Psychology of Sport and Exercise 11 (2010) 542–550

Contents lists available at ScienceDirect

Psychology of Sport and Exercise

journal homepage: www.elsevier.com/locate/psychsport

Motivation in the exercise setting: Integrating constructs from the approach–avoidance achievement goal framework and self-determination theory

Juan A. Moreno [a,*], David González-Cutre [b], Álvaro Sicilia [b], Christopher M. Spray [c]

[a] Universidad Miguel Hernández de Elche, Centro de Investigación del Deporte, Avda. de la Universidad s/n, 03202 Elche, Alicante, Spain
[b] Universidad de Almería, Spain
[c] Loughborough University, UK

ARTICLE INFO

Article history:
Received 7 September 2009
Received in revised form
27 May 2010
Accepted 16 June 2010
Available online 23 June 2010

Keywords:
Exercise
Motivational climate
Implicit ability beliefs
Approach and avoidance goals
Perceived competence
Self-determined motivation

ABSTRACT

Objective: The purpose of this study was to integrate the approach–avoidance model of achievement goals with self-determination theory in the context of structured exercise. More specifically, we analysed how perceived motivational climate, implicit ability beliefs, perceived competence, and achievement goals contributed to exercisers' self-determined motivation.
Design: A cross-sectional design using questionnaires was adopted.
Method: The sample consisted of exercisers ($N = 727$; 402 males and 325 females) aged between 16 and 78 years ($M = 32.57$, $SD = 11.39$) attending different sports centres. Examples of exercise activities undertaken included weightlifting, aerobics, Pilates, keep-fit for adults, indoor cycling, and fitness.
Results: Structural equation modelling showed that a perceived mastery climate positively predicted incremental beliefs and perceived competence, whereas a perceived performance climate positively predicted entity beliefs. Incremental beliefs underpinned mastery-approach goals, performance-approach goals and performance-avoidance goals, whilst entity beliefs underpinned both performance-approach and performance-avoidance goals. Perceived competence positively predicted approach goals. Self-determined motivation was predicted positively by mastery-approach goals but negatively by both performance goals. The model was invariant across gender and age.
Conclusions: The present study provides initial support for the integration of the approach–avoidance goal framework and self-determination theory in the exercise domain.

Introduction

Achievement goal theory (AGT; Nicholls, 1989) and self-determination theory (SDT; Deci & Ryan, 1991, 2000) are two principal contemporary motivational frameworks and numerous studies have attempted to test their principles in physical education (PE), sport and exercise settings (e.g., Biddle, Wang, Chatzisarantis, & Spray, 2003; Conroy, Elliot, & Hofer, 2003; Edmunds, Ntoumanis, & Duda, 2006). AGT's main principle is concerned with how individuals define competence in an achievement setting. The theory states that one can feel competent when one strives to improve one's previous level of performance (mastery goals) or when one's performance is better than that of others (performance goals). Those achievement goals adopted by a person will result in different behavioural, cognitive and affective outcomes. SDT considers different types of motivation, conceiving a self-determination continuum for behaviours depending on the perceived locus of causality being more internal or external to the individual. This theory identifies social factors that result in the adoption of more self-determined types of motivation (i.e., performing an activity because it is enjoyable or because it is important) and consequently in experiencing more positive outcomes.

However, several empirical questions remain untested regarding these theories, especially in relation to achievement striving in exercise and motivational regulation. On the one hand, some researchers (e.g., Roberts, 2001) question the applicability of the achievement goal framework to exercise, stating that in this context there are different reasons to participate other than the demonstration of competence. However, in the context of structured exercise undertaken in the presence of others, it is plausible that concerns about competence and incompetence are salient, just as in sport or PE. For example, individuals may strive to keep up

* Corresponding author. Tel.: +34 965 22 24 41.
E-mail address: j.moreno@umh.es (J.A. Moreno).

1469-0292/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.psychsport.2010.06.003

with others or to avoid doing worse in weightlifting, running on the treadmill or aerobic dance activities. Whether in the presence of others or not, exercisers may strive to lift more, run further and exercise for longer than they did previously. On the other hand, the situational and personal constructs defined by SDT do not explain all of the variance in individual's reported self-determined motivation, meaning that the examination of contextual and individual constructs from other theoretical frameworks is recommended to supply alternative perspectives and improve explained variance. Consequently, there is support for the integration of AGT and SDT perspectives to generate motivational models that will provide complementary explanations for self-determined motivation in exercise (see Hagger & Chatzisarantis, 2008). Therefore, the present study was designed to determine the significance of achievement goals and their antecedents on self-determination processes among individuals engaged in structured exercise.

Recent conceptualisation of the achievement goal construct has viewed individuals' competence-based aims in both approach and avoidance terms (see Elliot, 1999, 2005; Elliot & McGregor, 2001). Elliot and colleagues consider that, besides taking into account the way in which competence is defined (in connection with an absolute or intrapersonal standard or in connection with a normative standard), the valence of competence must be considered (competence can be viewed in negative terms such as failure and inadequacy at a task, or in positive terms such as success and adequacy). Crossing the two types of definition with the two types of valence produces four achievement goals (the 2×2 framework): mastery-approach (MAp: focused on achieving intrapersonal or task-based competence), performance-approach (PAp: focused on achieving normative competence), mastery-avoidance (MAv: focused on avoiding intrapersonal or task-based incompetence), and performance-avoidance (PAv: focused on avoiding normative incompetence). Moreover, in Elliot's framework (see Elliot, 1999), these four goals can be anteceded by a host of individual and situational factors. Consequently, the meaning of achievement striving to an individual will be determined by the goals which (s)he is trying to accomplish, along with those salient antecedents that underpin the goals. Antecedents include, but are not limited to, perceived motivational climate, perceived competence, and implicit theories about the nature of ability. In this study we chose these antecedents because they are prominent constructs in contemporary research on achievement motivation (see, for example, Cury, Elliot, Da Fonseca, & Moller, 2006), yet have received little attention in adult exercise settings.

According to Dweck and Leggett (1988), people can be differentiated in achievement contexts by the extent to which they view their ability as a skill that can be improved or as a stable entity. Therefore, two implicit ability beliefs have been proposed: an incremental belief, according to which the subject believes that his/her ability can be improved through training, learning and effort, and an entity belief, according to which ability is viewed as innate, cannot be improved upon, and depends on natural talent. In their original model, Dweck and Leggett proposed that individuals holding an incremental ability belief focus on learning, task mastery, and attaining personal improvement. On the other hand, individuals endorsing an entity belief focus on demonstrating their capacity at a task in relation to others. Regardless of the level of perceived competence (confidence in having enough ability to perform a task), mastery (approach) goals are related to adaptive motivational patterns, such as the search for challenge, persistence at tasks, performance, and intrinsic motivation. However, performance (approach) goals are related to adaptive motivational patterns only if individuals perceive themselves as competent. Research in physical education and sport has generally obtained results along the lines of the relations proposed, thus supporting the utility of the model in explaining motivational phenomena in these domains (Biddle et al., 2003; Sarrazin et al., 1996; Wang & Biddle, 2003).

Based on the more recent theoretical model of approach–avoidance achievement goals, Elliot (1999, 2005) proposed that an incremental belief leads to both MAp and MAv goals, whereas an entity belief leads to both PAp and PAv goals. Individuals who conceive ability as something that is not stable are more likely to strive for personal improvement or to avoid the absence of learning. However, individuals who consider ability as something fixed are more likely to seek to demonstrate that their ability is superior to that of others, or at least try to prove that it is not inferior compared to others. In addition, perceived competence is viewed as a predictor of achievement goals rather than as a moderator of the effects of performance goals. High perceived competence generates both types of approach goals, whereas low perceived competence leads to the adoption of both types of avoidance goals. That is, if a person perceives him/herself to be competent, he/she will strive to demonstrate competence, rather than focusing on avoiding incompetence. Partial support for these propositions has been found recently in sport and PE settings (Morris & Kavussanu, 2008; Warburton & Spray, 2008, 2009). However, the results of a recent study in PE (González-Cutre, Sicilia, & Moreno, 2008) have questioned the theoretical conceptualisation of Elliot regarding relations between ability beliefs and achievement goals. According to González-Cutre et al. (2008), it is clear that if individuals conceive of ability as something fixed, they are unlikely to view improvement of their ability level as a goal, but if they view ability as improvable they compare improvement of their ability with that of classmates. In other words, believing that ability can be improved is not necessarily incompatible with striving to be better or avoiding being worse than others.

In the 2×2 model, perceived motivational climate is also considered an antecedent of achievement goal adoption (Elliot, 1999, 2005). Elliot (1999) asserts that environmental factors can impact on goal adoption in both direct and indirect ways. In the present study, we were particularly interested in whether the perceived climate would predict participants' notions of the nature of ability and perceived competence in the exercise setting. We aimed to determine whether the motivational climate conveyed by the exercise instructor was related with beliefs about ability and exercisers' perception of competence to adopt specific approach–avoidance achievement goals. Mastery climate, in which effort, task mastery and personal improvement predominate, has been associated with incremental ability beliefs and perceived competence. However, performance climate, where comparison with peers and downplaying of the role of effort predominate, has been linked with entity beliefs (see Ntoumanis & Biddle, 1999; Ommundsen, 2001a). We expected these relationships to be evident among a sample of exercisers. If the instructor emphasises the importance of effort to achieve self-improvement, the exerciser is more likely to believe ability is malleable and will strive to improve accordingly. Furthermore, the exerciser is more likely to feel competent given that the criterion for success is easier to attain than showing superiority over others. However, if the instructor focuses on social comparison, the exerciser may believe that some people are more naturally gifted than others. In this context, the goals of the exerciser might be directed towards comparing their stable level of ability with that of others in the class.

In sport, Morris and Kavussanu (2008) showed that mastery team climate, learning/enjoyment parental climate and perceived competence positively predicted MAp goals. The learning/enjoyment parental climate also underpinned MAv goals, whereas performance team climate and perceived competence underpinned PAp goals. Lastly, worry-conducive parental climate positively predicted PAv goals. These findings suggest that motivational

climate is associated with individuals' definition of competence (i.e., the adoption of mastery/performance goals), whereas perceived competence is linked with individuals' valence of competence (i.e., the adoption of approach/avoidance goals).

Self-determined motivation for exercise was included in the current study as a positive motivational outcome in its own right (Deci & Ryan, 1991; Hagger & Chatzisarantis, 2007; Vallerand, 2007). Activities that are pursued for self-determined reasons are undertaken with volition, considered important to the individual (for example, in the case of exercise, because it is considered beneficial for health), and experienced as enjoyable. According to SDT, social factors (e.g., perceived autonomy support) influence the satisfaction of basic psychological needs (autonomy, competence and relatedness) and consequently self-determined motivation. Although this tenet has been demonstrated in many studies, there remains unexplained variance in the prediction of self-determined motivation (e.g., Edmunds et al., 2006; Kowal & Fortier, 2000; Standage, Duda, & Ntoumanis, 2006). This points to the possible influence of other variables. In the present study, an attempt was made to relate the theoretical framework of 2×2 achievement goals with SDT, providing an alternative model to explain self-determined motivation (i.e., motivational climates → implicit ability beliefs/perceived competence → achievement goals → self-determination). Deci and Ryan (2000) reflected in their theoretical principles on a general convergence of AGT and SDT for the design of optimal learning environments. Hagger and Chatzisarantis (2008) in a recent review also advocated the need to relate both theories, stating that "as mastery orientations reflect high perceived competence, it is likely that such approach orientations are precursors to intrinsic motivation, while performance-avoidance orientations are likely to be related to extrinsic motivational orientations as these perceptions are incongruent to the actors true sense of self, and therefore are unlikely to service personally-salient goals and be instrumental in satisfying psychological needs" (pp. 93–94). Empirical work seeking to utilise both theories has begun in sport. For example, a recent study with British athletes demonstrated that MAp goals positively predicted more self-determined forms of motivation, whilst PAp, MAv and PAv goals predicted less self-determined forms of motivation (Nien & Duda, 2008).

In the present investigation, we expected that MAp goals underpinned by perceptions of a mastery climate, incremental beliefs about ability and high perceived competence would be positively associated with self-determination for exercise. On the other hand, we expected that both performance goals underpinned by perceptions of a performance climate and entity beliefs about ability would be negatively associated with self-determination. Finally, we anticipated that MAv goals underpinned by perceived mastery climate and incremental beliefs would be negatively associated with self-determination in exercisers (see Fig. 1).

Method

Participants

The sample consisted of 727 exercisers attending different sports centres in a large Spanish city ($n = 402$ males and $n = 325$ females). Participants ranged in age from 16 to 78 years ($M = 32.57$, $SD = 11.39$). Among the sample, 26 participants exercised occasionally (less than once a week, at the weekend or when on holiday), 50 participants exercised once or twice a week and 651 participants exercised three or more times a week. Examples of exercise activities undertaken included weightlifting, aerobics, Pilates, keep-fit exercises for adults, indoor cycling, and fitness. All activities were carried out under the supervision of an instructor and occurred in the presence of other exercisers.

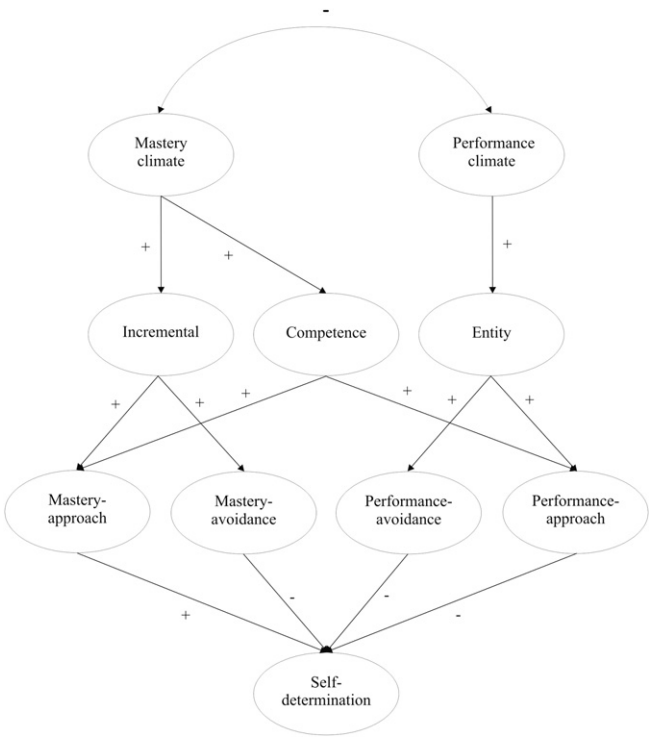

Fig. 1. Hypothesised structural equation model.

Measures

Motivational Strategy Measurement Questionnaire

The Motivational Strategy Measurement Questionnaire (Cervelló, Moreno, Del Villar, & Reina, 2007) was used to assess exercisers' perception of the motivational climate. This questionnaire was headed by the statement: "At the sports centre…" and it consisted of 24 items: 12 items for the mastery climate factor and 12 items for the performance climate factor. Each of the six TARGET areas defined by Ames (1992) was assessed using four items that reflected both mastery and performance climates: task (e.g., "Our instructor sets appropriate tasks so that we can learn and improve"), authority (e.g., "Our instructor organises the activities without letting us make any decisions"), recognition (e.g., "Our instructor encourages us to strive in order to improve"), grouping (e.g., "Our instructor always puts us in the same groups based on ability"), evaluation (e.g., "Our instructor often corrects our performances by comparing with other exercisers in the class") and time (e.g., "We have enough time to practise the tasks we are given in class"). This questionnaire used a Likert-type scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). In this study, Cronbach's alpha values of .77 and .78 were obtained for the mastery and performance climates respectively.

Conceptions of the Nature of Athletic Ability Questionnaire-2 (CNAAQ-2)

The Spanish version (González-Cutre et al., 2007) of the Conceptions of the Nature of Athletic Ability Questionnaire-2 (Biddle et al., 2003) was used to measure implicit beliefs about ability. In this study, we focussed on the two higher-order factors measured by the CNAAQ-2: incremental belief (e.g., "You need to learn and to work hard to be good at physical activity") and entity belief (e.g., "You have a certain level of physical ability and you cannot really do much to change that level"). The questionnaire consisted of 12 items (six for each scale), headed by the statement "Your beliefs about your physical ability are…", which were answered using a Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In this

study, Cronbach's alpha values of .72 and .70 were obtained for incremental beliefs and entity beliefs respectively.

Perceived Competence

The competence factor of the Spanish version (Moreno & Cervelló, 2005) of the Physical Self-Perception Profile (Fox & Corbin, 1989) was used to measure exercisers' perceived competence in the exercise setting. This factor was headed by the statement "My perception when I attend the sports centre is that…", and contained six items (e.g., "I am very good at virtually everything I do"). The answers were reported using a Likert-type scale ranging from 1 (*totally disagree*) to 4 (*totally agree*). The exercise competence factor obtained a Cronbach's alpha value of .83 in this study.

2 × 2 Achievement Goal Questionnaire (AGQ)

The Spanish adaptation (Moreno, González-Cutre, & Sicilia, 2008) of the 2 × 2 Achievement Goal Questionnaire by Elliot and McGregor (2001) was used to assess exercisers' goals. This instrument consisted of 12 items grouped into four factors (three items for each factor): PAp (e.g., "It is important for me to do better than others"), MAp (e.g., "I want to learn or improve as much as possible"), PAv (e.g., "I just want to avoid doing poorly") and MAv (e.g., "I'm often concerned that I may not learn or improve all that I can"). The questionnaire was headed by the sentence "At the sports centre…" and was answered using a Likert-type scale ranging from 1 (*not at all true for me*) to 7 (*very true for me*). Cronbach's alpha values of .73 were obtained for PAp, .61 for MAp, .69 for PAv and .75 for MAv goals. Given that this questionnaire had not been previously validated in Spain within the context of exercise, we carried out confirmatory factor analysis to establish factorial validity. Acceptable fit indexes were obtained: χ^2 (45, $N = 727$) = 285.94, $p = .00$; $\chi^2/df = 6.33$; CFI = .90; IFI = .91; RMSEA = .086 (90% CI = .076–.095); SRMR = .072. Items in each factor showed relatively high loadings (convergent validity): PAp: .62, .73, .67; MAp: .64, .74, .51; PAv: .44, .55, .79; MAv: .70, .71, .70. There was, nevertheless, a high correlation between MAv and PAv goals ($r = .83$). In order to test the discriminant validity, the model was respecified to constrain the correlation between these two factors to 1. The fit indices of the respecified model were better than those of the initial model, indicating significant overlap between the two avoidance goals.

Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2)

The Spanish version of the Behavioural Regulation in Exercise Questionnaire-2 (Markland & Tobin, 2004) validated by Moreno, Cervelló, and Martínez Camacho (2007) was employed to determine exercisers' self-determination in exercise. The questionnaire was headed by the statement: "Why do you engage in exercise?" and consisted of 19 items, grouped into five factors: intrinsic regulation (e.g., "I exercise because it's fun"), identified regulation (e.g., "I value the benefits of exercise"), introjected regulation (e.g., "I feel guilty when I don't exercise"), external regulation (e.g., "I exercise because other people say I should") and amotivation (e.g., "I don't see why I should have to exercise"). Responses were provided using a Likert-type scale from 0 (*not true for me*) to 4 (*very true for me*). Cronbach's alpha values were .77 for intrinsic regulation, .60 for identified regulation, .64 for introjected regulation, .76 for external regulation, and .60 for amotivation. Although some values were lower than the recommended .70, these can be considered as marginally acceptable ($\alpha \geq .60$). Scores obtained for each of the subscales were used to calculate the self-determination index (SDI): (2 × intrinsic regulation + identified regulation) − ((introjected regulation + external regulation)/2 + 2 × amotivation) (Vallerand & Rousseau, 2001). The SDI fluctuated between −5 and 12 in this study.

Design and procedure

We carried out a cross-sectional study in which participants responded to different questionnaires measuring perceived motivational climate, ability beliefs, perceived competence, achievement goals, and self-determined motivation. This study was carried out in two public sports centres in which class sizes ranged from 20 to 25 exercisers. The managers of the different sports centres were contacted to inform them about the objectives of the study and to ask for their consent. Participants were randomly, but proportionately, selected taking into account the attendance rate in terms of time slots and weekdays. That is, more questionnaires were administered during times when more exercisers attended the centres. On the whole, participants completed the questionnaires after exercise in a room with tables and chairs provided. Exercisers below the age of 18 years were asked for written consent from their parents to take part in the study. The questionnaires were administered by the first author, who provided instructions and stressed that replies were anonymous and all data were confidential.

Data analysis

First, descriptive statistics and bivariate correlations among the study variables were calculated. Second, a structural equation model was tested in two steps (Anderson & Gerbing, 1988). The first step tested the validity of the measurement model used by means of an analysis in which the nine different latent variables freely correlated. The second step analysed the predictive relations between perceived motivational climates, implicit ability beliefs, perceived competence, achievement goals, and self-determined motivation. Finally, the invariance of the model across gender and age was examined using multi-group analysis. The different analyses were conducted using the statistical packages SPSS 15.0 and AMOS 7.0.

Results

Preliminary analysis

Table 1 shows that exercisers demonstrated a higher score for mastery climate than performance climate, and a higher score for incremental beliefs compared with entity beliefs. The highest score in achievement goals was obtained for the MAp goal. Furthermore, moderately high scores were obtained for perceived competence and SDI.

The Pearson bivariate correlation analysis showed that the mastery climate was positively related with incremental beliefs, whilst the performance climate was positively associated with entity beliefs. Mastery climate was positively correlated, and performance climate negatively correlated, with perceived competence. Incremental beliefs were positively related with PAp, MAp and MAv goals. Entity beliefs positively correlated with PAp, PAv and MAv goals. The SDI was positively linked with MAp goals and negatively related with the remaining achievement goals.

Structural equation modelling

A structural equation model (SEM) was performed to test the relations hypothesised among the study variables. We used two indicators for all latent variables present in the model. For mastery climate and performance climate, each indicator represented the average score of six items chosen randomly within each factor. For incremental beliefs, entity beliefs and perceived competence, each indicator represented the average score of three items. For PAp goals, PAv goals and MAp goals, one of the indicators represented the score

Table 1
Descriptive statistics and bivariate correlations among all variables.

Variables	*M*	*SD*	Standardized skewness	Standardized kurtosis	1	2	3	4	5	6	7	8	9	10
1. Mastery climate	4.81	.85	−3.03	2.71		−.26**	.31**	−.10**	.24**	.02	.37**	.08*	.13**	.23**
2. Performance climate	2.59	.87	3.13	−1.56			−.12**	.35**	−.09**	.27**	−.14**	.18**	.13**	−.24**
3. Incremental beliefs	4.25	.60	−11.26	6.53				.03	.18**	.10**	.47**	.06	.12**	.30**
4. Entity beliefs	2.02	.72	5.83	−1.48					−.05	.27**	−.06	.16**	.15**	−.15**
5. Competence	3.57	.73	−4.07	−.71						.15**	.31**	.04	−.03	.32**
6. Performance approach	3.28	1.60	2.13	−4.83							.24**	.42**	.41**	−.12**
7. Mastery approach	5.60	1.09	−8.20	3.02								.18**	.27**	.26**
8. Performance avoidance	3.69	1.59	.21	−4.23									.56**	−.13**
9. Mastery avoidance	3.68	1.56	.34	−4.31										−.09*
10. Self-determination index	7.69	2.67	−12.29	8.48										

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

in one item and the other indicator represented the average score of the other two items making up the factor. The items comprising each factor of the BREQ-2 were divided into two groups. The formula for calculating the SDI was then applied to each of the two groups, and two indicators were obtained. We used parcels given that there were 84 different parameters in the model and that the sample was made up by 727 participants. Kline (2005) recommends 10 times as many cases as parameters and he states that 5 times or less is insufficient for significance testing of model effects. Given the high correlation between PAv and MAv goals ($r = .90$ in the measurement model), we decided to delete the MAv goal variable and test a trichotomous model (Elliot & Church, 1997; Elliot & Harackiewicz, 1996). Moreno et al. (2008) also found a high correlation between PAv and MAv goals when testing the 2×2 model of achievement goals in Spain, suggesting a significant overlap of both avoidance goals.

Given that Mardia's coefficient was high (45.38), the maximum likelihood estimation method was used together with the bootstrapping procedure. This procedure provides an average of the estimates obtained from bootstrap samples and its standard error. In addition, the bootstrapping procedure compares estimated values without bootstrapping with averages obtained from bootstrap samples, indicating the level of bias. Confidence intervals (differences between the highest and lowest estimated values from the different bootstrap samples) of the regression weights and standardized regression weights showed that estimated values were significantly different from zero. It was therefore assumed that the estimates were robust and not affected by lack of normality (Byrne, 2001).

The covariance matrix was used for the SEM analysis and different indices were used to check the goodness of fit of the proposed model. The following indices were analysed: the coefficient χ^2, the chi-square to degrees of freedom ratio (χ^2/df), the CFI (Comparative Fit Index), the IFI (Incremental Fit Index), the RMSEA (Root Mean Square Error of Approximation) plus its 90% confidence interval, and the SRMR (Standardized Root Mean Square Residual). Since χ^2 is very sensitive to sample size and p tends to be significant with high samples (Jöreskog & Sörbom, 1993), it is useful to take into account the coefficient χ^2/df, which is considered acceptable when it is less than 5 (Bentler, 1989). According to Hu and Bentler (1999), CFI and IFI values above .95, and values of .06 or less for RMSEA and .08 or less for SRMR, show an excellent fit of the model. However, Marsh and colleagues argue that these cut-off values are too restrictive and difficult to achieve when complex models with multiple indicators are tested, as in the present study (Marsh, Hau, & Grayson, 2005; Marsh, Hau, & Wen, 2004). Consequently, CFI and IFI values above .90 are considered to indicate an acceptable level of fit.

First, the measurement model was tested for construct validity. In this model, the nine latent variables were allowed to freely correlate. The indices obtained were: χ^2 (99, $N = 727$) = 272.61, $p = .00$; $\chi^2/df = 2.75$; CFI = .95; IFI = .95; RMSEA = .049 (90% CI = .042–.056); SRMR = .044. The correlations between the latent variables fluctuated between −.39 and .75. *H* coefficient obtained using the Hancock and Mueller (2001) formulas for each of the factors was: .76 for mastery climate, .74 for performance climate, .69 for incremental beliefs, .46 for entity beliefs, .75 for perceived competence, .63 for MAp, .73 for PAp, .66 for PAv and .78 for SDI. This coefficient represents the variance proportion in the construct which the indicators can in theory explain. These results showed that the measurement model was acceptable.

Second, the structural model was tested. The model proposed that mastery climate would positively predict incremental beliefs and perceived competence, whilst performance climate would positively predict entity beliefs. Incremental beliefs would positively predict MAp goals, whilst entity beliefs would positively predict PAp goals and PAv goals. Perceived competence would positively predict MAp and PAp goals. MAp goals would positively predict the SDI, whereas PAp goals and PAv goals would predict SDI negatively.

Modification indices showed that the model fit would improve substantially if a parameter was introduced between incremental beliefs and PAp goals and between incremental beliefs and PAv goals. This modification is in line with the relations proposed by González-Cutre et al. (2008) in their study in PE. Model results with this modification (see Fig. 2) revealed the following fit indices: χ^2 (121, $N = 727$) = 412.22, $p = .00$; $\chi^2/df = 3.40$; CFI = .92; IFI = .92; RMSEA = .058 (90% CI = .052–.064); SRMR = .055. All the relations were significant, with standardized regression weights fluctuating between −.25 and .77, with a total explained variance of the SDI of 42%. The standardized indirect effects showed that incremental ability beliefs had positive effects on the SDI ($\beta = .36$), whilst entity beliefs had negative effects ($\beta = -.31$). Taking into account the cut-off points established for the different fit indices, the present model can be considered satisfactory.

Multi-group invariance analysis[1]

We carried out an invariance analysis of the model across gender. Table 2 shows the fit indices for the six compared models. Significant chi-squared differences were found between the

[1] Following the suggestion of an anonymous reviewer, and in order to verify if the model could be applied to all exercisers independently of how frequently they exercised, we also performed an invariance analysis among those participants who exercised less than three times a week ($n = 76$) and those who exercised three or more times a week ($n = 651$). Results showed that there were no significant differences, either in chi-square or in ΔCFI between the unconstrained model and the other five invariance models. However, a limitation of this analysis is the uneven size of the two groups.

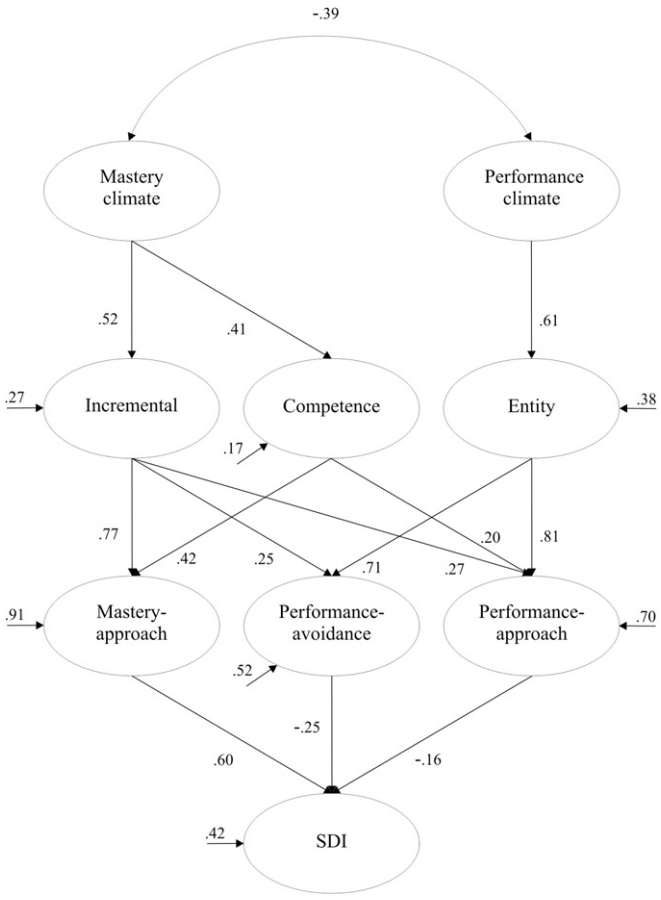

Fig. 2. Final structural equation model. Factor indicators are not represented for reasons of simplicity of presentation. All the parameters are standardized and statistically significant. Explained variances are shown on the small arrows. *Note*. SDI = self-determination index.

unconstrained model (Model 1) and the models with invariant measurement weights (Model 2), structural weights (Model 3), structural covariances (Model 4), structural residuals (Model 5), and measurement residuals (Model 6). Given the chi-squared coefficient is sensitive to sample size, we also used the criterion stated by Cheung and Rensvold (2002) regarding ΔCFI. According to these authors, ΔCFI values below or equal to −.01 indicate that the invariance null hypothesis should not be rejected.

Given the wide sample age range, multi-group analysis was also performed to check the invariance of the model across age (see Table 2). The sample was divided into three homogeneous subgroups. The first group consisted of 204 exercisers aged between 16 and 24 ($M = 20.06$, $SD = 2.51$); the second group consisted of 429 exercisers aged between 25 and 45 ($M = 34.01$, $SD = 6.06$); the third group consisted of 94 exercisers aged between 46 and 78 ($M = 53.15$, $SD = 7.06$). No significant chi-squared differences were found between the unconstrained model and the models with invariant measurement weights, structural weights, structural covariances, and structural residuals. Furthermore, ΔCFI values were below or equal to −.01. These results supported the existence of invariance of the model across age.

Discussion

The purpose of this study was to integrate the approach–avoidance achievement goal framework with self-determination theory in the exercise setting. Despite the popularity of AGT in sport- and physical education-based research (see Harwood, Spray, & Keegan, 2008), to date there have been few studies that have sought to test major tenets within voluntary, structured exercise settings. Results supported the applicability of the framework in the context of physical exercise. Moreover, one of the key aspects for the development of SDT is its integration with other theories of motivation (Hagger & Chatzisarantis, 2008). In this respect, this study examined a motivational model that integrated AGT and SDT to provide complementary explanations of self-determined motivation.

Incremental ability beliefs positively predicted MAp goals, whilst entity beliefs underpinned PAp goals and PAv goals. These findings indicate that exercisers who view ability as something that can be improved upon will strive to achieve personal improvement. On the other hand, exercisers who consider that their ability cannot improve any further may focus on comparison goals, trying to show better performance than others, or at least avoid doing worse than others. Warburton and Spray (2008) also demonstrated in a longitudinal study of physical education classes that incremental beliefs positively predicted an increase in MAp goals over time. Furthermore, entity beliefs predicted initial scores in PAp goals and the adoption of PAv goals over time.

Nevertheless, some relations between ability beliefs and achievement goals were obtained in this study which were not predicted by the approach–avoidance framework. Specifically, incremental beliefs positively predicted PAp goals and PAv goals. These results are in line with other research in PE settings

Table 2
Multi-group invariance analysis.

Models	χ^2	*df*	χ^2/df	$\Delta\chi^2$	Δdf	CFI	IFI	SRMR	RMSEA (90% CI)
Invariance analysis across gender									
Model 1	536.92	242	2.21	–	–	.91	.91	.058	.041 (.036–.046)
Model 2	559.90	251	2.23	22.97*	9	.91	.91	.058	.041 (.037–.046)
Model 3	582.75	264	2.20	45.82*	22	.91	.91	.060	.041 (.036–.045)
Model 4	583.23	267	2.18	46.31*	25	.91	.91	.060	.040 (.036–.045)
Model 5	590.59	274	2.15	53.66*	32	.91	.91	.060	.040 (.036–.044)
Model 6	629.76	292	2.15	92.83*	50	.90	.90	.060	.040 (.036–.044)
Invariance analysis across age									
Model 1	691.20	363	1.90	–	–	.91	.91	.060	.035 (.031–.039)
Model 2	706.34	381	1.85	15.14	18	.91	.91	.060	.034 (.030–.038)
Model 3	738.61	407	1.81	47.41	44	.90	.91	.061	.034 (.030–.037)
Model 4	749.68	413	1.81	58.48	50	.90	.90	.062	.034 (.030–.037)
Model 5	756.79	427	1.77	65.59	64	.91	.91	.063	.033 (.029–.036)
Model 6	850.96	463	1.83	159.76*	100	.89	.89	.063	.034 (.030–.038)

Note. Model 1 = unconstrained; Model 2 = invariant measurement weights; Model 3 = invariant structural weights; Model 4 = invariant structural covariances; Model 5 = invariant structural residuals; Model 6 = invariant measurement residuals. *$p < .05$.

(González-Cutre et al., 2008; Ommundsen, 2001b) and suggest the need to revise the theoretical framework established by Elliot (1999). The results firmly establish positive links between incremental ability beliefs and performance goals, although the relationship between incremental beliefs and mastery goals is stronger. Individuals who conceive of ability as something modifiable may give effort in order to achieve improvement (or possibly to avoid deterioration – not tested in the present investigation), but it is possible that they also wish to compare their ability level with that of others, attempting to be better or avoiding being worse than them. Although the relation between entity beliefs and mastery goals appears incompatible, the relation between incremental beliefs and performance goals has no reason to be so. Indeed, González-Cutre et al. (2008) suggest that positive relationships between incremental beliefs and performance goals occur in those motivational profiles with high scores for all the achievement goals and which may represent a motivationally-adaptive pattern of beliefs and goals. However, these assertions require further investigation in both PE and exercise settings.

The results also showed, as hypothesised, that perceived competence positively predicted both approach goals. If exercisers perceive themselves as competent, it is normal to try to demonstrate competence and not to avoid incompetence. Therefore, perceived competence seems to be a predictor of achievement goals. Some studies also found positive relations between perceived competence and the two approach goals in a physical education setting (Warburton & Spray, 2008) and in a sport setting (Morris & Kavussanu, 2008; Nien & Duda, 2008). However, Warburton and Spray (2008) also showed that perceived competence was positively related with MAv and PAv goals. Thus, the relations between perceptions of competence and the goals within the approach–avoidance framework deserve further research attention in different physical settings. Subtle differences may be identified in comparative work across sport, PE and exercise.

In line with results by Nien and Duda (2008), the structural equation model showed that MAp goals positively predicted self-determined motivation, whilst the other achievement goals negatively predicted SDI for exercise. These results point towards the positive influence of MAp goal on the type of motivation that is purported to result in the most adaptive cognitive, affective and behavioural outcomes (Vallerand, 2007). The search for personal improvement is related to exercise motivation that is characterised by enjoyment of the activity, acknowledgement of its usefulness, and persistence. However, making comparisons with fellow exercisers and striving to avoid demonstrating incompetence diminish self-determined motivation (see Conroy, Kaye, & Coatsworth, 2006). Furthermore, incremental and entity beliefs predicted self-determined motivation via achievement goal adoption. These results concur with prior studies that showed the importance of conceiving ability as something that can be improved upon to attain more self-determined motivation (Li, Lee, & Solmon, 2005; Wang & Biddle, 2001).

The motivational climate perceived to be salient in exercise environments was included in the model as a predictor of ability beliefs and perceived competence. The results showed that the mastery climate positively predicted incremental beliefs and perceived competence, whilst the performance climate predicted entity beliefs. These relations were also found in other studies (Ntoumanis & Biddle, 1999; Ommundsen, 2001a) and they allude to the possible influence of context in the development of individual differences. A context in which effort and personal progress are important could make the exerciser believe that ability can improve and help to engender a sense of personal competence. However, longitudinal research is necessary to substantiate these assertions.

Findings of the invariance analysis across gender suggest that the model considered in this study is invariant between males and females. These results indicate the applicability of this model for both genders and imply that the strategies carried out by exercise instructors in order to promote incremental ability beliefs, mastery-approach goals and more self-determined motivation could be independent of gender. Nevertheless, it should be acknowledged that, although analysis has shown satisfactory results according to the criterion stated by Cheung and Rensvold (2002) for ΔCFI, significant differences in chi-squared between the unconstrained model and the different invariant models were found. It is necessary, therefore, to interpret these results with caution and conduct further studies in order to support the applicability of this model with both male and female exercisers. It would be interesting to examine, within the motivational model proposed, how the perception by the exerciser of a class as being predominantly male or female could determine the exerciser's self-determined motivation, depending on his/her gender.

Despite the fact that the participants in the current study exhibited a wide age range, the multi-group analysis showed that this explanatory model was invariant across age. Thus, we can cautiously infer that motivational processes are similar across the different age groups. Nevertheless, we must take into account the uneven group sizes in the present investigation. Additional studies are clearly required to test the model with samples of exercisers across the lifespan.

This model offers information which could be useful in promoting adherence to exercise in sports centres, given that in our study there are exercisers with different exercise frequencies (the proportion of exercisers in each frequency is quite representative of what can be found in sports centres). The perception of a mastery climate in class could favour incremental ability beliefs, perceived competence, mastery-approach goals and self-determined motivation. However, the fact that in the present study we did not measure the length of time exercisers had attended the sports centre is a drawback. It would be interesting if further research could verify whether this model could be applied to different stages of exercise participation. For example, if a person starts exercise classes at a sports centre, and for a certain period of time perceives a mastery climate to prevail (taking all TARGET dimensions – task, authority, recognition, grouping, evaluation and time – into account), this exerciser may internalise motivation leading to enhanced commitment and adherence.

It is important to highlight that the relations obtained in this model are not causal and, therefore, they only serve as a starting point to understand a network of motivational relationships that may influence participation and adherence to exercise. We have attempted to elucidate motivational phenomena using a social-cognitive approach and contend that the approach–avoidance goal framework (i.e., the hierarchical model of achievement motivation) is a useful theoretical perspective to understand and predict self-determined motivation in exercise. An alternative model is presented here to that proposed by SDT. However, future research needs to more comprehensively integrate the situational and personal constructs from both theories (i.e., additional social factors and the psychological needs of competence, autonomy and relatedness) in explaining self-determined motivation and its behavioural consequences. Theoretical models allow researchers to devise informed interventions designed to optimise motivation. In accordance with prior research findings in sport and PE settings pointing to the importance of a mastery motivational climate, studies should experimentally test the effects of manipulation of the motivational climate on ability beliefs, perceived competence, achievement goals, and self-determination in exercise. A limitation of the current study was the high correlation found between the

two avoidance goals, which led us to delete the MAv goal from the structural model and to test the trichotomous achievement goal framework. Future research should try to include the complete 2 × 2 achievement goal framework for exercise. It is necessary to verify if exercisers are able to distinguish between both types of avoidance goals within this context, and if so, to identify the antecedents and consequences of MAv goals. It is possible that the problem of high correlation derives from the original questionnaire by Elliot and McGregor (2001). It needs to be taken into account that the Spanish version utilised in the current study is a translation and adaptation of this instrument. In the original questionnaire the items assessing performance-avoidance goals make no reference to a normative standard (e.g., the item is "I just want to avoid doing poorly" and should be "I just want to avoid performing worse than others"), which is not consistent with the definition of competence for such goals. This fact may have caused participants not to find much difference between the avoidance goal items. New research that uses this questionnaire must add the normative standard to the performance-avoidance items, as was done in the version adapted to sport (Conroy et al., 2003; see also Elliot & Murayama, 2008).

Similarly, it would be interesting to add the approach–avoidance perspective within recent models of motivational climate (see Papaioannou, Tsigilis, Kosmidou, & Milosis, 2007). The instructor can make salient situationally-based approach goals or avoidance goals and these will have an influence on the personal goals that exercisers adopt. Likewise, studies should test the relations obtained in this model between incremental ability beliefs and performance goals to determine whether the results can be replicated.

Conclusions

In conclusion, the present study has supported the application of the approach–avoidance goal framework and self-determination theory in the exercise domain. Results showed that perceptions of motivational climate predict ability beliefs and perceived competence; the latter predict achievement goals which are, in turn, differentially associated with exercisers' self-determination. The model identifies motivational processes that could influence the individual to continue engaging in regular structured exercise or to give up. It is important that future research efforts utilising a social-cognitive approach examine the ramifications of these motivational processes on exercise behaviour.

Acknowledgements

This research has been funded by the Ministry of Education and Science of Spain, via the research project "Motivational factors related to adherence to physical practice: Analysis in non-competitive physical activity contexts" (Ref. DEP2007-73201/ACTI).

References

Ames, C. (1992). Achievement goals, motivational climate, and motivational processes. In G. C. Roberts (Ed.), *Motivation in sport and exercise* (pp. 161–176). Champaign, IL: Human Kinetics.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: a review and recommended two-step approach. *Psychological Bulletin, 103*, 411–423.

Bentler, P. M. (1989). *EQS structural equations program manual*. Los Angeles: BMDP Statistical Software.

Biddle, S. J. H., Wang, C. K. J., Chatzisarantis, N. L. D., & Spray, C. M. (2003). Motivation for physical activity in young people: entity and incremental beliefs about athletic ability. *Journal of Sports Sciences, 21*, 973–989.

Byrne, B. M. (2001). *Structural equation modeling with Amos: Basic concepts, applications, and programming*. Mahwah, NJ: Erlbaum.

Cervelló, E., Moreno, J. A., Del Villar, F., & Reina, R. (2007). Desarrollo y validación de un instrumento de medida de las estrategias motivacionales empleadas en las clases de educación física. [Development and validation of a measurement instrument of the motivational strategies employed in physical education classes]. *Revista Iberoamericana de Psicología del Ejercicio y el Deporte, 2*(2), 53–72.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Conroy, D. E., Elliot, A. J., & Hofer, S. M. (2003). A 2 × 2 achievement goals questionnaire for sport: evidence for factorial invariance, temporal stability, and external validity. *Journal of Sport and Exercise Psychology, 25*, 456–476.

Conroy, D. E., Kaye, M. P., & Coatsworth, J. D. (2006). Coaching climates and the destructive effects of mastery-avoidance achievement goals on situational motivation. *Journal of Sport and Exercise Psychology, 28*, 69–92.

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology, 90*, 666–679.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: integration in personality. In R. Dienstbier (Ed.), *Perspectives on motivation. Nebraska symposium on motivation, Vol. 38* (pp. 237–288). Lincoln, NE: University of Nebraska Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behaviour. *Psychological Inquiry, 11*, 227–268.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256–273.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*, 2240–2265.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34*, 169–189.

Elliot, A. J. (2005). A conceptual history of the achievement goal construct. In A. J. Elliot, & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 52–72). New York: The Guilford Press.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*, 218–232.

Elliot, A. J., & Harackiewicz, J. (1996). Approach and avoidance achievement goals and intrinsic motivation: a mediational analysis. *Journal of Personality and Social Psychology, 70*, 461–475.

Elliot, A. J., & McGregor, H. A. (2001). A 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology, 80*, 501–519.

Elliot, A. J., & Murayama, K. (2008). On the measurement of achievement goals: critique, illustration, and application. *Journal of Educational Psychology, 100*, 613–628.

Fox, K. R., & Corbin, C. D. (1989). The physical self-perception profile: development and preliminary validation. *Journal of Sport and Exercise Psychology, 11*, 408–430.

González-Cutre, D., Martínez Galindo, C., Alonso, N., Cervelló, E., Conte, L., & Moreno, J. A. (2007). Las creencias implícitas de habilidad y los mediadores psicológicos como variables predictoras de la motivación autodeterminada en deportistas adolescentes. [Implicit beliefs of ability and psychological mediators as predictor variables of self-determined motivation in adolescent athletes]. In J. Castellano, & O. Usabiaga (Eds.), *Investigación en la Actividad Física y el Deporte II* (pp. 407–417). Vitoria: Universidad del País Vasco.

González-Cutre, D., Sicilia, A., & Moreno, J. A. (2008). Modelo cognitivo-social de la motivación de logro en educación física. [The social-cognitive model of achievement motivation in physical education]. *Psicothema, 20*, 642–651.

Hagger, M. S., & Chatzisarantis, N. L. D. (Eds.). (2007). *Intrinsic motivation and self-determination in exercise and sport*. Champaign, IL: Human Kinetics.

Hagger, M. S., & Chatzisarantis, N. L. D. (2008). Self-determination theory and the psychology of exercise. *International Review of Sport and Exercise Psychology, 1*, 79–103.

Hancock, G. R., & Mueller, R. O. (2001). Rethinking construct reliability within latent variable systems. In R. Cudeck, S. du Toit, & D. Sörbom (Eds.), *Structural equation modeling: Present and future. A Festschrift in honor of Karl Jöreskog* (pp. 195–216). Lincolnwood, IL: Scientific Software International.

Harwood, C. G., Spray, C. M., & Keegan, R. (2008). Achievement goal theories in sport. In T. S. Horn (Ed.), *Advances in sport psychology* (3rd ed.). (pp. 157–185) Champaign, IL: Human Kinetics.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Chicago: Scientific Software.

Kline, R. B. (2005). *Principles and practice of structural equation modelling* (2nd ed.). New York: Guildford Press.

Kowal, J., & Fortier, M. S. (2000). Testing relationships from the hierarchical model of intrinsic and extrinsic motivation using flow as a motivational consequence. *Research Quarterly for Exercise and Sport, 71*, 171–181.

Li, W., Lee, A. M., & Solmon, M. A. (2005). Relationships among dispositional ability conceptions, intrinsic motivation, perceived competence, experience, persistence, and performance. *Journal of Teaching in Physical Education, 24*, 51–65.

Markland, D., & Tobin, V. (2004). A modification to behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology, 26*, 191–196.

Marsh, H. W., Hau, K.-T., & Grayson, D. (2005). Goodness of fit evaluation in structural equation modeling. In A. Maydeu-Olivares, & J. McCardle (Eds.), *Contemporary psychometrics: A Festschrift to Roderick P. McDonald* (pp. 275–340). Mahwah, NJ: Erlbaum.

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu & Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320–341.

Moreno, J. A., & Cervelló, E. (2005). Physical self-perception in Spanish adolescents: effects of gender and involvement in physical activity. *Journal of Human Movement Studies, 48*, 291–311.

Moreno, J. A., Cervelló, E., & Martínez Camacho, A. (2007). Measuring self-determination motivation in a physical fitness setting: validation of the behavioral regulation in exercise questionnaire-2 (BREQ-2) in a Spanish sample. *Journal of Sports Medicine and Physical Fitness, 47*, 366–378.

Moreno, J. A., González-Cutre, D., & Sicilia, A. (2008). Metas de logro 2×2 en estudiantes españoles de educación física. [2×2 Achievement goals in Spanish students of physical education]. *Revista de Educación, 347*, 299–317.

Morris, R. L., & Kavussanu, M. (2008). Antecedents of approach–avoidance goals in sport. *Journal of Sports Sciences, 26*, 465–476.

Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, Mass.: Harvard University Press.

Nien, C.-L., & Duda, J. L. (2008). Antecedents and consequences of approach and avoidance achievement goals: a test of gender invariance. *Psychology of Sport and Exercise, 9*, 352–372.

Ntoumanis, N., & Biddle, S. J. H. (1999). A review of motivational climate in physical activity. *Journal of Sports Sciences, 17*, 643–665.

Ommundsen, Y. (2001a). Students' implicit theories of ability in physical education classes: the influence of the motivational aspects of the learning environment. *Learning Environments Research, 4*, 139–158.

Ommundsen, Y. (2001b). Self-handicapping strategies in physical education classes: the influence of implicit theories of the nature of ability and achievement goal orientations. *Psychology of Sport and Exercise, 2*, 139–156.

Papaioannou, A. G., Tsigilis, N., Kosmidou, E., & Milosis, D. (2007). Measuring perceived motivational climate in physical education. *Journal of Teaching in Physical Education, 26*, 236–259.

Roberts, G. C. (2001). Understanding the dynamics of motivation in physical activity: the influence of achievement goals on motivational processes. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 1–50). Champaign, IL: Human Kinetics.

Sarrazin, P., Biddle, S. J. H., Famose, J. P., Cury, F., Fox, K., & Durand, M. (1996). Goal orientations and conceptions of the nature of sport ability in children: a social cognitive approach. *British Journal of Social Psychology, 35*, 399–414.

Standage, M., Duda, J. L., & Ntoumanis, N. (2006). Students' motivational processes and their relationship to teacher ratings in school physical education: a self-determination theory approach. *Research Quarterly for Exercise and Sport, 77*, 100–110.

Vallerand, R. J. (2007). Intrinsic and extrinsic motivation in sport and physical activity. A review and a look at the future. In G. Tenenbaum, & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed.). (pp. 59–83) New York: John Wiley.

Vallerand, R. J., & Rousseau, F. L. (2001). Intrinsic and extrinsic motivation in sport and exercise: a review using the hierarchical model of intrinsic and extrinsic motivation. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed.). (pp. 389–416) New York: John Wiley & Sons.

Wang, C. K. J., & Biddle, S. J. H. (2001). Young people's motivational profiles in physical activity: a cluster analysis. *Journal of Sport and Exercise Psychology, 23*, 1–22.

Wang, C. K. J., & Biddle, S. J. H. (2003). Intrinsic motivation towards sports in Singaporean students: the role of sport ability beliefs. *Journal of Health Psychology, 8*, 515–523.

Warburton, V., & Spray, C. (2008). Motivation in physical education across the primary-secondary school transition. *European Physical Education Review, 14*, 157–178.

Warburton, V. E., & Spray, C. M. (2009). Antecedents of approach–avoidance achievement goal adoption in physical education: a longitudinal perspective. *Journal of Teaching in Physical Education, 28*, 214–232.