Analysis of scientific research on test anxiety and other emotions identified in the academic field

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Abstract

The results of studies addressing the impact of emotions on the academic field support that affective states influence the motivational and cognitive processes that are relevant to cognitive performance. More specifically, it has been shown that mood and emotions facilitate congruent memory processes, suggesting that positive affective states can increase motivation in addressing tasks, while negative emotional states can increase motivation to avoid them. In the control- value theory, academic emotions are defined as the emotions directly associated with learning activities or school results. According to this theory, there are four groups of emotions identified: positive activating emotions (e.g. joy, optimism, pride); positive deactivating emotions (relaxation, satisfaction, relief); negative activating emotions (anger, frustration, anxiety, shame); and negative deactivating emotions (boredom, sadness, disappointment, despair). Students' anxiety, especially anxiety manifested in evaluative contexts - is one of the most studied emotions in the academic field, and has been addressed in more than 1,000 studies. Test anxiety is a serious problem for many of the students in gymnasiums and high schools. Even though large-scale studies have seen some decrease, nearly 33% of students experience anxiety over evaluation, and those with high levels of test anxiety don't achieve a very good academic performance. For students with test anxiety, both preparations for an examination and examination itself are causing a high level of worry and discomfort. As a result, affected students fail to meet their potential, and the results of evaluations do not represent them, or their real level of knowledge and learning.

Keywords: academic emotions; control-value theory; test anxiety; academic performance

Studies on academic emotions - literature review

Pekrun and collaborators (2002a) have defined academic emotions as "those emotions experienced in academic contexts that are associated with study and training

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activities." Such emotions, for example, relate to the pleasure of learning, the pride of success, or the anxiety about the evaluation. In the past, academic emotions have largely been neglected in the field of educational psychology research, with the exception of test anxiety Pekrun (2005) argued that students' emotions are multiple and much richer in nature than some traditional points of view suggest.

Previous studies classify academic emotions in terms of value/valence and activation (Pekrun, 2000; Pekrun et al., 2002a). Value refers to the extent to which emotions are considered positive or negative. Activation refers to the extent to which emotions are considered to be activating physiologically (e.g., optimism) or deactivating (e.g., relief). Based on these dimensions, there are four groups of emotions identified: positive activating emotions (e.g. joy, optimism, pride); positive deactivating emotions (e.g. relaxation, satisfaction, relief); negative activating emotions (e.g. anger, frustration, anxiety, shame); and negative deactivating emotions (e.g., boredom, sadness, disappointment, hopelessness).

In most of the conditions, it is assumed that positive activating emotions have positive effects on performance (Pekrun et al., 2002a, Pekrun, Goetz, Perry, Kramer, & Hochstadt, 2004), while negative deactivating emotions have negative effects (Pekrun, 2006; Daniels et al., 2009), in contrast, positive deactivating emotions and negative activating emotions are supposed to have ambivalent effects on cognitive motivation and processing (Pekrun, 2006; Ganotice, Datu, & King, 2016).

Linnenbrink (2007) studied how pleasant and unpleasant emotions contribute to the selection by the subjects of how to approach work tasks. She analyzed several laboratory studies concerned about unpleasant emotions and noted that they had led students to address the tasks received with more attention. However, the results obtained by Linnenbrink, Ryan, and Pintrich (1999) demonstrated that unpleasant emotions were negatively correlated with memory functions and learning.

In some of the studies, the results have shown that positive emotions, despite their potential for stimulating creativity, are often maladaptive for performance as a result of inducing unrealistic positive appraisals, thus promoting less analytical processing of information (Aspinwall, 1998 Pekrun et al., 2002b). As detailed in Pekrun's cognitive-motivational model (2006), positive deactivating emotions, such as relaxation or relief, may also have negative effects on performance, while positive

activating emotions, such as pleasure in accomplishing a task should have positive effects. The studies quoted above suggest that pleasure maintains cognitive resources and the focus on tasks; facilitates the processing of relational information; induces intrinsic motivation; and encourages the use of flexible learning strategies and self-regulation, thus exerting a likely positive effect on overall performance across many types of tasks. Instead, positive deactivating emotions such as relaxation and relief can reduce attention on tasks, and also have different effects on motivation by undermining it; but at the same time, it can reinforce it in terms of re-engagement in the tasks.

Emotions such as joy, optimism, and pride have been positively correlated with the interest, effort invested in studying and developing learning materials, and self-regulation of learning, and they support the positive relationship with academic performance (Pekrun et al., 2002a, 2002b, Frenzel, Thrash, Pekrun, & Goetz, 2007; Goetz, Frenzel, Pekrun, Hall, & Lüdtke, 2007; Pekrun, Elliot, & Maier, 2009). The same thing was highlighted by the results that correlated the positive overall affect with the students' cognitive involvement (Linnenbrink, 2007). However, some studies have obtained null relations between positive activating emotions (or affect), and students' personal involvement and their school outcomes (Linnenbrink, 2007, Pekrun, Elliot, & Maier, 2009).

Some studies (e.g. Zeidner, 1998, 2007) have shown that emotions such as anger, anxiety, and shame produce irrelevant thoughts on task, reduce the cognitive resources available, and undermine the intrinsic motivation of students. On the other hand, these emotions can induce motivation to avoid failure and facilitate the use of more rigid learning strategies. By implication, the effects on academic performance depend on the task's complexity, and for this reason, they can be variable, similar to the effects of positive deactivating emotions. More specifically, it has been demonstrated that anxiety affects performance in complex or difficult tasks that require cognitive resources, such as the difficult items of an intelligence test, while performance in mild, less complex and repetitive tasks is not affected (Hembree, 1988; Zeidner, 1998, 2007). According to the experimental results, studies in the field claim that anxiety manifested in the evaluative context correlates negatively with students' academic performance (Hembree, 1988; Zeidner, 1998). In explaining thecorrelative evidence, one must take into account the mutual causal link between emotion and performance. The relationship between anxiety

and the academic results obtained can be caused by the effects of success and failure on the development of test anxiety (Pekrun, 1992b). Moreover, there have been ambiguous results in some studies over the effect of test anxiety on the academic performance, and positive correlations have also been found. More precisely, anxiety is likely to have a negative effect on many students but can facilitate general performance in those who are more flexible and can use it in a productive way, through its motivational energy (Pekrun & Linnenbrink-Garcia, 2012).

Several studies have addressed the effects of negative emotions other than those related to anxiety. Similar to anxiety, the shame of failure also correlated negatively with the student's academic outcomes and was a negative predictor of performance in exams (Pekrun et al., 2004, 2009). Similarly, the anger towards academic activities has correlated negatively with academic performance (Pekrun et al., 2002a, Pekrun, Goetz, Perry, Kramer, & Hochstadt, 2004; Pekrun, Elliot, & Maier, 2009).

Unlike negative activating emotions, studies of boredom and hopelessness (deactivating emotions) have demonstrated that they affect performance by reducing cognitive resources, intrinsic and extrinsic motivation, and favoring superficial information processing (Pekrun et al., 2002a; Pekrun, Elliot, & Maier, 2009).

In conclusion, the results obtained from the studies indicate that students' emotions have major effects on their degree of involvement and academic results. Most often, the effects of emotions such as joy and pleasure to learn are beneficial, compared to the hopelessness and boredom that have been shown to correlate negatively with students' commitment to tasks. The effects of emotions such as anger, anxiety, and shame are more complex, but for most students, they certainly have unfavorable consequences.

The control-value theory of academic emotions

In the control-value theory (Pekrun et al., 2002a), academic emotions are defined as the emotions directly associated with learning activities or school outcomes. School results can be defined as simply as the quality of the activities or their outcomes evaluated in relation to standards of excellence (Heckhausen, 1991). Clearly, most of the emotions involved in learning and evaluating students refer to academic emotions because they are related to behaviors and results that are usually considered according to quality standards by themselves and others.

In few words, the control-value theory specifies that the determinants of emotions experienced in the academic context involve the student's appreciation of the control and the value/valence attributed to learning activities and their outcomes. In other words, the student is experiencing certain academic emotions when he or she feels that has the control over learning activities or their results that are considered to be important for themselves.

Subjective control over learning activities and their outcomes are assumed to depend on causal expectations and cause-effect tasks that involve appraisals of control. Three types of causal expectations are relevant (Pekrun, 1988): expectations of action-control, meaning that a learning activity can be initiated and performed successfully ("self-efficacy expectations", Bandura, 1977 apud Pekrun et al., 2007); action-outcome expectancies, that these activities lead to the results the student wants to achieve; and situation-outcome expectancies, the fact that these results take place in a given situation without an action of their own.

As for the subjective values/valences attributed to activities and results, the theory makes a distinction between intrinsic and extrinsic values. The intrinsic values/valences of activities refer to the appreciation of an activity for what it implies and signifies, even if it does not produce relevant results. The extrinsic values/valences refer to the instrumental utility of activities to produce results, and the manner in which they can, in turn, generate additional results (Heckhausen, 1991).

Past research on emotions encountered in the academic world has mostly focused on emotions related to the outcomes (Table 1). Examples of emotions related to the outcomes are joy and pride experienced by students when academic goals are attained, and frustration and shame when their efforts fail. The differentiation between the emotions involved in the academic context is accomplished in accordance with the object upon which the academic emotion is focused. In addition, academic emotions can be grouped according to their valence (positive vs. negative or pleasant vs. unpleasant), and the degree of activation involved (emotions that activate vs. deactivate). With these three dimensions, academic emotions can be organized into a three-dimensional taxonomy (Table 1; Pekrun et al., 2002a).

Table 1The three-dimensional taxonomy of academic emotions (Pekrun et al., 2002a)

	Positive / pleasant emotion		Negative / unpleasant emotion	
Object	Activating	Deactivating	Activating	Deactivating
Activity focus	Enjoyment	Relaxation	Anger Frustration	Boredom
Outcome focus	Joy Hope Pride Gratitude	Contentment Relief	Anxiety Shame Anger	Sadness Disappointment Hopelessness

It is assumed that the appraisals about ongoing academic activities, as well as the history and future outcomes, are of prime importance in this respect. This key element of the theory states that individuals experience specific academic emotions when they feel they have or not the control on academic activities and their results that are important to themselves, which implies that appraisals of control and values are the determinants of these emotions (Pekrun et al., 2007). (Pekrun et al., 2007).

If this is true, then the individual antecedents should primarily affect these emotions by influencing appraisals related to control and value. Examples of such antecedents are individual academic goals, as well as academic control and appraisals of the value. However, theory recognizes that emotions are also influenced by noncognitive factors, including genetic and physiological predispositions related to temperament. Regarding the determinants of social backgrounds, or, rather, from the socio-historical context, the theory assumes that factors that influence individual appraisals of value and control should affect the academic emotions of the individual.

Brief review of test anxiety concept

The Diagnostic and Statistical Manual IV defines the concept of test anxiety as being primarily an individual's concern with regard to negative assessment (DSM-IV:

American Psychiatric Association (APA), 1994) and falls under the category of "social phobias ".

Other authors (Sarason, 1980; Spielberger & Vagg, 1995) define test anxiety as the predisposition of an individual to react through a state of excessive concern, intrusive thoughts, mental disorganization, tension, and physiological activation at the moment that the person is exposed to an evaluative situation. Some of the consequences of the assessment that students perceive to be threatening are: getting much lower scores on tests, experimenting shame, and the fact that they might disappoint some important people around them (Pekrun, Goetz, Frenzel, Barchfeld & Perry, 2011; Zeidner, 2007).

Several theoretical models have been developed regarding the concept of anxiety towards evaluation: the drive model (Mandler & Sarason, 1952), the cognitive-attentional models (Sarason, 1972; Wine, 1971; Carver & Scheier, 1984), the self-worth model (Covington, 1992), and the transactional model (Spielberger & Vagg, 1995), but we can't say that there is only one explanatory model that takes all factors into account in their complexity, or is consistent with all the research from this field (Zeidner, 1998).

At the beginning of the research on the concept of "test anxiety", the construct was considered to be unidimensional and was measured by scales such as the Test Anxiety Questionnaire (Mandler &Sarason,1952). Subsequently, field research has demonstrated that there are at least two dimensions present in measuring anxiety over evaluation.

Liebert and Morris (1967) have shown that "worry" and "emotionality" are present in measuring test anxiety and are two different components. The Worry component refers to intrusive thoughts, self-disapproving rumination, and other distractors types of the thinking process associated with testing. The cognitive component of test anxiety is the most commonly found factor associated with declines in performance (Hembree, 1988). In addition to the evidence available through traditional correlation studies and meta-analyses, it was confirmed that cognitive test anxiety has the closest connection to performance. The Emotionality component refers to body responses that are associated with anxiety (increased heart rate, headaches, sweating, etc.) (Cassady, 2004a). The Test Anxiety Scale (Sarason, 1978) and Test Anxiety

Inventory (Spielberger et al., 1980) are two of the most popular tools that have been developed in close connection with these two dimensions of test anxiety concept.

Most analyses on the structure of test anxiety have demonstrated the existence of two distinct factors: the emotionality dimension and cognitive anxiety dimension (Everson, Millsap, & Rodriguez, 1991; Hembree, 1988). Somewhat, there have been some attempts to establish additional factors, based on the idea that segmentation of test anxiety concept will lead to a better understanding of its effects on performance (e.g. Sarason, 1984, Covington, 1985, Schwarzer & Quast, 1985, Cassady & Johnson, 2002).

The impact of test anxiety on academic performance

The main interest in the field research of test anxiety was its relationship with performance. The results of numerous studies have shown that high levels of test anxiety correlate negatively with IQ, academic skills, academic results at reading, English, mathematics, natural sciences, foreign languages, psychology; problem-solving strategies, memory and school grades (Hembree, 1988). These effects have been identified in both, young students (third grade) and high school students. Most studies support the fact that the main factor associated with these decreases in performance is the cognitive component of test anxiety that affects students' performance during examinations (Hembree, 1988; Sapp, Durand, & Farrell, 1995).

Hembree (1988) conducted a meta-analysis using 562 studies on test anxiety and its influence on academic performance among American school students and university students and demonstrated through obtained results that there was a negative correlation between them at all levels of schooling. In the Seipp meta-analysis (1991) made using 126 studies, the negative relationship between test anxiety and academic performance is also supported. Schwarzer (1990) combined the results of the two meta-analyses of Hembree (1988) and Seipp (1991) and obtained the same negative correlation ($r = -.21$) between test anxiety and performance.

Even though there are studies examining the association between test anxiety and academic results, longitudinal studies focusing on the reciprocal effects of the two variables are in a small number (Seel, 2012). Most studies have shown negative correlations between test anxiety and academic outcomes (Cassady & Johnson, 2002; Smith & Smith, 2002; Nicholson, 2009).

Other results indicate that anxiety interferes with performance in many different assessment situations. Hill (1972) has conducted ananalysis of studies that demonstrate how anxiety influences performance in a wide variety of experimental tasks. Generally, these studies indicate that when anxious students perform tasks under pressure, they do less well than children with low levels of anxiety. For example, Stevenson and Odom (1965 apud Hill & Wigfield, 1984) showed that students with a high level of test anxiety did less well than those with low levels of anxiety in a task related to certain concepts learned because the anxiety experienced interferes with their ability to remember those concepts. Also, students with a high-level of test anxiety do less well in comparison with those whose level is lower when they are asked to perform tasks more quickly (Sarason et al., 1960 apud Hill & Wigfield, 1984), or when the task is presented as a skill test (McCoy, 1965). Other studies have shown that students who are affected by test anxiety tend to work with great caution in most situations (Ruebush, 1963 apud Hill & Wigfield, 1984) and perform tasks less well when an adult observer is present (Cox, 1968). Low anxious students are less affected by these types of manipulations. However, in some situations, students with a high level of anxiety can achieve better performances than the least anxious, and this situation can be encountered when tasks are introduced in a non-evaluative manner (McCoy, 1965).

Conclusions

Numerous studies to capture the relationship between anxiety and academic performance support the hypothesis that there is a negative influence between the two components, and more precisely that a high level of test anxiety affects the results of the students, and these, in turn, will intensify the anxiety manifested in the future tasks. In conclusion, correlations between test anxiety and academic results can be explained by mutual causality (Seel, 2012). This is underlined by longitudinal studies in this field suggesting that test anxiety and student learning outcomes are in fact linked through a mutual causality throughout the school years (Meece et al., 1990, Pekrun, 1992).

As regards the research on emotions experienced in the academic context, Pekrun (Pekrun et al., 2002a) performs a classification according to the object on which the academic emotion is focused. Thus, academic emotions can be grouped according to their valence (positive vs. negative or pleasant vs. unpleasant), and the degree of

activation involved (emotions that activate vs. deactivate). With these three dimensions, academic emotions can be organized into positive activating emotions (such as joy, optimism, pride); positive deactivating emotions (relaxation, satisfaction, relaxation); negative activating emotions (anger, frustration, anxiety, shame);and negative deactivating emotions (boredom, sadness, disappointment, hopelessness). Positive emotions such as joy, enthusiasm (positive activating emotions) are supposed to have positive effects on performance, while negative deactivating emotions have negative effects. In terms of positive deactivating and negative activating emotions is supposed to have ambivalent effects on motivation and cognitive processing. Even if there were attempts in their wider individual research, anxiety is still the most studied emotion in the academic context, with specialists in the educational field being particularly concerned about its negative effect on students' performance and well-being. According to the control-value theory (Pekrun et al., 2002a), the determinants of emotions experienced in the academic context imply the appreciations that students make about the control and the value/valence attributed to learning activities and their outcomes. In other words, the student is experiencing certain academic emotions when he or she feels that they have control over learning activities or their results that are considered important for themselves. Thus, in order to try to explain the causality of the anxiety manifested in the academic context, the two components of the theory (the control and the value) will be used, which emphasizes that anxiety occurs when the value attributed to the results is high, but there is no perceived control, which implies that success and failure are uncertain, and the subject's attention is directed to the possibility of experiencing a failure.

References:

American Psychiatric Association (1994). Diagnostic and statistical manual of mental disorders. Fourth Edition (DSM – IV). Washington, DC: American Psychiatric Association.

Aspinwall, L. (1998). Rethinking the role of positive affect in self-regulation. *Motivation and Emotion, 22*, 1–32.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *PsychologicalReview, 84,* 191 -215.

Benjamin, M., McKeachie, W. J., Lin, Y., & Holinger, D. P. (1981). Test anxiety: deficits in information processing. *Journal of Educational Psychology, 73,* 816–824.

Carver, C. S. & Scheier, M. F. (1984). Self-focused attention in test anxiety: A general theory applied to a specific phenomenon. In H. M. van der Ploeg, R. Schwarzer, & C. D. Spielberger (Eds.), *Advances in test anxiety research* (Vol 3, pp. 3-20). Lisse Netherlands: Swets & Zeitlinger.

Cassady, J. C. (2004a). The impact of cognitive test anxiety on text comprehension and recall in the absence of external evaluative pressure. *Applied Cognitive Psychology, 18,* 311–325.

Cassady, J. C. & Johnson, R. E. (2002). Cognitive test anxiety and academic performance. *Contemporary Educational Psychology, 27,*270–295.

Covington, M. V. (1985). Test anxiety: causes and effects over time. In H. M. van der Ploeg, R. Schwarzer, & C. D. Spielberger (Eds.), *Advances in test anxiety research, Vol. 4* (pp. 55–68). Lisse, The Netherlands: Swets & Zeitlinger.

Covington, M.V. (1992). Making the Grade: A Self-Worth Perspective on Motivation and School Reform. New York: Cambridge Univ. Press.

Cox, F. N. (1968). Some relationships between test anxiety, presence or absence of male persons, and boys' performance on a repetitive motor task. *Journal of Experimental Child Psychology, 6,* 1-12.

Culler, R. E. & Holahan, C. J. (1980). Test anxiety and academic performance: The effects of study-related behaviors. *Journal of Educational Psychology, 72,* 16-20.

Daniels, L. M., Stupnisky, R. H., Pekrun, R. H., Haynes, T. L., Newall, N. E., & Perry, R. P. (2009). A longitudinal analysis of achievement goals: From affective antecedents to emotional effects and achievement outcomes. *Journal of Educational Psychology, 101,* 948–963.

Everson, H. T., Millsap, R. E., & Rodriguez, C. M. (1991). Isolating gender differences in test anxiety: A confirmatory factor analysis of the test anxiety inventory. *Educational and Psychological Measurement, 51(1),* 243-251.

Frenzel, A. C., Thrash, T. M., Pekrun, R., & Goetz, T. (2007). Achievement emotions in Germany and China: A cross-cultural validation of the Academic Emotions Questionnaire–Mathematics (AEQ-M). *Journal of Cross-Cultural Psychology, 38,* 302–309.

Ganotice, F. A, Datu, J. A. D., & King, R. B. (2016). Which emotional profiles exhibit the best learning outcomes? A person-centered analysis of students' academic emotions. *School Psychology International, 37(5),* 498–518.

Goetz, T., Frenzel, A. C., Pekrun, R., Hall, N. C., & Lüdtke, O. (2007). Between- and within-domain relations of students' academic emotions. *Journal of Educational Psychology, 99,* 715–733.

Heckhausen, H . (1991). Motivation and action. New York: Springer.

Hembree, R. (1988). Correlates, causes, effects, and treatment of test anxiety. *Review of Educational Research, 58,* 47–77.

Hill, K. T. (1972). Anxiety in the evaluative context. In W. W. Hartup (Ed.), *The young child.* Vol. 2. Washington, DC: National Association for the Education of Young Children.

Hill, K. T. & Wigfield, Al. (1984). Test anxiety: a major educational problem and what can be done about it. *The Elementary School Journal*, *85,* 105-126.

Kirkland, K. & Hollandsworth, J. (1980). Effective test taking: Skills-acquisition versus anxiety-reduction techniques. *Journal of Counseling and Clinical Psychology, 48,* 431-439.

Liebert, R. M., & Morris, L. W. (1967). Cognitive and emotional components of test anxiety: A distinction and some initial data. *Psychological Reports, 20,* 975-978.

Linnenbrink, L. A. (2007). The role of affect in student learning: A multi-dimensional approach to considering the interaction of affect, motivation, and engagement. In P. A. Schutz & R. Pekrun (Eds.), *Emotion in education* (pp. 13–36). Amsterdam: Elsevier.

Linnenbrink, L. A., Ryan, A. M., & Pintrich, P. R. (1999). The role of goals and affect in working memory functioning. *Learning and Individual Differences, 11,* 213–220.

Mandler, G., & Sarason, S. B. (1952). A study of anxiety and learning. *Journal of Abnormal and Social Psychology, 47*, 166–173.

McCoy, N. (1965). Effects of test anxiety on children's performance as a function of instruction and type of task. *Journal of Personality and Social Psychology, 2,* 634-641.

Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. *Journal of Educational Psychology, 82,* 60–70.

Nicholson, A. M. (2009). Effects of Test Anxiety on Student Achievement (ACT) for College bound Students. Dissertation Abstract International.

Pekrun, R. (1988). Emotion, Motivation und Persoillicflkeit (Emotion, motivation, and personality). Munich/Veinheim: Psychologie Verlags Union.

Pekrun, R. (1992b). Expectancy-value theory of anxiety: Overview and implications. In D. G. Forgays, T. Sosnowski, & K. Wrzesniewski (Eds.), *Anxiety: Recent developments in self-appraisal, psychophysiological and health research* (pp. 23–41). Washington, DC: Hemisphere.

Pekrun, R. (2000). A social-cognitive, control-value theory of achievement emotions. In J. Heckhausen (Ed.), *Motivational psychology of human development.* Oxford: Elsevier.

Pekrun, R. (2005). Progress and open problems in educational emotion research. *Learning and Instruction, 15*(5), 497-506.

Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational psychology review, 18*(4), 315-341.

Pekrun, R., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology, 101, 1,* 115–135.