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Cognitive ability, exam-related emotions and exam performance: A field study in a college setting

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ABSTRACT

Using lab and field data, this paper investigates (a) the degree to which pre- and post-exam positive and negative achievement emotions and cognitive ability are uniquely and jointly associated with exam performance and (b) the degree to which exam performance influences subsequent post-exam emotions. Based on a sample of 102 students, results show that ability influences exam performance both directly and indirectly via pre-exam emotions. Also, ability and distraction interact to influence performance such that ability has a buffering effect. Distraction has a significant deleterious effect on performance for low ability students, but does not disrupt performance for high ability students. Moreover, positive emotions facilitate performance by decreasing distraction whereas negative emotions hinder performance by increasing it. Finally, results show that the exam itself has a significant impact on post-exam positive and negative emotions, even when controlling for pre-exam emotions. Results are discussed in terms of the emerging research on achievement emotions beyond test anxiety.

1. Introduction

Given the high-stakes nature of decisions based in part on test scores, and the potential impact that test results may have on an individual's self-esteem or other self-perceptions, it is not surprising that testing is an emotionally charged event (Pekrun, Goetz, Titz, & Perry, 2002; Zeidner, 1998). Traditionally, most of the focus has been on negative emotions—in particular, test anxiety—experienced during, or as a consequence of, testing. Indeed, as of December 2013, a search on PsychINFO revealed over to 3500 entries when using "test anxiety" as a key word. However, recent research estimates that test anxiety accounts for fewer than 30% of achievement-related emotional episodes experienced before, during and after exams (Pekrun & Stephens, 2010). In addition, there are several positive emotions that may actually facilitate performance or that may be a result of the testing experience. Unfortunately, these other achievement-related emotions have not been well studied leaving our understanding of their relationship to test performance wanting (Pekrun et al., 2002). Similarly, there is little evidence concerning how achievement emotions are influenced by, or influence, other determinants of test performance, such as general mental ability, and the occurrence of distracting thoughts. As such, the purpose of this paper is to investigate (a) the degree to which positive and negative achievement emotions (experienced immediately before taking a college exam) and cognitive ability are uniquely and jointly associated with exam performance, and (b) the degree to which exam performance influences subsequent post-exam emotional states.

2. A broader focus: test-related emotions other than test anxiety

In the context of achievement, emotions have a "diagnostic value, because their intensity and quality reveal how people think they are managing what is important to them" (Folkman & Lazarus, 1985, p. 152). Achievement-related emotions are defined as "emotions that are tied directly to achievement activities (e.g., studying) or achievement outcomes (success and failure)" (Pekrun & Stephens, 2010; p. 239). Achievement-related emotions are heterogeneous in nature, but can be stratified across two dimensions; namely, valence and activation/arousal (Feldman, 1995; Pekrun et al., 2004). Valence refers to the perceived pleasantness of the emotion (i.e., its "hedonic quality," Feldman, 1995, p. 153) ranging from positive (e.g., joy, relief or pride) to negative (e.g., anger, shame or anxiety). Activation refers to the degree of arousal or

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energy induced by the emotional experience, ranging from activating (e.g., anger and joy) to deactivating (e.g., relief and hopelessness).

Achievement-related emotions also differ between prospective (i.e., forward looking; e.g., anticipating an exam, awaiting one's grades) and retrospective (i.e., backward looking; e.g., reflecting upon an exam, reflecting upon one's preparation). Indeed, early studies by Folkman and Lazarus (1985) and Smith and Ellsworth (1987) noted that the emotional process test-takers experience is dynamic and changes across the entire test-taking process. Hence, it is important to differentiate between emotions occurring before and after the test has taken place because they may be different (Folkman & Lazarus, 1985). Although prospective and retrospective emotions may occur throughout the testing phase (from preparation to grade delivery), prospective emotions are expected to peak just before and after the start of the exam whereas retrospective emotions do so after the exam (Pekrun et al., 2004). Although both activating and deactivating emotions can occur throughout the entire testing process (i.e., from pre- to post-test), the pre-test phase tends to include a greater proportion of activating emotions than deactivating emotions (Pekrun et al., 2004, Studies 1 and 2). For this reason, we limit our focus in the current study to *activating prospective* emotions. To parallel our study design (explained below), we use the terms pre-exam emotions and post-exam emotions henceforth.

3. Modeling the influence of ability and emotions on exam performance

Of particular interest in this study is the influence of achievement-related emotions and general mental ability (GMA) on test performance. As such, our main research question was whether these constructs would each have a unique but also a joint effect on test performance. The study of GMA and its correlates has a long history (see Jensen, 1998 and Hunt, 2011 comprehensive summaries). The robust relationship between GMA and academic performance is well established in recent research (e.g., Kuncel & Hezlett, 2007; Kuncel, Hezlett, & Ones, 2004; Reeve, 2004). Yet, it is less clear what the nature of the specific relationship between GMA and achievement-related emotions may be. Differences in GMA are likely to create differences in the extent to which experiences afford positive reinforcement (Lubinski & Benbow, 2000; Reeve & Heggestad, 2004). In a complex domain, initial efforts to learn by high ability individuals are more likely to be successful and thus evaluated as positive and pleasurable experiences. In contrast, low ability individuals are more likely to experience difficulties and thus evaluate the situation as negative, frustrating or otherwise unpleasant experience. Indeed, Goetz, Preckel, Pekrun, and Hall (2007) argued that the feeling of personal control over the achievement situation may be greater for high ability students as compared to their low ability counterparts, which would translate into different emotional experiences. Consistent with this idea, these authors found that reasoning ability was related to emotions such that students scoring higher on reasoning ability reported higher levels of enjoyment whereas students scoring lower reported higher levels of anxiety and anger. Related to this finding is research linking self-perceptions of competencies (such as self-efficacy or self-concept) to achievement emotions. Here too, there is a strong positive link between perceived ability and emotions (Goetz, Cronjaeger, Frenzel, Lüdtke, & Hall, 2010). Furthermore, based on the theorizing of Lubinski and Benbow (2000), we surmise that higher ability students may experience more positive achievement-related emotions and fewer negative emotions than lower ability students in achievement-related settings. Combining these areas of research, we predict the relationships described below. These hypotheses allow us to focus on our first purpose, which was to examine the direct and indirect effects of ability and emotions on exam performance.

Hypothesis 1. Ability will be positively associated with exam performance.

Hypothesis 2a. Ability will be positively associated with positive achievement emotions.

Hypothesis 2b. Ability will be negatively associated with negative achievement emotions.

Past research has also argued for, and demonstrated, a link between achievement-related emotions and achievement situations such as exam performance. Perhaps most well-known is the research linking test anxiety to lower test performance (see Zeidner, 1998, for a comprehensive review; see also Hembree, 1988). Compared to research on the links between negative emotions (in particular, test anxiety) and exam performance, significantly less research has studied the links between positive achievement emotions and exam performance (Pekrun et al., 2002). Nonetheless, the research to date typically shows that positive activating emotions (and in particular enjoyment) are positively related to academic performance (Pekrun et al., 2002; see Pekrun & Stephens, 2010 for a review). It is thought that positive activating emotions facilitate performance by activating or marshalling intrinsic motivation, increasing focus (e.g., activating a flow state; c.f., Csikszentmihalyi, 1975), and enhancing self-regulation (Pekrun et al., 2002; Pekrun, 2006). For example, Pekrun et al. (2002) report that the positive activating emotions of enjoyment and hope correlated positively with reported effort expended (r = .43 and r = .49, respectively).

The idea that positive emotions help enhance focus and self-regulation is of particular import. Indeed, it may be that that a determinant of test performance is how well the student is able to concentrate during the exam. The idea that distraction and intrusive thoughts is related to poorer performance is reflected in many theories of how anxiety influences performance on an evaluative task (see Zeidner, 1998 for a review). Of interest to the present study is the notion that task-focusing activities such as gaining or regaining one's focus on the test is a key part of the emotional regulation process (Schutz & Davis, 2000; Zimmerman, 2000). Specifically, covert self-regulation is reflected in being able to adjust both cognitive and affective states during goal pursuits (Zimmerman, 2000). Furthermore, being able to change one's thinking patterns away from self-blame and criticism is also a component of regulation (Schutz & Davis, 2000). This self-regulation of thought patterns is also consistent with Pekrun's (2006) control-value theory and Eysenck et al.'s (2007) attention control theory. As such, it would seem that many theories all posit that falling prey to intrusive, self-criticizing, or otherwise distracting thoughts, or being unable to control them, damages goal pursuit. On the contrary, self-control, and attention focusing strategies will be helpful to goal pursuit (Zimmerman, 2000). In the context of exam performance, the degree of intrusive or distracting cognitions may translate in performance differences. Thus, we can conceptualize distraction as a proximal (negative) influence on exam performance. Combining these various perspectives allows us to posit that experiencing positive or negative achievement-related emotions may influence performance via a number of cognitive mechanisms, in particular, the control of cognitive resources. Specifically, we posit the following relationships between achievement emotions and distraction.

Hypothesis 3a. Positive activating emotions will be negatively associated with distraction.