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# Effects of a motivational climate intervention on state anxiety, self-efficacy, and skill development in physical education

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**ORIGINAL ARTICLE**

# Effects of a motivational climate intervention on state anxiety, self-efficacy, and skill development in physical education

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**Abstract**
The objective of the present study was to test the effects of TARGET premises on state anxiety, self-efficacy, and sport skill development. A total of 317 high school students with a mean age of 13.9 years ($s=0.76$) were assigned either to an intervention group or a control group. The triple jump and the Baryshnikov shot put techniques were taught to both groups in 10 teaching units. In the intervention group the teachers employed the TARGET structures, while in the control group the command style was used. Students completed pre- and post-intervention measures of state anxiety and self-efficacy just before execution of the two techniques. Motor skill development was evaluated by both absolute performance (in centimetres) and technical execution of the tasks. The results of repeated-measures analyses of variance indicated that the intervention group reported higher triple jump self-efficacy and better technical execution of the shot put than the control group. No intervention effects were observed for the anxiety responses. Our findings provide partial evidence for positive effects of a task-involving motivational climate on sport skill development and performance-related states.

**Keywords:** *Sport skill development, self-efficacy, anxiety, TARGET*

## Introduction

A large body of literature has documented a decline in motivation for physical education as children age (Digelidis & Papaioannou, 1999; Papaioannou, 1997; Van Wersch, Trew, & Turner, 1992; Xiang, McBride, Guan, & Solmon, 2003). Enhancing students' motivation towards exercise is one of the main objectives for physical education teachers. Motivation theorists argue that situational factors of the lesson could strongly affect students' motivation (Biddle, 2001; Roberts, 2001; Treasure, 2001). Physical education teachers, therefore, should focus their efforts on the structure of a motivational climate that will foster activity participation, effort, persistence, enjoyment, and maximize the effects of the learning process. Achievement goal theory (Ames, 1984; Nicholls, 1989) has provided a sound framework to study motivation in physical education.

Achievement goal theory proposes that individuals participate in an activity to demonstrate competence (Nicholls, 1989). This is the main criterion that defines success and failure of involvement in activity. Two different ways to perceive competence in an achievement setting have been proposed (Nicholls, 1989). The first, labelled "task orientation", represents an undifferentiated conception of competence and effort. Task-oriented individuals believe that effort will lead to high performance and, therefore, demonstration of competence (Nicholls, 1989; Roberts, 2001). For task-oriented individuals, success is defined based on self-referenced criteria, such as personal improvement and mastery of the tasks (Nicholls, 1989; Roberts, 2001). The second way to perceive competence in an achievement setting, labelled "ego orientation", reflects a differentiated conception of competence and effort, suggesting that results with low effort show high competence. For ego-oriented individuals, success is defined based on normative criteria, such as comparison with others, performance norms, and demonstration of superior ability (Nicholls, 1989; Roberts, 2001). Elliot and his colleagues (e.g. Elliot, 1997, 2006; Elliot & Church, 1997) suggested that ego orientation should

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be differentiated into approach and avoidance forms, performance-approach and performance-avoidance goals. These forms represent the tendency to pursue the demonstration of high ability relative to others (performance-approach) and to avoid the demonstration of low competence compared with others (performance-avoidance). More recently, Elliot and McGregor (2001) suggested that the approach–avoidance distinction should also be employed on task orientation, resulting in a $2 \times 2$ model (mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance). Although research in sport and physical education is still limited, there is evidence that mastery goals and approach goals are linked with more positive cognitive, affective, and behavioural outcomes (Conroy, Elliot, & Hofer, 2003; Cury, Elliot, Da Fonseca, & Moller, 2006).

Achievement goals have been used to describe either individuals' predispositions (Nicholls, 1989) or experiences during involvement (i.e. perceptions of motivational climate; Ames, 1984, 1992a, 1992b). Dweck and Leggett (1988) argued that predispositional and situational experiences interact in an achievement context. Dispositional goals adjust the way individuals perceive certain cues of the environment and alter the probability to adopt certain achievement behaviour. Situational experiences alter or diminish this probability. The relative strength of dispositional goals versus situational experiences determines which of the two predicts behaviour best, with the strongest of these being the best predictor (Dweck & Leggett, 1988; Roberts, 2001; Roberts, Treasure, & Kavussanu, 1997; Treasure, 2001). Hence, it appears that the appropriate manipulation of situational factors can affect both goal predispositions and behaviour.

Previous work has shown that task-involving environments, compared with ego-involving ones, are associated with more adaptive patterns of motivation, resulting in higher intrinsic motivation, persistence, effort, interest, and participation in the lesson (Ames & Ames, 1981; Ames & Archer, 1988; Carpenter & Morgan, 1999; Escartí & Gutiérrez, 2001; Sarrazin, Guillet, & Cury, 2001; Treasure, 1997). Based on the knowledge currently available, motivation researchers suggested that physical education teachers, as well as sport practitioners, should adopt practices that enhance a task-involving motivational climate (Biddle, 2001; Treasure, 2001; Treasure & Roberts, 1995).

To provide a firmer foundation for enhancement of a task-involving climate in education, Ames (1992a, 1992b) adapted Epstein's (1989) TARGET programme. "TARGET" is the acronym of the six dimensions that constitute the programme: namely, Task, Authority, Recognition, Grouping, Evaluation, and Time. Each dimension involves strategies aiming to enhance task engagement and diminish social comparison. The Task dimension places emphasis on the tasks taught during the lesson. According to this dimension, the basic purpose of the physical education teacher should be to make the tasks to be undertaken more fun and delightful, as well as to provide a better variety of drills for students, so as to extend their learning. An appropriate strategy is the use of various and diverse drills that alter students' skills and focus on personal improvement. The basic aim of the Authority dimension is to enhance students' participation in decision making. It has been proposed that physical education teachers should encourage students to participate in decisions regarding various aspects of the lesson, and thus provide opportunities to develop their responsibility (Ames, 1992a, 1992b). According to this dimension, physical education teachers should provide meaningful choices to students regarding task completion, method or pace of learning. The main concern of the Recognition dimension is the provision of feedback and rewards. It is considered more effective when this provision is in private rather than public settings. An important aspect of the dimension refers to the private provision of recognition. A basic tenet of this dimension is to provide informational and not controlling rewards for personal improvement, goal attainment, new ideas, and behaviours. The main objective of the Grouping dimension is to alter the social interaction during the class. It has been argued (Ames, 1992a, 1992b) that physical education teachers should enhance students' social interaction and provide opportunities for less competent students to interact with their teammates. Heterogeneous rather than homogeneous groups (in terms of ability) should be formed to diminish social comparison. The main focus of the Evaluation dimension concerns the assessment process. Teachers should develop a sound assessment framework, familiarize students with the evaluation process, and enhance self-evaluation. Criteria based on personal improvement, accomplishing personal goals, participating in tasks, and applying effort ought to be applied. Regarding the Time dimension, an important concern of the physical education teacher should be the organization of the lesson, according to students' needs and improvement. The basic objective of the lesson's organization should be to improve the rate of teaching and to allow the learning task and students' needs to dictate the pace of learning (Ames, 1992a, 1992b; Epstein, 1989).

In the last decade, the TARGET programme has been applied to several studies in physical education and sport settings. Most of these endeavours have tested the effect of the programme on participants' perceptions of motivational climate and other motivational concepts. For instance, Treasure and

Roberts (1995) and Treasure (2001) cited the dissertation of Treasure (1993), which applied TARGET premises in a 10-session soccer unit of a physical education course, to test its effect on perceptions of motivational climate, dispositional achievement goals, and other cognitive and affective responses of students, such as task engagement, beliefs about success, and satisfaction. Students in the intervention group reported a more adaptive cognitive and affective response pattern than those in the control group.

In a similar vein, Cecchini et al. (2001) used TARGET dimensions to examine the influence of motivational climate on school children's cognitive and affective responses to athletics during a physical education course. The intervention lasted 4 weeks (12 one-hour sessions). A discriminant analysis indicated that task-involving climate was linked with enjoyment, perceived ability and effort in the PE classes, pre-competition somatic anxiety, and post-competition vigour. An ego-involving climate was related to self-confidence, pre-competition vigour, and post-competition stress. Although the authors did not apply covariance analyses to test for between-groups differences after the application of the intervention, the results supported the positive influence of TARGET on student's responses.

Morgan and Carpenter (2002) provided further support for the positive influence of the TARGET guidelines on the cognitive and affective responses of secondary school children. The intervention was applied in an athletics course and lasted 7 weeks. The results indicated that students in the intervention group increased their satisfaction and their preference for challenging tasks, and they reported positive attitudes towards the lesson. Expanding these studies, Digelidis and colleagues (Digelidis, Papaioannou, Laparidis, & Christodoulidis, 2003) and Barkoukis and colleagues (Barkoukis, Tsorbatzoudis, & Grouios, 2008a) examined the effectiveness of the TARGET programme during physical education classes for a period of 7 months. The TARGET guidelines were effective in creating a task-involving motivational climate and had a positive influence on the variables examined. At the end of the intervention, students in the intervention group reported more positive attitudes towards exercise and healthy eating, higher task-orientation, enjoyment and perceived competence, lower trait anxiety, and perceived their teacher to place more emphasis on task-involvement than controls.

The TARGET guidelines have also been applied in sport settings. Theeboom and colleagues (Theeboom, De Knop, & Weiss, 1995) examined the effects of the intervention on children's enjoyment, perceived competence, intrinsic motivation, and motor skill development. The intervention was applied for 3 weeks with children learning martial arts in an organized sports programme. Results indicated that children who were taught martial arts following the TARGET guidelines reported higher enjoyment, perceived competence, and intrinsic motivation. In addition, they demonstrated better motor skills than children in the control group. Valentini and Rudisill (2004a, 2004b) also reported the positive effect of a 12-week application of TARGET structures on motor skill performance of children with and without disabilities. Importantly, the effects of the intervention on the developmentally delayed children remained after a 6-month period (Valentini & Rudisill, 2004a).

Emerging evidence from these lines of research has suggested that the TARGET programme can effectively modify the motivational climate in physical education settings and develop a positive pattern of cognitive and affective responses. Teaching sport skills is a primary objective of physical education lessons. However, limited data are available regarding the role of motivational climate on sport skill development and, especially, performance-related responses in the physical education context. State anxiety and self-efficacy are such responses. Both state anxiety and self-efficacy are considered among the most important variables affecting motor performance. There is substantial research evidence suggesting that pre-competitive state anxiety and self-efficacy can determine the standard and quality of performance in sports. Anxiety is negatively related to task performance in competitive sport (Cerin, Szabo, Hunt, & Williams, 2000; Eubank, Collins, & Smith, 2000; Woodman & Hardy, 2003). Self-efficacy is also an important predictor of task performance in competitive sport; high self-efficacy is associated with better performance (Beauchamp, Bray, & Albinson, 2002; Bray, Balaguer, & Duda, 2004; Moritz, Feltz, Fahrbach, & Mack, 2000). Furthermore, self-efficacy is a positive predictor of academic performance (Linnenbrink & Pintrich, 2003; Thelwell, Lane, & Weston, 2007). Despite the important roles state anxiety and self-efficacy play in the prediction of performance in sport, there is limited evidence regarding their effect on performance in physical education lessons. Furthermore, there is limited research evidence regarding the association of class structure and performance-related responses, such as state anxiety and self-efficacy, in physical education (Cecchini et al., 2001; Papaioannou & Kouli, 1999) and the possibility to improve them through the manipulation of motivational climate. Therefore, the purpose of the present study was to test the effectiveness of TARGET in enhancing self-efficacy and skill performance and reducing anxiety responses related to skill learning in

physical education lessons. More specifically, the present study attempted to examine the effectiveness of TARGET in real conditions in terms of curriculum, time, teacher, and student constraints. Therefore, the number of sessions was limited to that described in the national curriculum. The length of each session was restricted to the 45 min duration of a physical education lesson, the physical education teachers were ordinary teachers without prior experience and knowledge of TARGET or other similar interventions, and the students were typical high school students without a specific interest in track and field. Based on conclusive scientific evidence of TARGET, it was hypothesized that the application of TARGET dimensions would have a positive influence on the variables examined – that is, it would enhance self-efficacy and skill development and decrease perceptions of state anxiety.

## Methods

### *Participants*

The initial sample consisted of 335 high school students (147 males and 170 females) with a mean age of 13.9 years ($s = 0.76$). They were recruited from typical co-educational schools of an urban city in Northern Greece. All students attended typical co-educational physical education classes. To ensure that the participants did not have prior experience of track and field tasks, we selected students who had not previously joined track and field clubs. Eighteen students were excluded, resulting in a final sample of 317. The physical education teachers who participated in the study were all males and had had more than 15 years' experience teaching physical education. All physical education teachers were interviewed and confirmed as using the typical teaching style (i.e. the command style; Mosston & Ashworth, 2002); they were not familiar with the TARGET structures.

### *Instruments*

*State anxiety.* A recently developed scale was used to estimate the anxiety experienced during physical education lessons. The Physical Education State Anxiety Scale (PESAS; Barkoukis, Tsorbatzoudis, Grouios, & Rodafinos, 2005) measures three dimensions of anxiety: somatic anxiety, worry, and cognitive processes (6 items each). 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 the somatic and cognitive anxiety constructs proposed by multidimensional anxiety theory (Martens, Burton, Vealey, Bump, & Smith, 1990). Cognitive processes, the third subscale, are also a measure of cognitive anxiety. The latter subscale was included based on arguments that cognitive processes, such as attention, cognition, thought, memory, and problem solving during the anxiety experience should be taken into account when examining anxiety (Schwarzer, 1986; Tobias, 1986; Wine, 1982). Participants were asked to rate their anxiety before the execution of two track and field tasks. Responses were indicated on a 5-point Likert scale (1 = *not at all*, 5 = *very much*). Examples of somatic anxiety, trait worry, and cognitive processes items are "I sense a feeling of pressure on my chest", "I am concerned about making errors during task execution", and "I find it difficult to focus on the PE task presented", respectively. Barkoukis et al. (2005) supported the factorial validity and reliability of the scale (alphas ranged from 0.79 to 0.83). In addition, Barkoukis and colleagues (Barkoukis, Tsorbatzoudis, & Grouios, 2008b) provided satisfactory evidence on the construct validity of the scale using a multitrait–multimethod approach.

*Self-efficacy.* Self-efficacy was measured using the micro-analytic approach proposed by Bandura (1997). The strength and generality of students' self-efficacy were assessed. To measure strength of self-efficacy, the two track and field tasks were divided into their functional components. Triple jump was divided into the approach, the take-off, the hop, the step, the jump, and the landing phases (e.g. "How confident are you that you can perform the step correctly?"). Shot put was divided into the turn, the power position, and the delivery phases (e.g. "How confident are you that you can perform the turn phase correctly?"). To measure the generality of self-efficacy, three items were added for each task, asking students how confident they felt about their performance (e.g. "How confident are you that your shot put performance will be among the six best performances?"). Students rated their responses on a 10-point Likert scale from 1 (*not at all*) to 10 (*very much*). Internal consistency was estimated with Cronbach alpha. The alpha values were high for both triple jump ($\alpha = 0.93$) and shot put ($\alpha = 0.94$).

*Performance evaluation.* Two indices were used for the evaluation of performance. The first was the students' absolute performance in triple jump and shot put, measured in centimetres. However, potential improvements in students' performances in the track and field tasks might have been the result of physical condition training or involvement in out-of-school physical activities. In this case, it would not be possible to examine the effects of the programme on learning. Hence, a second index, concerned with the technical execution of the tasks, was employed to

assess learning, as the primary purpose of the study was to assess the effectiveness of TARGET in enhancing learning during physical education lessons.

Two track and field experts, national coaches who also taught track and field at the university, assessed the technical execution of the tasks of all students. The assessment was based on the criteria of efficient technique (i.e. posture, movement sequence, timing, etc.) reported by Bowerman and Freeman (1991), Carr (1991), Jacoby and Fraley (1995), and Schmolinsky (1983). Technical execution was evaluated on a 10-point Likert scale from 1 (*very poor execution*) to 10 (*excellent execution*). Inter-rater reliability was tested with the intra-class correlation coefficient and was high ($r = 0.86$, $P < 0.001$). The performance and technical execution indices were used separately for the estimation of performance. A composite index was not computed, as there is no research evidence on the relative influence of technique and physical ability on the final performance in track and field tasks.

### *Experimental design*

The 317 students attended 12 physical education classes. These classes were randomly assigned to the intervention (57 males and 74 females, mean = 13.9 years, $s = 0.61$) and control (90 males and 96 females, mean = 13.9 years, $s = 0.81$) groups.

The two physical education teachers of the control group continued to teach the track and field tasks using the typical teaching style described in the physical education curriculum for high schools (Ministry of Education and Religious Affairs, 1997). The typical teaching style is based on the command style of the spectrum of teaching styles (Mosston & Ashworth, 2002). The physical education teacher makes all the decisions regarding the preparation, implementation, and evaluation of the lesson, while students follow their commands.

For the intervention group, the physical education teachers taught the track and field tasks using the principles of the TARGET programme (Ames, 1992a, 1992b; Epstein, 1989). The tasks were presented through a variety of drills; alternative drills and levels of difficulty were presented when possible (use of the practice and inclusion styles; Mosston & Ashworth, 2002) and personal goal setting was encouraged (Task). Meaningful choices were provided to students who were guided to discover the correct solution in several aspects of the drills taught (use of the guided discovery style; Mosston & Ashworth, 2002). The objectives of the drills were presented to the students, who were encouraged to suggest alternative ways to execute the drills, and allowed to select new combinations of drills (Authority). Rewards were provided in private, and were based on self-referenced criteria, such as effort and personal improvement (Recognition). Students were assigned to small and cooperative groups. The criteria of correct technical execution were provided to students and they were encouraged to provide feedback to their peers (Grouping). Students were also informed about the evaluation criteria and the aspects of task execution that would lead to high performance. Students were asked to evaluate their own performance on the drills, thus fostering self-evaluation (Evaluation). The needs of the students dictated the pace of teaching. Students could select the level of difficulty for each drill and when a drill was not well understood and executed, students had the opportunity to work on it until they reached an adequate level of performance (Time).

The basic principles, aims, and purposes of the TARGET programme were taught to the teachers of the intervention group in private meetings with the researchers. Seven sessions were conducted (an introductory one and one for each structure), which lasted approximately 90 min each. In the sessions, the teachers received instruction in 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.). In addition, the strategies for achieving 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 physical education teachers how to apply these strategies to their lessons (i.e. specific examples on teaching the track and field tasks). Finally, suggestions were offered on how to deal with potentially problematic situations that could emerge during teaching.

The triple jump and Baryshnikov shot put techniques were selected as (a) they were unknown to the students, (b) performance in these events is largely dependent on their technical execution and not solely on students' physical ability, and (c) they differ in complexity – triple jump is less complex than the Baryshnikov technique (Bowerman & Freeman, 1991; Carr, 1991). The general programme for teaching the track and field tasks was the same for both the intervention and the control group. It consisted of 10 teaching sessions and was based on the methods used to teach these tasks in track and field (Jacoby & Fraley, 1995; Schmolinsky, 1983). Each teaching session was performed after a short warm-up and was scheduled to last 30 min (15 min for each task), to ensure that all drills would be presented and performed in the 45-min lesson. The

number of lessons and time spent in the tasks were restricted by the national curriculum, which suggests 8–10 lessons should be devoted to track and field in each semester (Tsorbatzoudis, Grouios, Barkoukis, & Alexandris, 2008). Two national track and field coaches, who also were university teachers, assisted in the development of the programme, by recommending the most representative and effective drills. The physical education teachers of the intervention group applied the principles of the TARGET described above during the teaching of the track and field tasks. The physical education teachers of the control group followed the typical teaching style described in the curriculum.

### *Procedure*

Permission to conduct the study was granted by the Ministry of Education and Religious Affairs. Informed consent to engage the students in the study was obtained by the school principals and physical education teachers. At the pre-intervention meeting, students were informed that their school was one of several selected to participate in a large project of the Ministry of Education and Religious Affairs (1997) regarding students' perceptions about physical education and that they would be asked to complete a series of questionnaires. All students agreed to participate in the study.

During the pre-intervention meeting, the physical education teachers informed the students that the triple jump and Baryshnikov shot put would be taught in the following 10 lessons. Students were informed that task execution before and after these lessons would be videotaped and their performance would be one of the criteria for their semester grade. It was stressed to the students in the intervention group that personal improvement would be the basic criterion for their evaluation. Teachers demonstrated the two tasks with specific reference to each task's components.

Next, the students completed the state anxiety and self-efficacy scales. Both oral and written instructions were provided to the students regarding the completion of the scales. They were assured about the confidentiality of their responses and they were encouraged to ask any questions regarding the understanding of the items. Completion of the pre-intervention questionnaire took approximately 10 min. Then, the pre- measurement of each student's performance on the two tasks was undertaken.

The shot put was performed with a 3-kg medicine ball (the same ball was used in both tests and during practices to ensure the safety of the students). Students performed the tasks twice, and the best trial was recorded. The execution of both trials was videotaped. The whole procedure lasted approximately 45 min. In addition, the short version of the LAPOPECQ (Digelidis et al., 2003) was included as part of the pre-intervention questionnaire to test for differences in the pre-intervention perceptions of motivational climate. The results of the analysis indicated no differences in task- and ego-involving climate between the students of the intervention and control groups.

For the following 10 lessons, the physical education teachers taught the tasks based on the programme provided by the researchers. One of the researchers observed five of the ten lessons of the intervention group to ensure that the teacher was applying the TARGET structures. Similarly, he observed five of the ten lessons of the control group to ensure that the teachers did not alter their teaching methods or incorporate any aspects that might have affected students' performance of affective responses. In these lessons, a record was kept regarding teachers' actions applying the TARGET structures and advice was provided to them as needed. For example, if a teacher in the intervention group fostered social comparison ("Let's see who will do it better"), he was advised to reword his guidelines to promote self-improvement ("Let's see whether you can do it better than on your previous trial"). Following the 10 lessons, the post-intervention measurement was undertaken. The place, the time, the instruments, and the procedure were identical to the pre-intervention measurement. Students completed the state anxiety and self-efficacy scales, and performed the tasks twice. Once again, both trials were videotaped and the best one used for analysis.

## Results

### *Psychometric properties of the PESAS*

Confirmatory factor analysis of the data for the pre-intervention measurement was used to test the factorial validity of the state anxiety scale. The fit indices were acceptable for the PESAS, supporting its factorial validity ($\chi^2 = 410.079$, $\chi^2/\text{d.f.} = 1.83$, non-normed fit index $= 0.891$, comparative fit index $= 0.904$, standardized root mean square residual $= 0.063$, and root mean square error of approximation $= 0.054$). Internal consistency was tested using Cronbach alpha, and the alpha coefficients were satisfactory for the three subscales ($\alpha =$ 0.72 for cognitive processes, $\alpha = 76$ for somatic anxiety, and $\alpha = 83$ for worry).

### *Correlational analyses*

The descriptive statistics of the variables of the study are presented in Table I. The analyses of correlation

Table I. Descriptive statistics and Cronbach alphas of the variables of the study

| | Mean | *s* | Skewness | Kurtosis | α |
|---|---|---|---|---|---|
| Cognitive processes | 1.97 | 0.67 | .889 | 1.073 | 0.72 |
| Cognitive processes[#] | 1.80 | 0.69 | 1.096 | 1.581 | 0.74 |
| Somatic anxiety | 1.56 | 0.65 | 1.544 | 1.522 | 0.76 |
| Somatic anxiety[#] | 1.55 | 0.69 | 1.514 | 1.126 | 0.77 |
| Worry | 2.48 | 0.92 | 0.475 | −0.497 | 0.83 |
| Worry[#] | 2.18 | 0.87 | 0.677 | −0.087 | 0.83 |
| Triple jump efficacy | 4.90 | 2.07 | 0.095 | −0.533 | 0.93 |
| Triple jump efficacy[#] | 5.40 | 2.10 | 0.046 | −0.508 | 0.93 |
| Shot put efficacy | 4.45 | 2.36 | 0.314 | −0.860 | 0.94 |
| Shot put efficacy[#] | 4.79 | 2.24 | 0.272 | −0.754 | 0.94 |
| Triple jump performance | 7.86 | 1.53 | 0.326 | 0.808 | |
| Triple jump performance[#] | 7.93 | 1.51 | 0.035 | −0.595 | |
| Shot put performance | 7.74 | 3.36 | 0.551 | −0.215 | |
| Shot put performance[#] | 8.69 | 3.88 | 0.556 | −0.317 | |
| Triple jump technique | 3.20 | 1.82 | 0.462 | 0.689 | |
| Triple jump technique[#] | 3.19 | 1.81 | 0.248 | −0.810 | |
| Shot put technique | 3.08 | 1.70 | 0.938 | 0.904 | |
| Shot put technique[#] | 3.44 | 1.59 | 0.965 | 0.658 | |

[#]Post measurement.

among the variables of the study in both measurements are shown in Table II. Moderate, positive relationships emerged between the anxiety subscales. Both triple jump and shot put efficacy were negatively linked to the anxiety subscales. These correlations were low to moderate. A high correlation was revealed between triple jump and shot put efficacy ($r = 0.73$, $P < 0.01$). A similar pattern of correlations emerged after the intervention.

### *Intervention effects*

A two-way repeated measures analysis of variance was computed to test for differences in the dependent variables between the intervention and control groups – that is, the state anxiety dimensions (cognitive processes, somatic anxiety, and worry), triple jump and shot put self-efficacy, and performance and technical execution of the triple jump and shot put – across the two measurements.

For the state anxiety dimensions, the results of the analysis revealed a significant main effect for time (Wilks' $\lambda = 0.96$, $F_{1,273} = 9.12$, $P < 0.01$, $\eta^2 = 0.04$ for cognitive processes and Wilks' $\lambda = 0.93$, $F_{1,241} = 16.66$, $P < 0.001$, $\eta^2 = 0.07$ for worry). In both cases, the students reported less anxiety post-intervention (mean = 1.80, $s = 0.69$ for cognitive processes and mean = 2.18, $s = 0.87$ for worry) than pre-intervention (mean = 1.97, $s = 0.67$ for cognitive processes and mean = 2.48, $s = 0.92$ for worry). The main effects for group ($F_{1,273} = 1.17$, $P > 0.05$ for cognitive processes and $F_{1,241} = 1.78$, $P > 0.05$ for worry) and the interaction effect ($F_{1,273} = 1.65$, $P > 0.05$ for cognitive processes and $F_{1,241} = 1.78$, $P > 0.05$ for worry) were not significant. For somatic anxiety, neither the interaction ($F_{1,267} = 1.23$, $P > 0.05$) effect nor the main effects ($F_{1,267} = 0.37$, $P > 0.05$ for time and $F_{1,267} = 1.72$, $P > 0.05$ for group) reached statistical significance.

For self-efficacy, significant interaction effects were found for both triple jump and shot put efficacy (Wilks' $\lambda = 0.97$, $F_{1,274} = 6.74$, $P < 0.01$, $\eta^2 = 0.03$ for triple jump efficacy and Wilks' $\lambda = 0.97$, $F_{1,274} = 7.08$, $P < 0.01$, $\eta^2 = 0.03$ for shot put efficacy). *Post hoc* comparisons using an analysis of simple effects revealed that only in the intervention group did students report higher efficacy perceptions post-intervention (mean = 5.52, $s = 2.03$ for triple jump

Table II. Correlation coefficients among the variables of the study, with pre-intervention above the diagonal and post-intervention below the diagonal

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Cognitive processes | | 0.49* | 0.33* | −0.24* | −0.19* |
| 2. Somatic anxiety | 0.60* | | 0.36* | −0.21* | −0.20* |
| 3. Worry | 0.46* | 0.47* | | −0.33* | −0.29* |
| 4. Triple jump efficacy | −0.15* | −0.18* | −0.24* | | 0.79* |
| 5. Shot put efficacy | −0.07 | −0.14* | −0.18* | 0.73* | |

*$P < 0.01$.

and mean = 4.85, $s = 2.27$ for shot put) compared with pre-intervention (mean = 4.62, $s = 1.91$ for triple jump and mean = 4.05, $s = 2.17$ for shot put).

With respect to performance indicators, the results demonstrated a significant interaction effect only for the technical execution of shot put (Wilks' $\lambda = 0.97$, $F_{1,208} = 6.31$, $P < 0.01$, $\eta^2 = 0.03$). *Post hoc* comparisons using an analysis of simple effects revealed that students in the intervention group executed a better technique of shot put (mean = 3.70, $s = 0.15$) than students in the control group (mean = 2.88, $s = 0.13$). No significant interaction or main effects were found for triple jump performance ($F_{1,197} = 3.45$, $P > 0.05$), shot put performance ($F_{1,209} = 0.29$, $P > 0.05$) or technical execution of the triple jump ($F_{1,197} = 2.75$, $P > 0.05$).

## Discussion

In the present study, we examined the effects of an intervention designed to modify the motivational climate on state anxiety, self-efficacy, and motor skill development in a physical education setting. The intervention used in the present study has been applied successfully in the past in physical education and sport and is considered to be effective in creating a task-involving motivational climate (Cecchini et al., 2001; Digelidis et al., 2003; Morgan & Carpenter, 2002; Theeboom et al., 1995; Treasure, 2001).

Results indicated that the application of the intervention had some effects on the variables examined. Self-efficacy has been consistently found to be a strong predictor of sport performance (Bandura, 1997; Escarti & Guzman, 1999; Kane, Marks, Zaccaro, & Blair, 1996; LaGuardia & Labbe, 1993; Moritz et al., 2000). Results revealed that students in the intervention group, compared with those in the control group, reported higher self-efficacy to perform the triple jump. However, no differences were evident between the groups in shot put efficacy. A potential explanation may reside in the possibility that the triple jump requires a less complex technique than the shot put (Bowerman & Freeman, 1991; Carr, 1991). Thus, it may be assumed that during the 10 training units of the programme, through the modelling of the tasks and the experiences acquired while exercising, students formed higher efficacy beliefs about the simpler task (i.e. triple jump) than the more complex task (i.e. shot put). It is possible that more training time is needed to create performance experiences that could alter the efficacy beliefs for the successful completion of a complex task.

In terms of the effectiveness of the intervention programme on sport skill development, no differences were reported in the technical execution of triple jump. The triple jump technique is considered relatively simple, and thus it could be assumed that all participants reached an adequate level of technical execution after training. On the other hand, results showed improvement in technical execution of the shot put. The latter findings are consistent with those of Theeboom et al. (1995) and support previous evidence that the use of innovative methods can enhance skill development in physical education (Ashy, Lee, & Landin, 1988; Dyson & O'Sullivan, 1998; Parker & Lepper, 1992; Silverman, 1985). However, as the intervention had a positive effect on self-efficacy to perform the triple jump, one would expect that it would have a more robust influence on the performance indices used. The weak effects of the programme on performance may be due to its short duration. If this is the case, one could argue that the more enjoyable way the drills were applied to the intervention group resulted in better assimilation of the task's aspects. That is, students were more focused on the task at hand, showed more interest, and applied more effort. Another possible explanation is that of Smith and colleagues (Smith, Smoll, & Barnett, 1995), who reported that children's skill is unstable and links to psychological factors are difficult to establish. This might imply that although the intervention produced changes in self-efficacy, these changes did not affect skill development.

In terms of anxiety, the results indicated that anxiety decreased after the intervention for both groups. This implies that familiarization with the tasks was the key element that diminished students' anxiety. Although there was a trend for lower scores in the intervention group, the intervention did not impact significantly on anxiety. These findings are not in accord with our hypothesis, that a supportive environment would have a positive influence on anxiety responses during the learning process. A plausible explanation might lie in the nature of the tasks being taught. The relatively simple motion sequence of the triple jump, one of the two tasks being taught, might have resulted in low anxiety in both experimental and control students. In the future, more complex tasks should be examined to alter the anxiety levels of students. Additionally, perhaps the number of the lessons was not adequate to create changes in anxiety responses. State anxiety is an emotional state largely affected by the predisposition to perceive external stimuli as threatening. Therefore, it may take more time to alter these perceptions. To determine whether this is the case, future studies should apply TARGET for longer periods of time. Another possible explanation might be the context of the study. We attempted to alter the anxiety responses by telling the students that their performance would affect their physical education

grade. However, students knew that this was only one test among several others that would determine their grade. Furthermore, the contribution of physical education grade to general academic grade is minimal. Hence, it is possible that the students did not perceive the situation as threatening for their grade and, accordingly, responded with relatively low levels of anxiety at the task at hand. Also it might be attributed to the students' relationship with their physical education teachers. In general, students have a comfortable relationship with their physical education teachers and physical education is usually a fun lesson. Hence, perhaps they did not perceive the test as threatening to themselves. Finally, another possible reason for the unexpected small differences between the control and experiment groups may be due to the inefficient realization of the intervention by the teachers. Indeed, the lessons' records indicate that during the first lessons, the teachers were unable to employ the entire TARGET programme simultaneously. In conjunction with the small duration of the intervention, this might have reduced the effect of the intervention on the psychological variables under study.

Due to the application of TARGET in real settings by regular physical education teachers, the lack of a more rigorous check of the manipulation of the TARGET structures is a possible limitation of the study. We preferred to observe the lessons to provide immediate feedback to the teachers and help them employ the intervention more effectively. Yet, a systematic monitoring of the lesson with sophisticated tools (see Curtner-Smith & Todorovich, 2002; Sproule, Kinchin, Yelling, McMorris, & McNeill, 2002) could have provided more information on the fidelity of the experimental condition. Furthermore, the duration of the intervention was relative short. Applying TARGET for longer periods of time could have more salient effects on psychological variables (Barkoukis et al., 2008a). Another possible limitation of the study is the absence of a follow-up measurement. The effects of the intervention have been found to decline with time (Digelidis et al., 2003) and future research should examine the time over which these effects start to deteriorate. Finally, the students were instructed that personal improvement would affect their physical education grade. This might have resulted in a conscious underperformance pre-intervention to guarantee the maximum improvement observed post-intervention. Although there was no significant improvement in all aspects of students' performance to justify this rationale, future studies should control for this effect.

To summarize, the application of the TARGET programme during 10 teaching units of track and field tasks had a positive influence on certain cognitive and performance aspects of the physical education lesson. However, the changes produced were not as strong as would be expected. The present study attempted to examine the effectiveness of TARGET under normal conditions. The aims of physical education are to introduce sport activities to students, to develop their gross motor abilities, and to foster their interest in sport and physical activity (Tsorbatzoudis et al., 2008). Therefore, the time and the equipment offered and students' interests do not guarantee strong learning results. Hence, the findings of the present study are thought to describe adequately the impact of TARGET on motor skill development and students' cognitive and affective responses in real physical education lessons. Future research should examine further the role of motivational climate and motivation-related variables, such as basic psychological needs and motivational regulations, on motor skill development and cognitive and affective responses in physical education. Additionally, future studies should examine the influence of TARGET on teaching other skills and sports in physical education lessons. The findings of the present study also have important implications for practitioners. Physical education teachers should foster a task-involving climate by using TARGET structures. More specifically, they should provide a variety of tasks and activities during the lesson. They should present these tasks in an interesting and challenging way to the students. Furthermore, they should provide students with meaningful choices, allow them to make decisions during the lesson, and dictate the learning process. Physical education teachers should praise students' achievements (goal attainment, out-of-school achievements in sport, etc.) and personal improvement but avoid social comparison. In addition, they should foster learning through cooperation by creating small and heterogeneous teams during the teaching process. Finally, effort and personal improvement in the taught skills, rather than normative and peer comparisons, should be the main criteria for students' evaluation.

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