

Running head: DEVELOPMENTAL CHANGES IN PE

Developmental Changes in Achievement Motivation and Affect in Physical
Education: Growth Trajectories and Demographic Differences

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Abstract

We examined changes in student achievement goals, perceptions of motivational climate and affective responses in secondary school physical education. Greek junior high school students (N = 394; 191 males and 203 females) responded to a multi-section questionnaire twice a year from the ages of 12 -15 years. Multilevel modeling analyses showed significant linear decreases in perceptions of task-involving teacher climate, task and ego goal orientations, which were somewhat reversed by the beginning of the last year of the junior high school. Significant linear decreases were also observed for enjoyment whereas there were significant linear increases for perceptions of ego-involving climate and boredom. There was significant variability in the intercepts and/or average changes over time for all variables and, therefore, we included demographic and theoretical predictors in an attempt to account for such variations. The results indicated that decreases in adaptive motivation over time vary across students and in some cases may be tackled by fostering a task-involving teacher climate.

Keywords: achievement goal theory, developmental changes, motivational climate, enjoyment, boredom

There is evidence to suggest that there are significant decreases in students' motivation to participate in school physical education (PE) during the junior high school years and beyond. This evidence has been based on cross-sectional comparisons of different age cohorts (e.g., Digelidis & Papaioannou, 1999), with limited evidence derived from longitudinal studies of a relatively short duration (e.g., Papaioannou, Bebetsos, Theodorakis, Christodoulidis & Kouli, 2006). Expanding upon previous research, the aim of the present study, which drew from achievement goal theory (AGT; Nicholls, 1989; Ames, 1992), was to examine the trajectories of student achievement goals, perceptions of motivational climate and feelings of enjoyment and boredom during the three years of junior high school in Greece (i.e., ages between 12 and 15 years).

Achievement Goal Theory

This is a social cognitive theoretical approach to motivation which has been widely used to study achievement motivation patterns in youth sport and PE (Duda & Hall, 2001). Nicholls (1989) was a theorist who made an important contribution to AGT. According to him, in achievement contexts (e.g., classroom, sport) individuals can judge their level of competence in two major ways, namely in a task- and an ego-involved manner. When task-involved, perceived competence is self-referenced and tied to personal improvement, task mastery, and exerted effort. When ego-involved, perceived competence is other-referenced and entails the demonstration of superior ability or the avoidance of demonstrating inferior ability. Nicholls argued that there are individual differences in the proneness to be task- and/or ego-involved when engaged in achievement-related activities. He referred to these tendencies as task and ego dispositional goal orientations. Ames (1992), another important contributor to AGT, suggested that students' achievement goals can be influenced by situational factors, in particular the

motivational climate created by those in position of authority (e.g., teachers). Similar to achievement goals, Ames suggested that perceptions of motivational climates can also vary in their degree of task- and ego-involving features.

Substantial research evidence indicates that task orientation, compared to ego orientation, is associated with more positive achievement behaviors and emotions in the PE context, such as high effort, persistence and enjoyment and low levels of boredom (e.g., Spray, Biddle & Fox, 1999; Thomas & Barron, 2006; Weigand & Burton, 2002). Furthermore, perceptions of a task-involving motivational climate, compared to perceptions of an ego-involving climate, have been associated with an adaptive pattern of responses such as practice strategies, intrinsic motivation, task orientation, higher levels of positive affect in PE and lower levels of negative affect (e.g., Ommundsen & Kvalø, 2007; Standage, Duda, & Ntoumanis, 2003).

Temporal Changes in Achievement Goals During Childhood and Adolescence

There is limited evidence examining changes in student motivation in PE classes using an AGT perspective. Digelidis and Papaioannou (1999) showed, through cross-sectional age cohort comparisons, that senior high school Greek¹ students reported lower intrinsic motivation, perceptions of task-involving teacher climate, task orientation and perceived athletic ability, as well as perceptions of higher ego-involving climate, compared to junior high school and elementary school students. Xiang et al. (2004) reported no significant changes in US elementary school children's task orientation over a period of two years and, unexpectedly, decreases in ego orientation which were moderated by gender. Recently, Papaioannou and colleagues (2006) in a 14-month longitudinal study of junior and senior Greek high school students showed negative relationships between age and task orientation, effort, enjoyment, perceived competence, and physical activity involvement. Changes in the perceptions of motivational climate were not

examined by Papaioannou et al. or Xiang et al. In contrast, Marsh, Papaioannou, Martin, and Theodorakis (2006) reported negative correlations between age and perceptions of task-involving climate, task orientation and enjoyment, at both the start and the end of the school year in a large sample of Greek students ranging from elementary to senior high school.

The developmental work by Nicholls (1989) can be used to study the observed changes in students' achievement goals. Nicholls established that very young children do not differentiate effort from ability; thus high effort should lead to more learning which reflects higher ability. Nicholls called this the undifferentiated conception of ability. However, at around the age of 12 years children become able to fully differentiate between ability from effort (as well as from the constructs of luck and task difficulty). This differentiation is primarily manifested in the cognitive capacity to appreciate that the effect of effort on performance can be limited by one's ability level. Nicholls called this the differentiated conception of ability. At that juncture, young people are in a position to use an undifferentiated or differentiated perspective on ability. **The undifferentiated conception of ability is related to task orientation, whereas the differentiated conception is linked to ego orientation.** Developmental work in sport psychology shows that during late childhood and early adolescence peer feedback and normative (i.e., ego-based) comparisons are increasingly utilised by young people to judge their own physical competence (Weiss, Ebbeck & Horn, 1997).

Research in the classroom has also examined developmental changes in student motivation. The findings also demonstrate decreases in adaptive forms of student motivation. For example, Anderman and Anderman (1999) found decreases in task goals and increases in ego goals of 5th and 6th graders. The increase in ego goals was associated with an increase in perceptions of a teacher ego-involving motivational climate. In another study not embedded

within AGT but examining constructs related to achievement goals, Fredericks and Eccles (2002) showed declines in children's competence and value beliefs associated with math and sports from childhood to adolescence. Further, gender differences in all variables were recorded in favor of boys, however, the gender gap decreased over time. In an attempt to explain such findings, Wigfield and Eccles (2002) argued that, in contrast to younger children, older children can make more accurate estimations of their ability, engage more frequently in social comparison processes, and are influenced by school environments that put more emphasis on student evaluation and competition.

Affective Responses in PE Classes

In this study we examined longitudinal changes in one positive and one negative affective state (i.e., enjoyment and boredom) in PE, as these variables have been consistently found to be differentially related with perceptions of motivational climate and dispositional achievement goals (Morgan, Kingston, & Sproule, 2005; Spray et al., 1999). According to AGT, perceptions of motivational climate and dispositional achievement goals should influence students' affective responses in educational settings. Cross-sectional research evidence indicates that task orientation and perceptions of task-involving climate, compared to ego-orientation and perceptions of ego-involving climate, are associated with a more adaptive pattern of affective responses in PE, such as higher satisfaction and lower anxiety (Ommundsen, 2001), and higher levels of enjoyment and lower levels of boredom (Morgan et al., 2005; Spray et al., 1999).

Although not using an achievement goal theory perspective, Prochaska, Sallis, Slymen, and McKenzie (2003) reported a significant decrease in enjoyment over a period of three years in a sample of US elementary school students (M age = 9.5; SD = .4 at the initial assessment). This decrease was more evident among girls and among those not involved in organized sport

activities. Unfortunately, there has been no longitudinal research on levels of boredom in PE classes. Clearly, more longitudinal research is needed examining enjoyment and boredom (as well as other indices of positive and negative affect) as outcomes of achievement goals and perceived motivational climate.

A Case for Studying Developmental Changes in Achievement Motivation and Affect in PE

Some time ago, Weiss and Bredemeier (1983) underlined the importance of studying the physical, cognitive and psychological changes that occur as individuals move through different developmental stages in their lives. These authors argued that by adopting a developmental perspective, youth sport psychology research can offer better explanations for psychosocial and behavioral changes in young people's motivation. Up to date there is scant (and of relatively limited duration) longitudinal evidence on changes in achievement goals and perceptions of motivational climate during late childhood and adolescence, and on the effect of these changes on students' affective responses. We believe that it is important to examine such changes for various reasons. First, as there is ample evidence to suggest that perceptions of task-involving climate and task orientation are related to more adaptive outcomes than perceptions of an ego-involving climate and ego orientation, it is important to examine whether perceptions of motivational climate and achievement goals change over a meaningful period of time (across all years of Greek junior high school in our case), and whether such changes have subsequent effects on important motivation-related outcomes (affective ones in our study). Second, if developmental changes in motivational variables are found, research should examine whether such changes are uniform across individuals or whether there is significant between-person variation. Identifying variables that can account for between-person variations in developmental changes is important not only from a theoretical perspective but also in terms of enhancing the

effectiveness of intervention work. For example, high scores on certain predictor variables might result in more adaptive growth trajectories of the motivational variables. In our study we sampled Greek students from the age of 12 years and for a period of three years with two measurements (i.e., beginning and end of the school year) taken in each year. We chose this age group because research evidence shows that both physical activity levels and adaptive motivation for physical activity start to decline at around the age of 12 to 13 years (Digelidis & Papaioannou, 1999; Sallis, 2000). Also, according to achievement goal theory, most young people at that age will be able to fully differentiate between task- and ego-involving criteria for success (Nicholls, 1989). This has implications for both adopting achievement goals and perceiving such goals in the social environment.

Aims and Hypotheses

Our study had two purposes. The first purpose was to examine changes in perceptions of motivational climate, achievement goal orientations, and two motivation-related affective outcomes (enjoyment and boredom in PE) from the start of the first year of Greek junior high school (i.e., approximately 12 year olds) until the end of the final year of junior high school (i.e., approximately 15 year olds). Based on aforementioned findings in education and PE (e.g., Anderman & Anderman 1999; Digelidis & Papaioannou, 1999; Papaioannou et al., 2006) regarding the temporal patterning of motivation-related variables, we hypothesized that over the three years students would report increases in perceptions of ego-involving climate, ego orientation, and boredom, and decreases in perceptions of task-involving climate, task orientation, and enjoyment.

The second purpose of our investigation was to examine whether any between-person differences in the initial mean scores of the variables under investigation or in their trajectories

over the three years could be accounted for by theory-based and demographic (i.e., gender and out of school sport participation) predictors. We included out of school sport participation as a predictor because usually students who participate in such activities have more positive experiences with sport overall and PE in particular (see also Papaioannou, 1997). Wang, Chatzisarantis, Spray and Biddle (2002) indicated that students with a high task/high ego profile were more physically active outside school, compared to those with a low task/low ego profile who were less active. These findings imply that leisure time physical activity might be affected by dispositional achievement goals. Furthermore, Papaioannou, Marsh and Theodorakis (2004) and Theodosiou and Papaioannou (2006) indicated that task orientation and task-involving climate is associated with higher levels of out-of-school sport or physical activity participation. However, there is no longitudinal evidence on the association of achievement goals or motivational climate with out-of school physical activity participation. We also included gender as a predictor because it is an individual difference variable that has been frequently examined in the achievement goal literature (Duda, Chi, Newton, Walling & Catley, 1995). Cross-sectional research shows that boys are more likely to be ego-oriented than girls and display higher levels of ego-involving climate, whereas girls tend to be more task-oriented and display higher levels of task-involving climate than boys (Flores, Salguero & Márquez, 2008; Moreno, Cervelló, & González-Cutre, 2008). However, the relationships between gender and achievement goals have not been examined longitudinally in PE.

We first predicted task- and ego-involving climate scores. Socio-contextual factors, such as perceptions of motivational climate, are theoretically assumed to be antecedents of achievement goals. Therefore, only gender and sport participation outside school were tested as predictors of motivational climate. We then predicted task and ego achievement goals. Children

and young adolescents, who may not have clearly formulated their views on achievement (i.e., goal orientations), can be very susceptible to the influence of motivational climate (Treasure & Roberts, 1995). Therefore, we examined the extent to which perceptions of task- and ego-involving climate, in addition to gender and sport participation could predict task and ego achievement goals. We lastly, examined the prediction of enjoyment and boredom. Perceptions of motivational climate (e.g., Treasure & Roberts, 1995) and achievement goals (e.g., Ntoumanis & Biddle, 1999) have been implicated as predictors of affect in physical activity settings; therefore, we examined the predictive utility of these variables in addition to gender and competitive level.

We hypothesized that perceptions of a high task-involving climate would predict high task orientation and perceptions of an ego-involving climate would predict ego orientation. Drawing from empirical work in the AGT literature on the motivational determinants of affect (e.g., Ntoumanis & Biddle, 1999) we expected that perceptions of task-involving climate and task orientation would positively predict levels of enjoyment. In contrast, perceptions of ego-involving climate and ego orientation were expected to positively predict levels of boredom. Further, we anticipated that students with out of school sport experience would report higher enjoyment (as was also the case in Prochaska et al., 2003) and lower boredom compared to those with no out of school sport experience. Based on the Duda et al. (1995) findings, we anticipated females to report higher task orientation than males. No other hypotheses were made for a particular predictor-outcome relationship due to the lack of consistent (or relevant) findings in the literature. Further, due to lack of previous research findings, we did not make any predictions as to whether the strength of the aforementioned relationships would vary over time.

Method

Participants

Four hundred and fifty three Greek students (males = 226; females = 226; 1 student did not report his/her gender) from 17 PE classes of five schools in a large city took part in the study. Approximately 48% of the students ($n = 218$) participated in organised sport outside school (measured as 0= yes, 1=0) at the first wave of the data collection. This percentage was very similar across all measurement occasions. Most classes (15) were taught by the same PE teachers across the junior high school years. In the remaining two classes the PE teachers changed in the second year. All teachers who participated in this study had more than 10 years of teaching experience (their age ranged from 38 to 51 years).

The aims of the curriculum for PE in Greek junior high schools at the time of the data collection² were to develop the intellectual, social, physical and psychological attributes of the students through participation in sporting activities (Ministry of National Education and Religious Affairs, 1997). The curriculum recommended the teaching of various team sports (basketball, soccer, handball and volleyball), athletics, gymnastics and traditional dance. The emphasis in the first year of junior high school was on skill development. In subsequent years there was more emphasis on teaching game tactics (as far as team sports are concerned) and preparing students for competitions (Ministry of National Education and Religious Affairs, 1997).

All students were Caucasians from low or middle socioeconomic status families and were attending typical co-educational Greek schools. The students were sampled at the start and the end of the school year in the first year (i.e., age 12), second year (i.e., age 13) and third year (i.e. age 14) of junior high school. Thus, in total 6 measures were taken. One hundred and forty three students completed the questionnaires on all occasions whereas the rest completed the

questionnaires on some occasions (not necessarily the same). Specifically, 93 students completed the questionnaires on five occasions, 59 on four occasions, 45 on three occasions and 54 on two occasions. Fifty nine students completed the questionnaires on one occasion only and were excluded from the analysis as we could not examine the change of their scores over time. Thus, the analyses reported below were carried out with 394 students (females $n = 203$; males $n = 191$; M age at the beginning of the study = 12; $SD = .65$).

Measures

Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda & Nicholls, 1992). The TEOSQ, adapted for use in PE, was employed to assess task and ego goal orientations. Task orientation was measured with seven items (e.g., "I feel most successful in PE when I learn something that is fun to do"), and ego orientation was assessed with six items (e.g., "I feel most successful in PE when the others can't do as well as me"). Participants responded to scales ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The TEOSQ is considered a valid and reliable tool for the assessment of goal orientations of Greek children. For example, Barkoukis, Zahariadis, Anastasiadis, Tsorbatzoudis, and Grouios (2004) reported satisfactory fit indices from a confirmatory factor analysis of the scale with a Greek sample, and Cronbach alpha values of .73 and .71 for ego and task orientation, respectively.

Learning and Performance Orientations in Physical Education Classes Questionnaire (LAOPEPCQ; Digelidis, Papaioannou, Laparidis & Christodoulidis, 2003). A short version of the LAOPEPCQ (13 items) was used to assess students' perceptions of task-involving (7 items) and ego-involving (6 items) motivational climates created by their PE teachers. Participants responded to the stem 'In this PE class...' using scales ranging from *strongly disagree* (1) to *strongly agree* (5). An example item from the task-involving factor is "the PE teacher is

completely satisfied when every student's skills are improving", and from the ego-involving factor is "the PE teacher regards as competent students only those with the best sport record". Digelidis et al. (2003) reported acceptable fit indices from a confirmatory factor analysis of the scale with Greek junior high school students.

Boredom and enjoyment. Boredom and enjoyment were assessed with 3 and 4 items respectively, developed by Duda, Fox, Biddle, and Armstrong (1992) to measure children's affective responses in sport. Both scales were adapted to the PE context. Example items are "When playing in this PE class I am usually bored" (boredom), and "I usually have fun in this PE class" (enjoyment). Participants responded on a 7-point scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). Duda et al. reported Cronbach alphas of .84 and .70 for enjoyment and boredom, respectively.

Procedure

The principals and PE teachers of all schools involved in the study were provided with consent forms and written information about the purposes of the study. Parental and child consent forms were also obtained from all participants. The students completed the questionnaires indoors in a quiet environment at the beginning of a regular PE class, without the presence of their PE teacher, and under the supervision of experienced teaching assistants. Both verbal and written instructions were given to the students regarding the content and the completion of the questionnaires. In accordance with the APA ethical principles, the students were reassured about the confidentiality of the responses and their right to withdraw at any time during the completion of the questionnaires. The completion of the questionnaires lasted approximately 20 minutes. The same procedure was followed across the six measurements. Student questionnaires were

matched up across the six measurement occasions by using information regarding their school class, gender and date of birth.

Results

Descriptive Statistics and Internal Reliability Coefficients

Table 1 presents the means, standard deviations and Cronbach alpha coefficients for all variables on each of the six measurement occasions. An inspection of the mean scores shows that the variables reflecting adaptive motivation and positive affect (i.e., task orientation, perceptions of task-involving climate, and enjoyment) decreased over time. Unexpectedly, ego orientation scores also decreased over time. In contrast, perceptions of ego-involving climate and boredom scores increased. The statistical significance of the changes in the mean scores of all variables is examined below via the testing of unconditional growth multilevel models. The Cronbach alpha coefficients were acceptable for all variables.

Multilevel Analysis of Student Motivation in PE

Multilevel regression analysis employing MLWin 2.0 (Rasbash, Steele, Brown, & Prosser, 2004) was used to examine changes in student motivation over the three years. This type of analysis is particularly useful when there are missing observations since it does not assume equal number of measurement occasions for all individuals (Hox, 2000). Two levels of analysis were specified. Level 1 encompassed the repeated observations of perceptions of motivational climate, goal orientations, enjoyment and boredom. These repeated observations were nested within students, therefore the latter constituted level 2 in the analysis. The analysis had two purposes. The first was to examine whether there were significant between-person variations in the means and rates of change of all variables under investigation. The second purpose was to ascertain whether any identified between-person variations found in the first step could be partly accounted for by

demographic and AGT-based predictors. In theory, the 17 classes could have constituted level 3 of the analysis. However, the number of classes was rather small, and therefore, the estimates of between-class variation would have been biased.

Between-Person Variations in Means and Rates of Change

Following Singer and Willett's (2003) approach, we first tested a series of models with no predictors (i.e., unconditional intercept models) that examined whether there was sufficient between-person variation in the mean (intercept) of each variable. The results revealed that there was substantial between-person variability in the mean scores of all variables (see Table 2). The intraclass correlation coefficients were substantial, ranging from .43 to .66 (*Mdn* = .60).

We also tested a series of models that examined whether there were significant differences in the rates of change of the scores of the variables under investigation (i.e., unconditional growth models). With six data points, linear, curvilinear (i.e., quadratic) and cubic changes can be examined to obtain a more complete understanding of how the data change over time (Singer & Willett, 2003). However, when we tested for cubic effects, none of the cubic terms was significant. Therefore, we kept the linear and quadratic terms, the values of which were centered so that the intercept in the equation reflected mean scores at time 1 (i.e., beginning of the first year of junior high school; Singer & Willett, 2003). As can be seen in Table 2, the linear slope for time was significant for all variables. Specifically, the slope was negative (i.e., indicating decrease over time) for perceptions of task-involving motivational climate, task and ego goal orientations, and enjoyment. In contrast, the linear slope for time was significant and positive (i.e., indicating increase over time) for perceptions of ego-involving climate and boredom. This fixed effect of slope represents average change over time in the whole sample. An inspection of the between-person variability of the slope terms (Table 2) indicates that there was

significant variability in these slopes, indicating that the rate of changes in these variables (except task orientation) varied across individuals.

Significant positive quadratic terms were found for perceptions of task-involving climate, task orientation, and ego orientation (Table 2). As discussed previously, the linear growth terms for these variables were negative. Plotting the linear and quadratic terms revealed that the scores of these variables reached a plateau at around the beginning of the final year of the junior high school (i.e., measurement occasion # 5). The variance component of the quadratic term was significant for perceptions of task- and ego-involving climate, boredom and enjoyment. This finding implies significant between-person variability in these quadratic changes. The covariances between the intercept, and the linear and quadratic terms for time were significant for a number of variables, indicating that the degree of linear or non-linear change varied depending on the mean levels of these variables at the beginning of the study. The R^2_{ϵ} in Table 2 indicates the amount of within-person variation in the variables under investigation explained by time (slope and quadratic terms). This is an estimate of effect size, analogous to an R^2 (McArdle & Woodcock, 1997). Most of these values are quite substantial.

Predictors of Mean Differences and Rates of Change

To account for the between-person variability in the intercepts, as well as the linear and quadratic terms for time, we added a number of predictors in the multilevel regression equations. Each predictor was regressed on the intercept, the slope and the curvature (see Tables 3-5). For a similar analytic approach, see Aber, Brown and Jones (2003). The effect of each predictor variable on the intercept reflects the relationship between the predictor and the outcome at the beginning of the study. Any significant interaction between the predictor and the linear or quadratic terms for time would indicate that this relationship varies in strength over time. Non-

significant interaction terms imply that the relationship between the predictor and the outcome remains the same over time.

For perceptions of motivational climate, gender (0=males, 1=females) and sport participation outside school (0=yes, 1=no) were tested as predictors of the intercepts and the rates of change. The results for perceptions of task-involving climate (Table 3) showed that there were no gender or sport participation mean differences at the beginning of the study. Further, the two predictors did not account for the linear and quadratic changes in perceptions of task-involving climate, which remained significant. With regard to perceptions of ego-involving climate, also no significant gender or sport participation mean differences were found at the beginning of the study. However, the interaction between the curvature for time and gender was significant. We plotted this interaction at the end of each academic year (i.e., time= 1, 3 and 5). Also, we examined the significance of the simple slopes at the same time points using procedures outlined by Aiken and West (1991). The results revealed that for male students there were no significant changes in perceptions of ego-involving climate over time. In contrast, for females there was a significant increase at the end of the first year.

In regard to the prediction of mean scores and rates of change for task and ego goal achievement goals, we examined the role of perceptions of task- and ego-involving climate (Roberts & Treasure, 1995), in addition to gender and sport participation. The results, presented in Table 4, show that those with perceptions of a high task-involving climate reported higher levels of task orientation. No other effects were significant, with the exception of the linear term for time which indicated a linear decrease of task orientation over time. The quadratic term for time was no longer non-significant. In relation to ego orientation, the linear and quadratic effects for time remained significant after introducing the predictors. However, there were also positive

effects from the two types of perceptions of motivational climate. Specifically, those with perceptions of high task-involving and high ego-involving climate reported higher levels of ego orientation. However, the positive effect from perceptions of task-involving climate on ego orientation is most probably a statistical artifact due to net suppression, as the Pearson correlations between the two variables was negative (ranging from $r = -.01$ to $r = -.18$; correlation tables for all variables at each time point are available upon request).

The last set of multilevel analyses examined motivational factors that could predict enjoyment and boredom. As perceptions of motivational climate (e.g., Treasure & Roberts, 1995) and achievement goals (e.g., Ntoumanis & Biddle, 1999) have been implicated as predictors of affect in physical activity settings, all these variables, in addition to gender and competitive level, were tested as predictors of the intercept, and the linear and quadratic time changes in enjoyment and boredom. Perceptions of task-involving climate were positive predictors of mean enjoyment scores. Perceptions of task-involving and ego-involving climate were negative and positive predictors, respectively, of mean levels of boredom. No other significant results were found.

Discussion

Achievement goal theory has been extensively studied in both classroom and PE as it is thought to provide a sound framework to investigate the factors that affect experiences during PE participation (Spray et al., 1999; Standage et al., 2003). In this study we examined how central variables of AGT, namely perceptions of motivational climate and achievement goals, as well as affective experiences in PE classes, change over the Greek junior high school years (i.e., approximately ages of 12-15 years). Further, we investigated whether theory-based and demographic predictor variables could predict the mean scores and changes of these variables.

Our results are largely in agreement with previous research in PE (e.g., Digelidis & Papaioannou, 1999; Papaioannou et al., 2006) and classroom (e.g., Anderman & Anderman, 1999) revealing decreases in adaptive motivation and increases in some maladaptive types of motivation. Specifically, perceptions of a task-involving motivational climate, task goal orientation, and enjoyment decreased linearly over time. Perceptions of ego-involving climate and boredom increased linearly over time. Contrary to our hypotheses, there were decreases in ego orientation. Lastly, the scores of perceptions of task- and ego-involving climate and task orientation reached a plateau at around the beginning of the final year of the junior high school.

The decreases in perceptions of task-involving climate and task orientation and the parallel increase in perceptions of ego-involving climate are worrying from a motivational perspective. Similar trends have also been reported by Digelidis and Papaioannou (1999) in a cross-sectional comparison of senior and junior Greek high school students. Our findings could be due to the school curriculum giving more emphasis, as children grow older, on competitions as opposed to learning of sport skills, and on selection for school teams (Digelidis & Papaioannou, 1999). Therefore, it seems that with older students, PE teachers tend to emphasize more normative (ego-involving) criteria for success/failure and team selection, as opposed to task-involving criteria, such as learning and skill development. Such changes may well explain the decreases in perceptions of task-involving and associated increases in perceptions of ego-involving climate. Such trends are problematic as perceptions of ego-involving climate have been associated with maladaptive cognitive, behavioral, and affective outcomes (Biddle, 2001). Given the positive relationship between task orientation and perceptions of task-involving climate in our study, it seems that the decline in perceptions of task-involving climate might have resulted in declines in students' task orientation.

There were no gender or sport participation status differences in the initial mean levels of perceptions of ego-involving or task-involving climate, or in the trajectory of perceptions of task-involving climate. However, in regard to the trajectory of perceptions of ego-involving climate, there were significant gender differences with females reporting a significant increase at the end of the first year of junior high school, almost “catching up” with males. Therefore, it seems that the increased teacher emphasis on normative student evaluation and competition during the junior high school years (as reported earlier with reference to the positive linear change for perceptions of ego-involving climate in the whole sample), also observed by Wigfield and Eccles (2002), is somewhat delayed in teachers interacting with female students. This might reflect a student gender stereotype, favoring males, in terms of teacher expectations about student achievement in physical tasks (see also Chalabaev, Sarrazin, Trouilloud, & Jussim, in press), which might result in the use of more ego-involving teaching practices with male students.

Surprisingly, levels of ego orientation decreased over time, although they reached a plateau by the start of the final year of the junior high school. Given that a complete differentiation between effort and ability, which is linked to the development of ego orientation, takes place around the age of 12 years (Nicholls, 1989), one would have expected to see increases in ego orientation. Nevertheless, similar age-related decreases in ego orientation have also been reported by Marsh et al. (2006). Unlike competitive sport, PE classes accommodate a much more diverse range of physical abilities, especially of the lower end of the spectrum. Thus, increases in ego-involving teaching practices can dissuade students, especially those with low physical ability (Ntoumanis, Pensgaard, Martin, & Pipe, 2004), and result in lower levels of approach goals in PE. Both task and ego orientation, as measured by the TEOSQ, reflect approach goals (Barkoukis, Ntoumanis & Nikitaras, 2007). It is possible that increases in ego-

involving climate might have resulted in more avoidance goals (Elliot & McGregor, 2001), but unfortunately we did not measure those in our study.

Similar to the results pertaining to perceptions of motivational climate, there were no significant gender or sport participation mean differences in task or ego goal orientation. Although our results are in contrast to findings reported by Kavussanu and Ntoumanis (2003) and Duda et al. (1995), it should be noted that these two studies sampled university athletes. It is possible that gender and sport participation differences become more evident later on in senior high school when the emphasis in Greek PE shifts from play to competition and selection for school teams (Digelidis & Papaioannou, 1999).

In accordance with theoretical predictions (e.g., Ames, 1992), those with perceptions of a high task-involving climate also reported higher task orientation levels. In contrast, students with perceptions of a high ego-involving climate reported higher ego orientation. In view of the widespread evidence in the physical domain (e.g., Duda & Hall, 2001) and in the classroom (Dweck, 1999) regarding the adaptive role of task orientation, compared to ego orientation, our findings highlight the importance of interventions reinforcing perceptions of task-involving climates in PE classes. Practical suggestions for such interventions are offered by Biddle (2001) and Ntoumanis and Biddle (1999).

Lastly, we measured temporal changes in two affective outcomes often assessed in PE settings, namely enjoyment and boredom. As expected, levels of enjoyment decreased over the years, whereas levels of boredom increased. These findings can be attributed to the decreased intrinsic appeal of PE, which might be the result of a normative referenced environment, as suggested by the results showing a decrease in perceptions of task-involving climate and an increase in perceptions of ego-involving climate. Consistent with previous research (cf. Duda &

Hall, 2001), higher mean levels of enjoyment were reported by students with perceptions of high task-involving. Further, higher mean levels of boredom were reported by students with perceptions of high ego-involving and low task-involving climate. These findings imply that affective responses in PE can be influenced by changes in perceptions of motivational climate. However, the present study did not examine possible underlying mechanisms that might account for this change. It could be argued that the decline in perceptions of task-involving climate would have affected the degree of students' satisfaction of their basic psychological needs (cf. Deci & Ryan, 2002), which, in turn, might have resulted in decreased enjoyment, an inherent part of the intrinsic motivation construct. Similarly, increases in perceptions of an ego-involving climate might have indirectly resulted in low or non self-determined motivation and, hence, higher levels of boredom. Boredom is an inherent part of amotivation characterized by lack of interest and intention to participate (Deci & Ryan, 2002). Through their behaviours and instructions, PE teachers can play an important role in forming students' affective responses in PE; future research should examine in more detail the effects (direct and indirect) of specific teaching practices on students' affective experiences in PE. Unexpectedly, achievement goals were not significant predictors of boredom or enjoyment. These findings, when contrasted with those for perceptions of motivational climate, imply that achievement goals are weaker antecedents of affective experiences in PE classes.

Limitations, Future Research Directions and Conclusions

One of the limitations of this study was that it did not include any measures of physical activity. Given that decreases in adaptive motivation for PE occur approximately at the same time that levels of childhood physical activity start to decline (Digelidis & Papaioannou, 1999), it is important that the temporal associations between indices of adaptive and maladaptive

motivation and physical activity are examined in future studies by employing measures of physical activity, preferably objective ones (e.g., accelerometers). Further, our study did not include any objective measures of achievement such as grades in PE; such measures can be incorporated in future studies.

In conclusion our findings indicate that levels of achievement goals, perceptions of motivational climate and enjoyment in PE generally decline over the three years of Greek junior high school, whereas levels of boredom increase. We found that these rates of changes were not moderated by any predictors, with the exception of perceptions of ego-involving climate whose trajectory was moderated by gender. However, significant relationships at the beginning of the study were established indicating that perceptions of high task-involving climate were associated with higher levels of task orientation and enjoyment and lower levels of boredom. The lack of significant interactions between perceptions of task-involving climate and time indicates that these relationships were constant throughout the study. Thus, our results have implications for interventions aiming to manipulate motivational climate in an effort to foster positive experiences in PE and potentially increase physical activity levels.

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Footnotes

¹In the Greek educational system children aged between 6 and 12 years attend elementary school, those between 12 and 15 years attend junior high school, and children between 15 and 18 years attend senior high school.

²More recently, the curriculum also emphasises the teaching of life skills and the promotion of lifelong sport participation.

Table 1

Means, Standard Deviations, and Cronbach Alpha Coefficients for All Variables on Each of the Six Measurement Occasions.

Variable List	Beginning of first grade (n= 344)			End of first grade (n= 297)			Beginning of second grade (n= 307)			End of second grade (n= 269)			Beginning of third grade (n= 331)			End of third grade (n= 311)		
	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	α
Task climate	4.02	0.75	.75	3.75	0.90	.85	3.61	0.86	.80	3.51	0.97	.86	3.50	0.92	.85	3.45	0.91	.84
Ego climate	2.36	0.85	.71	2.43	0.89	.76	2.55	0.85	.73	2.52	0.90	.74	2.67	0.90	.76	2.68	0.88	.76
Task orientation	4.33	0.58	.69	4.16	0.74	.82	4.02	0.74	.80	4.03	0.76	.82	4.05	0.73	.85	4.00	0.75	.83
Ego orientation	3.14	0.97	.82	2.99	0.99	.84	2.91	0.97	.85	2.76	0.98	.83	2.84	1.03	.87	2.82	0.96	.86
Boredom	2.34	1.48	.69	2.39	1.44	.72	2.63	1.48	.73	2.62	1.50	.71	2.71	1.46	.73	2.79	1.44	.69
Enjoyment	5.41	1.32	.76	5.31	1.33	.78	5.06	1.35	.77	5.01	1.35	.76	4.91	1.40	.81	4.88	1.38	.80

Table 2

Mean (Intercept) Scores, Linear and Quadratic Changes in all Variables over the Six Measurement Occasions

Variable List	Fixed Effects Model			Within- Person	Between-Person						R^2_{ε}
	Intercept	Time (linear term)	Time (quadratic term)	Intercept variance	Intercept variance	Time (linear term) variance	Covariance between intercept and time (linear term)	Time (quadratic term) variance	Covariance between intercept and time (quadratic term)	Covariance between the linear and quadratic terms of time	
Task Climate	3.984**	-0.241**	0.026**	0.262**	0.360**	0.075**	0.027	0.003**	-0.014**	-0.012*	0.41
Ego Climate	2.362**	0.105**	-0.008	0.317**	0.461**	0.091**	-0.077*	0.003**	0.002	-0.012*	0.33
Task Orientation	4.308**	-0.179**	0.024**	0.228**	0.173**	0.020	0.035	0.001	-0.012**	-0.002	0.28
Ego Orientation	3.150**	-0.161**	0.021**	0.395**	0.611**	0.073*	-0.111**	0.000	0.010	-0.006	0.22
Boredom	2.358**	0.134*	-0.008	0.806**	1.593**	0.350**	-0.370**	0.009**	0.030	-0.048**	0.34
Enjoyment	5.403**	-0.186**	0.014	0.635**	1.233**	0.163**	-0.151*	0.005*	0.006	-0.022*	0.28

Note: R^2_{ε} = Percentage of within-person variation accounted for by time (linear and quadratic terms)

Table 3

Predictors of the Intercepts and Growth Trajectories of Perceptions of Motivational Climate

Variable List	Task-involving climate		Ego-involving climate	
	<i>B</i>	SE	<i>B</i>	SE
Intercept	4.018**	0.068	2.418**	.077
Gender	.006	.083	-.143	.093
Sport Participation	.066	.072	.035	.084
Linear change	-.256**	.051	.076	.057
Gender	.033	.061	.125	.067
Sport Participation	-.006	.060	-.075	.067
Curvilinear change	.031**	.010	-.004	.011
Gender	-.009	.012	-.027*	.013
Sport Participation	.001	.012	.022	.013

Note: * $p < .05$ ** $p < .01$

Table 4

Predictors of the Intercepts and Growth Trajectories of Achievement Goal Orientations

Variable List	Task Orientation		Ego Orientation	
	<i>B</i>	SE	<i>B</i>	SE
Intercept	4.213**	.055	3.166**	.083
Gender	.085	.063	-.133	.100
Sport Participation	-.057	.057	.054	.085
Task Climate	.314**	.053	.177*	.073
Ego Climate	.052	.048	.187**	.068
Linear change	-.113**	.042	-.142*	.056
Gender	-.004	.048	.001	.064
Sport Participation	-.015	.048	-.002	.066
Task Climate	-.003	.047	-.094	.065
Ego Climate	-.040	.044	.090	.062
Curvilinear change	.013	.008	.023*	.010
Gender	.001	.009	.001	.064
Sport Participation	.007	.009	-.003	.013
Task Climate	-.003	.009	.019	.013
Ego Climate	.008	.009	-.013	.012

Note: * $p < .05$ ** $p < .01$

Table 5

Predictors of the Intercepts and Growth Trajectories of Enjoyment and Boredom

Variable List	Enjoyment		Boredom	
	<i>B</i>	SE	<i>B</i>	SE
Intercept	5.402**	.117	2.580**	.136
Gender	-.219	.141	-.186	.161
Sport Participation	-.098	.115	.020	.140
Task Climate	.368**	.097	-.256*	.117
Ego Climate	.076	.085	.239*	.103
Task Orientation	.132	.115	-.017	.139
Ego Orientation	.159	.089	-.038	.096
Linear change	-.105	.078	.016	.096
Gender	.080	.089	.040	.110
Sport Participation	.010	.091	.006	.111
Task Climate	-.011	.088	.048	.105
Ego Climate	-.035	.079	.005	.095
Task Orientation	.176	.102	-.144	.122
Ego Orientation	-.042	.075	.062	.090
Curvilinear change	.010	.015	.007	.018
Gender	-.014	.017	-.012	.021
Sport Participation	-.007	.018	.006	.021
Task Climate	.005	.018	.002	.021
Ego Climate	.004	.016	.003	.019

Task Orientation	-.027	.020	.026	.024
Ego Orientation	.001	.015	-.010	.018

Note: * $p < .05$ ** $p < .01$