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How to achieve in elite training centers without burning out? An achievement goal theory perspective

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ABSTRACT

In training centers, the demonstration of high competence is essential and there is considerable emphasis placed on sporting achievement. Athlete burnout can be a consequence of such pressures and expectations. More information is needed regarding the social, environmental and individual differences in achievement-related characteristics which are relevant to the occurrence of burnout in this context.
Objectives: To examine the relationships among the coach-created climate, perceived competence, achievement goals and burnout in elite adolescent-age athletes.
Design: Prospective six-month-follow-up.
Methods: Data were collected from a sample of 309 young French handball players participating in elite training centers. Cluster analysis and structural equation modeling procedures were employed to evaluate the hypotheses.
Results: Comprised of differential scores on the dimensions of burnout, four distinct clusters were identified. Athletes in these cluster groups varied in perceptions of the motivational climate, goal orientations, and perceived competence. The structural model regarding the hypothesized relationships between perceived coach climate, perceived competence, achievement goals and athlete burnout, offered good fit to the data.
Conclusions: Findings indicated that young talented athletes perceiving an ego-involving climate and emphasizing mastery avoidance goals at the beginning of the season had a higher risk of experiencing burnout symptoms at the season's end. In contrast, players perceiving a high task-involving climate and emphasizing mastery approach goals at the beginning of the season had lower burnout scores when the season concluded. Moreover, players with high feelings of competence, who also report higher scores on performance approach and avoidance goals, higher scores on mastery approach goals and lower scores on mastery avoidance goals, are less likely to experience burnout.

The achievement context of elite training centers

To the lay public, an achievement is equated to success in finishing something or reaching an aim, especially after a lot of work or effort. Heckausen (1974) proposed that, when an element of personal competence is involved, the individual is responsible for the result and success in the task or activity in question is uncertain and socially valued, these are the hallmarks of an achievement context. Most sporting situations (e.g., training, competition) meet these conditions. This is particularly the case for elite training centers which are structures that receive the best young athletes from each region in France. A national decree (Decree of July 18th 2002) specified that the elite training centers focus on helping athletes to reach the highest levels of performance, as well as to provide the necessary preparation for a successful transition to professional sporting life. It is also expected that the athletes in these centers have good academic results.[1]

In these elite training structures, there is a dual sporting goal. On one hand, they are intended to help athletes to learn and master new skills. On the other hand, they have the objective of ensuring that these athletes can reach the highest level of proficiency in their sport. Throughout their tenure in the center, the athletes will be evaluated several times and will be involved in numerous intra-team competitions. Thus, it is paramount that the athletes involved demonstrate and develop their personal competence as well as achieve success. Targeting this specific achievement

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[1] Student-athlete in PE had higher success rates at the national exam "baccalauréat" – nearly 95% – than the students outside the PE program – nearly 80%.

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context, many studies (Gould, Udry, Tuffey, & Loehr, 1996; Lemyre, Hall, & Roberts, 2008) have emphasized the role of motivational factors to the heightened risk for young and highly capable athletes to never realize their full athletic potential and exhibit burnout. Such negative outcomes are held to be a result of young talented athletes' total devotion to their goals, excessive training and perceived insufficient psychosocial support (Gould & Dieffenbach, 2002). Other work, grounded in contemporary achievement goal frameworks (e.g., Duda, 2001) suggest that it is variability in the motivational climate operating, and the manner in which such young elite sport participants tend to judge their competence and define success, which can lead to successful and healthy progression through training centers or less optimal development, compromised well-being, disengagement, and should potentially raise the risk of athlete burnout. Pulling from this literature, the current study examined the relationships among perceptions of the coach-created climate, perceived competence, approach and avoidance achievement goals and burnout in junior elite adolescent-age athletes over time using an achievement goal perspective.

Athlete burnout

Initial research interest in athlete burnout was stimulated by media reports documenting the negative sport experiences of some high-profile athletes (Cresswell & Eklund, 2006; Gould et al., 1996). More recently, athlete burnout has been a growing subject of interest in the scientific community (e.g., athlete burnout was the focus of a special issue of the *International Journal of Sport Psychology* in 2007). The first conceptualization of burnout in sport was proposed by Smith (1986). Smith (1986) defined athlete burnout as psychological, emotional and at times physical withdrawal from a formerly enjoyed activity. According to the author, athlete burnout represents the situational, cognitive, physiological and behavioral components of stress. Studies using this design (e.g., Gould et al., 1996) showed that burnout comes from an increasing stress due to personal and situational factors. Later, Silva (1990) developed a model focused on physical and training factors. In his model, it was assumed that burnout is a product of excessive training stress and that the training load can have both positive and negative effects. According to Silva, the negative adaptation will lead, in its extreme form, to burnout. In addition to the earlier stress-based models, Coakley (1992) suggested that the social organization of elite sport can lead to burnout in athletes. He assumed that the lack of control and the unique identity development are factors of elite sport that lead to burnout in young athletes.

The initial research on athlete burnout has predominantly been based on a stress perspective, but Raedeke (1997) has pointed out that burned out players have not always been stressed. In line with this statement, Raedeke (1997) and Schmidt and Stein (1991) have assumed that in addition to the stress perspective, the level of commitment of athletes can lead to burnout. Indeed, these authors assumed that athletes who felt entrapped in their sport should be more at risk to burnout.

Past research on athlete burnout has also been marked by the lack of an operational definition. Raedeke (1997) and Raedeke and Smith (2009) developed a multidimensional definition based on the workplace definition of Maslach and Jackson (1981), and characterized athlete burnout as a syndrome with three key dimensions: (a) reduced sense of accomplishment, in terms of sport skills and abilities, (b) sport devaluation, which corresponds to a loss of interest and desire to practice, and (c) emotional and physical exhaustion, which refers to a negative response to the intense demands of training and competition. This definition of burnout is currently the most used in the sport domain. Grounded in this multidimensional conceptualization of burnout, Raedeke and Smith (2001, 2009) developed a valid measurement tool to assess athlete burnout, namely, the Athlete Burnout Questionnaire (ABQ).

In the literature, little is know about the prevalence of athlete burnout (Gustafsson, Kenttä, Hassmén, & Lundqvist, 2007). Raedeke (1997) and Eklund and Cresswell (2007) have estimated that six to eleven percent of the athletes have high levels of burnout, which correspond to moderate to high scores on the three dimensions of this syndrome. In the present study, one goal was to provide information on the level of athlete burnout by examining different profiles of burnout symptoms in adolescent age athletes. This was done by a cluster analysis on the dimensions of athlete burnout and then by considering the burnout characteristics of and number of athletes represented in each cluster.

Several previous studies have examined the relationships between motivation and athlete burnout (e.g., Cresswell & Eklund, 2005; Lemyre et al., 2008). Some of this past work has assumed that burnout is the result of a motivational problem, e.g., Gould (1996) has suggested that burnout is a "motivation gone awry". Grounded in achievement goal framework, Hall and Kerr (1997) have highlighted that burnout often happens in individuals who are strongly oriented toward ego achievement. A second goal of the present study was to examine the links between the burnout profiles and dimensions, and the key motivational constructs embedded in achievement goal theory (Elliot & McGregor, 2001; Nicholls, 1984).

Athlete burnout and achievement goal theory (AGT)

AGT (Dweck, 1986; Nicholls, 1984) analyzes human behavior and experiences in relation to the demonstration of competence. Specifically, AGT assumes that the overall goal of action, which becomes the energizing force in achievement settings, is the desire to develop and demonstrate competence and to avoid demonstrating incompetence. This framework provides insight into the emotional reactions, cognitions and behaviors of individuals engaged in social situations in which their skills and abilities are involved.

The 2 × 2 model of achievement goals

The goal adopted by the individual in a given achievement context is a function of situational factors but also motivation-related dispositions or tendencies regarding how success is typically defined and the manner in which competence is judged (Duda, 1998). Since the inception of the achievement goal tradition, the bi-dimensional approach emphasized two ways to define competence (i.e., the definition of competence is one dimension of competence), which underlie the pursuit of two different achievement goals (Nicholls, 1989). One is termed an ego or performance goal, which entails an emphasis on the demonstration of normative competence. A second goal, labeled a task or mastery goal, stems from an emphasis on demonstrating self referenced competence.

More recently, research on achievement goals has also considered another dimension of competence: the valence. It has been argued that competence can have an appetitive (*approach*) or aversive (*avoidance*) valence (Elliot & Harackiewicz, 1996). With a consideration of this second dimension of competence, Elliot and McGregor (2001) developed the hierarchical model of approach-avoidance motivation which proposes four types of goal varying in the criteria by which success and competence are defined and valenced. Elliot and colleagues (Elliot & Church, 1997; Elliot & McGregor, 2001) argue that the consideration of the definition and the valence of competence allows for a more comprehensive approach to the types of goals that individuals adopt and pursue in sport environments.

Mastery approach goals (MApG) reflect a focus on surpassing a previous personal performance on a task, or performing a task as well as possible. These goals are expected to be the most positive achievement goal because they combine the more desirable definition of competence with the more desirable valence. In past studies, this hypothesis has been confirmed as MApG have been linked to an optimal set of motivation-related processes and consequences (e.g., intrinsic motivation, life satisfaction, self esteem, lower anxiety; Adie, Duda, & Ntoumanis, 2008; Castillo, Duda, Alvarez, Mercé, & Balaguer, 2011). Mastery avoidance goals (MAvG) reflect a focus on not doing worse than previous performance, or not making mistakes. These goals combine a desirable definition of competence with an undesirable focus on avoiding incompetence, so they are expected to have a more negative pattern of consequences than MApG and a more positive pattern than performance avoidance goals (Elliot & McGregor, 2001, p.503). In previous research, this hypothesis has been partially supported as MAvG have been linked to more undesirable responses in sport (i.e., threat appraisals, amotivation; Adie et al., 2008; Nien & Duda, 2008).

When emphasizing performance approach goals (PApG), the focus is placed on demonstrating normative ability, or outperforming others. These goals are not expected to be entirely optimal because of their assumed definition of competence, but not entirely maladaptive because they are valenced toward demonstrating high competence. Past studies have confirmed these hypotheses as PApG are linked to positive consequences (e.g., intrinsic motivation, competence valuation, lower anxiety, life satisfaction; Roberts, Treasure, & Conroy, 2007) but also more negative responses and characteristics (e.g., fear of failure, extrinsic motivation, threat appraisals; Adie et al., 2008; Nien & Duda, 2008). Finally, performance avoidance goals (PAvG) reflect a focus on avoiding the demonstration of comparative inability, or not being outperformed by others. These goals are expected to be the more dysfunctional of the achievement goals because they combine the less desirable definition of competence with the less desirable valence. In previous studies, these hypotheses have been confirmed as PAvG have been related to heightened anxiety, lower intrinsic motivation, amotivation, and low self esteem (Castillo et al., 2011; Roberts et al., 2007).

In terms of understanding the concomitants of athlete burnout, the 2 × 2 model of achievement goal (Elliot & McGregor, 2001) has received little attention. Most of the studies examining the interplay between achievement goals and athlete burnout have been grounded in the dichotomous model (Nicholls, 1989). Lemyre et al. (2008) found a "maladaptive motive" profile (i.e., high ego orientation, low task orientation, high ego-involving climate, low task-involving climate and low perceived ability) linked to higher burnout scores. Appleton, Hall, and Hill (2009) (in a study of the moderation effect of achievement goals in the perfectionism − burnout relationships) found that neither goal was a significant predictor of burnout. In yet another study, task orientation (negative predictor) explained 12% of the total variance in athlete burnout scores (Lemyre, Roberts, Treasure, Stray-Gundersen, & Matt, 2004).

To our knowledge, only one investigation has examined the relationships between achievement goals (as defined in the 2 × 2 model) and athlete burnout. In a short communication, a study of French athletes revealed that sub-elite athletes who were oriented toward both MApG and PApG reported less burnout symptoms (Guillet & Gautheur, 2008). It seems prudent to further test the utility of the 2 × 2 model in terms of the prediction of athlete burnout.

Perceived competence in the 2 × 2 model

Initially, in Nicholl's dichotomous model of achievement goals, perceived competence was assumed to moderate the relationship between motivational climate and achievement responses (Nicholls, 1989). In the 2 × 2 model and in line with the assumptions of the need for achievement theory (Atkinson, 1957), Elliot and McGregor (2001) also extended the AGT by considering perceived competence as a central construct of a process model, held to be a consequence of the motivational climate and a precursor of the valence of the adopted goal (Elliot & McGregor, 2001). Whether defined in terms of task or ego related criteria, individuals with perceptions of high competence are expected to orient toward success and to adopt approach goals, whereas those with low perceptions of competence are expected to orient toward failure and to emphasize avoidance goals (Cury, Da Fonseca, Rufo, & Sarrazin, 2002; Elliot & Church, 1997).

To date, sport studies which have specifically examined the predicted links between perceived competence and approach/avoidance goals have provided only partial support for Elliot's predictions (Elliot & McGregor, 2001). In the case of university level athletes, Nien and Duda (2008) tested the theoretically expected relationships regarding perceived competence and fear of failure to the four achievement goals. As hypothesized, perceived competence was positively related to both MApG and PApG. However, no significant negative paths between perceptions of competence and the two avoidance goals emerged. Similar findings were reported in two subsequent investigations involving large samples of young soccer players and university athletes, respectively (Castillo et al., 2011; Morris & Kavussanu, 2008). These unexpected results (i.e., no significant negative paths between competence and the two avoidance goals) could potentially be explained by the perceptions of competence reported by athletes. Indeed in the latter two studies, as a group, the athletes sampled reported high levels of perceived competence. Thus, it could be the case that no significant negative paths between perceived competence and the two avoidance-based goals emerged because a limited number of individuals reported low perceptions of competence.

In addition to AGT's assumption that perceptions of competence predict goal orientations, the athlete burnout literature has also suggests that perceptions of competence directly predict athlete burnout. Indeed, several studies have shown that high perceptions of competence were linked to lower reported scores of athlete burnout (Cresswell & Eklund, 2004; Hodge, Lonsdale, & Ng, 2008).

Motivational climate

As well as the perceptions of competence, one of the fundamental assumptions of AGT is the central role of the social situation in motivational processes (Nicholls, 1984, 1989). That is, the nature of an individual's experience in achievement contexts is held to be a function of the degree to which task and ego criteria for success are perceived as salient in the context (Duda & Balaguer, 2007). Two situation-focused constructs are highlighted: a task-involving climate (or mastery climate), which reflects the athletes' perceptions that the environment focuses on the learning process, that trying hard and improving are valued and that every member of the team has an important role to play (Newton, Duda, & Yin, 2000). An ego-involving climate (or performance climate) reflects a psychological environment centered on the demonstration of normatively referenced competence. In an ego-involving environment, athletes perceive that they will be punished if they make mistakes, that the coach recognizes and reinforces the better players, and that intra-team rivalry is present (Newton et al., 2000).

AGT postulates that the motivational climate induced by the behaviors of the coach should lead to the adoption of different achievement goals (Duda, 1998). Elliot (1999) extended the original AGT by assuming that the achievement environment can have an indirect effect on the adoption of achievement goals by altering

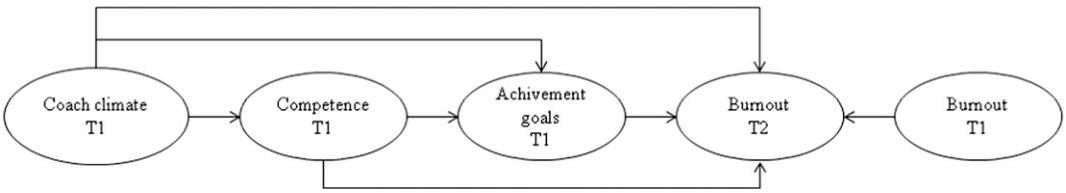

Fig. 1. Hypothesized model of the relations between coach climate, perceived competence, achievement goals and burnout across two measurement waves. T1 = November 2007; T2 = April 2008.

individuals' perceptions of competence. More precisely, it is assumed that a task-involving climate should lead to higher feelings of competence. An ego-involving climate, conversely, should lead to lower feelings of competence.

In addition to influencing the achievement goals adopted by the athletes, the motivational climate is expected to have direct implications for athlete burnout. This is consistent with theoretical models of athlete burnout (i.e., Smith, 1986), which assumed that the situational factors can have a direct impact on athlete burnout. In his stress-based model, Smith (1986) proposed that the personality characteristics and social variables shape the appraisal process which subsequently determine the degree to which burnout is experienced as a result of stress. Considering past research grounded in AGT perspective and burnout theoretical stress-based model (Smith, 1986), it can be hypothesized that a task-involving climate should lead to reduce risks of athlete burnout and that an ego-involving climate should lead to athlete burnout. It makes sense that athletes who feel that they will be punished if they do make mistakes and that the coaches will not recognize their efforts should be more at risk to burnout (i.e., to experience reduced sense of accomplishment, emotional/physical exhaustion and to devalue their sport). Reinboth and Duda (2004) confirmed this assumption and found that emotional and physical exhaustion was positively predicted by perceptions of an ego-involving climate. Lemyre et al. (2008) also found that the maladaptive motivational profile (i.e., high performance climate, low task climate) is linked to higher scores on the three dimensions of athlete burnout. More recently, Harris and Smith (2009) have shown that athletes perceiving a highly ego-involving climate that is low in its task-involving features are at higher risk to experience burnout.

The present study

Drawing from the existent literature, the first objective of the current study was to provide information on the different burnout profiles evident in elite training centers at the season's end and to examine whether these profiles could be distinguished in relation to the athletes' perceptions of the motivational climate created by their coach, approach/avoidance mastery/performance goal emphases, and perceived competence at the beginning of the season. It was hypothesized that at least two different burnout profiles exist in term of the severity of the syndrome; a profile which could be labeled "low burnout" and a profile which could be labeled "high burnout". We also hypothesized that the "low burnout" profile should have more adaptive characteristics regarding AGT constructs than the "high burnout" profile. The second aim was to test a process model over the course of a season, which pulls from both AGT (Nicholls, 1984) and Elliot's 2 × 2 model (Elliot & McGregor, 2001) and reflects the assumed motivation-related precursors to athlete burnout. More precisely, we longitudinally examined the inter-relationships between the AGT constructs and their link to athlete burnout. The present study examined the influence of the perceived coach-created motivational climate on young sub-elite athletes' perceived competence and achievement goals as well as the relationship of perceived competence to achievement goals at the beginning of the season. We also determined the direct paths between the coach-created motivational climate, perceived competence and achievement goals at the beginning of the season to the athletes' reported burnout at the season's end. It was hypothesized (Fig. 1) that a young athlete perceiving a more ego-involving climate would feel less competent and would place greater emphasis on avoidance goals at the start of the season, and that an emphasis on avoidance goals would be associated with greater burnout at the season's end. Conversely, it was hypothesized that a young athlete perceiving a more task-involving climate would feel more competent and would place greater emphasis on approach goals at the start of the season, and that an emphasis on approach goals would be associated with lower burnout at the season's end. We also hypothesized that the perception of the climate and the feelings of competence at the beginning of the season would have a direct impact on the relationship with athlete burnout at the end of the season.

Method

Participants and procedure

A sample of 309 French handball players who were participants in elite training centers (152 males and 157 females) participated in this study. They trained an average of 11 h a week ($SD = 3.5$). Their mean age was 15.4 years ($SD = 0.90$) and their average playing experience in their sport was 6.8 years ($SD = 2.4$).

In accordance with the recommendations of the ethics committee, written parental consent was obtained in the case of the minor age athletes. Coaches were informed by mail and contacted by phone regarding the overall purpose of the study and logistics of questionnaire administration with their team members. The first author administered the questionnaire pack, providing instructions to the athletes, and indicating that she would answer any questions they had while responding to the scales. The players answered the questionnaires twice during a season [i.e., in November (Time 1) and in April (Time 2)]. These two dates of data collection were selected because they were six months apart, which is a sizeable period in the longitudinal analysis of the data and they represented two key points in the season.[2]

Measures

In the three first measurement tools described below, participants responded used 5-point scales (1 = "*not true at all*", 5 = "*very true*").

[2] In November, the athletes had entered the structure only two months ago, they were not have any exam period since December, and their competitive season had begun in the middle of October. In April, the athletes had been in the structure for eight months, it was the last school term, they had to take several exams, and it was almost the end of the competitive season so the matches were really important for the athletes. So, in this last period, the athletes had longer training periods, more homework, and more pressure; which can lead to an increase in fatigue and in burnout among these athletes (Gustafsson et al., 2007).

Perceived coach motivational climate

The perceived coach climate was measured by an adaptation[3] of the "Questionnaire des Rôles des Autrui Significatifs dans l'Implication des Buts d'Accomplissement en Sport" [QRASIBAS (Questionnaire of the Roles of Significant Others in the Involvement of Achievement Goals in Sport); LeBars, Ferron, Maïano, & Gernigon, 2006]. The questionnaire consist of four items measuring perceptions of an ego involving coach climate ($\alpha = .86$; e.g., "My coach notices only the best players") and four items assessing perceptions of the task involving coach climate ($\alpha = .72$; e.g., "My coach is very attentive to technical progresses of all players").

Perceived competence

To assess perceived handball competence, a 4-item scale adapted from the Perceived Competence in Life Domains Scale (PCLDS, Losier, Vallerand, & Blais, 1993) was used ($\alpha = .86$; e.g., "I consider myself to be a good player").

Multiple achievement goals

To assess achievement goals aligned with Elliot's 2 × 2 model (Elliot & McGregor, 2001), a French version of the Achievement Goals Questionnaire for Sport (Conroy, Elliot, & Hofer, 2003), the Approach and Avoidance Questionnaire for Sport and Physical Education Settings (AAQSPE; Schiano-Lomoriello, Cury, & Da Fonséca, 2005) was used. The questionnaire consists of three items measuring MApG ($\alpha = .78$; e.g., "I want to learn as much as possible"), three items measuring MAvG ($\alpha = .83$; e.g., "Sometimes I'm afraid that I may not progress as much as I'd like"), three items measuring PApG ($\alpha = .89$; e.g., "It is important for me to be better than other players"), and three items measuring PAvG ($\alpha = .78$; e.g., "I just want to avoid performing poorly than other players").

Athlete burnout

The athletes reported experience of burnout symptoms was measured by a French validation of the Athlete Burnout Questionnaire (ABQ, Raedeke & Smith, 2009), the "Questionnaire du Burnout Sportif" (QBS; Isoard-Gautheur, Oger, Martin-Krumm,& Guillet, 2010). The questionnaire consists of five items measuring reduced sense of accomplishment ($\alpha = .75$; e.g., "It seems that no matter what I do, I don't perform as well as I should"), five items measuring physical and emotional exhaustion ($\alpha = .83$; e.g., "I am exhausted by the mental and physical demands of handball"), and five items measuring sport devaluation ($\alpha = .72$; e.g., "I feel less concerned about being successful in handball than I used to"). In this last measurement tool, the participants responded on a 5-point Likert scale (1 = "*almost never*", 5 = "*most of time*"). All the alphas for each of the subscales were above Henson's (2001) suggested criterion of 0.70.

Data analysis

The burnout dimensions at Time 2 were submitted to hierarchical cluster analysis in STATISTICA 7.1 software (Statsoft, 2005). We made the assumption that different burnout profiles at time 2 should appear and that they should be related to different motivational characteristics at time 1. Before the cluster analyses were carried out, all the variables were standardized using *Z* scores (mean of 0 and a standard deviation of 1). Standardization prevents variables measured in larger units contributing more toward the distance measured than the variables utilizing smaller units in the cluster analysis (Hair, Anderson, Tatham, & Black, 1998). With this method, each observation starts out as its own cluster. Subsequently, new clusters are formed by combining the most similar observations until either all observations are grouped into a single cluster or the researcher determines that a parsimonious solution has been achieved based on the agglomeration schedule and dendrogram. Ward's method was chosen to minimize the within-cluster differences and to avoid problems with "long chaining" of the observations found in other methods (Aldenderfer & Blashfield, 1984) and the distance was measured using squared Euclidean distances. Outliers (values higher or lower than mean plus two standard deviation) were deleted from the data set. Pairwise deletion was used for missing data. A total of 18 cases were deleted.

Structural equation modeling (SEM) in LISREL 8.7 software (Jöreskog & Sörbom, 2004) was used to examine the relationships between perceptions of the coach climate, perceived competence, achievement goals and burnout. We make the assumption that certain variables (ego-involving climate and avoidance goals measured in time 1) will have a dysfunctional effect by accentuating athlete burnout among our subjects (measured in time 2). Other variables (task-involving climate, perceived competence and approach goals measured in time 1) could have a functional effect by limiting athlete burnout (measured in time 2). SEM, which is particularly useful in longitudinal research (Bentler, 1980), allows examination of the relationships among all the constructs involved in a model using a latent representation of constructs that is not influenced by errors of measurement. Employing 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 was examined in the structural model. The model identification was achieved by fixing one item's loading per latent variable to 1. Power analysis with STATISTICA 7.1 software (Statsoft, 2005) was performed and revealed an adequate sample size regarding the number of latent factors in the analysis (statistical power of the model 0.92). Missing data were handled by multiple imputation available in the LISREL 8.7 software (Jöreskog & Sörbom, 2004).

It is recommended to examine and report a range of fit indices to achieve a comprehensive evaluation of fit (Hu & Bentler, 1999; McCallum & Austin, 2000). Based on the suggestions made by several researchers (Hu & Bentler, 1999; McCallum & Austin, 2000) and to enable comparisons with previous studies, multiple fit indices were chosen to assess model fit: the Bentler–Bonett non-normed 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 0.90 and 0.94 for the *CFI* and *NNFI* indicate acceptable fit, whereas values of 0.95 and higher indicate relatively good fit. *RMSEA* values of less than 0.05 represent a close fit, ideally the lower value of the 90% confidence interval is very near zero (i.e., not worse than 0.05) and the upper value is not very large (i.e., less than 0.08). The width of the confidence interval is very informative about the precision in the estimate of the *RMSEA*. A cutoff value close to 0.08 for SRMR indicates acceptable model (Hu & Bentler, 1999). With this method, we tested a model with perceived coach climate predicting competence, the four achievement goals and burnout, competence predicting the four achievement goals and burnout, and the four achievement goals predicting burnout.

[3] Items of this questionnaire have been modified in regard with questionnaire measuring physical education class climate. Precisely, some items of the task-involving climate of the QRASIBAS have been modified in accordance with the questionnaire of Biddle et al. (1995) in order to add other dimensions (i.e., working together and equal recognition) to the learning aspect of the task-involving climate.

Results

Preliminary results

Descriptive statistics for perceptions of the task- and ego-involving facets of the coach climate, perceived competence, multiple achievement goals and burnout scores are presented in Table 1. Adolescents reported moderate scores on the perceived ego-involving coach climate, competence, MAvG, PAvG, PApG, reduced sense of accomplishment, exhaustion and sport devaluation scales. They reported high scores on the scales assessing perceptions of the task-involving coach climate and MApG emphasis.

Burnout profiles at time 2 and their links with the motivational climate, achievement goals and perceived competence at time 1

A hierarchical cluster analysis was conducted on the three dimensions of burnout at Time 2 (Fig. 2). Joining two very different clusters results in a large percentage of change in the coefficients. So we looked for large increases in the agglomeration coefficient (Hair et al., 1998). The solution with four clusters was identified as the more adequate (45% of change in the coefficients between the solution with three clusters and the solution with four clusters and only 33% of change between the solution with four clusters and the solution with five clusters). Then, a nonhierarchical technique (i.e., K-mean) was used to adjust the results from the hierarchical procedure. Finally, after having repeated the same procedure with our sample split in two equal groups, the adoption of four clusters was confirmed. This approach is the opposite of the approach used by Lemyre et al. (2008). Indeed, they created clusters on the motivational characteristics at time 1 and examined the links of these profiles with the scores on the three dimensions as well as total burnout at time 2. Our approach provides more insight into athlete burnout as it offers information on the types and prevalence of burnout profiles which exist among adolescent athletes in training centers at the season's end. Moreover, the tactic adopted allowed us to examine the links between the motivational characteristics of these young sub-elite athletes at the beginning of the season and the different burnout profiles which emerged at the conclusion of the season.

Cluster 1 consisted of players with a "lower burnout" profile ($N = 86$), Cluster 2 consisted of players with a "higher exhaustion" profile ($N = 66$), Cluster 3 consisted of players with a "higher sense of reduced accomplishment" profile ($N = 102$), and Cluster 4 consisted of players with a "higher devaluation and reduced accomplishment" ($N = 55$; Table 2).

The next stage of the analysis was to examine the motivational characteristics corresponding to the four clusters considering the key constructs embedded in AGT (Fig. 3). A one-way MANOVA was conducted with perceptions of the task- and ego-involving coach climate, perceived competence, and four achievement goals at Time 1 as the dependent variables, and cluster group membership as the independent variable.

The results of the multivariate test indicated significant and conceptually coherent differences among the four clusters on the perceived coach climate dimensions and perceptions of competence (Wilks' $\Lambda = 0.89$, $F\,(9, 309) = 3.97$, $p < .001$). Post hoc tests using Newman–Keuls were used to examine pairwise comparisons between each of the groups (Table 2). Athletes in Cluster 4 had significantly higher scores on perceptions of an ego-involving coach climate than athletes in Clusters 1 and 2 ($p < .001$). In terms of the perceived task-involving features of the coach climate, there were no significant differences between the four clusters ($p < .001$). Athletes in Cluster 1 had significantly higher scores on perceived

Table 1
Descriptive statistics and Pearson correlation matrix for burnout, achievement goals, competence and perceived coach climate.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Reduced accomplishment T1	2.56	0.50	1.00																			
2. Exhaustion T1	2.60	0.69	0.13*	1.00																		
3. Sport devaluation T1	1.69	0.66	0.48*	0.01	1.00																	
4. Ego-involving climate T1	2.48	1.07	0.18*	−0.03	0.25*	1.00																
5. Task-involving climate T1	4.22	0.67	−0.14*	0.07	−0.15*	−0.23*	1.00															
6. Mastery-approach T1	4.81	0.41	−0.30*	0.02	−0.37*	−0.10	0.24*	1.00														
7. Mastery-avoidance T1	3.69	0.92	−0.03	−0.03	−0.10	0.06	0.04	0.29*	1.00													
8. Performance-approach T1	3.34	1.10	−0.20*	−0.08	−0.11*	0.08	0.04	0.29*	0.69*	1.00												
9. Performance-avoidance T1	3.45	1.01	0.36*	0.07	0.12*	0.27*	−0.08	0.07	0.21*	0.04	1.00											
10. Competence T1	3.24	0.68	−0.57*	−0.01	−0.22*	−0.08	0.10	0.30*	0.14*	0.33*	−0.19*	1.00										
11. Reduced accomplishment T2	2.87	0.58	0.57*	0.16*	0.26	0.18*	−0.07	−0.18*	−0.05	−0.22*	0.31*	−0.39*	1.00									
12. Exhaustion T2	2.61	0.76	0.12*	0.52*	−0.03	−0.05	0.01	0.01	−0.02	−0.01	0.08	−0.07	0.20*	1.00								
13. Sport devaluation T2	1.90	0.80	0.35*	0.06	0.60*	0.16*	−0.07	−0.35*	−0.08	−0.13*	0.06	−0.16*	0.43*	0.12*	1.00							
14. Ego-involving climate T2	2.99	1.10	0.06	−0.02	0.12*	0.57*	−0.11	−0.10	0.02	0.05	0.14*	−0.07	0.24*	0.05	0.21*	1.00						
15. Task-involving climate T2	4.20	0.70	−0.16*	−0.03	−0.21*	−0.27*	0.39*	0.30*	0.10	0.08	0.04	0.09	−0.24*	−0.04	−0.30*	−0.28*	1.00					
16. Mastery-approach T2	4.58	0.74	−0.26*	−0.02	−0.37*	−0.15*	0.13*	0.52*	0.12*	0.16*	−0.04	0.18*	−0.27*	0.06	−0.56*	−0.19*	0.43*	1.00				
17. Mastery-avoidance T2	3.37	1.13	−0.09	−0.06	−0.07	−0.07	0.15*	0.18*	0.55*	0.50*	0.01	0.11	−0.19*	−0.08	−0.11*	−0.01	0.24*	0.19*	1.00			
18. Performance-approach T2	3.06	1.21	−0.16*	−0.06	−0.09	−0.00	0.08	0.23*	0.50*	0.64*	0.00	0.21*	−0.24*	−0.02	−0.16*	−0.04	0.16*	0.19*	0.77*	1.00		
19. Performance-avoidance T2	3.22	1.07	0.19*	0.03	−0.01	0.09	0.04	0.15*	0.10	0.00	0.39*	−0.12*	0.39	0.14*	0.06	0.06	0.04	0.15*	0.07	0.03	1.00	
20. Competence T2	3.23	0.72	−0.45*	−0.06	−0.17*	−0.13*	0.12*	0.25*	0.07	0.24*	−0.18*	0.54*	−0.65*	−0.13*	−0.41*	−0.19*	0.24*	0.28*	0.21*	0.32*	−0.31*	1.00

*Correlations are significant at $p < .05$.

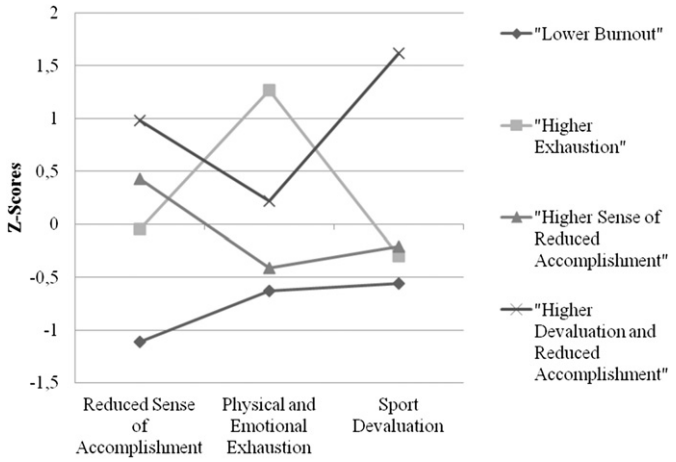

Fig. 2. *Z*-scores for the four burnout profiles identified by hierarchical cluster analysis of the three dimensions of burnout at time 2.

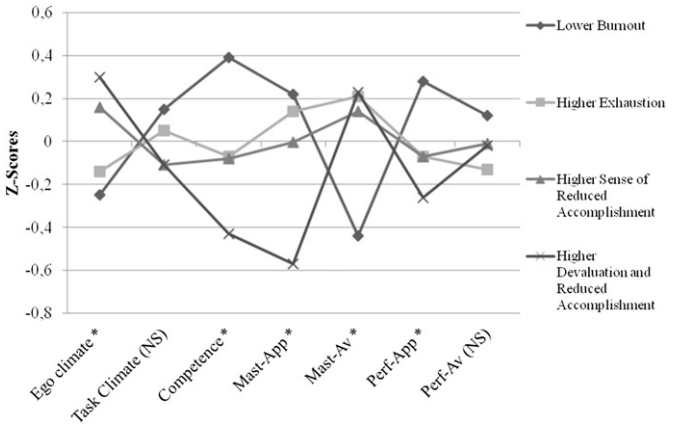

Fig. 3. Significant differences in the perceived climate, perceived competence, achievement goals and burnout symptoms for the four burnout profiles. Mast-App = mastery approach goal; Mast-Av = mastery avoidance goal; Perf-App = performance approach goal; Perf-Av = performance avoidance. *Note*. * = significant differences between the groups, (NS) = non significant differences between the groups.

competence than athletes in the three other clusters ($p < .001$). The results of the multivariate test also indicated significant differences among the four clusters on the emphasis placed on the four achievement goals (Wilks' $\Lambda = 0.82$, $F\,(12, 309) = 5.08$, $p < .001$). The post hoc tests revealed that athletes in Cluster 4 had significantly lower scores than the athletes in the three others cluster on MApG ($p < .001$). Finally, athletes classified in Cluster 1 had significantly higher scores on PApG and significantly lower scores on MAvG than athletes in the three other clusters ($p < .001$). In terms of the importance placed on PAvG, there were no significant differences between the four clusters.

Relationships between the dimensions of the perceived coach climate, perceptions of competence, achievement goals, and burnout

Before testing the structural model, a measurement model was tested via CFA. Adopting this strategy allows us to focus on the factor structure underlying the items of each construct before looking at hypothesized structural relationships, and to test the discriminant validity of factors sharing a common method (i.e., self-report), which would tend to inflate correlations between the measures across constructs (Perugini & Conner, 2000). Maximum likelihood factor extraction (all skewness and kurtosis values below 1 in absolute magnitude) with a variance-covariance matrix was used with Lisrel 8.71 software (Jöreskog & Sörbom, 2004). The CFA model was based on 39 observed measures and ten latent constructs. As recommended by Anderson and Gerbin (1988), the latent factors were allowed to correlate freely during assessment of the measurement sub-model.

The measurement model provided an adequate fit to the data ($\chi^2\,(1406) = 2705.48$, *NNFI* = 0.92, *RMSEA* = 0.05 [90% CI = 0.048; 0.054], *CFI* = 0.93, *SRMR* = 0.06). The correlations between latent constructs were inspected to verify the discriminant validity between the constructs. The results from the CFA revealed that the measurement model was appropriate.

The structural model was tested using maximum likelihood estimation with Lisrel 8.71 software (Jöreskog & Sörbom, 2004) because skewness and kurtosis were lower than one in absolute value. The model revealed adequate fit to the data ($\chi^2\,(1412) = 2664.18$, *NNFI* = 0.92, *RMSEA* = 0.05 [90% CI = 0.048; 0.054], *CFI* = 0.93, *SRMR* = 0.09). Values and directions of the significant paths between the constructs can be viewed in Fig. 4. The paths between ego-involving climate on the one hand, and competence, MApG, PApG, PAvG, and the three dimensions of burnout on the other hand were non-significant. The paths between task-involving climate on the one hand, and competence, MAvG, PApG, PAvG, and the three dimensions of burnout on the other hand were non-significant. The path between competence and sport devaluation was non-significant. The paths between MApG on the one hand, and reduce sense of accomplishment, and physical and emotion exhaustion on the other hand were non-

Table 2
Cluster characteristics, effect sizes of MANOVA and means of perceived coach climate, competence, and achievement goals at time 1 for each cluster.

	Lower burnout *M* (*Z*)	Higher exhaustion *M* (*Z*)	Higher reduced sense of accomplishment *M* (*Z*)	Higher devaluation and reduced accomplishment *M* (*Z*)	Effect sizes of MANOVA (η^2)
Cluster characteristics					
Reduced accomplishment T2	2.24 (−1.11)	2.84 (−0.05)	3.14 (0.43)	3.44 (0.98)	
Exhaustion T2	2.15 (−0.63)	3.57 (1.27)	2.32 (−0.41)	2.81 (0.22)	
Sport devaluation T2	1.46 (−0.56)	1.65 (−0.30)	1.75 (−0.21)	3.27 (1.62)	
N	86	66	102	55	
Means of the dependent variables for each cluster					
Ego-involving climate T1	2.23 (−0.25)	2.33 (−0.14)	2.61 (0.16)	2.81 (0.30)	0.046 (moderate)
Task-involving climate T1	4.33 (0.15)	4.25 (0.05)	4.13 (−0.11)	4.15 (−0.11)	0.014 (non significant)
Competence T1	3.51 (0.39)	3.19 (−0.07)	3.17 (−0.08)	2.98 (0.39)	0.078 (moderate)
Mastery approach T1	4.91 (0.22)	4.87 (0.14)	4.81 (−0.004)	4.60 (−0.57)	0.073 (moderate)
Mastery avoidance T1	3.01 (−0.44)	3.66 (0.21)	3.58 (0.14)	3.63 (0.23)	0.080 (high)
Performance Approach T1	3.65 (0.28)	3.26 (−0.07)	3.25 (−0.07)	3.10 (−0.26)	0.036 (low)
Performance avoidance T1	3.85 (0.12)	3.55 (−0.13)	3.69 (−0.01)	3.62 (−0.02)	0.008 (non significant)

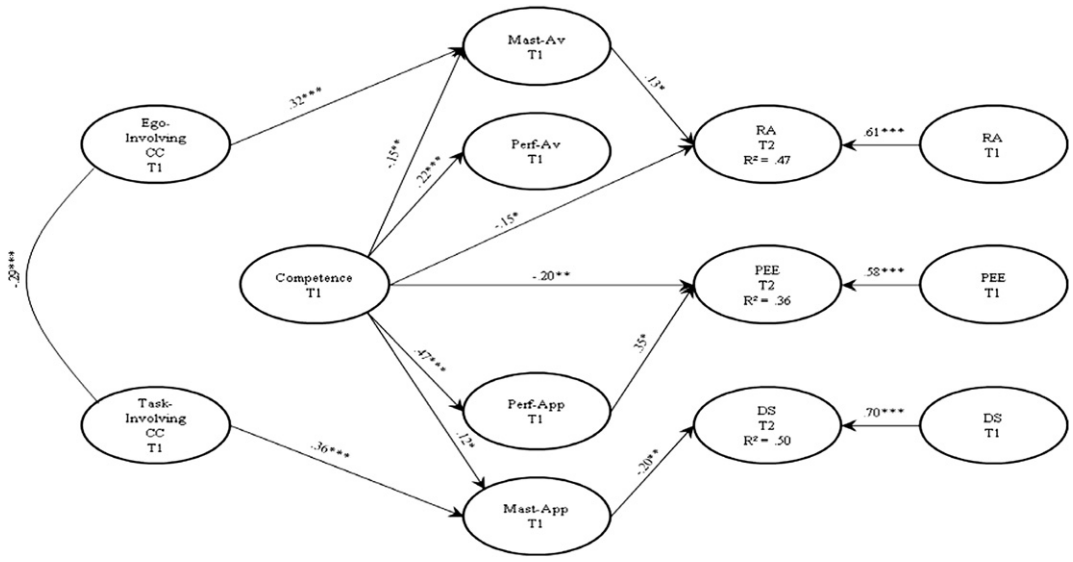

Fig. 4. Structural equation modeling of the relations between coach climate, perceived competence, achievement goals and burnout across two measurement waves. Completely standardized robust maximum likelihood parameter estimates. Only significant relationships are presented. CC = coach climate; Mast-App = mastery approach goal; Mast-Av = mastery avoidance goal; Perf-App = performance approach goal; Perf-Av = performance avoidance goal; SD = sport devaluation; RA = reduced accomplishment; PEE = physical and emotional exhaustion; T1 = November 2007; T2 = April 2008. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

significant. The paths between MAvG on the one hand, and physical and emotional exhaustion and sport devaluation on the other hand were non-significant. The paths between PApG on the one hand, and reduced sense of accomplishment, and sport devaluation on the other hand were non-significant. Finally, the paths between PAvG and the three dimensions of burnout were non-significant.

Discussion

The purpose of the present study was to examine the relationships between the perceived coach climate, perceived competence, approach and avoidance-based achievement goals and burnout among sub-elite adolescent handball players participating in training centers. Cluster analyses were used to examine the profiles of athlete burnout present in these structures and their links with the key motivational constructs embedded in AGT. Structural equation modeling was used to longitudinally examine the interrelationships between the AGT constructs and their links to athlete burnout. The results partially support our hypotheses grounded in achievement goal frameworks (Elliot & McGregor, 2001; Nicholls, 1984) and the extant literature on the associations between achievement goals and experiences of burnout in athlete populations. The hypothesized structural model (Fig. 1) fit the data well. We found perceptions of the coach climate and perceived competence to differentially predicted achievement goals, which predicted the burnout characteristics exhibited by the handball players six months later.

AGT constructs: the prediction of burnout profiles

Athlete burnout is considered to be a syndrome with three dimensions (Raedeke & Smith, 2009), which suggests that in order to consider that an athlete is burned out, he or she should report moderate to high scores on all the three dimensions (Eklund & Cresswell, 2007; Raedeke, 1997). Recent qualitative studies using retrospective interviews have proposed that the three dimensions of burnout develop differentially over time and that sport devaluation might be the last step of a sequence involving emotional/physical exhaustion and reduced sense of accomplishment (Cresswell & Eklund, 2007; Gustafsson, Hassmén, Kenttä, & Johansson, 2008). In the current study, the results of the cluster analysis revealed four burnout profiles. No comprehensively "burned out" profile was revealed (i.e., a profile marked by moderate to high scores on all three dimensions). This non-finding might be due to what is termed the 'healthy worker effect' (Gustafsson et al., 2007). Indeed, athletes with high scores on all three burnout dimensions would have been expected to have dropped out from sport participation due to the negative self-perceptions and emotional and physical states. One of the profiles which emerged in this study, labeled "higher sport devaluation and reduced accomplishment" represents the more negative burnout profile in the present research because two of the three dimensions of burnout are moderate to high, and represented 17.80% of the participants. In particular, scores on sport devaluation were relatively high, and this attribute is considered as the last step in the 'burning out' process (Cresswell & Eklund, 2007; Gustafsson et al., 2008). Compared with the prevalence reported in past researches (Cresswell & Eklund, 2007; Raedeke, 1997), the percentage of athletes in this profile was slightly higher. However, the profile in the present study consisted of moderate to high scores only on two dimensions of athlete burnout (i.e., reduced sense of accomplishment and sport devaluation) whereas in past study the lower percentage concerned athletes with moderate to high scores on the three dimensions of athlete burnout. This profile corresponded to more negative achievement related characteristics. Indeed, the players who had this profile at the end of the season, perceived the coach-created environment to be more ego-involving, reported lower competence, and placed less emphasis on MApG and PApG in the beginning of the season. These results are concordant with the theory and past research. According to AGT, higher maladaptive responses may appear among individuals who place less emphasis on MApG and PApG and higher emphasis on MAvG and PAvG, who perceive lower competence, a low task-involving coach climate and a highly ego-involving coach climate (Adie et al., 2008; Castillo et al., 2011; Duda, 2005; Nien & Duda, 2008; Roberts et al., 2007). Indeed perceptions of an ego-involving coach climate have been linked to maladaptive responses (Duda & Balaguer, 2007) and to athlete burnout specifically (Harris & Smith, 2009). Moreover,

lower perceived competence has also been found to be a predictor of athlete burnout (Cresswell & Eklund, 2004), and MApG and PApG have been coupled with positive consequences (Adie et al., 2008; Roberts et al., 2007). Finally, research by Lemyre et al. (2008) revealed the more maladaptive motivational profile (i.e., characterized by perceptions of an ego-involving coach climate and lower perceived ability) to be linked to higher burnout.

With respect to the profile marked by lower burnout characteristics at the conclusion of the competitive season, these athletes viewed the climate as low in its ego-involving features. They were also high in a MApG and PApG emphasis, and placed lower importance on MAvG at the beginning of the season. These results are concordant with the theory and past research as an environment low in its ego-involving features would not be expected to link to maladaptive responses (Duda & Balaguer, 2007). Further, MApG and PApG have been associated with positive outcomes and MAvG have emerged as a predictor of undesirable responses in sport (Adie et al., 2008; Roberts et al., 2007). Our findings are also aligned with the research by Guillet and Gautheur (2008) involving young elite handball athletes. However, the present results are only in part consistent with a previous study by Lemyre et al. (2008) who found that high ego orientation and low task orientation were linked to burnout. Drawing from our MANOVA results, both mastery and performance approach goal emphases were high among athletes classified in the cluster labeled "lower burnout". Hodge and Petlichkoff (2000) have shown that a profile comprises of individuals with both high task and high ego orientations is linked to higher perceived competence. Indeed, consistent with AGT, athletes with high task orientation might rate themselves as having high competence, even if they have high ego orientation. That is to say, individuals high in both task and ego orientations have several achievement options for continued participation in the activity (Duda, 1989) and might have lower risks to burnout than individuals low in both task and ego orientations.

With respect to the emerging profile labeled "higher exhaustion", the players within this cluster tended to perceive their sporting environment to be less ego-involving. Our findings are in contrast to the theory as a highly ego-involving coach climate is expected to be linked to more maladaptive responses (Duda & Balaguer, 2007), and to the results of Reinboth and Duda (2004) in their research involving adolescent-age male players. These researchers found higher exhaustion to be positively linked to perceptions of a highly ego-involving climate in non-elite athletes. However, in their study on judo elite training centers, Le Bars, Gernigon, and Ninot (2009) found that even if the context of high level training is highly ego-involving, it is not detrimental to athletes' motivation as long as a task-involving climate is concomitantly sustained. They also highlighted that the peer motivational climate was relatively independent from the coach-motivational climate. It can be speculated that in the current study, lower ego-involving coach climate was linked to higher exhaustion because other motivational determinants of the climate (i.e., perceived peer and parent motivational climate) may have influenced the perceived level of exhaustion. Future research should examine the influence of the perceived motivational climate from coaches, peers and parents on athlete burnout.

Relationship of achievement goals to athlete burnout

The present findings revealed MApG to be a negative predictor of sport devaluation, that MAvG were positively associated with a reduced sense of accomplishment, and that PApG were positively linked to reported emotional and physical exhaustion in the players. However no significant relationships between the emphasis placed on PAvG and indices of athlete burnout emerged. These results are partly in accordance with previous studies on the concomitants of burnout in sport, which have primarily been based on the dichotomous approach of achievement goals. These past studies have shown that high ego orientation is linked to a greater risk of experiencing the burnout syndrome in athletes (Lemyre et al., 2008). Guillet and Gautheur (2008), in their study grounded in the 2×2 achievement goals approach, found that a profile marked by high MApG and PApG linked to reduced athlete burnout.

The present results indicated that each achievement goal (expect for PAvG) has a unique relationship with a specific burnout symptom. First, and aligned with previous research, MAvG are linked with reduced sense of accomplishment. Adie et al. (2008) and Nien and Duda (2008) have also found MAvG to be linked to undesirable responses in sport (e.g., threat appraisals and amotivation). By focusing on the definition of this achievement goal (i.e., focus placed on not doing worse than previous performance, or not making mistakes; Elliot & McGregor, 2001), it is not surprising that this goal is especially linked to the feeling of reduce sense of accomplishment, which corresponds to a sense of ineffectiveness and the tendency of an individual to evaluate himself negatively in terms of performance and athletic achievements (Raedeke & Smith, 2001).

The current results also shown that MApG were negatively linked to sport devaluation. This relationship is in concordance with the theory and past studies. According to AGT, these goals are expected to be the most positive achievement goal because they combine the more desirable definition of competence with the more desirable valence (Elliot & McGregor, 2001). Adie et al. (2008), and Castillo et al. (2011) confirm this hypothesis and found MApG to correspond to an optimal set of motivational related processes and consequences (e.g., intrinsic motivation, life satisfaction and self-esteem). When emphasis is placed on mastery approach achievement goals, the individual focuses on surpassing a previous personal performance on a task, or performing a task as well as possible. Sport devaluation is considered to be the most negative dimension of athlete burnout and MApG are assumed to be the quintessential adaptive achievement goal. Because of the way competence is defined (i.e., self-referenced) and valenced (i.e., approach) in MApG it makes sense that this type of goals would not lead to the negative and detached attitude toward sport, resulting in a lack of interest about sport and performance associated with sport devaluation (Raedeke & Smith, 2009).

Finally, in the present study, PApG were positively linked to emotional and physical exhaustion. This result is in accordance with AGT and the previous studies of Adie et al. (2008) and Nien and Duda (2008). Indeed, due to the inherent comparative and performance definition of competence embedded within it, PApG have been linked to both positive consequences (e.g., intrinsic motivation, self esteem, life satisfaction) and maladaptive responses and characteristics (e.g., fear of failure, extrinsic motivation, threat appraisals; Roberts et al., 2007). Athletes scoring high in PApG focus on demonstrating normative ability or outperforming others, and demonstrate a relentless striving toward high comparative achievement standards which are fueled by a fear of failure (Elliot & McGregor, 2001). Therefore, athletes who follow these achievement goals (particularly if not also striving for MApG) are at higher risk to be physically and emotionally exhausted (Raedeke & Smith, 2009).

Relationships of perceived competence to achievement goals

Elliot (1999) assumed that perceived competence is a precursor of the valance of the adopted goals. Elliot and McGregor (2001) hypothesized that competence would be positively linked to MApG and PApG and negatively linked to MAvG and PAvG. In the

current study, perceived competence was positively associated with MApG and PApG, and negatively associated with MAvG. These observed associations are consistent with the theory (Elliot & McGregor, 2001) and aligned with some previous empirical work. More specifically, in research grounded in the 2 × 2 framework, Cury, Elliot, Da Fonséca, and Moller (2006) found that perceived competence was positively related to MApG and PApG, and negatively linked to MAvG and PAvG. However, other studies in the sport domain have not found significant and expected negative relationships between perceived competence and the emphasis placed on MAvG (Castillo et al., 2011; Nien & Duda, 2008).

In the present study and in contrast to what would be expected based on Elliot's theory (Elliot & McGregor, 2001), we also found that perceived competence was positively related to PAvG. However, this significant relationship has to be taken with caution as these two constructs are significantly negatively correlated in the correlation matrix (i.e., correlation between perceived competence at time 1 and PAvG at time 1 = −0.19). It could then be plausible that the observed significant path was due to suppression effects (MacKinnon, Krull, & Lockwood, 2000). Indeed, in this relationship, MAvG may act as a suppressor in a mediative model. In this model, to be considered as a suppressor, an independent variable (i.e., the suppressor) may be linked to another independent variable and these two variables may be causes of the dependent variable (Cohen, Cohen, West, & Aiken, 2003). In the present study, perceived competence and MAvG (i.e., suppressor) may be linked together and may cause PAvG. It can be hypothesize that the combination of high perceived competence and the desire to not doing worse than a previous performance (i.e., MAvG) should lead the athlete to focus on avoiding the demonstration of comparative inability (i.e., PAvG). Indeed in the correlation matrix, MAvG are positively and significantly correlated to perceived competence (correlation coefficient = 0.14), and to PAvG (correlation coefficient = 0.21).

Relationship of perceived competence to athlete burnout

The present findings revealed high perceived competence to negatively predict physical and emotional exhaustion and reduced sense of accomplishment. These results are in concordance with the theory and past studies. Perceived competence is held to be a precursor of the valence of the adopted goal (Elliot & McGregor, 2001) and it is assumed to orient the individual toward striving for success and the avoidance of failure. However, in AGT, it is assumed that high perceived competence should have positive consequence (at least in the short term) on athletes, regardless of the achievement goals adopted (Duda, 2005). In past studies on athlete burnout, it has been shown that perceived competence is negatively linked to burnout. For example, Lemyre et al. (2008) found that low perceived ability linked to increased burnout symptoms. Cresswell and Eklund (2004), in their study of elite rugby players, have also shown that high perceived competence corresponded to a lower risk of burnout. Hodge et al. (2008) demonstrated in elite rugby players that perceptions of competence were negatively linked to a reduced sense of accomplishment and sport devaluation. In the present study results, no significant path was found between perceived competence and sport devaluation. However, perceived competence was positively linked to MApG which were negatively linked to sport devaluation.

Influence of coach climate on perceived competence, achievement goals and athlete burnout

Duda (2005) highlighted that the motivational climate is best viewed as a psychological environment that influences individuals' feelings of competence. Elliot (1999) assumed that achievement environment can have an indirect effect on the adoption of achievement goals by altering individuals' perceptions of competence. In the current study, at the start of the season, perceptions of an ego-involving climate and task-involving climate were not significantly linked to perceived competence and to athlete burnout. Considering the expected negative implications of an ego-involving environment (Duda & Balaguer, 2007), it seems surprising that the motivational climate did not link to perceived competence and athlete burnout in the present study. The absence of associations between perceptions of the coach climate and perceived competence might be explained by the possibility that the climate and competence interact and together impact achievement goal emphases. In this view, the perceived competence might not be a consequence of the coach climate, but instead should interrelate with the climate. Moreover, it should be kept in mind that the perceived coach climate, perceived competence and achievement goals were measured at the same point in time. It is possible that by measuring these constructs at different time intervals, significant relationships between perceptions of the coach-created climate and perceived competence might emerge. The absence of associations between perceptions of the coach climate and athlete burnout might also be explained by the possibility that the climate indirectly influences athlete burnout via the achievement goals adopted by the individuals. These proposed possibilities need to be tested in future research.

In the literature, it has been assumed that a task-involving climate refers to structures that emphasized task mastery, whereas a perceived ego-involving climate captures structures that emphasize social comparison and intra-group competition (Newton et al., 2000). In the present study, perceptions of a task-involving climate corresponded to greater importance being placed on MApG. This finding is aligned with the theory and results from previous studies. More specifically, a task-involving coach climate which captures an environment focused on the learning process, that trying hard and improving are valued and that every member of the team had an important role to play (Newton et al., 2000) has been linked to MApG. In accordance with the current results, in the physical education context, Cury et al. (2002) found that a perceived task-involving climate was a positive predictor of mastery goals. Elliot (1997), in an academic setting, also observed perceptions of a task-involving climate to lead to MApG and PApG.

In the present study, the results also show that perceptions of an ego-involving climate positively linked to MAvG. According to AGT, an ego-involving coach climate corresponds to the perception of an environment focused on the demonstration of normatively referenced competence, that athletes will be punished if they made mistakes and that coach recognized and reinforced the better players (Newton et al., 2000). This climate has been related to MAvG goal emphasis which corresponds to a focus on not doing worse than previous performance or not doing mistakes (Elliot & McGregor, 2001). In line with the AGT and the result presented in this study, Cury et al. (2002) found that perceptions of an ego-involving climate were a negative predictor of mastery goals.

Limitations and perspectives

The current study examined the influence of the task-involving and ego-involving climate with an AGT perspective. However, recent research on the motivational climate using a Self-Determination Theory perspective (SDT; Deci & Ryan, 2002) proposes that additional motivation-related dimensions of the coach climate (i.e., autonomy supportive and/or controlling) are relevant to the incidence of athlete burnout (Quested & Duda, 2011) and therefore future research should examine the influence of both

the ego-/task-involving climate, and the autonomy supportive and/or controlling climate on perceived competence, achievement goals and athlete burnout.

The student-athletes participating in this study belong to a particular achievement structure where the demonstration of both personal mastery and comparative performance is important. This study needs to be replicated with other athletes (and elite performers) in other achievement contexts, in order to examine whether mastery and performance orientations, as well as their interplay between motivational climate and the perceived competence, play a similar role in predicting the incidence of burnout.

The present study examined the inter-relationships between the achievement goal constructs (drawing from Eliot's 2 × 2 model) and athlete burnout. Future research should examine the moderating role of competence in the relationships between the climate/achievement goals, and between the climate/athlete burnout. The moderating role of achievement goals in the relationships between the climate/athlete burnout and the competence/athlete burnout should also be examined. Finally, it should also be of particular interest to do intervention based studies where coaches are taught how to create a more task-involving climate, and to examine changes in athlete burnout during and after such an intervention.

Conclusion

The results stemming from the cluster analysis and structural equation modeling of the current study indicate that a perceived ego-involving climate, in addition with low perceptions of competence and a MAvG emphasis are vulnerability factors in terms of the degree to which burnout symptoms are exhibited by young talented handball players during the course of a season. As a consequence, the present work implies that the coaches in these training centers might play a key role in promoting or attenuating the development of burnout in junior elite athletes. It therefore seems of particular interest to pursue this line of research on athlete burnout grounded in achievement goal frameworks.

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