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Manipulation of motivational climate in physical education: Effects of a seven-month intervention

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Abstract

The objective of this study was to examine the impact of an intervention programme that manipulated task, authority, recognition, grouping, evaluation and time (TARGET) structures on the cognitive and affective response of students to their physical education (PE) lesson. The sample consisted of 374 high school students (*M* age = 13.8, S.D. = .73) assigned to either an intervention or a control group. The students completed measures of perceptions of motivational (task- and ego-involving) climate, dispositional achievement goals (task and ego orientation), intrinsic motivation and trait anxiety (cognitive processes, somatic anxiety and worry). The questionnaires were administered at the beginning and at the end of the academic year, that is, within a period of seven months. In between the two measurements, PE teachers taught the intervention group using the TARGET structures. The results of a Multilevel Random Coefficient Modelling indicated that students in the intervention group reported higher levels of teachers' emphasis on learning orientation, students' learning orientation, students' task orientation, enjoyment and perceived competence, and lower levels of worry after the intervention. These findings support the positive influence of TARGET structures on cognitive and affective responses of the students to PE lessons.

Key-words: affective responses • cognitive responses • TARGET structures

Research evidence indicates that a) an active lifestyle promotes physical and psychological health, b) physical education (PE) lessons could enhance participation in out-of-school physical activity, c) positive motivational aspects of participation in PE class decrease during adolescence, and d) sedentary lifestyles are increasingly prevalent amongst both adolescents and adults (Cale and Almond, 1992; Hagger et al., 2003; Van Wersch et al., 1992). These research findings demonstrate that school could provide a setting where this decline can be reversed and physical activity participation can be enhanced. Standage et al. (2003) argued that researchers should optimize students' motivation during PE classes by promoting a task-involving climate. A

task-involving climate is focused on improving one's capabilities and learning new and challenging tasks, and success is defined based on self-referenced improvement and effort (Sproule et al., 2007). The aim of the present study was to examine the influence of an intervention programme, designed to enhance task-involving motivational climate, on several cognitive and affective aspects of the PE lesson compared to a control group who experienced regular PE teaching.

Achievement goal theory provided the theoretical framework to study motivational climate in PE (Ames, 1992a, 1992b; Nicholls, 1989). In the past three decades achievement goal theory has been among the most prominent social cognitive approaches to motivation because it provides a sound basis for comprehending how individuals behave in achievement contexts (Roberts, 2001). This theory holds that the main purpose of participating in achievement settings is to demonstrate ability (Nicholls, 1989). Achievement goal theorists have recognized two basic conceptions of ability, namely task and ego orientation. Individuals adopting a task-involving conception engage in an activity in order to improve their abilities and master the task at hand, whereas those adopting an ego-involving conception attempt to demonstrate superior ability and outperform others (Nicholls, 1989). This dichotomous achievement goal approach has been revised by Elliot and his colleagues (e.g. Conroy et al., 2003; Elliot, 1997; Elliot and McGregor, 2001; Wang et al., 2007) by suggesting the approach–avoidance distinction in addition to the task–ego distinction. This led to four achievement goals: mastery[1] approach and mastery avoidance, performance approach and performance avoidance. This 2×2 approach has been examined in general education (Elliot and McGregor, 2001), PE (Wang et al., 2007) and sport (Conroy et al., 2003) and supported the existence of four goals with different antecedents and consequences. Rawsthorne and Elliot (1999) in a meta-analysis of 23 studies provided strong evidence that mastery goals have positive effect on intrinsic motivation, whereas performance avoidance goals undermine intrinsic motivation.

The conceptions of ability have been considered in the literature either as predispositions (Nicholls, 1989) or as experiences during involvement (i.e. motivational climate; see Ames, 1992a, 1992b). Dispositional achievement goals represent the probability of adopting a certain behaviour in an achievement context, while motivational climate is considered as the means to alter this probability (Roberts et al., 1997; Treasure, 2001). Research evidence reveals that a task-involving climate is associated with a more positive motivational pattern than an ego-involving climate. A task-involving climate has been found to enhance intrinsic motivation, persistence, interest and participation in PE (Carpenter and Morgan, 1999; Escartí and Gutiérrez, 2001; Sarrazin et al., 2001; Treasure, 1997). These constructs were found to be unaffected or negatively influenced by an ego-involving climate (see Biddle, 2001; Ntoumanis and Biddle, 1999, for comprehensive reviews). So far research on motivational climate has largely relied on the dichotomous approach of achievement goals. Church et al. (2001) and Cury et al. (2002, 2003) experimentally manipulated motivational climate by handing participants a written manipulation of the three achievement goals (mastery, performance approach and avoidance goal conditions). The

results of these studies indicated that mastery goal conditions were associated with more positive responses compared to performance goal conditions.

Grieve et al. (1994), Lloyd and Fox (1992), Marsh and Peart (1988) and Vallerand et al. (1986) manipulated motivational climate in sport and PE settings. The researchers controlled subjects' orientation by suggesting those in the task-involving groups focus on personal improvement and those in the ego-involving groups focus on beating the other participants. These studies provided evidence that task-involving climate is associated with positive cognitive, affective and behavioural responses during activity involvement. A task-involving motivational climate affected, also, the experience of enjoyment, motivation, perceived competence, mood and internal attributions. The positive influence of a task-involving climate on motivational concepts and behaviour led researchers to propose the adoption of practices that enhance such a climate (Biddle, 2001; Treasure, 2001; Treasure and Roberts, 1995).

Ames (1992a, 1992b) adapted an intervention, developed by Epstein (1989; the TARGET intervention), in education and sport in order to develop a task-involving climate. The TARGET structures were developed to affect children's motivation to learn (Epstein, 1989). The programme consists of six structures: 1) Task, 2) Authority, 3) Recognition, 4) Grouping, 5) Evaluation, and 6) Time. The initials of the six structures form the acronym TARGET. The TARGET structures have been applied in both sport and PE in order to manipulate the motivational climate and enhance task orientation. According to Ames (1992b), teachers should provide a variety of tasks and activities during the lesson, and tasks that are interesting and challenging to the students, in order to implement the task structure. In the authority structure, teachers should provide students with meaningful choices and opportunities to participate in the decision-making process on the lesson's activities. Teachers should provide recognition on students' effort and personal improvement, thus providing emphasis on students' self-improvement and creating opportunities for all students to succeed. Teachers should focus on the formation of heterogeneous groups and foster learning through cooperation. Teachers should use students' personal achievements and improvement as criteria for evaluation. Finally, teachers should allow students' pace to dictate the learning process in order to implement the time structure.

Theeboom et al. (1995) implemented TARGET in a sport setting and indicated that athletes who used it reported more positive cognitive, affective and behavioural responses. Indeed, young athletes in the task-involving climate group experienced higher levels of enjoyment, perceived competence and intrinsic motivation and performed better than the athletes in the control group. Until recently, there was only scarce evidence regarding the application of TARGET in PE settings (Biddle, 2001). Treasure (1993, cited in Treasure, 2001) was the first to apply the TARGET structures in a PE setting, during a 10-session soccer intervention. In this study, the author hypothesized that the motivational climate would override dispositional achievement goals and be a stronger predictor of children's cognitive and affective responses. The results of Treasure's study revealed that the PE teacher plays an active role in constructing the motivational climate of the class, and that the motivational climate

could be affected to such an extent as to override dispositional achievement goals. Furthermore, children who perceived a task-involving climate adopted a more positive pattern of cognitive and affective responses, such as engaging in more challenging tasks, experiencing more satisfaction and believing that success is a result of effort.

Recently, more studies have attempted to examine the effectiveness of TARGET structures in the PE setting. Cecchini et al. (2001) applied the TARGET structures in a 12-session athletics course during PE lessons. The task-involving climate was associated with enjoyment, perceived ability, effort in the PE classes, and pre-competition somatic anxiety and post-competition vigour. By contrast, the ego-involving climate was linked with self-confidence, pre-competition vigour, and post-competition stress. Morgan and Carpenter (2002) implemented a seven-week intervention using TARGET structures and demonstrated that the experience of a task-involving climate resulted in increased task orientation, preference for challenging tasks, satisfaction and positive attitudes.

Christodoulidis et al. (2001) argued that such short interventions would not create permanent effects in motivation and behaviour. Thus, they designed a seven-month study to examine the influence of an adaptive motivational climate on perceptions of motivational climate, goal orientations, interest in the lesson and attitudes toward exercise (Digelidis et al., 2003). The daily lesson plans were designed by the researchers and administered by the PE teachers. The findings of the study revealed that the students assigned to the intervention group reported more positive attitudes toward exercise and healthy eating, higher levels of task orientation, and perceived their teacher to emphasize task involvement.

In general, TARGET has been conceived to provide a sound framework to manipulate motivational climate and foster task orientation in sport and PE (Biddle, 2001; Treasure, 2001; Treasure and Roberts, 1995). However, research using the TARGET structures should be extended. First, there is only one study that has examined the applicability of TARGET structures for long periods of time (Digelidis et al., 2003). Additionally, most studies that tested TARGET in PE used specific sports taught in the lesson (i.e. athletics, soccer) or specifically designed teaching units taught by trained personnel (Digelidis et al., 2003). In fact, besides the Morgan and Carpenter (2002) study, there is no research evidence concerning the applicability of TARGET structures by ordinary PE teachers, not familiar to such practices. Furthermore, research so far has focused on positive concepts, such as interest, enjoyment, satisfaction, etc. Yet there is no evidence concerning negative constructs, such as anxiety, that students might experience during the lesson. Tremayne (1995) argued that PE lessons may trigger feelings of anxiety due to their comparative, competitive and evaluative nature. Papaioannou and Kouli (1999) found that students who perceived the class structure as task-involving and the PE teacher as task-oriented were less anxious during the lesson. So far, there is scarce evidence on how manipulation of motivational climate can affect anxiety in PE (see Cecchini et al., 2001), yet

Barkoukis (2007) argued that a task-involving climate should lessen the experience of anxiety in PE lessons.

In this vein, the present seven-month study was designed to test the impact of TARGET structures on several cognitive and affective responses of students during PE lessons. The goal of the present study was to test the hypothesis that the intervention would 'change' students' personal characteristics and responses related to their motivation. Specifically, the following research question was posited: are there differences between the experimental and control groups on student's motivationally-related responses?

Conceptually, the meaning of a psychological concept differs at different levels of analysis. As Lau and Nie (2008) pointed out, if a researcher is interested in examining the contextual effects of classroom goal structures on students' responses, then the level of conceptualization is the classroom and not the individual. In this case, classroom should be treated in the analysis as a level-2 variable. On the other hand, if the objective is to examine the correlates of students' goals, then the level of conceptualization is the individual, and, statistically, should be treated in the analysis as a level-1 variable. According to Raudenbush and Bryk (2002), it is inappropriate to neglect the nested nature of the data and extract conclusions from single-level analysis. Thus, given the nested nature of the data (i.e. the need to account for between-classrooms differences across student responses), the data were analysed using Multilevel Random Coefficient Modelling (MRCM), which is briefly described in data analysis section.

Method

Sample

Three hundred and seventy four high school students participated in the study (174 males and 180 females, 20 students did not report their gender; *M* age 13.8 years, S.D. = .73). Participants were recruited from four schools of an urban city in Northern Greece. Students attended 19 typical coeducational PE classes in the 8th and 9th grade. Seven PE teachers, randomly selected, took part in the study. They were all males and each one of them had more than 15 years of teaching experience in PE. All PE teachers were interviewed and identified as using the typical teaching style (i.e. the command style; Mosston and Asworth, 2002) described in the PE curriculum for the high school and were not familiar with the TARGET structures.

Measures

Achievement goal orientations

The Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda and Nicholls, 1992) was used to measure achievement goal orientations. The TEOSQ consists of 13

items assessing the two basic goal orientations; task (seven items) and ego (six items). An example of a task orientation item is: 'I feel most successful in physical education when I learn something that is fun to do', while an example of an ego orientation item is: 'I feel most successful in physical education when the others can't do as well as me.' Participants responded to the items on a five-point Likert scale from 1 ('strongly disagree') to 5 ('strongly agree'). The questionnaire has been adapted in Greek (Papaioannou and Macdonald, 1993), and used successfully with high school students (Barkoukis et al., 2004; Papaioannou and Kouli, 1999). A confirmatory factor analysis performed by Barkoukis et al. (2004) revealed high model fit (CFI = .971 and RMSEA = .052). In addition, internal consistency coefficients were high and acceptable (alphas were .81 for task orientation and .73 for ego orientation). These findings support the factorial validity and reliability of the scale.

Intrinsic motivation

The Intrinsic Motivation Inventory (IMI), developed by Ryan (1982) and adapted to sport and PE by McAuley et al. (1989), was used to measure intrinsic motivation in PE classes. The IMI consists of four subscales, interest-enjoyment (e.g. 'I enjoy the PE lesson very much'), perceived competence (e.g. 'I am pretty skilled in PE activities'), importance-effort (e.g. 'I put all of my effort into the PE class') and tension-pressure (e.g. 'I feel tension in the PE lesson'). Responses were given on a four-point scale ranging from 1 ('strongly disagree') to 4 ('strongly agree'). McAuley et al. (1989) supported the psychometric properties of the scale. The scale has been adequately adapted and used in the past with Greek high school students (Digelidis et al., 2003).

Teacher-initiated motivational climate

The Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ; Papaioannou, 1994) was used to measure the perceptions of the motivational climate created by the PE teacher. The questionnaire assesses two second-order factors that represent the two basic orientations, learning and performance. Learning orientation, reflecting task-involving climate, consists of two first-order factors: teacher-initiated learning orientation (six items; e.g. 'In this PE class, the PE teacher is most satisfied when every student learns something new'), and students' learning orientation (seven items; e.g. 'In this PE class, the way the lesson is taught helps me learn how to exercise myself'). Performance orientation, representing ego-involving climate, consists of three first-order factors: students' competitive orientation (five items; e.g. 'In this PE class, students try to outperform each other'), students' worries about mistakes (five items; e.g. 'In this PE class, students worry about failure to perform skills because it would lead to the disapproval of others') and outcome orientation without effort (four items; e.g. 'In this PE class, it is very significant to win without trying hard'). Participants responded to the items on a five-point scale (1 = 'strongly disagree' to 5 = 'strongly agree'). Papaioannou and Kouli (1999) have used the scale with Greek students and provided evidence on its validity and reliability.

Trait anxiety

A new scale recently developed in Greece for the assessment of PE trait anxiety was used to estimate the anxiety experienced during PE lessons. This scale, labelled Physical Education Trait Anxiety Scale (PETAS; Barkoukis, 2001) measures three dimensions of anxiety: somatic anxiety, worry and cognitive processes. The somatic anxiety subscale corresponds to feelings of tension and apprehension. The worry subscale corresponds to negative expectations from involvement in the activity. Both constructs are similar to somatic and cognitive anxiety proposed by the multidimensional anxiety theory (Martens et al., 1990). The third subscale, cognitive processes, is also a cognitive anxiety one and involves the cognitive reactions, such as attention, cognition, thought, memory and problem-solving, during the anxiety experience (Schwarzer, 1986; Tobias, 1986; Wine, 1982). Participants were asked to rate their anxiety during PE classes on a five-point Likert scale (1 = 'totally disagree' to 5 = 'totally agree'). Examples of trait worry, cognitive processes and somatic anxiety items are 'When performing PE tasks, I am concerned about making errors', 'I find it difficult to focus on PE tasks' and 'During PE classes, I sense a feeling of pressure on my chest', respectively. Confirmatory factor analysis with high school students indicated acceptable indices of factorial validity (CFI = .93 and RMSEA = .047) and Cronbach alphas supported the subscales' internal consistency (alphas ranged from .76 to .80) (Barkoukis, 2001).

Intervention programme

The defining characteristics and features of each TARGET structure used in the present study are now outlined.

Task

Tasks were designed to provide various levels of difficulty (i.e. shooting in basketball from different distances) and students were allowed to work at their own level. Alternative drills were provided to students (i.e. instead of passing in pairs, they play, for example, the 'diamond'). Furthermore, the students were encouraged to set specific and short-term goals and time was provided for them to work on their goals in each lesson.

Authority

Students were encouraged to participate in decision-making during the lessons. On several occasions they were allowed to select their own teammates, location, posture (i.e. position of body and limbs, for example, when students are in line), order of tasks, starting time per task, pace and rhythm, stopping time per task, interval between tasks, etc. Furthermore, opportunities were created for students to lead an activity (i.e. stretching).

Recognition

Private recognition was provided to students for self-improvement and achieving personal goals. Students were also praised for exerting effort and participating in the lesson. Furthermore, students were recognized and praised for taking part in self-imposed sport activities (i.e. out-of-school physical activities, school championships).

Grouping

The formation of small teams during the lesson was encouraged (i.e. working in pairs during stretching, small teams instead of pairs during the games) to promote students' social interaction. To further develop social interplay, care was taken that the groups were heterogeneous. Regarding ability, the formation of mixed-ability groups and their interplay during the lesson was encouraged.

Evaluation

Evaluation was based on self-referenced criteria, that is, personal improvement, achieving personal goals, participating in the lesson and applying effort. Teachers encouraged students to evaluate themselves, keep personal records and monitor the goal-setting process. Teachers used students' self-evaluations during grading.

Time

The time spent in an activity is a crucial factor determining task learning (Silverman, 1985). Behaviour 'protocols' were used on several occasions (i.e. initiation of the lesson, provision of athletic equipment, passing from one drill to another, end of a lesson, etc.) to avoid indiscipline in the lesson and maximize the time spent on performing drills. Students were allowed to dictate the pace of learning based on their needs and interests, that is, opportunities were given to students to decide on when to move on to the next drill (see also authority dimension). At the end of the lesson, students were allowed to work on their goals.

Experimental design

The four PE teachers of the intervention group were teaching 10 classes (two teachers were teaching three classes and the other two two classes) with a total of 193 students (96 males and 86 females, 11 students did not report their gender, M = 13.9 years, S.D. = .81). The three teachers of the control group were teaching nine classes (each teacher was teaching three classes) with a total of 181 students (78 males and 94 females, 9 students did not report their gender, M = 13.8 years, S.D. = .69). The three PE teachers of the control group continued to use the typical teaching style described in the PE curriculum for high school (Ministry of National Education and Religious Affairs, 1997). The typical teaching style is similar to the command style (Mosston and Asworth, 2002) and considered to be teacher-centred and sport-oriented. The PE teacher is required to decide about the tasks taught and the organization of the lesson, and is encouraged to apply the drills reported in the

curriculum in order to maximize motor development. Students' participation in the whole process is limited to the execution of the tasks presented. Students in both intervention and control groups were taught the tasks described in the curriculum provided by the Ministry of National Education and Religious Affairs (1997). This involves games (football, basketball, volleyball and handball), track and field, gymnastics and traditional dances. In each term a game and aspects of track and field, gymnastics and traditional dances was taught. There was a consensus between the activities taught in both groups of students as PE teachers agreed to teach the same activities in the same terms. Accordingly, the same type of grading system (a scale ranging from 0 to 20) was used in both groups as described by the curriculum (although the criteria were somewhat different based on the evaluation and recognition structures).

In the intervention group, the PE teachers were asked to teach using the guidelines of the TARGET intervention programme (Epstein, 1989), as described by the researchers in private training sessions. Seven sessions were conducted (an introductory one and one for each structure) lasting approximately 90 minutes each. This training period lasted two to three weeks and it was arranged to be held just prior to the initiation of the academic year. In these sessions teachers received instruction regarding the basic principles, aims and purposes of the programme (i.e. basic elements of achievement goal theory, emphasis on personal improvement, provision of rewards, avoiding social and peer comparison, etc.). Additionally, the strategies to achieve these aims were described (i.e. innovation and variety of the teaching drills, support of students' autonomy, provision of positive reinforcement, enhancement of social interactions, promotion of self-evaluation, etc.). The researchers discussed with the PE teachers how to apply these strategies to their lessons (i.e. example drills for all activities taught in the lesson, tips for optimum organization of the lesson, etc.). Finally, specific examples of everyday life situations were discussed and suggestions were made on how to deal with these according to the intervention programme (coping with discipline issues, rewarding and interacting with students, etc.). Therefore, the lessons in the experimental and control groups were identical regarding the kind of activities taught and the amount of exercise, but differed in the TARGET structures of the lessons.

Procedure

Permission from the Ministry of National Education and Religious Affairs was granted to conduct the study. The researchers contacted the school principals and obtained informed consent to participate in the study. At the first meeting, the students were informed that their school was selected among others to participate in a large project of the Ministry of National Education and Religious Affairs regarding students' perceptions about PE, and that they would be asked to complete a series of questionnaires throughout that year. All students obtained informed consent from their parents to participate in the study.

The first set of measurements took place at the beginning of the academic year, at the end of September. Participants completed the questionnaire during regular school hours under the supervision of the researchers and/or trained personnel. Both oral and written instructions were given to students regarding the completion of the scale. They were assured about the confidentiality of their responses and they were encouraged to ask any questions regarding understanding of the items of the questionnaire. The completion of the questionnaire lasted approximately 25 minutes. During the following seven months the PE teacher of the intervention group applied the TARGET programme, while the control group followed the typical teaching style, in which the teacher makes all the decisions regarding the lesson. The second measurement took place in the first fortnight of May. The procedure was identical to that of the first measurement. During the intervention period the researchers communicated with the PE teachers via personal meetings (once a week). In each meeting, lasting approximately 30 minutes, the teachers were asked to present a daily lesson plan presenting the methods they used to apply the TARGET structures. For example, what drills did they use to teach the week's contents of the lessons? How did they design the drills for different levels of ability? On which occasions were the students allowed to participate in decision-making or lead an activity? On which occasions, and how did they recognize and praise the students? How did they foster teamwork during the lesson? How did they promote goal-setting and self-evaluation? Were the drills organized to maximize students' participation? These daily plans provided evidence that the PE teachers of the intervention group modified their teaching style to embody the TARGET premises. As soon as the daily plans showed that teachers comprehended how to apply the TARGET structures (i.e. after two to three weeks), the discussion focused on problems occurring during the lesson and the suggested solutions. The PE teachers of the control group continued to teach as they had so far, using the drills of the curriculum. Weekly meetings were held to ensure that they were teaching in their usual way, in line with the curriculum (Ministry of National Education and Religious Affairs, 1997).

Data analysis

Multilevel Random Coefficient Modeling (MRCM) is a data analytic technique in which variability at one level of analysis (e.g. student level) can be modelled as a function of variability at another, higher order level (e.g. classrooms, schools, countries) (Raudenbush and Bryk, 2002). There are several types of nested models that can be implemented but, for the purpose of the present study, student responses were considered level-1 variables that were nested within classes, i.e. level-2 predictors (Bryk and Raudenbush, 1992). All analyses were conducted by use of the Hierarchical Linear Modeling (HLM) package (HLM 6.1; Bryk and Raudenbush, 1992). There are several advantages of multilevel models, oftentimes arising from the fact that level-1 units are analysed separately and have their own parameter estimates that subsequently are analysed using parameters from the level-2 variables (Nezlek,

2001). Thus, for example, the standard error at level-1 results from estimating regression equations for each individual 'i' that belongs to group 'j', and deviations from grand means and grand slope contribute to the estimation of that error. Given the present study's data structure, there were two types of variances to model: (a) variability between students representing individual differences in students' motivational responses (between-person variance), and (b) variability between classes, which represents differences between classrooms at the variables of interest (see Kreft and de Leeuw, 1998; Snijders and Bosker, 1999, for a description of the modelling).

Results

Psychometric properties of the scales

Confirmatory factor analyses on the data of the first measurement were performed in order to test the factorial validity of scales. Analyses were conducted via EQS, 5.7b (Bentler, 1995). The Comparative Fit Index (CFI) was used as a basic index of goodness-of-fit because it expresses low variability and high stability across various sample sizes (Bentler, 1990). Furthermore, the goodness-of-fit χ^2, the Non-Normed Fit Index (NNFI), the Standardized Root Mean Square of the Residuals (SRMR) and the Root Mean Square Error of Approximation (RMSEA) were used along with the CFI for the examination of model fit (Hu and Bentler, 1999). Among them, the RMSEA and CFI are preferred because they are unaffected by sample size and provide an intuitive approach to understanding model fit, and adequate models should exceed the cutoff value of .90 for the CFI and be less than .08 for the RMSEA (Bentler, 1990; Hu and Bentler, 1999).

The fit indices were at acceptable levels for all the scales used in the study providing evidence on their factorial validity (see Table 1). Internal consistency of the scales was tested via Cronbach's alpha. The alphas were at acceptable and satisfactory levels for almost all the variables examined (alphas ranged from .62 to .82). Low alphas were found for effort (α = .40) and tension-pressure (α = .38). These subscales were excluded from further analyses, as low alphas attenuate the magnitude of relationships among variables. Additionally, outcome orientation without effort showed a relative low alpha (α = .62) but it was retained in further analyses, as similar scores

Table 1 Fit indices for the study's scales

Scale	χ^2	d.f.	NNFI	CFI	SRMR	RMSEA
LAPOPECQ	524.068*	312	.91	.92	.05	.04
TEOSQ	113.416*	56	.91	.93	.05	.05
IMI	231.523*	91	.87	.91	.06	.06
PETAS	482.683*	222	.91	.92	.05	.05

* $p < .001$, χ^2 = goodness-of-fit chi square; d.f. = degrees of freedom; NNFI = Non-Normed Fit Index; CFI = Comparative Fit Index; RMSR = Standardized Root Mean Square of the Residuals; RMSEA = Root Mean Squared Error of Approximation.

have been reported in the past and thought to be adequate (Papaioannou and Kouli, 1999) and there are assertions that scales with less than 10 items can be reliable if the coefficient is close to .60 (Pedhazur and Schmelkin, 1991). The alphas for task (α = .69) and ego orientation (α = .67), enjoyment (α = .68) and perceived competence (α = .68) were close to the criterion of .70 and, thus, these subscales were included in further analyses.

Intervention effects

In order to answer the study's research question, the following MRCM model was fit to the data:

Level 1

$$Y'_{(\text{Student attribute})} = B_{0;} + r$$

Level 2

$$B_0 = \gamma_{00} + \gamma_{01}\,(\text{Group}) + u_0$$

B_0 represents the mean levels of students' motivational characteristic (e.g. interest, task orientation, etc.) and r represents the error around that estimate; γ_{00} represents the intercept of the level-2 equation and γ_{01} represents a dummy variable in which zero defines the control group and 1 the experimental. Thus, the resultant coefficient represents the difference between the experimental and control groups (since the intercept represents the mean of the control group). If the γ_{01} coefficient is significant, it signals differences due to intervention across student characteristics. The term u_0 represents the level-2 error, that is, the error associated with the dummy variable estimate (i.e. intervention effectiveness). All effects were considered statistically significant if their estimates exceeded conventional levels of significance at $p < .05$.

Results, as shown in Table 2, indicated that there were six statistically significant effects, highlighting the effectiveness of the intervention across those variables. Specifically, there was a statistically significant effect with regard to feelings of worry. As a function of the intervention, participants had significantly lessened levels of worry (b = –0.251, p = 0.021) compared to participants in the control condition. Furthermore, the intervention was associated with enhancements of (a) teachers' learning orientation (b = 0.329, $p < 0.001$), (b) students' learning orientation (b = 0.315, $p < 0.001$), (c) students' task orientation (b = 0.309, p = 0.007), (d) students' enjoyment (b = 0.390, p = 0.005) and (e) students' perceived competence (b = 0.339, p = 0.037). The remaining variables remained largely unchanged as a function of the intervention.

Discussion

The aim of the present study was to examine the effectiveness of TARGET in creating an adaptive motivational pattern in PE lessons. Results supported most of the

Table 2 Multi-level model predicting students' responses as a function of intervention effectiveness

Model variables	Coefficients	S.E.	*t*-test	*p*	d.f.
Learning Orientation: Teacher's Emphasis					
Intercept β_{00}	–0.155	0.041	–3.769	0.003*	12
Experimental manipulation	0.329	0.051	6.436	0.000*	12
Learning Orientation: Student					
Intercept β_{00}	–0.150	0.062	–2.978	0.003*	12
Experimental manipulation	0.315	0.054	4.656	0.000*	12
Task Orientation: Student					
Intercept β_{00}	–0.145	0.074	–1.953	0.074	12
Experimental manipulation	0.309	0.094	3.297	0.007*	12
Competitive Orientation: Student					
Intercept β_{00}	0.005	0.088	0.057	0.956	12
Experimental manipulation	–0.015	0.141	–0.111	0.914	12
Worry about Mistakes					
Intercept β_{00}	0.009	0.062	0.158	0.878	12
Experimental manipulation	–0.021	0.112	–0.189	0.854	12
Results without Effort					
Intercept β_{00}	0.016	0.102	0.161	0.875	12
Experimental manipulation	–0.036	0.171	–0.209	0.838	12
Ego Orientation: Student					
Intercept β_{00}	0.024	0.127	0.189	0.854	12
Experimental manipulation	–0.058	0.193	–0.301	0.768	12
Worry					
Intercept β_{00}	0.118	0.079	1.480	0.165	12
Experimental manipulation	–0.251	0.094	–2.672	0.021*	12
Somatic Anxiety					
Intercept β_{00}	0.113	0.097	1.161	0.269	12
Experimental manipulation	–0.241	0.144	–1.671	0.120	12
Cognitive Anxiety					
Intercept β_{00}	0.113	0.094	1.210	0.250	12
Experimental manipulation	–0.243	0.144	–1.683	0.188	12
Enjoyment					
Intercept β_{00}	–0.182	0.086	–2.112	0.056	12
Experimental manipulation	0.390	0.113	3.441	0.005*	12
Perceived Competence					
Intercept β_{00}	–0.157	0.105	–1.491	0.162	12
Experimental manipulation	0.339	0.145	2.341	0.037*	12

* $p < .05$. Effects are organized from statistically significant to non-significant. The coefficients represent difference scores between pre and post measures in order to account for potential individual differences between students at pretest. This practice allowed for a pure evaluation of intervention effectiveness. The intervention coefficients are interpreted as regression coefficients.

hypotheses, indicating that the TARGET structures have a positive influence on the cognitive and affective responses of students participating in PE lessons. Specifically, regarding perceptions of motivational climate, the results of the present study demonstrated that students in the intervention group perceived themselves as being more learning-oriented and that their teachers gave more emphasis to learning orientation after the end of the intervention. These findings imply that, similar to previous studies, the TARGET structures, as applied by the teachers of the intervention group, fostered emphasis on task learning and personal improvement and created a high task-involving structure in the classes.

The high task-involving structure of the intervention group was followed by changes in the levels of dispositional task orientation. These findings are congruent with previous research with TARGET in PE (Digelidis et al., 2003; Morgan and Carpenter, 2002). Moreover, they support the interactionist approach (Dweck and Leggett, 1988) by suggesting that when situational factors are strong they will have a positive influence on the corresponding dispositional goal orientation and possibly a negative effect on the contradictory one (i.e. a task-involving climate will enhance task orientation and undermine ego orientation) (see also Church et al., 2001). This is of great importance, because it makes the PE teacher's role more central, as he/she can intervene and influence to some extent an individual's dispositions. However, in order to have permanent effects on these dispositions, the learning motivational climate should be consistent across years, as its effects can be lost after a period with a typical class structure (Digelidis et al., 2003).

Unexpectedly, a lack of change was found for ego orientation and the ego-involving climate subscales, students' performance orientation, worry about mistakes and outcome orientation without effort. Based on previous research (Church et al., 2001) a decline of these responses was expected. These findings might imply that the structures of TARGET emphasize the increment of task-oriented perceptions of motivational climate and not the decline of ego-involving climate. With respect to dispositional achievement goals, research has indicated that multiple goals can exist in educational settings (Pintrich, 2000), suggesting that students may hold different levels of task and ego orientation simultaneously. This might imply that there is no interplay between these dispositional orientations; that is, enhancing the one will necessarily cause the decline of the other. Furthermore, it might indicate that an alteration of one will not affect the other. Thus, the TARGET structures that focus on enhancing task-involving climate and were found effective in increasing task orientation, may not effectively influence ego orientation.

The development of a task-involving motivational climate resulted also in higher levels of enjoyment during lesson participation. Contrary to Digelidis et al. (2003), who did not report significant changes in enjoyment, in the present study, the students of the intervention group experienced more enjoyment than those in the control group. One of the basic elements of the intervention strategies was that teachers in the present study were instructed to employ a variety of novel and attractive drills when teaching potentially boring PE tasks. It seems that the implementation of task structure resulted

in the experience of more fun and pleasure during lessons. These findings supported Biddle's (2001) notion that the motivational climate is an important determinant of motivation in compulsory PE, where participation might be perceived as an obligation and students perform tasks for introjected rather than autonomous reasons. The motivational climate can foster interest and intrinsic motivation by altering self-determination and overriding the extrinsic or introjected reasons for participation (Biddle, 2001).

Furthermore, the intervention significantly affected perceptions of perceived competence. These findings are in accordance with those reported by Theeboom et al. (1995) and Grieve et al. (1994). Among the basic elements of the intervention strategies was that teachers in the present study were instructed to employ drills with various levels of difficulty and allow students to work at their own level. Additionally, teachers encouraged goal setting and self-evaluation. These strategies might have helped students to construe better, more salient and realistic perceptions of competence. Therefore, several aspects of the task, time and evaluation structures were considered to enhance task-involving climate in a way that had positive influence on the perceptions of competence.

The PE lesson can be anxiety-evoking for many students, especially those with low abilities (Barkoukis, 2007; Tremayne, 1995). Feelings of anxiety in a physical activity setting can undermine enjoyment and overall participation and lead to drop-out (Smith et al., 1995). To explore this possibility, the present study tested the efficacy of the TARGET structures in reducing anxiety in PE lessons. Results indicated that students in the intervention group scored lower in worry than those of control group. Worry reflects negative thoughts and expectations from involvement in the activity. This dimension has been found to be a negative predictor of performance in physical activity environments, such as sport and school PE (Barkoukis et al., 2005; Woodman and Hardy, 2003). Present findings resemble those of Smith et al. (1995) in sport, and imply that students in the intervention group felt less anxiety from involvement in PE lessons. The use of drills with various levels of difficulty, the enhancement of social interaction among students and provision of feedback on self-improvement are thought to be the strategies that reduced students' worry. These findings indicate that the implementation of the recognition and grouping structures can help in reducing the negative feelings that might be experienced in PE.

The results of the study indicated that the implementation of TARGET structures positively influenced perceptions of motivational climate and students' responses. Not all structures were considered simultaneously effective in affecting each climate dimension or affective response. For example, task dimension was thought to be responsible for alterations in enjoyment, recognition and grouping in worry, and task, time and evaluation structures in perceived competence. That is, a specific structure might have more strong effect on certain responses, but this effect might be achieved in some way by a combination of structures. These findings are congruent with those reported by Morgan et al. (2005), who showed that the Recognition and Evaluation structures of TARGET had the greatest impact upon perceptions of motivational

climate. Findings from both studies indicate that the TARGET structures act in a joint fashion; one structure complements the other, and as Ames (1992b) suggested, when a structure is not implemented adequately can be compensated for by strengths in another.

The application of the TARGET structures requires a conscious effort from the PE teachers. From this standpoint, the lack of direct observations of the teaching process and a more rigorous check of the manipulation of the motivational climate are two of the limitations of the study. A systematic monitoring of the lesson could provide more information regarding how TARGET structures were applied in everyday school life and ensure the fidelity of the experimental conditions. Sproule et al. (2002) have recently developed a computer-based taxonomy to record a variety of behaviours in different situations and settings. Morgan et al. (2005) used this software to measure TARGET structures behaviours in PE and suggested that it can effectively be used to estimate students' behaviours in the different TARGET structures. In the future, this software could be used for a rigorous check of motivational climate manipulation and, furthermore, to examine the interdependency of TARGET structures and their relative influence on several cognitive, affective and behavioural responses. Additionally, the absence of a follow-up measurement is a limitation of the study. Digelidis et al. (2003) reported that the effects of their intervention were lost after 10 months. In the future, research should examine the time period in which these effects start to deteriorate or potential interventions that will maintain the changes. In terms of the conceptual framework of the study, the dichotomous approach was used in examining both dispositional achievement goals and motivational climate as there was scarce evidence on the existence of several dimensions of motivational climate, and no clear assumptions could be made on how TARGET structures could affect them. As research on the dimensions of motivational climate increases (see also Barkoukis et al., 2007), future studies should investigate the impact of TARGET structures on motivational climate incorporating the approach–avoidance distinction. For example, the task and time dimensions may have positive effect on performance-approach goals and performance as they focus on teaching sport skills, whereas the authority and grouping dimensions may mainly affect mastery goals and self-determined motivation as they focus on developing autonomy and relatedness. Finally, the present study relied on self-report measures of students' responses. However, the use of behavioural indices of motivation and physical activity would provide more information on the direct effects of the intervention on the students' behaviour. A combination of self-report and objective measures of motivation and physical activity would be ideal to determine the success of an intervention programme.

In summary, the findings of the present study indicated that the application of TARGET structures can change high school students' perceptions of motivational climate and foster perceptions of task-involving climate. This high task-involving climate was associated with alterations of task orientation, enjoyment and perceived competence, and lessening of worry. These alterations were attributed to the

implementation of mainly the task, time and evaluation structures. Future studies should examine the interdependence of the TARGET structures and their relative influence on several cognitive, affective and behavioural aspects of physical education participation. For example, do certain structures outweigh others or do they act jointly in developing a task-involving climate? Do certain structures have stronger influence on certain responses (e.g. the authority structure on perceptions of autonomy, or the grouping structure on perceptions of relatedness)? Future studies should employ TARGET structures in more school disciplines and for longer periods of time to test the time needed to create more stable effects. A recent meta-analysis revealed that an autonomy supportive climate in a PE setting affects positively regular physical activity in a leisure-time setting (Hagger and Chatzisarantis, 2007). Examining the effectiveness of TARGET structures in enhancing these transcontextual effects of motivational climate would be an interesting avenue for future research.

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Note

1 In the revision of achievement goal theory task goals were referred as mastery goals and ego goals as performance goals. This terminology is used in the text whenever studies using the trichotomous or 2 × 2 approaches are reported.

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