ns non significant

Table 1 *(continued)*

12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1,00																
0,18	1,00															
0,20	0,45	1,00														
0,46	0,20	0,17	1,00													
0,24	0,60	0,46	0,20	1,00												
0,33	0,08	-0,08	0,42	0,05	1,00											
0,62	0,10	-0,06	0,19	0,08	0,39	1,00										
-0,06	0,03	0,10	0,02	0,04	-0,14	-0,12	1,00									
-0,09	0,06	0,14	-0,02	0,04	-0,16	-0,18	0,57	1,00								
0,20	0,04	-0,02	0,15	0,06	0,23	0,24	-0,36	-0,30	1,00							
0,34	0,02	-0,00	0,14	0,02	0,20	0,46	-0,18	-0,21	0,44	1,00						
0,05	0,14	0,24	0,09	0,13	-0,23	-0,13	0,15	0,08	-0,01	-0,03	1,00					
0,00	0,12	0,24	0,10	0,14	-0,18	-0,27	0,05	0,13	-0,05	-0,11	0,66	1,00				
-0,16	0,02	0,08	-0,11	0,03	-0,35	-0,18	0,32	0,21	-0,46	-0,32	0,28	0,21	1,00			
-0,21	0,05	0,12	-0,08	0,02	-0,25	-0,32	0,24	0,31	-0,34	-0,42	0,24	0,30	0,55	1,00		
-0,18	0,02	0,19	-0,08	0,02	-0,22	-0,23	0,12	0,09	-0,07	-0,12	0,25	0,21	0,30	0,19	1,00	
-0,21	0,11	0,20	-0,07	0,05	-0,26	-0,30	0,13	0,17	-0,07	-0,15	0,19	0,19	0,20	0,27	0,64	1,00

Table 2 Mediators, Total Effects, Direct Effects, Total Indirect Effects and Type of Mediation of the Relationships between Perceived Coaching Style, Needs Satisfaction and Athlete Burnout

Relationships	Mediator(s)	Total effects	Direct effects	Total indirect effects	Type of mediation
Autonomy supportive → Red Acc	Autonomy, Competence, IM Knowledge & Accomplishment, EM Identified	-.14**	-.09 ^{NS}	-.03	Partial
Autonomy supportive → Exhaustion		-.12*	-.04 ^{NS}		None
Autonomy supportive → Sport devaluation		-.005^{NS}	-.02 ^{NS}		None
Controlling → Red Acc		.06 ^{NS}	.09 ^{NS}		None
Controlling → Exhaustion		-.09 ^{NS}	-.28*		Suppression effects
Controlling → Sport devaluation		.06 ^{NS}	.15 ^{NS}		None
Competence → Red Acc	EM Identified	-.15**	-.04 ^{NS}	-.04	Partial
Competence → Exhaustion		-.10*	-.06 ^{NS}		None
Competence → Sport devaluation		.00 ^{NS}	.02 ^{NS}		None
Autonomy → Red Acc		-.19 ^{NS}	-.26**		None
Autonomy → Exhaustion		-.11 ^{NS}	-.13 ^{NS}		None
Autonomy → Sport devaluation		-.04 ^{NS}	-.04 ^{NS}		None
Relatedness → Red Acc		.02 ^{NS}	.07 ^{NS}		None
Relatedness → Exhaustion		.09 ^{NS}	.12*		Suppression effects
Relatedness → Sport devaluation		-.05 ^{NS}	-.02 ^{NS}		None

Note. T1 = time 1 (November), T2 = time 2 (April), Red Acc = Reduce Accomplishment, IM = Intrinsic Motivation, EM = Extrinsic Motivation. Direct effects are taken from the combined effect model

* p = < .05, ** p = < .01, ^{NS} = non significant

effects and non significant total effects) among controlling coach style, relatedness, autonomy, and the three dimensions of burnout, and between autonomy supportive coach style, competence, and exhaustion and sport devaluation.

Suppression Effects. The results of the current study indicate that controlling coaching style is negatively linked to exhaustion, that relatedness is positively linked to this dimension, and that identified regulation is negatively linked to reduced accomplishment and exhaustion. These significant relationships have to be taken with caution as they are non significant in the direct effect models and mediation models (i.e., models 1–4[2]) and in the correlation matrix. It could then be plausible that these relationships are due to suppression effects (Mac Kinnon, Krull & Lockwood, 2000).

Discussion

The purpose of the current study was to examine the relationships between coaching style and burnout among adolescent handball players in training centers. The results partially support our hypothesis, widely expressed in the literature, on relationships between burnout and self-determination theory constructs.

We have tested five models regarding the influence of coaching style on athlete burnout, based on a self-determination theory approach. One of these models seems to have particular good fits. In this model, the coaching style predicted burnout directly and indirectly (by a mediating influence of the psychological needs and the self-determination) six months later.

Influence of Coaching Style on Psychological Needs

The current results show that the coaching style is significantly related to psychological needs. Indeed, the controlling style of the coach is negatively linked to autonomy, and the autonomy supportive coaching style is positively linked to autonomy and competence. However, the results of the structural equation modeling display non significant relationships between autonomy supportive coaching style and relatedness, but there is a low and positive correlation between these two constructs. These findings are consistent with theoretical prediction (Deci & Ryan, 2000) and past researches. Vallerand and Losier (1999) had suggested that coaches who are perceived as controlling (e.g., directing of individual behavior) undermine intrinsic motivation and identified regulation, whereas those who encourage initiative and autonomy facilitate these aspects. Moreover, they had suggested that the individual's perceptions of competence, autonomy and relatedness represent psychological mediators of the impact of social events on motivation.

Influence of Psychological Needs on Motivation

Consistent with previous research, autonomy, relatedness and competence are positively linked to self-determined motivation and autonomy is negatively linked to external regulation and amotivation. However, competence is also positively linked to non self-determined forms of motivation (i.e., introjected and external regulations). According to Deci and Ryan (2000), the satisfaction of the three psychological needs enhance intrinsic motivation and internalization, whereas

non satisfaction of these needs lessen intrinsic motivation and enhance extrinsic motivation. It then seems surprising that competence is positively linked with non self-determined forms of motivation. Recent studies have discussed the validity of the Sport Motivation Scale (SMS) items (e.g., Lonsdale, Hodge, & Rose, 2008). They have highlighted that the external regulation of the SMS does not measure the most controlling dimensions of external reward and punishment. If the measure of external regulation is not as controlling as it should be, it could explain why we found a positive link between competence and external regulation. Moreover, the measure of competence used in the current study can also explain the positive relationships between competence and introjected and external regulations. Indeed, competence is partly related to how the players rate their competence compared with their teammates' (PCLDS is measuring competence with normative and self-referenced information). It then appeared that competence could be linked to non self-determined forms of motivation as it partially refers to an external point of comparison. Finally, current findings can also be explained by recent research on motivational profiles. Gillet, Vallerand and Rosnet (2009) have found a motivational profile in which athletes have high scores on autonomous forms of motivation and on controlled forms of motivation. This profile has the same positive consequences on performance than a profile with high scores on autonomous forms of motivation and with low scores on controlled forms of motivation. That is to say, controlled forms of motivation could be link to positive antecedents and consequences when autonomous forms of motivation are high.

Influence of Motivation on Athlete Burnout

In the current study, we found that intrinsic motivation is negatively linked to a reduced sense of accomplishment, whereas amotivation is positively linked to a reduced sense of accomplishment and sport devaluation six months later. This is concordant with previous studies that have shown that burnout is negatively related to the most self-determined motivations and positively linked to the less self-determined forms, and that athletes with a motivation becoming less self-determined during a season have higher scores of burnout (Cresswell & Eklund, 2005; Lemyre et al., 2007). Findings also indicate that identified regulation is negatively linked to a reduced sense of accomplishment (in models 4 and 5) and exhaustion (in model 5), however these significant relationships could be due to suppression effects.

Finally, our results specifically show that amotivation, which is defined as a nonadapted motivational form, was only linked to sport devaluation. Devaluation is defined as a detachment from what is important, the athletes stop caring about their sport and their performance (Raedeke, 1997), which might explain why amotivation is the only motivational regulation linked to it. Indeed, Lemyre et al. (2006) argued that devaluation could be one of the most cognitive dimension of burnout and so, its association to amotivation is expected.

Influence of Perceived Coaching Style on Athlete Burnout: Mediating Role of Needs and Motivation

The results showed that perceived autonomy supportive coaching style has a negative mediating influence on reduced sense of accomplishment. Vallerand and Losier (1999) have suggested that the individual's perceptions of competence, autonomy

and relatedness represent psychological mediators of the impact of social events on motivation. Moreover the present results imply that autonomy, competence, intrinsic motivation to know and to accomplish things and identified regulation represent mediators of the impact of perceived coaching style on athlete burnout.

Influence of Needs on Athlete Burnout: Mediating Role of Motivation

In the current study, the need for autonomy is negatively linked to the reduced sense of accomplishment. This result confirms findings from previous studies, in fact, Perreault et al. (2007) have reported that the satisfaction of fundamental needs is linked to lower scores of burnout. More recently, Hodge et al. (2008) have also shown that perceptions of autonomy and competence are strongly related to the levels of athlete burnout among elite rugby players, when relatedness was only a low to moderate predictor of burnout. They suggested that the lack of relatedness may be involved in the development of athlete burnout, but it is likely to play a less important role than the needs for autonomy and competence. The findings of the current study showed that motivation mediate the relationships between competence and reduced accomplishment. More precisely, our findings suggest that external regulation partially mediate the competence → reduced sense of accomplishment relationship. Lonsdale et al. (2009) have tested these mediated relationships and showed that the relationship between autonomy and competence, and exhaustion and devaluation were largely mediated by athletes index of self-determination, whereas, their relationship with reduced sense of accomplishment and global burnout were partially mediated. In the current study the results suggest that the need for autonomy is negatively linked to physical and emotional exhaustion, whereas the need for relatedness is positively linked to this dimension. However, these results have to be taken with caution as they are assumed to be due to suppression effects.

Applied Implications

In elite training centers such as the ones found in the French national sport system, the coach plays a fundamental facilitating or debilitating role impacting the well-being of athletes. The findings of the current study clearly suggest paying attention to the role of the coach and the athletes' perceptions of the coaching style when assessing risks of exhaustion and athlete burnout. First, the current study reports that an autonomy supportive coaching style is related to greater satisfaction of basic psychological needs in athletes, which are linked to more adaptive forms of motivation.

Coaching seminars aimed at making coaches more aware of the impact of their coaching style on both the performance as well as the well-being of their athletes should be put in place by national sporting bodies to facilitate the development of autonomy supporting styles and the suppression of controlling coaching styles. These seminars should also address the promotion of meaningful relationships between teammates at training centers as a means to increase the fulfillment of the basic psychological need for relatedness and favor the development of self-determined motivation in athletes. Finally, the current study's findings support the importance of developing strategies aimed at helping athletes being driven by self-determined forms of motivation to reduce the risks of developing symptoms of athlete burnout during their sporting career.

Limitations and Perspectives

Some limitations should be considered when interpreting the results of the current study. First, the design of the current study does not provide absolute evidence about the causal relationships between the constructs. Future studies can address this issue by using an experimental design to examine these relationships to have stronger evidence of causality. Secondly, the design of the current study did not allowed the examination of mediation effects of needs on the coach style → motivational regulations relationships. As a result, it seems important to replicate this study with a larger number of participants to test these mediation effects. Finally, the student-athletes participating in this study belong to a particular structure where the coach has a specific role, and the results of the current study need to be replicated with other athletes in other contexts, to examine whether the coaching style has the same influence in another sport context or in another athlete population.

Conclusion

The models revealed that a controlling style of coaching, the non satisfaction of the three basic psychological needs and a non self-determined form of motivation might expose the adolescents in handball elite training centers to higher risks of burnout. Inversely, an autonomy supportive coaching style, the satisfaction of the three basic psychological needs and self-determined forms of motivation might lead adolescents in handball elite training centers to lower risks of burnout. These findings support the idea that the self-determination theory may provide a useful conceptual framework for understanding athlete burnout. Moreover, this study implies that the coaches of the elite training centers might play a key role in avoiding the development of burnout within their group. Further research into athlete burnout from this theoretical perspective appears justified.

Notes

1. Before the central analysis, multilevel analysis was conducted to ensure that being in one of the elite training center is not a variable that influence the response of the athletes. Our results indicate that the affiliation of one's in a center is not a significant level of analysis (only 1.89% of the explained variance).
2. Model 1: coaching style → burnout (χ^2 (628) = 1032.93, *NNFI* = .94, *RMSEA* = .05, *CFI* = .95, *SRMR* = .06); model 2: coaching style → needs satisfaction → burnout (c^2 (1435) = 2524.02, *NNFI* = .92, *RMSEA* = .05, *CFI* = .93, *SRMR* = .09); model 3: coaching style → needs satisfaction → motivation → burnout (c^2 (3478) = 5759.82, *NNFI* = .91, *RMSEA* = .05, *CFI* = .91, *SRMR* = .09); model 4: needs satisfaction ® burnout is added to model 3 (c^2 (3469) = 5746.19, *NNFI* = .91, *RMSEA* = .05, *CFI* = .91, *SRMR* = .08); and model 5: coaching style → burnout is added to model 4 (χ^2 (3463) = 5759.82, *NNFI* = .91, *RMSEA* = .05, *CFI* = .91, *SRMR* = .08). The model fits of the five models are not significantly different (chi-square difference test, $\Delta\chi^2$, $p > .05$).

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