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Developmental Trajectories of Motivation in Physical Education: Course, Demographic Differences and Antecedents

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Abstract

This study investigated changes in student motivation to participate in physical education and some determinants of these changes over a period of three years. Measures were taken twice a year, from the age of 13 until the age of 15 years, from a sample of Greek junior high school students. Multilevel modeling analyses showed significant decreases in task-involving teacher climate, relatedness, identified regulation, and intrinsic motivation. In contrast, there were significant increases in ego-involving climate and amotivation. For some of these variables the observed linear decreases or increases were somewhat reversed by the beginning of the last year of the junior high school. No significant changes were observed in competence need satisfaction and in extrinsic and introjected regulations. We found substantial between-student variability in the intercepts and growth trajectories of most variables and, therefore, we tested a number of theoretical and demographic predictors to partly account for such variations. The results indicated that increases in maladaptive motivation in physical education over time are not uniform across all students and may be partly tackled by facilitating competence need satisfaction.

Keywords: Self-determination theory, changes in motivation, Greek students, psychological need satisfaction, motivational regulations

The importance of physical activity for physical and psychological health and well-being throughout the lifespan is well-established (e.g., Fox, Boutcher, Faulkner, & Biddle, 2000; Landers & Arent, 2001). However, recent evidence in the US, the UK and other Western societies indicates that many children lead sedentary lifestyles. For example, in the UK evidence from the Department of Health (2004) indicates that one-third of boys and one-third to a half of girls report activity levels that may compromise their health. In Greece there are no data at a national level, but individual studies show that only a very small proportion of boys and girls participate in moderate or vigorous physical activity in their leisure time (e.g., Manios, Kafatos, & Codrington, 1999).

Large epidemiological studies in the US, the Netherlands, and Finland indicate that the largest decrease in physical activity levels occurs during early adolescence (Sallis, 2000). This trend parallels age-related declines in intrinsic motivation and other adaptive indices of motivation in compulsory school physical education classes (PE) (Digelidis & Papaioannou, 1999). Such decreases are problematic given that positive experiences in school PE are related to physical activity participation during leisure time (Hagger, Chatzisarantis, Barkoukis, Wang & Baranowski, 2005). However, most studies examining student motivation in PE from a developmental perspective have performed cross-sectional comparisons of different age groups (e.g., Digelidis & Papaioannou, 1999). Further, the few longitudinal studies that have been conducted (e.g., Xiang, McBride, Guan, & Solmon, 2003) have looked at only a very limited number of personal and situational indices of student motivation. The purpose of this study is to investigate changes in student motivation to participate in compulsory school PE and some of the determinants of such changes over a period of three years utilizing multiple indices of student motivation.

Self-Determination Theory

Self-determination theory (SDT; Deci & Ryan, 1985, 2002) has been recently employed to examine motivation in PE. According to this theory, behavior in any life context can be intrinsically motivated, extrinsically motivated, or amotivated. Intrinsic motivation refers to engaging in an activity for the pleasure and satisfaction experienced while performing the activity, or for the opportunities it offers for learning. In contrast, involvement in an activity to obtain rewards or due to external or internal pressures represents extrinsically motivated behaviors. Three types of extrinsic motivation have been measured in PE (adapted from Ryan & Connell, 1989; see examples in *Method*), which reflect varying degrees of self-determination: External regulation, introjected regulation and identified regulation. External regulation represents the lowest degree of self-determined motivation and refers to behaviors carried out in order to attain tangible rewards or to avoid punishment. Introjected regulation describes extrinsically motivated behaviors which have been only slightly internalized and which are performed out of feelings of guilt or shame. Identified regulation is a more self-determined type of extrinsic motivation, compared to external and introjected regulations. Individuals with high identified regulation acknowledge the value of certain behaviors which they perform out of choice but without necessarily enjoying them. Finally, amotivation, the third broad type of behavioral regulation proposed by SDT, is evident when individuals lack the intention and willingness to engage in a behavior (Deci & Ryan, 1985).

According to Vallerand (1997), high self-determined motivation (i.e., intrinsic motivation and identified regulation) tends to result in more adaptive behavioral, cognitive and affective outcomes. In contrast, low self-determined motivation (introjected and external regulation) or amotivation often result in maladaptive outcomes. Self-determined motivation is likely to be observed when individuals' fundamental psychological needs are satisfied. In contrast, need

thwarting is more likely to give rise to amotivation and external regulation, and sometimes to introjected regulation. According to Deci and Ryan (2000), there are three basic psychological needs which represent "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (p. 229). *Autonomy* refers to the need to experience choice and the feeling that one is responsible for one's own actions. The need for *competence* refers to an individual's desire to interact effectively with the environment, and to experience a sense of effectance in producing desired outcomes (Deci & Ryan, 1985). Lastly, the need for *relatedness* involves feeling connected to others, or feeling that one belongs in a given social milieu (Baumeister & Leary, 1995).

The three psychological needs often explain the influence of social-contextual factors on motivation (Vallerand, 1997). According to SDT, social-contextual factors that satisfy the three basic psychological needs will promote self-determined forms of motivation. In contrast, if social-contextual factors undermine the three needs, low self-determined motivation or amotivation will be observed. For example, teacher instructional style and behaviors can have significant effects on student psychological need satisfaction and, indirectly, on student motivation (Taylor & Ntoumanis, 2007). The current study aims to examine such effects of the teaching environment across the three years of junior high school in Greece.

Empirical work in PE has offered broad support for the propositions of SDT. For example, in a cross-sectional study of motivation in British PE classes, Ntoumanis (2001) found that teacher emphasis on individual criteria for improvement predicted student competence need satisfaction, teacher promotion of cooperative learning predicted student relatedness need satisfaction, and teacher provision of choice predicted student autonomy need satisfaction. In turn, the three psychological need satisfaction variables were positive predictors of self-determined motivation. The three contextual variables measured by Ntoumanis are indicators of

a task-involving climate (Ames, 1992), which is often contrasted in the literature with an ego-involving climate. The latter promotes normative criteria for student evaluation, and encourages student competition and outperforming others. Research has found a task-involving climate to facilitate psychological need satisfaction and intrinsic motivation in PE, unlike an ego-involving climate which is often negatively related to these outcomes and positively related to low or non-self-determined motivation (e.g., Brunel, 1999; Sarrazin, Guillet, & Cury, 2001; Standage, Duda, & Ntoumanis, 2003).

Temporal Changes in Motivational Indices During Childhood and Adolescence

Both cross-sectional and longitudinal studies in the classroom have shown decreases in adaptive motivation across the elementary school years and into the middle school years. For example, in a longitudinal investigation of 3rd through 8th grade children, Lepper, Corpus, and Iyengar (2005) found that intrinsic motivation in the classroom declined across the grade levels, whereas extrinsic motivation remained unchanged. The authors speculated that the decreases in intrinsic motivation might partly be the result of a greater emphasis on ego-involving criteria for success and competence. Unfortunately, Lepper et al. did not differentiate between more and less self-determined forms of extrinsic motivation and therefore, the results pertaining to extrinsic motivation are difficult to interpret. Anderman and Anderman (1999) found that increases in ability (i.e., ego) goals between the 5th and 6th grade were predicted by situational goal structures in the 6th grade that emphasized normative ability (i.e., a teacher ego-involving climate). Lastly, Fredericks and Eccles (2002a) examined children's competence and value beliefs associated with math and sports. The results showed declines in all variables from childhood to adolescence. Further, gender differences were found in both competence and value beliefs in favor of boys, however, the gender gap decreased over time. Wigfield and Eccles (2002a) attributed the negative changes in children's competence-related beliefs and achievement values

in the classroom to the increased emphasis by the school environment on student evaluation and competition (i.e., ego-involving climate), and the children's tendency to engage in social comparisons with their peers to a greater extent.

Developmental research in PE examining changes in student motivation is scarce. Nevertheless, the available research evidence mirrors the findings reported with respect to classroom motivation by indicating age-related declines in indices of adaptive motivation in PE. For example, Digelidis and Papaioannou (1999) found in a cross-sectional study of 674 Greek students that senior high school students reported lower intrinsic motivation, task-involving teacher climate and perceived athletic ability than junior high school and elementary school students. Further, using a sample of 414 US elementary school students, Prochaska, Sallis, Slymen, and McKenzie (2003) examined fluctuations in enjoyment of PE (an index of intrinsic motivation) from 4th to 6th grade. The results showed a significant decrease in enjoyment, especially among girls and among those not involved in organized sport activities outside school.

Such declines in indices of adaptive motivation can be attributed to a number of reasons. For example, research by Horn and Weiss (1991), and Weiss, Ebbeck, and Horn (1997) in the physical domain has shown that children in late childhood and early adolescence frequently use peer feedback and normative comparisons to judge their level of physical competence. Such comparisons can be motivationally detrimental, as normative differences in physical ability are highly visible in PE classes and are often accentuated by biological changes associated with puberty. The implications of such normative differences in terms of peer acceptance and relatedness need satisfaction are important. Research by Weiss and Duncan (1992) has linked peer acceptance with physical competence by demonstrating significant relationships between perceived and teacher ratings of social acceptance and perceived physical competence in a sample of 8- to 13- year old US children.

Another reason for the observed declines in indices of adaptive student motivation in PE is the increased emphasis by teachers on competition and social comparison criteria (i.e., increases in perceptions of an ego-involving climate). School sport teams become more selective in junior high school (Digelidis & Papaioannou, 1999), and as a consequence less competent children feel marginalized or amotivated (Ntoumanis, Pensgaard, Martin, & Pipe, 2004). An increased emphasis on competition and winning might also be detrimental to students' self-determined motivation in PE. Although there is no experimental evidence in PE to support this claim, research by Vansteenkiste and Deci (2003) on a spatial-relations puzzle task shows that trying to win competitions and associated rewards can be counter-productive with respect to intrinsic motivation.

Study Aims and Hypotheses

To date, there are no longitudinal studies in PE examining changes in multiple indices of student motivation, in particular those proposed by SDT. Furthermore, besides simply observing changes in motivational variables over time, it is also important to examine whether any increases or decreases in these variables are uniform across all children, or whether the trajectories of change vary depending on the influence of demographic and theory-based predictors. Such questions have important theoretical and practical implications in terms of facilitating adaptive motivation in PE. In view of these arguments, this study had two purposes. First, we wanted to examine changes in a number of motivation-related variables from the start of the first year until the end of the final year of Greek junior high school (i.e., approximately, ranging across the ages of 13, 14 and 15 years). In the Greek school education system junior high school is considered to be part of secondary education. The main objective of the Greek PE curriculum for secondary education, which is compulsory for students of both gender groups, is the enhancement of motor development, fitness and health of students through the teaching of

the basic skills of some popular sports (Greek Ministry of Education, 1997). We chose this particular age range because research evidence shows that both physical activity levels and motivation for physical activity start to decline at around the age of 12 to 13 years (Digelidis & Papaioannou, 1999; Sallis, 2000).

Based on the aforementioned findings in education and PE regarding the temporal patterning of motivation-related variables, we first examined (and expected to find) between-student variability in the mean score and growth trajectory of each variable in the study. In terms of the direction of growth trajectories, we had *a priori* hypotheses only for linear change (although we also tested for non-linear change). In brief, we expected increases in maladaptive indices of motivation and decreases in adaptive indices of personal and situational motivation. Specifically, we hypothesized that over the three years students would report increases in perceptions of ego-involving climate, amotivation and low self-determined (i.e., introjected and external regulations) motivation, and decreases in task-involving climate, high self-determined motivation (i.e., intrinsic motivation and identified regulation), and psychological need satisfaction.

The second purpose of our investigation was to examine whether any between-person differences in the mean scores of the variables under investigation or in their growth trajectories could be accounted for by theory-based and demographic predictors. We formulated hypotheses only for the effects of these predictors on the mean scores of the outcome variables, due to lack of previous evidence regarding the effects of these predictors on the linear or non-linear rate of change of the outcome variables. Specifically, we hypothesized that perceptions of a high task involving climate and psychological need satisfaction would predict higher levels of self-determined motivation. In contrast, perceptions of a high ego-involving climate and low need satisfaction were expected to predict lower levels of self-determined motivation and amotivation.

In terms of demographic predictors, we examined the predictive role of out-of-school sport participation and gender. We anticipated that students who participated in out-of-school sport would have more positive experiences in PE (see also Papaioannou, 1997). Therefore, we expected them to report higher need satisfaction and more self-determined motivation, compared to those with no out-of-school sport experience. With regard to gender, we expected females to report lower competence need satisfaction than males (Fredericks and Eccles, 2002; Lirgg, 1991). No other hypotheses were made regarding the prediction of mean differences due to the lack of consistent findings in the literature. In sum, in the second part of our analysis we tested whether the means and growth trajectories of psychological need satisfaction were predicted by motivational climate, and whether the means and growth trajectories of motivational regulations were predicted by both psychological needs and motivational climate. Gender and out-of-school sport participation were predictors of the means and growth trajectories of all other variables (i.e., motivational climate, psychological need satisfaction and motivational regulations).

Method

Participants

The original sample comprised of 453 students (males n = 226; females n = 226; 1 student did not report his/her gender) from 17 classes of five schools in a large Greek city. The students were taught by 11 PE teachers. All students were Caucasians and were attending typical co-educational Greek schools. Approximately 48% of the students participated in organized sport outside school at the first and subsequent waves of data collection. Those students were not identical at all six waves, but approximately 34% of them participated in out-of-school sport through the entire three years. The students were sampled at the beginning and the end of the school year in the three grades of Greek junior high school (i.e., ages 13-15 years). Thus, in total

six measures were taken. One hundred and forty three students completed the questionnaires on all occasions, whereas the rest completed the questionnaires on some of the six occasions because they had moved to (or from) a different school or neighborhood, or because they were absent on the dates of data collection (see Table 1 for the sample size at each measurement wave). 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. Comparisons of mean scores at the beginning of the study between those who completed the questionnaires at all time points and those who did not, revealed no differences in perceptions of motivational climate (Pillai's Trace = .004; F (2, 341)= .603; p>.05), psychological need satisfaction (Pillai's Trace = .016; F (3, 340)= 1.84; p>.05), or motivational regulations (Pillai's Trace = .027; F (5, 337)= 1.89; p>.05).

Measures

Task-and ego-involving climate. A short version (13 items) of the Learning and Performance Orientations in Physical Education Classes Questionnaire (Digelidis, Papaioannou, Laparidis & Christodoulidis, 2003) was used to assess students' perceptions of task-involving (7 items; e.g., "the PE teacher is completely satisfied when every student's skills are improving") and ego-involving (6 items; e.g., "the PE teacher regards as competent students only those with the best sport record") motivational climates created by their PE teachers. Answers were provided on a *strongly disagree* (1) to *strongly agree* (5) scale. Digelidis et al. (2003) reported Cronbach alpha reliabilities above .60 and relatively good fit indices from a confirmatory factor analysis in a sample of Greek high school students (e.g., CFI's ranged from .90 to .94 across three measurement waves).

Psychological need satisfaction. Autonomy and relatedness need satisfaction were measured with two items each, developed by Ntoumanis (2001). Competence need satisfaction

was measured with five items from the Competence subscale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989). Responses for all three psychological needs were made on scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items are: “I can decide which activities I want to practice in this PE class” (autonomy), “Participating in this PE class makes me feel closer to the other students” (relatedness), and “I think I am pretty good in this PE class” (competence). McAuley et al. (1989) reported a Cronbach alpha of .84 for the competence subscale.

Motivational regulations. We used a PE-adapted version of the Self-Regulation Questionnaire, developed by Goudas, Biddle and Fox (1994), to measure intrinsic motivation, as well as identified, introjected and external regulations. We also used the amotivation subscale of the Academic Motivation Scale (Vallerand et al., 1992), also adapted to PE by Goudas et al. (1994). Hence, in total we used five subscales (4 items per factor). The participants responded to the stem "I take part in this PE class…" on scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items are: “because it is fun” (intrinsic motivation), “because I want to improve in sport” (identified regulation), “because I would feel bad about myself if I didn’t” (introjected regulation), “so that the teachers won’t yell at me” (external regulation), and “but I can’t see what I am getting out of PE” (amotivation). The instrument has been shown to have good fit indices in confirmatory factor analyses with British (Goudas, et al., 1994) and Greek children (Kiriakidis, 2005). Further, all subscales have been shown to have Cronbach alphas above .70, with the exception of introjected regulation whose alpha coefficient is sometimes marginally below .70.

Procedure

The principals and physical education 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 in a quiet environment at the beginning of regular PE time 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. Student questionnaires were matched up across the six measurement occasions by using information regarding the students' class, gender and date of birth.

Results

Descriptive Statistics and Internal Reliability Coefficients

Table 1 presents descriptive statistics and Cronbach alpha coefficients for all variables for each of the six measurement occasions. An inspection of the mean scores shows that the adaptive motivation variables decreased over time, whereas the maladaptive ones increased. The Cronbach alpha coefficients are acceptable for most variables. Relatedness need satisfaction has marginal coefficients, whereas those for autonomy need satisfaction are unacceptably low. Therefore, autonomy was not included in any further analysis. Both relatedness and autonomy need satisfaction were measured with two items each, which may explain the low alpha coefficient values. The intercorrelations among the variables at each time point are available from the first author upon request.

Multilevel Analyses of Student Motivation in PE

Multilevel regression analyses, 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. Two level of analysis were specified. Level 1 encompassed the repeated observations of perceptions of motivational climate, psychological need satisfaction and motivational regulations. These repeated observations were nested within students, therefore the latter constituted level 2 in the analysis. In fact, the 17 classes and/or 11 PE teachers could have constituted further higher levels. We examined this possibility only for the 17 classes, although this number is quite small for a higher level unit. The between-class variation for all variables, with the exception of task-involving climate, was not significant. In fact, the median between-class variation across all study variables, expressed as a percentage of total variation, was only 5%. Thus, we proceeded with two levels. The analysis had two parts. The first part examined whether there were significant between-person variations in the means (intercepts) and rates of change (growth trajectories) of all motivational variables under investigation. The second part aimed to ascertain whether any between-person variation found in the first step could be accounted for by a number of demographic and theory-based predictors.

Part 1: Variations in intercepts and growth trajectories of perceived class climate, student psychological need satisfaction and motivation regulations

Following Singer and Willett's (2003) approach, we first tested a series of unconditional (i.e., intercept-only) models, one for each variable under investigation. Their purpose was to examine whether there was sufficient between-person variation in the intercepts, so that any such variation could be accounted for in the second part of the analysis. The results revealed there was substantial variability in the intercepts of all variables (see Table 2). In fact, intraclass correlation coefficients ranged from .36 to .51 (*Mdn* = .47), which are relatively large values.

We also tested a series of unconditional growth models to examine the rates of change of the motivational variables. Again, we aimed to account for any such variation in the second part of the analysis. With six data points, linear, curvilinear and cubic changes can be examined.

However, when we tested for cubic effects, none of the cubic terms was significant. Therefore, we kept the linear and quadratic terms. The scores for both terms were centered at time 1 (i.e., the beginning of the first year of junior high school was assigned the value 0). The growth trajectories are presented in Table 2 and Figure 1. As can be seen, the linear term (i.e., slope) for time was negative (i.e., indicating decrease over time) for task-involving motivational climate, relatedness need satisfaction, identified regulation, and intrinsic motivation. In contrast, the slope for time was significant and positive (i.e., indicating increase over time) for ego-involving climate, and amotivation. No significant temporal changes were observed in competence need satisfaction, and in introjected and external regulations. These slope coefficients represent fixed effects (i.e., average change) over time across the whole sample. However, an inspection of the between-person variability of these slopes (Table 2) indicates that there was significant variability even when the fixed effects of these slopes were not significant (with the exception of the slope for competence need satisfaction). In other words, some individuals changed significantly over time even though the average change across the whole sample was not significant.

We also examined quadratic rates of change and between-person variability in such rates. Significant positive quadratic terms were found for task-involving climate, relatedness need satisfaction and identified regulation (Table 2). As discussed previously, the linear growth terms for these variables were negative. Taken together, these results indicate that after a certain point in time the negative trend in the scores of these variables was reversed. Plotting the linear and quadratic terms revealed that the reversal in the direction of the scores for these five variables started at 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 task- and ego-involving climate, external and identified regulation. This finding implies significant between-person

variability in these quadratic changes. The R^2_{ε} in Table 2 indicates the amount of within-person variation in the variables under investigation explained by time (both linear 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, ranging from 21% to 41%.

Part 2: Predictors of variations in the intercepts and growth trajectories

In the second part of the analysis we added a number of demographic and theory-based predictors in the multilevel regression equations. These predictors aimed to account for the between-person variability associated with the intercepts of all variables. Further, these predictors aimed to explain the between-person variability in the growth trajectories of task and ego climates, relatedness need satisfaction, identified and external regulation. For competence need satisfaction, amotivation, introjected regulation and intrinsic motivation, both the fixed effect and the between-person variability of the linear and/or quadratic terms were not significant. Thus, since there was no change in these variables to be accounted for, we did not add any predictors in the equations. This is the reason why there are empty cells in Tables 4 and 5. In terms of our model strategy, we decided not to eliminate non-significant effects (e.g., the effect of competence need satisfaction on the intercept of identified regulation) and re-estimate the models, because with such exploratory procedures, there is always the possibility that some decisions that lead to the final model are based on chance (Hox, 2002).

Socio-contextual factors, such as perceptions of motivational climate, are theoretically assumed to be antecedents of all the other motivation-related variables assessed in this study. Thus, only gender (0=males, 1=females) and sport participation outside school (0=yes, 1=no) were tested as predictors of motivational climate. The results for task-involving climate (Table 3) showed that there were no gender or sport participation mean differences at the beginning of the

study (i.e., time was centered 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. This finding could also be interpreted as indicating that gender and sport participation mean (non-significant) differences in task-involving climate remained consistent throughout the study. With regard to perceptions of an ego-involving climate, again no significant gender or sport participation mean differences were found. However, the interaction between the quadratic term for time and gender was significant. We plotted this interaction, and all subsequent interactions (see Figure 2), and examined the significance of the simple slopes 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.

Psychological need satisfaction is purported to be influenced by socio-contextual variables (Vallerand, 1997), such as perceptions of motivational climate created by significant others (Ntoumanis, 2001). Thus, we examined whether perceptions of task- and ego-involving motivational climate created by PE teachers can predict the mean scores of the three psychological needs proposed by SDT, as well as the linear and quadratic changes associated with relatedness need satisfaction. In relation to competence need satisfaction, the results showed that students with perceptions of high task-involving climate felt that their need for competence was more satisfied. Lastly, those who participated in sport activities outside school reported higher competence need satisfaction compared to those who did not. With regard to relatedness need satisfaction, males and those with perceptions of high task-involving climate reported higher relatedness need satisfaction compared to females and those with lower perceptions of task-involving climate. In addition, gender interacted with both the linear and quadratic terms for time. In such a case, only the highest order term in the regression (i.e., gender x time^2) should be

interpreted and plotted (see Aiken & West, 1991, p. 112). For females, there were no significant changes in relatedness over time. However, for males, the results showed significant decreases at the end of the first year and significant increases at the end of the last year of junior high school.

According to Ryan and Deci (2002), different motivational regulations can result from the degree of psychological need satisfaction and various socio-contextual influences. Therefore, we examined whether the satisfaction of the needs for competence and relatedness, as well as perceptions of task- and ego-involving climate, can predict the intercept and linear terms for time associated with each of the five motivational regulations proposed by SDT, as well as the quadratic terms for external and identified regulations (see Table 5). The results for amotivation showed that it was positively predicted by competence need satisfaction and perceptions of an ego-involving climate, and negatively predicted by perceptions of a task-involving climate. Further, students who did not take part in sport activities outside school reported higher amotivation than those who did participate in such activities. In addition, the amotivation scores of the former group increased over time, as indicated by a significant interaction between time and sport participation, whereas amotivation remained stable for those who participated in out-of-school sport.

With regard to external regulation, the results showed that it was positively predicted by perceptions of an ego-involving climate. Also, there was a significant interaction between competence need satisfaction and the linear term for time. Plotting this interaction revealed that those with low competence need satisfaction reported significant increases over time. In contrast, those with high competence need satisfaction reported no significant changes over time. Introjected regulation was positively predicted by an ego-involving climate only.

As expected, identified regulation was positively predicted by task-involving climate, competence and relatedness need satisfaction. Also, those who participated in out-of-school

sports reported higher identified regulation. Lastly, there was a significant interaction between the linear term for time and competence need satisfaction. Plotting this interaction revealed that students with high competence need satisfaction reported no significant decreases in identified regulation over time; in contrast, significant decreases were reported by those with low competence need satisfaction. With regard to intrinsic motivation, the findings showed that students who participated in out-of-school sport reported higher intrinsic motivation compared to those who did not participate in such activities. Also, task-involving climate, competence and relatedness need satisfaction emerged as positive predictors of intrinsic motivation.

Discussion

Given that adaptive motivation in PE is linked to physical activity participation during leisure time (Hagger et al., 2005), and that physical activity is linked to physical and psychological health (Fox et al., 2000), it is important to understand how motivation to participate in PE classes fluctuates over the school years, as well as the factors that can account for such changes. In this study we extended previous cross-sectional research by looking at changes in student motivation from the start until the end of Greek junior high school (i.e., approximately ages of 13-15 years) measuring motivational indices which have been extensively studied in the classroom and in PE. First, we examined mean scores at the start of the high school, as well as linear and quadratic changes over the three years, in teacher motivation climate, psychological need satisfaction, and motivational regulations. Second, we looked at whether theory-based predictors and two demographic variables (gender and out-of-school sport participation) could account for the between-student variability in the means and the trajectories of some of the variables under investigation.

Our results are largely in agreement with previous research (mainly cross-sectional) in PE and the classroom, revealing decreases in adaptive motivation in early adolescence (e.g., Digelidis & Papaioannou, 1999; Xiang et al., 2003). Specifically, perceptions of task-involving motivational climate, relatedness need satisfaction, and self-determined motivation (i.e., intrinsic motivation and identified regulation), decreased over time. For some of these variables there was a curvilinear trajectory with an upward change at the beginning of the last year of the junior high school, however, such increases were comparatively small. At the age of 13 years, students have to face many changes, such as the transition from elementary to secondary education in the Greek school system, as well as biological and cognitive developments (e.g., abstract thinking, processing strategies) which may affect the students' self-concept and motivation (Wigfield & Eccles, 2002b). The small upward curve at the age of 15 years might indicate that by the end of the last year of junior high school the effect of these changes dissipates.

Decreases in task-involving climate have also been reported by Digelidis and Papaioannou (1999) in a cross-sectional comparison of senior and junior Greek high school students. Such decreases are worrying as in our study they were also accompanied by increases in perceptions of an ego-involving climate. It seems that, as children grow older, PE teachers tend to emphasize more and evaluate children more frequently on the basis of normative criteria for success and failure. This could be because school sport teams become more selective as children grow older (Digelidis & Papaioannou, 1999). Similar patterns are evident in classroom environments in junior high schools. In these environments it has been observed that there is greater teacher control and fewer opportunities for student choice and involvement in decision making, perhaps because teachers feel less effective in their teaching compared to primary school teachers (Wigfield & Eccles, 2002b). This situation is highly problematic as perceptions of ego-involving climate have been linked with a variety of maladaptive cognitive, behavioral,

and affective outcomes (Biddle, 2001), especially among amotivated children (Ntoumanis et al., 2004).

There were no gender or sport participation status differences in the initial mean levels of ego-involving or task-involving climate, or in the trajectory of task-involving climate. However, in regard to the trajectory 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. In contrast, the increase over time in the scores of male students was small and not significant. Therefore, it seems that the enhanced teacher emphasis on normative student evaluation and competition during the junior high school years, also observed by Wigfield and Eccles (2002a), starts a bit earlier in male students. This might reflect a student gender stereotype, favoring males, in 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.

Significant decreases over time were observed for relatedness need satisfaction (with a small upward trend in the last year). We also found a significant moderating role for gender, in that females reported higher relatedness need satisfaction at the beginning of the study compared to males. Further, males reported significant decreases in relatedness by the end of the first year. It is possible that the disruption in peer networks that occurs in the transition to junior high school (Wigfiled & Eccles, 2002b) is more evident in males. In contrast, relatedness need satisfaction remained stable among the female students. In relation to competence need satisfaction, there were no significant linear or curvilinear changes. However, we found variations in the mean levels of competence based on whether the students participated or not in out-of-school sport programs. Specifically, similar to findings by Papaioannou (1997), students

with out-of-school sport experience reported greater levels of competence need satisfaction, which is expected given their broader sport experience.

Students who reported high perceptions of a task-involving climate were also likely to report higher mean scores for relatedness and competence need satisfaction initially, and throughout the study (as the interactions of task-involving climate with the linear and quadratic growth parameters were not significant). These findings make conceptual sense and are in accordance with results of previous research (Sarrazin et al., 2001). According to Deci and Ryan (2000), psychological need satisfaction is more likely to occur in social contexts that support individuals' autonomy. Although we did not assess autonomy support in this study, a task-involving climate shares many similarities with the concept of autonomy support in that it fosters student autonomy by offering choice of tasks and involving students in decision making (see Ames, 1992).

Consonant with our predictions, levels of self-determined motivation (i.e., intrinsic motivation and identified regulation) decreased with age. In contrast, extrinsic regulations low in self-determination (i.e., introjected and external regulation) remained stable. Our results parallel those reported by Lepper et al. (2005) in the classroom, although their sample was younger. However, despite these negative trends, it was encouraging to see in our study that students with high perceptions of a task-involving climate, high relatedness and competence need satisfaction reported higher mean levels of identified regulation and intrinsic motivation. Further, students with high competence need satisfaction reported no significant decreases in identified regulation over time. These results further emphasize the importance of promoting a task-involving climate (see Biddle, 2001) and facilitating psychological need satisfaction among less able students in PE classes (see Ntoumanis et al., 2004). Similar to Papaioannou (1997), students with out-of-school sport experience reported higher levels of intrinsic motivation and identified regulation in

PE, compared to student with no such experience. However, it is not known whether students who enjoy PE are more likely to participate in out-of-school sport (see Hagger et al., 2005), or whether those who participate in out-of-school sport find PE more enjoyable because they have advanced physical skills and aptitudes.

External and introjected regulation remained stable over time. However, further probing showed that for students with low competence need satisfaction external regulation showed a significant increase over time. In addition, as far as amotivation is concerned, students with low competence need satisfaction reported higher mean amotivation scores. These findings, in conjunction with those pertaining to the effects of competence need satisfaction on self-determined motivation regulations, provide additional evidence for the importance of fostering perceptions of competence in PE settings. It seems that students who feel competent in PE are less likely to feel pressured to participate in the lessons or to feel that PE has no value for them. In contrast, the motivation of those with low competence need satisfaction seems to become more maladaptive over time. These young people are less likely to play sport outside of PE (e.g., see the time x participation status interaction predicting amotivation), and thus are more at risk for developing a sedentary lifestyle. Lastly, consonant with our hypothesis, the results also revealed that participants with high perceptions of an ego-involving climate reported higher mean levels of amotivation, external regulation and introjected regulation. In addition, high perceptions of a task-involving climate were negative predictors of amotivation scores.

This study is important for several reasons. First, it extends previous cross-sectional research on age-related changes in motivation in PE settings. Second, compared to the very limited longitudinal work in this area, it offers a more comprehensive assessment of both personal and situational indices of motivation. Third, it shows that the mean levels and rates of changes of many motivational variables vary between students. For example, as far as

motivational regulations are concerned, self-determined motivation decreased over time, but the mean levels were higher for those who perceived a task-involving climate and had high competence and relatedness need satisfaction. In fact, high competence need satisfaction was also associated with no increases in external regulation and amotivation. The fourth contribution of this study is that it adds to the scant amount of evidence in the SDT literature regarding the developmental interplay of psychological need satisfaction and motivational regulations. Finally, the findings of this study can be used for comparisons purposes across different educational domains.

Limitations and Future Research Directions

One of the limitations of this study was the poor internal reliabilities of relatedness and, in particular, autonomy need satisfaction. Given the importance of these needs in SDT theory and research, it is imperative that future studies develop measures of these variables that are not only multi-item and reliable, but also take into account cultural variations in the operationalization of these psychological needs, in particular autonomy (cf. Deci and Ryan, 1985). Also, our findings cannot be directly generalized to students from other cultures with different curriculum programs, although it should be noted that they are in agreement with the results of cross-sectional studies carried out in the US, UK and other western countries. Another limitation 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 physical activity of young people start to decline (Sallis, 2000), it is important that the temporal association between indices of motivation and physical activity levels is examined in future studies.

Future longitudinal research could also investigate compensation mechanisms over time in psychological need satisfaction, especially in situations where the social context pits one psychological need against another (Ryan & Deci, 2000). For example, amotivated students with

low competence need satisfaction might seek meaning in PE activities by forging feelings of relatedness with other students, probably of comparable ability levels (Ntoumanis et al., 2004). Such compensation processes will result in an unbalanced psychological need profile balance which might be detrimental for psychological health (Sheldon & Niemiec, 2006). Further, we do not know to what extent the decreases in adaptive motivation observed in this study were due to peer norms and pressures regarding school achievement (see Ryan, 2001). Wigfield and Eccles (2002b) argued that perceived importance of school decreases during adolescence and young people value more social activities outside school. Another factor that can potentially explain the declines in adaptive motivation is the reduced parental involvement in school activities during adolescence (Wigfield & Eccles, 2002b). Lastly, the degree to which changes in motivation in PE are related to changes in self-concept and identity development is also not known. Harter (1990) has shown that in early adolescence the self-concept is both less integrated and more unstable than in earlier or later years. It is possible that this turbulent period might impact on some children's ability to fulfill their psychological needs.

Conclusions

Our longitudinal findings are in line with SDT's predictions regarding the relationships between socio-contextual factors, psychological need satisfaction and motivational regulations. Further, they provide support to previous cross-sectional studies in PE and the classroom which have shown that levels of adaptive motivation generally decline as children grow older. However, our findings also show that the mean levels of these variables and the rates of decline vary substantially between students and such variations can be partly accounted for by a number of theory-based and demographic predictors. By identifying such predictors, researchers can potentially develop successful interventions aiming to foster positive psychological experiences in PE and increased physical activity levels.

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Table 1

Means, Standard Deviations, and Cronbach Alpha Coefficients for All Variables Across the Three Grades of Greek Junior High School.

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)		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	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
Competence N.S.	5.03	1.14	.72	5.03	1.22	.75	4.92	1.11	.66	4.92	1.16	.70	4.94	1.09	.69	4.85	1.12	.69
Autonomy N.S.	3.77	1.67	.33	3.80	1.65	.38	3.68	1.51	.35	3.71	1.68	.48	3.65	1.55	.40	3.70	1.50	.37
Relatedness N.S.	5.13	1.54	.53	5.04	1.53	.56	4.78	1.46	.51	4.71	1.67	.67	4.79	1.59	.64	4.81	1.59	.64
Amotivation	2.20	1.42	.83	2.17	1.45	.86	2.53	1.45	.82	2.29	1.42	.82	2.34	1.44	.86	2.49	1.49	.85
External Regulat.	3.00	1.54	.74	2.92	1.54	.75	3.14	1.56	.79	3.03	1.63	.81	3.13	1.62	.80	3.13	1.59	.78
Introjected Regulat.	3.46	1.50	.68	3.31	1.53	.70	3.48	1.34	.62	3.25	1.38	.62	3.39	1.40	.68	3.35	1.38	.69
Identified Regulat.	5.55	1.17	.67	5.30	1.31	.72	5.07	1.32	.74	5.05	1.41	.75	4.84	1.48	.79	4.78	1.48	.79
Intrinsic Motivation	5.41	1.42	.80	5.29	1.48	.81	5.02	1.43	.79	5.04	1.48	.81	4.87	1.50	.82	4.84	1.49	.82

Note: N.S.= Need satisfaction

Table 2

Linear and Curvilinear Changes in Motivational Variables over the Six Measurement Occasions

	Fixed Effects Model			Within-Person	Between-Person						R^2_{ε}
Variable List	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
Competence N.S.	5.021**	-0.021	-0.002	0.481**	0.935**	0.085	-0.091	0.002	-0.009	-0.007	0.27
Relatedness N.S.	5.144**	-0.222**	0.030**	1.154**	1.346**	0.294**	-0.328**	0.007	0.033	-0.038*	0.25
Amotivation	2.213**	0.101*	-0.009	0.844**	1.345**	0.087	-0.146	0.002	0.004	-0.008	0.21
External Regulation	2.969**	0.056	-0.003	0.902**	1.558**	0.379**	-0.341**	0.008**	0.033	-0.048**	0.29
Introjected Regulation	3.432**	-0.024	0.003	0.856**	1.599**	0.202*	-0.358**	0.004	0.025	-0.021	0.25
Identified Regulation	5.526**	-0.254**	0.020*	0.656**	0.945**	0.155*	-0.082	0.004*	-0.004	-0.018	0.36
Intrinsic Motivation	5.394**	-0.194**	0.015	0.757**	1.463**	0.125	-0.180*	0.002	0.005	-0.010	0.28

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

N.S.= Need Satisfaction

$R^2_{\varepsilon=}$ Percentage of within-person variation accounted for by time (linear and quadratic terms)

Table 3

Demographic and Theory-Based Predictors of the Intercepts and Growth Trajectories of Motivational Climate

Variable List	Task-involving climate		Ego-involving climate	
	B	*SE*	*B*	*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

Demographic and Theory-Based Predictors of the Intercepts and Growth Trajectories of Psychological Needs

	Competence Need Satisfaction		Relatedness Need Satisfaction	
	B	*SE*	*B*	*SE*
Intercept	5.143**	.100	5.189**	.142
Gender	-.107	.119	-.380*	.165
Sport Participation	-.227*	.100	-.061	.150
Task Climate	.305**	.087	.603**	.133
Ego Climate	.156	.080	-.021	.120
Linear change			-.279**	.104
Gender			.326**	.118
Sport Participation			.026	.120
Task Climate			-.212	.113
Ego Climate			-.051	.107
Curvilinear change			.044**	.019
Gender			.058*	.022
Sport Participation			-.004	.022
Task Climate			.025	.022
Ego Climate			.015	.021

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

See text for the explanation of empty cells.

Table 5

Demographic and Theory-Based Predictors of the Intercepts and Growth Trajectories of Motivational Regulations

Variable List	Amotivation		External Regul.		Introjected Regul.		Identified Regul.		Intrinsic Motivation	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	2.353**	.108	3.030**	.135	3.535**	.115	5.510**	.103	5.352**	.106
Gender	-.209	.133	-.133	.159	-.264	.143	.118	.123	-.109	.134
Sport Participation	.196*	.099	.119	.136	.016	.109	-.347**	.100	-.225*	.091
Task Climate	-.213*	.092	-.004	.123	.111	.086	.320**	.094	.458**	.080
Ego Climate	.299**	.077	.281**	.112	.251**	.088	.064	.077	-.098	.071
Competence N.S.	-.155*	.070	.090	.093	.086	.075	.145*	.061	.227**	.061
Relatedness N.S.	.005	.049	.008	.062	-.011	.049	.107*	.041	.150**	.043
Linear change	.062*	.028	.020	.091	.001	.031	-.126	.068	-.095**	.025
Gender	-.009	.033	.023	.105	-.022	.037	-.115	.077	.033	.029
Sport Participation	-.078*	.032	.001	.102	-.013	.035	.052	.078	.043	.029
. Task Climate	.043	.030	-.068	.098	.019	.030	.039	.078	-.002	.027

Ego Climate	.001	.027	.101	.091	.033	.029	-.052	.070	.045	.025
Competence N.S.	-.047	.024	-.169*	.075	-.047	.024	.123*	.059	.000	.021
Relatedness N.S.	-.024	.016	-.016	.051	.029	.016	-.002	.039	.016	.014
Curvilinear change			-.002	.015			-.004	.012		
Gender			.003	.018			.024	.014		
Sport Participation			-.007	.018			.003	.015		
Task Climate			.012	.019			.001	.016		
Ego Climate			-.019	.017			.011	.014		
Competence N.S.			.024	.014			-.027	.014		
Relatedness N.S.			.004	.010			.006	.008		

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

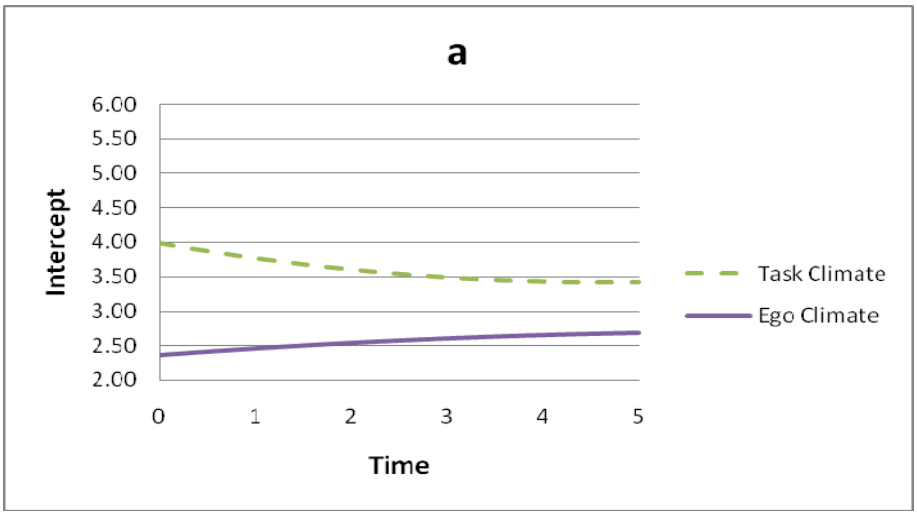
N.S. =Need Satisfaction

See text for the explanation of empty cells.

Figure Captions

Figure 1. Trajectories of a) motivational climate, b) psychological need satisfaction and c) motivational regulations over the three years of junior high school in Greece

Figure 2. Significant interaction plots: a) between time (quadratic) and gender predicting ego climate, b) between time (quadratic) and gender predicting relatedness need satisfaction, c) between time (linear) and participation status predicting amotivation, d) between time (linear) and competence need satisfaction predicting external regulation, and e) between time (linear) and competence need satisfaction predicting identified regulation.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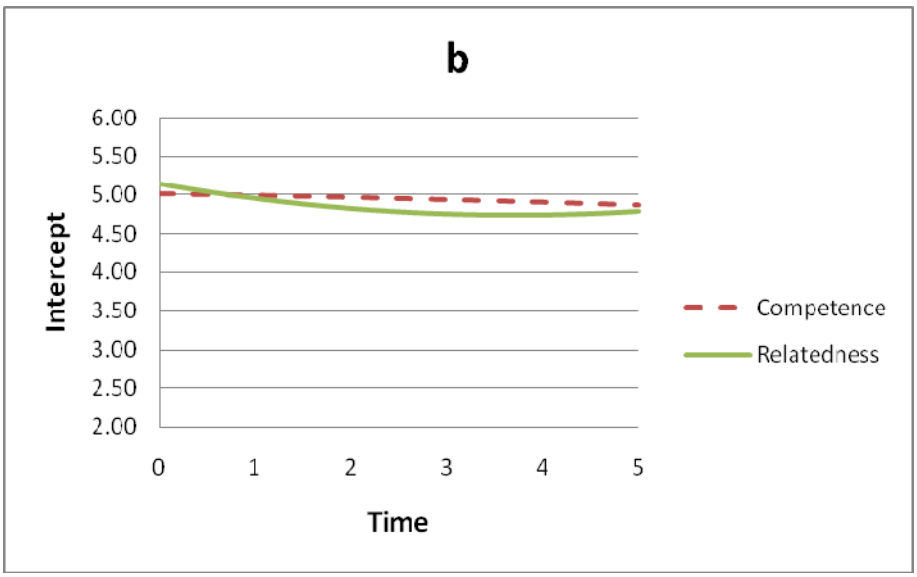
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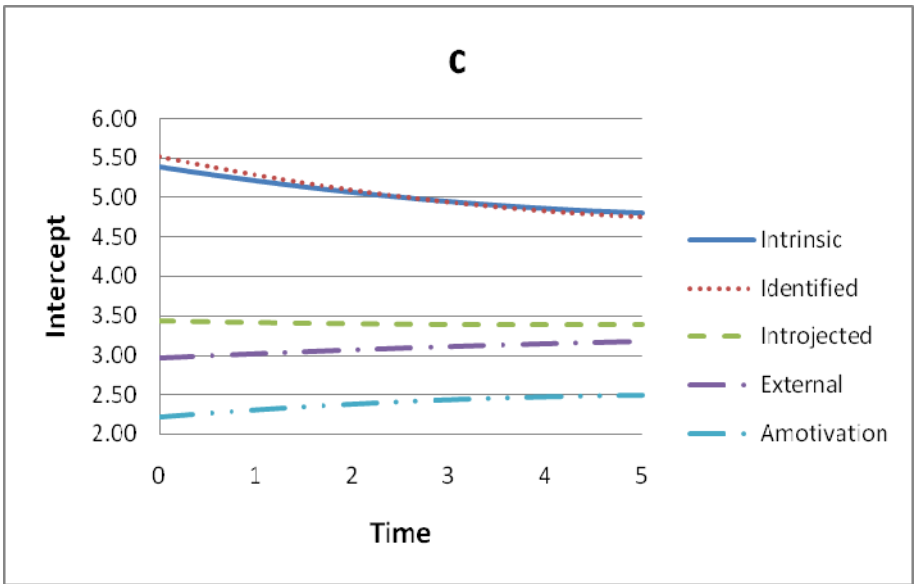
Relatedness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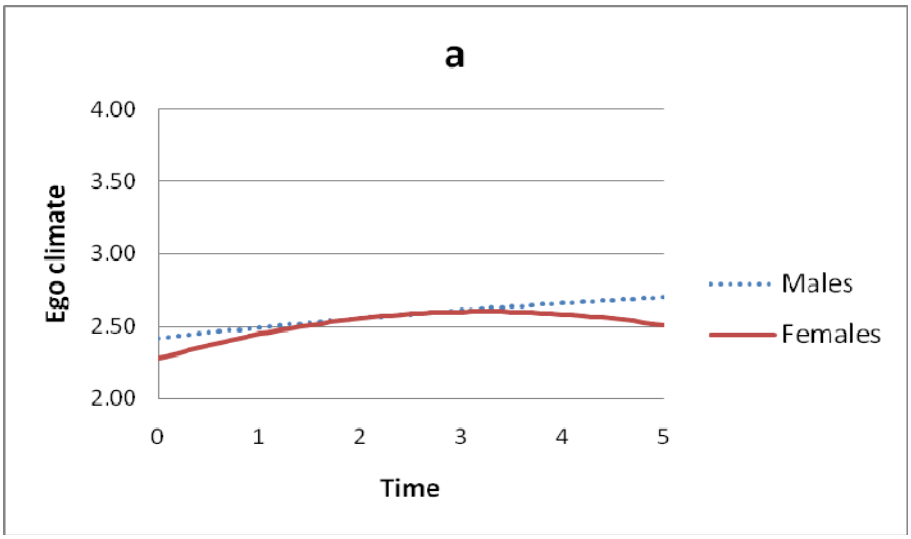
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
Intercept
0
1
2
3
4
5
Time
Intrinsic
Identified
Introjected
External
Amotivation


a
Ego climate
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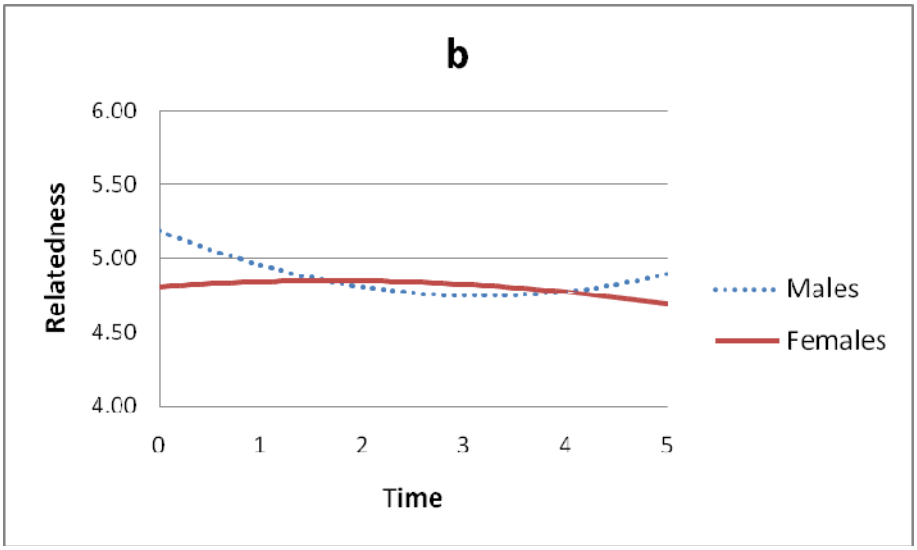
3.50
3.00
2.50
2.00
0
1
2
3
4
5
Time
Males
Females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Relatedness
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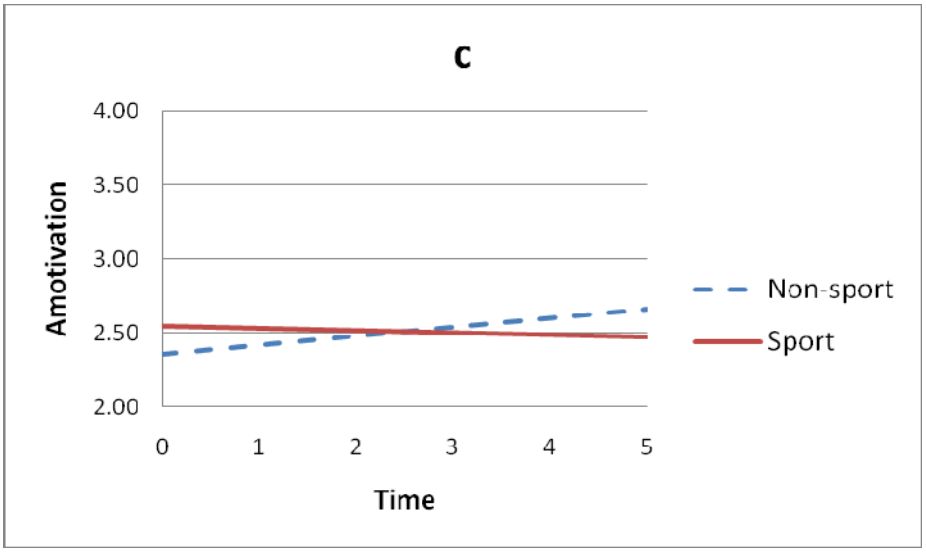
5.50
5.00
4.50
4.00
0
1
2
3
4
5
Time
Males
Females


c
Amotivation
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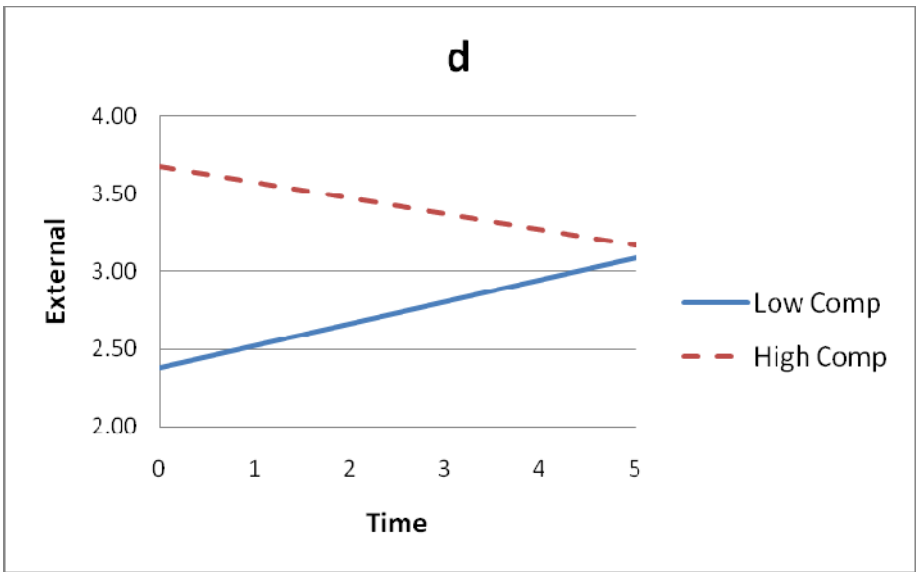
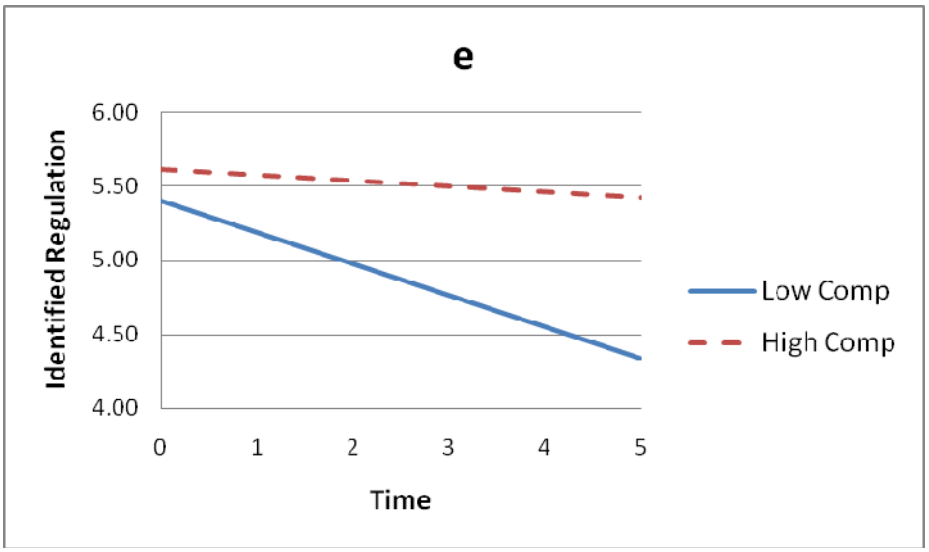
3.50
3.00
2.50
2.00
0
1
2
3
4
5
Time
Non-sport
Sport


d
4.00
3.50
3.00
2.50
2.00
External
0
1
2
3
4
5
Time
Low Comp
High Comp


e
6.00
5.50
5.00
4.50
4.00
Identified Regulation
0
1
2
3
4
5
Time
Low Comp
High Comp

Appendix

Table X

Means, Standard Deviations, and Cronbach Alpha Coefficients for All Variables Across the Three Grades of Greek Junior High School for Students who Completed All Six Assessments (n = 143).

Variable List	Beginning of first grade			End of first grade			Beginning of second grade			End of second grade			Beginning of third grade			End of third grade		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α
Task climate	4.07	.65	.71	3.81	.84	.83	3.69	.80	.76	3.56	.94	.87	3.48	.91	.85	3.44	.93	.86
Ego climate	2.33	.81	.71	2.30	.84	.75	2.48	.87	.77	2.57	.93	.76	2.57	.92	.79	2.59	.89	.78
Competence N.S.	5.04	1.09	.72	5.03	1.13	.72	4.95	1.10	.66	4.86	1.14	.82	4.89	1.05	.68	4.48	1.05	.65
Autonomy N.S.	3.59	1.59	.50	3.77	1.54	.55	3.66	1.64	.52	3.67	1.63	.66	3.46	1.52	.57	3.58	1.54	.54
Relatedness N.S.	5.24	1.42	.65	5.29	1.36	.72	4.77	1.50	.72	4.87	1.54	.71	4.91	1.55	.77	4.93	1.50	.75
Amotivation	1.98	1.20	.80	2.04	1.33	.83	2.33	1.45	.86	2.19	1.44	.86	2.17	1.36	.85	2.25	1.40	.85
External Reg.	2.90	1.52	.74	2.86	1.56	.77	3.05	1.59	.80	2.89	1.60	.82	2.98	1.63	.82	2.96	1.57	.81
Introjected Reg.	3.30	1.36	.63	3.19	1.41	.65	3.33	1.40	.65	3.14	1.35	.66	3.28	1.48	.73	3.20	1.40	.70
Identified Reg.	5.59	1.08	.70	5.32	1.22	.70	5.13	1.25	.70	5.17	1.38	.79	4.87	1.43	.78	4.88	1.38	.77
Intrinsic Motivat.	5.52	1.33	.83	5.40	1.37	.81	5.10	1.46	.81	5.24	1.33	.78	4.90	1.40	.78	4.96	1.41	.80

Note: N.S. = Need Satisfaction

Table X
Intercorrelations Among the Study Variables in the First Grade

	Task climate	Ego climate	Relatedness N.S.	Competence N.S.	Amotivation	Intrinsic Motivation	Identifi-cation	Introjection	External regulation
Task climate	1	-.18**	.44**	.25**	-.30**	.53**	.45**	-.05	-.26**
Ego climate	-.23**	1	-.11*	.05	.35**	-.05	.02	.34**	.36**
Relatedness N.S.	.49**	-.15**	1	.37**	-.23**	.46**	.40**	.02	-.19**
Competence N.S.	.33**	-.04	.41**	1	-.17**	.39**	.35**	.11*	-.15**
Amotivation	-.29**	.27**	-.33**	-.30**	1	-.40**	-.35**	.32**	.66**
Intrinsic Motivation	.56**	-.16**	.53**	.42**	-.35**	1	.70**	.05	-.33**
Identification	.54**	-.12*	.52**	.47**	-.36**	.75**	1	.16**	-.20**
Introjection	-.04	.29**	-.08	-.06	.37**	.08	.13*	1	.52**
External regulation	-.22**	.39**	-.27**	-.22**	.61**	-.24**	-.13*	.65**	1

Note: * $p < 0.05$ ** $p < 0.01$
The upper diagonal presents the intercorrelations at the beginning of the grade and the lower diagonal presents the intercorrelations at the end of the grade.

Table X
Intercorrelations Among the Study Variables in the Second Grade

	Task climate	Ego climate	Relatedness N.S.	Competence N.S.	Amotivation	Intrinsic Motivation	Identifi-cation	Introjection	External regulation
Task climate	1	-.33**	.22**	.27**	-.27**	.52**	.45**	-.03	-.25**
Ego climate	-.25**	1	-.03	-.01	.38**	-.20**	-.12*	.35**	.42**
Relatedness N.S.	.23**	.01	1	.28**	-.17**	.40**	.36**	.14**	-.10
Competence N.S.	.17**	-.05	.36**	1	-.28**	.42**	.47**	.08	-.12*
Amotivation	-.21**	.30**	-.20**	-.34**	1	-.46**	-.39**	.38**	.62**
Intrinsic Motivation	.56**	-.10	.45**	.43**	-.45**	1	.72**	.03	-.33**
Identification	.51**	-.01	.38**	.42**	-.35**	.72**	1	.09	-.20**
Introjection	-.03	.29**	.10	.01	.46**	.01	.07	1	.59**
External regulation	-.27**	.40**	-.12	-.22**	.64**	-.36**	-.27**	.54**	1

Note: * $p < 0.05$ ** $p < 0.01$
The upper diagonal presents the intercorrelations at the beginning of the grade and the lower diagonal presents the intercorrelations at the end of the grade.

Table X
Intercorrelations Among the Study Variables in the Third Grade

	Task climate	Ego climate	Relatedness N.S.	Competence N.S.	Amotivation	Intrinsic Motivation	Identifi-cation	Introjection	External regulation
Task climate	1	-.24**	.36**	.28**	-.31**	.54**	.50**	.03	-.31**
Ego climate	-.31**	1	-.04	-.05	.27**	-.15**	-.10	.32**	.34**
Relatedness N.S.	.38**	-.02	1	.28**	-.25**	.52**	.50**	.09	-.21**
Competence N.S.	.38**	-.07	.37**	1	-.34**	.41**	.44**	.13*	-.21**
Amotivation	-.34**	.32**	-.24**	-.36**	1	-.43**	-.40**	.27**	.64**
Intrinsic Motivation	.55**	-.16**	.50**	.50**	-.41**	1	.77**	.01	-.49**
Identification	.52**	-.12*	.48**	.51**	-.38**	.75**	1	.15**	-.39**
Introjection	.06	.31**	.19**	.10	.29**	.14*	.26**	1	.47**
External regulation	-.28**	.33**	-.14**	-.29**	.65**	-.41**	-.32**	.44**	1

Note: * $p < 0.05$ ** $p < 0.01$
The upper diagonal presents the intercorrelations at the beginning of the grade and the lower diagonal presents the intercorrelations at the end of the grade.