EXAMINING TEST EMOTIONS IN UNIVERSITY STUDENTS: ADAPTATION OF THE TEST EMOTIONS QUESTIONNAIRE IN THE GREEK LANGUAGE

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Abstract: Achievement emotions are an indispensable component of learning situations. This study aimed at adapting the Test Emotions Questionnaire (TEQ, Pekrun et al., 2004) in the Greek language in order to examine how achievement emotions are shaped in a different educational context. Participants were 510 university students of both genders. The TEQ assesses eight positive and negative test-related emotions. The instrument's validity and internal consistency were examined. Overall, it was found that the Greek version of the TEQ had adequate psychometric properties. The emotion scales had good internal consistency and acceptable validity in terms of factor structures and relations to other individual variables, such as academic self-efficacy, learning strategy use and psychosocial adaptation to university. The study provides further evidence in regard to the conceptualization of emotions in a different language and educational setting.

Key words: Academic self-efficacy, Achievement emotions, Learning strategies, Test emotions

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INTRODUCTION

A notable bulk of research on emotions in academic settings has shown that students' emotions interact with cognitive processing, motivation, other affective factors and students' learning behaviors, thus, supporting or impeding learning and achievement outcomes (e.g., Efklides & Volet, 2005; Linnebrink-Garcia & Pekrun, 2011; Pekrun & Linnebrink-Garcia, 2014; Schutz & Pekrun, 2007). Moreover, emotions and affect relate to students' academic engagement, their educational decisions, adaptation and social interactions in the classroom, and to perceived health problems (Baker, 2004; Linnenbrink-Garcia & Pekrun, 2011; Schutz, Hong, Cross, & Osbon, 2006).

Pekrun and his collaborators developed a theoretical and research framework for examining emotions in education from a socio-cognitive perspective (e.g., Pekrun 2009; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Pekrun & Perry, 2013). In the control-value theory, *achievement emotions* are defined as emotions that are directly linked to achievement activities or achievement outcomes (Pekrun, 2009). Emotions are conceptualized in terms of *valence* (positive vs. negative) and *activation* (activating vs. deactivating). Furthermore, close links between a learner's individual appraisals, achievement emotions, engagement, learning behaviors and academic performance are assumed (Pekrun, 2006, 2009).

Antecedents of achievement emotions: Self-efficacy

The control-value theory (Pekrun, 2006) posits that students' emotions are determined by their control- and value appraisals. Control appraisals are best represented by academic self-efficacy (Pekrun, 2009; Pekrun, Goetz, Perry, Kramer, & Hochstadt, 2004). Several studies have shown that high self-efficacy expectations tend to relate positively to positive emotions and negatively to negative emotions (DeCuir-Gunby, Aultman, & Schutz, 2009; Goetz, Frenzel, Stoeger, & Hall, 2010). For example, Pekrun et al. (2004) reported that university students' self-efficacy and perceived academic control were positively related to test-related joy, hope, and pride, whereas negative correlations were found for negative test emotions. A number of other studies examined either students' general academic emotions or class-related emotions in relation to various self-constructs regarding academic abilities or efficacy beliefs. Specifically, it was reported that students with higher self-concept beliefs tend to feel joy and pride (Frenzel, Pekrun, & Goetz, 2007; Goetz, Cronjaeger, Frenzel, Ludtke, & Hall, 2009). Previous studies also showed that Greek university students' competence beliefs affected their class-related emotions, and their predictive power varied across academic courses and within each academic course (Stephanou,

Kariotoglou, & Dinas, 2011; Stephanou & Kyridis, 2012). Similarly, Chatzistamatiou, Dermitzaki, Efklides, and Leondari (2015) found that maths self-efficacy beliefs in elementary students affected their reported enjoyment of mathematics learning. Furthermore, both Artino, La Rochelle, and Durning (2010) in a research among medical students and Bembenutty, McKeachie, and Lin (2000) reported that high academic self-efficacy beliefs were negative predictors of anxiety. Moreover, Pekrun (2006) conjectured that the relation between academic self-efficacy and emotions is stronger for outcome-related emotions, such as pride and anxiety, than for activity-related emotions, like enjoyment of learning or anger towards the demands of the academic environment.

Achievement emotions and learning strategies

Achievement emotions are assumed to exert effects on student achievement via their effects on the use of learning strategies, motivation, and self-regulation (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Pekrun et al., 2004). The claim is that positive academic emotions facilitate the use of flexible, creative learning strategies such as elaboration, organization, critical evaluation, and metacognitive monitoring. Negative emotions, on the other hand, trigger the use of more rigid strategies, such as simple rehearsal and reliance on algorithmic procedures (Pekrun, Goetz, Titz, & Perry, 2002). Pekrun et al. (2002) in a series of seven cross-sectional, three longitudinal, and one diary-based study with university and school students found that positive emotions, with the exception of relief, related positively to metacognitive strategies such as elaboration, organization, and critical thinking. Relations between negative emotions and flexible learning strategies were negative but weaker and less consistent. These findings suggest that positive academic emotions facilitate flexible, creative modes of thinking. An alternative interpretation would be that creative learning is more enjoyable. Concerning more rigid ways of learning, most of the correlations with rehearsal strategies were near zero for both positive and negative emotions. However, in some of their data sets, Pekrun et al. (2002) found significant positive correlations between anger, anxiety, and shame, on the one hand, and use of rehearsal strategies, on the other. In line with theoretical predictions, these findings suggest that negative activating emotions may facilitate the use of specific kinds of learning strategies, even if such effects do not appear in a consistent way when self-report measures of learning strategies are used.

It has been also claimed that achievement emotions are related to various dimensions of student academic life and subjective well-being, such as adaptation to college. It has been shown that student adaptation to university is related positively

to their positive emotions, such as enjoyment, satisfaction, and hope, and negatively to negative emotions, such as anxiety, helplessness, and despair (Baker, 2004; Beyers & Goossens, 2002; Sasaki & Yamasaki, 2007). Halamandaris and Power (1999) showed that university students' positive emotions of hope and enjoyment were associated with positive adaptation while negative emotions of loneliness and fear were associated with negative adaptation. Pancer, Hunsberger, Pratt, and Alisat (2000) and Wintre and Yaffe (2000) reported that perceived stress was a significant predictor of students' overall adjustment. Skowron, Wester, and Azen (2004) and Fiedlander, Reid, Shupak, and Cribbie (2007) also showed that lower college stress predicted greater overall, academic, personal-emotional, and social adjustment in college. Hernández et al. (2016) found that positive emotions indirectly predicted higher academic adjustment. Finally, negative academic emotions were found to longitudinally predict students' quitting university courses (Ruthig, Hladkyi, Hall, Pekrun, & Perry, 2002); negative emotions were also significantly higher in students who dropped out of university compared to students who finished their studies (Ziegler, 2001).

The measurement of achievement emotions

In order to effectively assess emotions in education, multiple methods and well elaborated instruments are needed. As Linnenbrink-Garcia and Pekrun (2011, p. 1) underlined "...it is essential that research in this area defines and assesses emotions in a clear and consistent manner". In line with the control-value theory, a battery of questionnaires assessing emotions in the academic domain was developed. The *Achievement Emotions Questionnaire* (AEQ, Pekrun, Goetz, & Perry, 2005; Pekrun et al., 2011) focuses on relatively stable emotional responses in academic settings. It assesses students' habitual, trait-like achievement emotions experienced across academic achievement situations. Previous research using the AEQ has shown that achievement emotions were predictive of students' academic achievement, course enrollment, and dropout rates (e.g., Pekrun et al., 2004; Pekrun et al., 2005; Pekrun et al., 2002). The AEQ includes three distinct scales assessing multiple achievement emotions in specific learning situations: during individual studying (learning-related emotions), during class learning (class-related emotions), and during test-taking and exams (test-related emotions). Pekrun et al. (2011) provided evidence that the AEQ is a reliable, internally and externally valid instrument. The conceptualization of discrete emotions that occur in different achievement settings, namely, study-related, class-related, and test-related emotions, (i.e., three distinct scales) was supported.

The Test Emotions Questionnaire

In the present study, we focused on the third part of the AEQ, the *Test Emotions Questionnaire* (TEQ, Pekrun et al., 2004; Pekrun et al., 2005) assessing university students' test-related emotions. In colleges and universities, tests and exams are among the most important achievement situations and the main means to assess students' learning outcomes. Moreover, tests and exams can sometimes be critical for students' further education and professional career. Therefore, tests can trigger various emotions before, during, and after an exam procedure. *Test emotions* are defined as "...emotions subjectively relating to taking tests and exams... (they) can be experienced at any time before, during, or after test taking." (Pekrun et al., 2004, p. 290). The TEQ (Pekrun et al., 2004, 2005) is a self-report instrument designed to assess students' typical, individual emotional reactions experienced in academic achievement situations, especially when writing tests and taking exams (trait achievement emotions). In terms of valence and activation, the TEQ includes positive activating emotions (enjoyment, hope, pride), positive deactivating emotions (relief), negative activating emotions (anger, anxiety, shame), and negative deactivating emotions (hopelessness). Moreover, there is a conceptual differentiation between activity-related emotions (enjoyment, anger) and outcome-related emotions (hope, pride, relief, anxiety, shame, hopelessness, and sometimes anger) that pertains to the object of the achievement emotions (Pekrun, 2009). Items in the TEQ are ordered in three units assessing emotional experiences before, during, and after taking a typical test or exam.

Each emotion assessed is viewed as a set of interrelated psychological processes that comprise four different components: cognitive, affective, motivational, and physiological. Regarding these components, Pekrun et al. (2011, p. 37) clarified: "...anxiety can comprise uneasy and tense feelings (affective), worries (cognitive), impulses to escape from the situation (motivational), and peripheral activation (physiological)" (see Appendix). Such a conception is in line with contemporary component-process models of emotions (Scherer, 2001) addressing affective, cognitive, and physiological facets, such as the component models of test anxiety (Zeidner, 1998).

Regarding the TEQ, various studies provided evidence of its psychometric characteristics. The instrument's reliability, structural and external validity have been supported with samples of students from Germany and Canada (e.g., Pekrun et al., 2004; Pekrun et al., 2011). Cronbach's alphas were reported to be above .77 for the eight emotion scales examined. Pekrun et al. (2004) using a series of confirmatory factor analyses for each emotion scale separately showed that the theoretical conception of distinct components in each emotion is valid.

Concerning the antecedents and outcomes of test-related emotions, these are determined by students' control- and value-related appraisals, such as academic self-efficacy. The emotions then can affect students' adaptation and achievement through mediating variables, such as strategy use (Pekrun, 2009; Pekrun et al., 2011). Pekrun et al. (2004) reported significant and consistent relations of the TEQ scales to academic self-efficacy, interest and effort, strategy use, self-regulation of learning, and academic achievement, findings that are consistent with the theoretical predictions.

Gender effects

Past research on students' emotions showed consistent differences between genders mainly in anxiety. It was found that females report significantly higher test anxiety than males (e.g., Zeidner, 1998). Studies using the TEQ scales also reported gender differences. Pekrun et al. (2004) and Pekrun et al. (2011), with German and Canadian students respectively, found that female students had higher test anxiety in comparison to male students. In addition, girls reported more test-related relief, more shame and more hopelessness (Pekrun et al., 2004) and less test-related hope (Pekrun et al., 2011) than boys. These findings, however, were not consistent across studies and the effect size of these differences was small. Therefore, it seems that it is academic anxiety that differentiates female and male students rather than other test-related emotions.

Aim and hypotheses of the study

The above mentioned studies administered the original TEQ to German university students and a translated English version to North-American (Canadian) participants (Pekrun et al., 2004; Pekrun et al., 2011). The aim of the present study was to adapt the TEQ in the Greek language and to examine the psychometric qualities of the Greek version. As far as we know, this is the first study that administered the TEQ in Greek university students. It is important to adapt the TEQ in Greek because there is a lack of reliable and valid instruments that assess achievement emotions in Greek university students. Furthermore, evidence from Greek students can extend our understanding on how multiple emotions are shaped in a different educational context. Tertiary education in Greece and Germany share many characteristics; however, there are also differences between the two educational systems. For example, students in German universities usually take mid-studies exams at the end of the second year of studies and admission to the next phase is contingent on passing these exams (Pekrun et al., 2004, p. 298) while in Greece this is not the case.

Based on previous findings, it was assumed that the Greek version of the TEQ will present good internal consistency (Hypothesis 1a) and the theoretical conception of discrete test emotions with discrete components each will be supported (Hypothesis 1b). Moreover, it was assumed that positive test-related emotions would positively correlate and negative emotions would negatively correlate with academic self-efficacy, strategy use, and adaptation to university (Hypothesis 2). Finally, it was expected that female students should report more test-related anxiety in comparison to male students (Hypothesis 3).

METHOD

Description of the Test Emotions Questionnaire

The Test Emotions Questionnaire (TEQ, Pekrun et al., 2004) assesses four positive emotions (enjoyment, hope, pride, and relief) and four negative emotions (anger, anxiety, hopelessness, and shame). The eight test emotion scales consist of 77 items. Specifically, anxiety consists of 12 items, hopelessness 11 items, each of the shame, anger, enjoyment, and pride scales 10 items, hope eight items, and relief six items. Each emotion is assessed with reference to its cognitive, affective, motivational, and physiological component. Exceptions are hope and relief scales. Hope includes an affective, a cognitive, and a motivational component and relief includes an affective and a physiological component (Pekrun et al., 2004). Examples are given in the Appendix. Answers are given on a 5-point Likert-type scale from 1 (Strongly disagree) to 5 (Strongly agree).

Overview of the adaptation procedure of the TEQ in the Greek language

The adaptation of TEQ in the Greek language proceeded as follows. First, a bidirectional translation of the TEQ was completed. Second, tests of face and content validity of the instrument took place. Third, an exploratory study aiming at a preliminary examination of the psychometric properties of the instrument was conducted. Finally, a second study examining the instrument's internal reliability, construct validity, and external validity was conducted.

Translation
The TEQ was translated from English to Greek independently by two persons fluent in both languages who finally agreed on a common translated version of the

questionnaire. Back translation from Greek to English was also done from a person fluent in English. Comparison between the two English versions, the original and the translated one, resulted in changes and corrections of the Greek translation.

Face validity

The Greek version of the TEQ was, firstly, administered to four postgraduate students in a group interview. The researcher was reading item by item and the students commented on their understanding of it. A few changes were decided to be done in the wording of some items that seemed to facilitate the grasp of the original meaning. Next, 12 undergraduates completed individually the translated TEQ and commented on the item wording. After these two steps, alterations in the wording of 30 items were made according to the students' comments. Moreover, based on the students' comments, it was decided to employ the response scale 1 (Totally untrue for me) to 5 (Totally true for me) instead of the original 1 (Strongly disagree) to 5 (Strongly agree).

Content validity

Definitions of each of the scales of the eight emotions assessed in the TEQ were given to five expert judges, all psychologists with Master's or doctoral degrees. The judges made two judgments for each item. First, they had to match each item of the TEQ to the emotion they assumed it represented. Second, the judges rated each item on a 7-point scale asking how well the sentence represents the emotion to which it was allocated. Following the comments of the judges, alterations in the wording of 13 items were made.

EXPLORATORY STUDY

This study aimed at a preliminary examination of the psychometric properties and possible improvement of item wording, if needed, of the Greek version of TEQ as adapted in the initial phase. Participants were 147 students (116 females) from the Departments of Primary Education, Special Education, and Planning and Regional Development of the University of Thessaly, a medium-sized University of central Greece. Their mean age was 20.26 years (SD = 1.25).

Results and Discussion

Descriptive statistics, Cronbach's alpha, mean inter-item correlations of the emotion scales and the component subscales (cognitive, affective, motivational, and

physiological), and Pearson *r* correlation coefficients between the TEQ emotion scales were calculated. The emotion scales had Cronbach's alpha ranging from .78 to .91, which denote satisfactory to high internal consistency. Regarding the interrelations of the scales, the Pearson *r* correlation coefficients between positive emotions were .32 < *r* < .71 and between negative emotions .49 < *r* < .75.

The results of the exploratory study suggested that a rewording of eight items of TEQ was needed. The statistical criteria taken into account were the Cronbach's alpha of each component subscale, the mean inter-item correlation within each component subscale, and the mean item-total correlation within the whole emotion scale.

MAIN STUDY

This second study aimed at examining the psychometric properties of the Greek version of TEQ in a larger sample of university students. In order to test TEQ's external validity, the relations of students' test emotions with their academic self-efficacy, psychosocial adaptation to university, and learning strategies used were examined.

Participants and procedure

Participants were 550 students of the University of Thessaly, Greece. After checking the students' answers, 510 completed questionnaires were finally retained for statistical analyses. The students' mean age was 21.12 years (*SD* = 2.62). Two hundred and fifteen students (42.2%) were males and 295 (57.8%) were females. Participants were from the School of Humanities (*n* = 133), the School of Engineering (*n* = 131), the Department of Physical Education and Sport Science (*n* = 110), the Department of Economics (*n* = 65), the School of Medicine (*n* = 43), and the Department of Agriculture and Rural Environment (*n* = 28). Paternal occupation was ranked at the middle socio-economic level (38.2%) while 46.8% of the mothers were either housewives or their occupation was ranked at the low socio-economic level.

Data were gathered during the spring semester and during regular classes. The teaching staff gave permission to the researchers to distribute the questionnaires in the beginning or in the end of their weekly course. The students responded to the questionnaires voluntarily and anonymously after having being informed on the objectives of the study. Completion of the scales of the study lasted about 20 minutes.

Instruments

Test Emotions Questionnaire-Greek

The TEQ-Greek included eight emotions scales and 77 items overall (before a test or exam: 25 items, during a test or exam: 27 items, after a test or exam: 25 items). Each emotion was assessed by means of 6 to 12 items as in the original questionnaire.

Academic self-efficacy

Students' academic self-efficacy was assessed with 7 items of the "Self-efficacy" subscale of the Students' Motivation Towards Science Learning questionnaire (SMTSL, Tuan, Chin, & Shieh, 2005; Adaptation in the Greek language by Dermitzaki, Stavroussi, Vavougyios, & Kotsis, 2013). The "Self-efficacy" scale taps students' beliefs about their own ability to achieve a good performance in science learning tasks. An example item is: "Whether the (science) content is difficult or easy, I am sure I can understand it". The original seven items in the present study were reworded in order to refer generally to the various university subjects and not particularly to science. Answers were given on a 5-point Likert-type scale from 1 (Strongly disagree) to 5 (Strongly agree). Cronbach's alpha of the scale was .82.

Learning strategies

Students' use of learning strategies during learning in university was assessed with eight items of the Active Learning Strategies subscale of the SMTSL questionnaire presented above (Tuan et al., 2005). The Active Learning Strategies subscale assesses students' active participation in their learning through a variety of strategies aiming at constructing new knowledge based on prior understanding. An example item is: "When learning new concepts, I attempt to understand them". The original eight items were reworded in the present study in order to refer generally to the various university subjects and not particularly to science. Answers were given on 5-point Likert-type scale from 1 (Strongly disagree) to 5 (Strongly agree). The Cronbach's alpha for this scale was .79.

Adaptation to the university

The College Adaptation Questionnaire (CAQ, Crombag, 1968; Klip, 1970; adaptation in the Greek language by Gadona, Stogiannidou, & Kalantzi-Azizi, 2005) assesses psychosocial adjustment to the university environment. It consists of 18 statements. Students answer on a 7-point Likert-type scale. Eight statements indicate good adjustment and 10 statements indicate the lack of it (reversed items). An example

item is: "I am very satisfied with the course of my studies". The Cronbach's alpha of
the scale in the present study was .85.

RESULTS

Reliability

In order to test the internal consistency reliability of the TEQ (Hypothesis 1a),
Cronbach's alpha and mean inter-item correlations for each emotion scale were
calculated. Table 1 depicts the descriptive statistics, Cronbach's alpha, and mean
inter-item correlations for the emotion scales.
As shown in Table 1 the internal consistency of the eight emotion scales ranged from
good to excellent in terms of Cronbach's alpha, $.78 < α < .90$, and mean inter-item

Table 1. Descriptive statistics, mean inter-item correlations, Cronbach's α, and Pearson's r correlation coefficients for the Greek TEQ (N = 510)

Emotion	Items	Min.	Max.	Mean	SD	Mean r (inter-item)	Cronbach's α	Academic self-efficacy	Learning strategies	Adaptation
1. Enjoyment	9	1.11	4.44	2.52	.62	.29	.78	.30**	.34**	.27**
2. Hope	8	1.00	5.00	3.31	.69	.47	.88	.49**	.35**	.44**
3. Pride	10	1.10	5.00	3.26	.67	.40	.87	.34**	.37**	.34**
4. Relief	6	1.17	5.00	3.55	.81	.39	.78	.04	.22**	.10*
5. Anger	10	1.00	4.92	2.55	.74	.35	.84	-.37**	-.14**	-.34**
6. Anxiety	12	1.00	5.00	2.56	.74	.35	.87	-.35**	-.09*	-.33**
7. Hopelessness	11	1.00	4.00	1.95	.68	.44	.90	-.59**	-.29**	-.49**
8. Shame	10	1.00	4.64	1.76	.67	.42	.87	-.54**	-.23**	-.42**

$* p < .05$, $** p < .01$

correlation, $.29 < r < .47$. Moreover, means show that it is not only anxiety, but a
variety of emotions that are triggered in relation to tests and exams in the university.
In addition, students scored higher on positive emotions than on negative emotions,
$F(4, 504) = 510.724$, $p < .001$, partial $η^2 = .802$.

Structural validity

In order to test Hypothesis 1b, namely, that there would be specific test-related
emotions with discrete components each, Confirmatory Factor Analysis (CFA) was
conducted to test the structural validity of the questionnaire. The EQS (Structural
Equation Modelling Software) Version 6.1 for Windows statistical program (Bentler,
2005) and the maximum likelihood method were used. The goodness-of-fit of the

estimated models was evaluated using the following indicators: χ^2 test, Bentler-Bonnet Normative Fit Index (BBNFI), Bentler-Bonnet Non-Normative Fit Index (BBNNFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999; Marsh, Balla, & Hau, 1996).

Different structural models were tested. All the emotions examined were inserted in each CFA model tested. Mean composite scores were calculated representing the components of each emotion scale, that is, affective, cognitive, motivational, and physiological components. In Model 1, the component scores were explained by eight different emotions/factors. Model 1 was a simple eight-factor model positing first-order factors for enjoyment, hope, pride factor, relief, anger, shame, anxiety, and hopelessness. Covariances between the latent factors were also included. The fit of this model was not satisfactory, $\chi^2(531, N = 547) = 1710.580$, $p < .001$, BBNFI = .820, BBNNFI = .828, CFI = .851, SRMR = .088, RMSEA = .087.

After testing Model 1, a different approach for the testing of TEQ's structure was adopted. The eight latent factors/emotions tested in Model 1 were considered as nested within a higher-order general factor supposed to represent students' general emotional response to tests and exams. The nested-factor model (NF-model) technique allows directly specifying the relations between observed variables and orthogonal latent variables (factors) of different degrees of generality. Using this technique allows achieving a decomposition of observed variables' variance in components of variance from sources of different degrees of generality (Gustafsson, 1994). The NF-model has the advantage of allowing more straightforward interpretations while, in contrast, in the higher-order models "...the general factor stands in a more remote and indirect relationship with the observed variables" (Gustafsson, 1994, p. 58). Model 2 was a NF-model with a common "general emotional response" factor and the eight factors of Model 1 accounting for the variance of the 29 composite component scores. The fit of Model 2 was not satisfactory, $\chi^2(348, N = 547) = 2025.009$, $p < .001$, BBNFI = .787, BBNNFI = .785, CFI = .816, SRMR = .120, RMSEA = .097. The next step was to test Model 3 which was a NF-model that extended Model 2 by including covariances between the eight factors/emotions and 13 pairs of error covariances, as suggested by the Lagrange Multiplier Test. All covariances were statistically significant and the pairs of error covariances reflected relations either between components of positive emotions or between components of negative emotions. The rationale of Model 3 was that the general factor reflects a general emotional response indicative of students' emotions towards tests and exams, and the eight narrow factors are indicative of the eight different emotions examined by TEQ. Both the general factor and the specific emotion factors directly explained part of the variance of the emotion components. The fit indexes for the Model 3 were, $\chi^2(306, N = 547) = 826.085$, $p < .001$, BBNFI = .913, BBNNFI = .924, CFI = .943, SRMR = .045, RMSEA = .058. The fit of

Model 3 is acceptable. The BBFI, BBNNFI, CFI are above .90, and SRMR and RMSEA meet the statistical cut-off criteria for an acceptable fit (Hu & Bentler, 1999; Marsh et al., 1996). The full Model 3 is given in Table 2.

Table 2. The nested-factor model of the structural equation modelling of TEQ (Model 3)

	General factor	Enjoy-ment	Hope	Pride	Relief	Anger	Shame	Anxiety	Hopelessness	Error
Enjoy-A	-.10*	.61								.78
Enjoy-C	-.17	.75								.63
Enjoy-M	.23	.63								.74
Enjoy-P	.27	.67								.68
Hope-A	-.21		.81							.55
Hope-C	-.23		.86							.45
Hope-M	.05*		.79							.61
Pride-A	.05*			.83						.55
Pride-C	.18			.83						.52
Pride-M	.06*			.73						.67
Pride-P	.22			.69						.69
Relief-A	.21				.89					.40
Relief-P	.48				.41					.77
Anger-A	.25					.77				.58
Anger-C	.28					.60				.75
Anger-M	.13					.57				.81
Anger-P	.26					.59				.76
Shame-A	.27						.80			.52
Shame-C	.40						.77			.48
Shame-M	.32						.55			.77
Shame-P	.47						61			.63
Anxiety-A	.76							.34		.55
Anxiety-C	.47							.46		.75
Anxiety-M	.50							.60		.62
Anxiety-P	.74							.23		.63
Hopeles-A	.17								.84	.52
Hopeles-C	.15								.84	.53
Hopeles-M	.11*								.81	.57
Hopeles-P	.39								.61	.68

Covariances between factors	1.	2.	3.	4.	5.	6.	7.	8.
1. Enjoyment	-							
2. Hope	.77	-						
3. Pride	.83	.82	-					
4. Relief	.38	.40	.44	-				
5. Anger	-.39	-.39	-.24	-.21	-			
6. Shame	-.37	-.54	-.46	-.31	.57	-		
7. Anxiety	-.81	-.72	-.69	-.24	.70	.57	-	
8. Hopelessness	-.55	-.74	-.53	-.31	.68	.81	.84	-

Note 1: Loadings noted with an asterisk (*) were nonsignificant.

Note 2: The symbols A, C, M, and P stand for "Affective", "Cognitive", "Motivational", and "Physiological" components respectively.

Inspection of Model 3 suggests that the variance of the component scores was better explained by the respective specific factor/emotion than by the general emotional factor. However, three components of anxiety were better explained by the general emotional factor in comparison to the specific anxiety factor. Regarding the covariances between the factors, as expected, positive emotions were positively associated with each other and negatively with negative emotions.

Concurrent validity

The present study sought to replicate previous findings on the associations of test emotions with academic self-efficacy, learning strategies use, and adaptation to university with reference to a sample of Greek university students. It was expected that positive test-related emotions would positively correlate and negative emotions would negatively correlate with academic self-efficacy, learning strategy use, and adaptation to university (Hypothesis 2). Pearson's *r* correlation coefficients between the emotion scales and the individual variables examined are depicted in Table 1.

   As expected, positive emotions correlated significantly and positively with students' academic self-efficacy, the active learning strategies used, and their adaptation to university. An exception was relief that correlated weakly with the academic self-efficacy and students' adaptation to university (see also Pekrun et al., 2004 for similar results). Moreover, negative emotions correlated significantly and negatively with students' academic self-efficacy, active learning strategies use, and their reported adaptation to university. Specifically, students' test emotions correlated with academic self-efficacy, $.30 < r < -.59$, with the exception of relief, $r = .04$. Test emotions also correlated with active learning strategy use, $-.14 < r < .37$, with the exception of a weak but significant correlation for test anxiety, $r = .09$. They were also correlated with psychosocial adaptation to university life, $.27 < r < -.49$, with the exception of a weak but significant correlation for test relief, $r = .10$.

Gender differences

Based on previous literature, it was expected that female students would report more test-related anxiety in comparison to male students (Hypothesis 3). A Multivariate Analysis of Variance was performed on the data in order to investigate whether there are significant differences between male and female students' scores in the eight emotion scales. A significant multivariate effect of gender on test emotions was found, $F(8, 499) = 7.806$, $p < .001$, partial $\eta^2 = .11$. Between-subjects tests revealed significant differences between genders in anxiety, $F(1, 506) = 24.398$, $p < .001$,

partial η^2 = .046; relief, $F(1, 506)$ = 28.620, $p <$ .001, partial η^2 = .054, and pride, $F(1, 506)$ = 6.170, p = .013, partial η^2 = .012. In agreement with previous research, female students reported more anxiety, M = 2.70, SD = .75, regarding tests and exams in the university in comparison to male students, M = 2.37, SD = .68. It was additionally found that female students reported more relief, M = 3.71, SD =.75 vs. M = 3.33, SD = .83 for males, and more pride, M = 3.33, SD = .68 compared to male students, M = 3.18, SD = .66. However, the effect sizes of these differences were small.

DISCUSSION

The aim of this study was to examine the psychometric properties of the Greek version of the Test Emotions Questionnaire (TEQ, Pekrun et al., 2004; Pekrun et al., 2005). This kind of evidence adds to the ecological validity of the TEQ and to our understanding of the multiple emotions experienced in a different educational context. Moreover, there is a lack of well-elaborated reliable and valid instruments in Greece that assess achievement emotions in university students. Thus, adapting the TEQ in Greek can offer new insights regarding the contribution of affective factors in university students' learning and achievements. In the present study, we tested the instrument's internal consistency, face and content validity, structural validity, and concurrent validity.

A series of pilot studies tested the instrument's face validity, content validity, and initial psychometric characteristics with a small sample of students in order to refine the Greek translation of the English version of the TEQ. The main study showed that, overall, the Greek version of the TEQ had adequate psychometric properties and its characteristics were similar to those reported for the original German scale and the translated English North-American version (Pekrun et al., 2004).

Specifically, the Greek version of the TEQ scales have good internal consistency in terms of Cronbach's alpha, similar to the alphas reported in the Pekrun et al. (2004) study and slightly higher than the Pekrun et al. (2011) study, and inter-item correlations within each scale. Therefore, Hypothesis 1a stating that the TEQ will have good internal reliability was confirmed. Furthermore, the descriptive statistics showed that the whole set of test-related emotions are present in Greek university students, in agreement with previous studies. Moreover, students scored higher on positive emotions than on negative emotions.

Moreover, the TEQ had acceptable structural and concurrent validity. Regarding structural validity, Hypothesis 1b stated that the theoretical assumption that there are discrete emotions and each emotion consists of four components an affective, a

cognitive, a motivational and a physiological one would be confirmed (Pekrun, 2006). This hypothesis was supported to a large extent, though not fully. In the structural model confirmed, there was a General Emotional Response to tests factor that explained part of the variance of the discrete emotions' components. The emotion-specific factors explained higher percentage of the variance of their respective component scores than the General Emotional Response factor, with the exception of test anxiety. Three components of the anxiety factor were better explained by the General Emotional Response factor than by the specific anxiety factor. This finding may denote that in Greek participants the Anxiety factor does not stand as a distinct emotion factor or that anxiety is central or representative of students' affect towards tests and exams in the university. A future study should investigate the conceptual structure of the TEQ with other groups of students, university or younger. Recently, a validation study confirmed the basic conceptual structure of the AEQ addressed to Portuguese pre-adolescents (Peixoto, Mata, Monteiro, Sanches, & Pekrun, 2015). This was a shorter version with 48 items for both class-related and test-related emotions focusing on school mathematics.

Regarding the covariances between the specific emotion factors, as expected, positive emotions were positively associated with each other and negatively with negative emotions. Similar patterns of correlations between the emotions scales were reported by Pekrun et al. (2004, 2011). In our study, the pairs enjoyment-pride, enjoyment-hope, and hope-pride were associated, a finding that agrees with the high correlations reported in Pekrun's et al. (2004) study. Specifically, Pekrun et al. (2004, p. 305) argued that "Hope and pride can be regarded as specific variants of the primary emotion of joy, implying overlap between these constructs". Similarly, the covariance found between anxiety- hopelessness and shame-hopelessness replicates the respective correlations reported by Pekrun et al. (2004), who argued that these three emotions may share components and antecedents, and, therefore, they should correlate.

Hypothesis 2, stating that positive test-related emotions would positively correlate and negative emotions would negatively correlate with academic self-efficacy, active learning strategy use, and adaptation to university was confirmed in agreement with previous studies. Both the direction and the strength of the correlations between individual factors and test emotions found in our study are similar to those reported in the studies by Pekrun and associates, despite the different measures of academic self-efficacy and learning strategies used in the present study. Overall, the associations found attest to the concurrent validity of the Greek version of the TEQ as the predicted relations were supported.

Specifically, students' academic self-efficacy correlated significantly and positively

with their positive emotions and negatively with negative emotions (see also DeCuir-Gunby et al., 2009; Pekrun et al., 2004; Pekrun et al., 2011). An exception was the test-related relief that correlated weakly with all of the individual variables examined, replicating previous findings (see Pekrun et al., 2004). Pekrun et al. (2004) and Perkun et al. (2011) reported similar correlations between academic self-efficacy and test emotions. In our study, the strongest correlations observed were between students' academic self-efficacy, test-related hopelessness, and shame –negative correlations , and test-related hope –positive correlations. Strong correlations between self-efficacy, hope and hopelessness were also reported by both Pekrun et al. (2004) and Pekrun et al. (2011). These findings are in line with theoretical assumptions that academic self-efficacy seems to be more strongly associated with outcome emotions than with activity emotions (Pekrun, 2006).

Regarding the associations between test emotions and adaptive learning strategies use, the correlations found in the present study were statistically significant, though moderate. Significant correlations between emotion scales and flexible use of learning strategies were reported in past studies (Ahmed et al., 2013; DeCuir-Gunby et al., 2009; Pekrun et al., 2002). In previous studies, it was shown that positive emotions related positively to flexible, creative modes of thinking, such as use of elaboration and organization strategies. In our study, the correlations between positive emotions and use of active learning strategies appeared to be stronger in comparison to the respective correlations between negative emotions and active learning strategies use (see also Pekrun, 2006; Pekrun et al., 2011). Specifically, students' test-related pride, hope, and enjoyment had the strongest correlations with self-reported active learning strategy use in line with previous studies (e.g., Ahmed et al., 2013). As predicted by the control-value theory, one way to induce application of flexible learning strategies in students is to foster positive emotions in achievement settings.

Moreover, the hypothesis that students' positive emotions would relate positively and negative emotions negatively to adaptation to university was also supported. To our knowledge, there are no studies investigating the associations of a variety of test emotions with students' psychosocial adaptation to university. In our study, the highest correlations were observed, firstly, between students' test-related hopelessness and shame that were negatively related to good adaptation to academic life, and, secondly, between test-related hope that was positively correlated with good adaptation. Thus, outcome-related test emotions seem to play an important role in university students' psychosocial adaptation, either beneficial, in the case of hope, or detrimental, in the case of hopelessness and shame. Previous studies investigated the relations mainly between college stress and other measures of college adaptation, such as the Students' Adaptation to College Questionnaire (Baker & Siryk, 1987).

These studies reported negative correlations between college stress and adjustment (Pancer et al., 2000; Skowron et al., 2004; Wintre & Yaffe, 2000). Regarding positive emotions, happiness was found to correlate with adjustment in college (Halamandaris & Power, 1999).

Furthermore, in agreement with previous research on gender differences in students' test emotions, female students reported more anxiety in comparison to male students, thus supporting Hypothesis 3. Higher achievement anxiety for females in comparison to males is consistently found in literature (Goetz, Bieg, Lüdtke, Pekrun, & Hall, 2013; Pekrun et al., 2011; Zeidner, 1998). Additionally, Greek female students reported more relief and more pride regarding tests and exams in comparison to male students. However, the effect size of the above differences was small. More test-related relief, more shame and more hopelessness for girls in comparison to boys have been also reported by Pekrun et al. (2004), with small effect sizes as well — therefore, considered as non-systematic effects. Further investigation is warranted in order to detect the extent of gender differences on test emotions in Greek educational settings.

Overall, the present study supported to a large extent the cross-cultural equivalence of the TEQ's psychometric characteristics and the underlying component structure of test emotions, with the exception of test anxiety. The study tried to shed further light to our understanding of how multiple test emotions are shaped in a different educational context. Whether the findings of the study are due to the specific educational and cultural context, to the specific group of participants or to other factors remains an open question for the future. More data from representative samples of Greek students in different educational contexts, e.g., secondary education, are needed. Such findings would allow for more straightforward cross-cultural comparisons. The concurrent validity of the emotion scales should be further established in the future by examining their relations with similar constructs.

As regards the limitations of the study, a sample of students from different departments of a Greek university participated. The generalizability of the findings for Greece would be supported if the Greek version of TEQ was administered to samples from other universities as well. The structural invariance over contexts, time, age and gender remain to be investigated. In addition, as such data are correlational in nature, future longitudinal research could investigate the directions of the relations between students' test emotions and individual and contextual processes across various educational and learning settings. Finally, TEQ data could be combined in multi-method research designs with different kinds of measures, for example, combining students' self-reports with actual physiological and facial emotional signs in actual testing situations (Linnenbrink-Garcia & Pekrun, 2011).

The findings of this study have a number of practical implications. The TEQ can be a useful tool for psychologists, teachers, and researchers in assessing and understanding university students' test-related emotions. The instrument offers the possibility to identify person-centered profiles of test emotions to explain individual differences in learning situations. Furthermore, as the central assumptions of the control-value theory about the links between emotions, subjective appraisals and learning were supported, educators and psychologists should pay attention to the antecedents and consequences of affective factors for learning, performance and adaptation in university. Finally, TEQ could be used for evaluation purposes and in students' counselling and support of learning situations.

Certainly, more research is needed to understand how different contexts and cultures shape emotions and what are the effects of students' emotional experiences on their cognitive performance outcomes. Theoretically-grounded measurement instruments are required to assess achievement emotions in education providing a robust conceptualization of emotions across contexts, languages and cultures.

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APPENDIX

Table 1. Examples of TEQ items

Emotion Scale	Example item
Enjoyment	For me the test is a challenge that is enjoyable.
Hope	I am optimistic that everything will work out fine.
Pride	I'm proud of how well I mastered the exam.
Relief	I feel relief.
Anger	I wish I could freely express my anger.
Shame	I get embarrassed because I can't answer the questions correctly.
Anxiety	I am so anxious that I'd rather be anywhere else.
Hopelessness	I feel so resigned that I have no energy.

Table 2. Examples of emotion components

Emotion component	Example item
Anxiety – affective	Before the exam I feel nervous and uneasy.
Anxiety – cognitive	I worry whether the test will be too difficult.
Anxiety – motivational	I get so nervous I can't wait for the exam to be over.
Anxiety – physiological	I feel sick to my stomach.