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Do you have an opportunity or an obligation to score well? The influence of regulatory focus on academic test performance

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ABSTRACT

Three studies explored academic test performance in the context of regulatory focus theory (Higgins, 1997), which posits that individuals pursue goals with a focus on growth and advancement (i.e., a promotion orientation) or on safety and security (i.e., a prevention orientation). In Studies 1 and 2, we brought participants into the lab, induced them to hold a promotion or prevention orientation, and asked them to complete math and verbal sections from an SAT exam. Students induced to hold a prevention orientation performed significantly better than students induced to hold a promotion orientation. In Study 3, we measured individual differences in students' regulatory orientations and then examined their performance on actual college course final exams. The more prevention-oriented (and less promotion-oriented) participants were, the higher their exam scores. Together, these findings suggest that a prevention orientation may be adaptive for test performance in certain analytic testing situations that have minimal time pressure.

1. Introduction

Academic tests are a ubiquitous part of students' progression through primary and secondary education. In addition to high-stakes standardized exams (which are currently a source of much debate; e.g., Levesque & Welner, 2015), students take numerous classroom unit tests that serve as a primary determinant of their GPAs. Students' scores on tests exert an enormous influence on their entrance into high school and college, their ability to graduate, and whether or not they are considered for certain jobs after graduation. Yet relying so heavily on test scores is somewhat problematic, because there is not a perfect correspondence between students' academic abilities and their test scores. For example, one student might be very inquisitive and attentive in her classes but struggle when it comes to completing her course midterm exams, consistently scoring lower than her peers of similar academic ability. Another student might earn mediocre school marks, but score at the top of his age group when he takes the SAT. Because testing is a widespread determinant of educational outcomes, it is important to understand what causes discrepancies between students' test scores above and beyond differences in academic ability, and to try and utilize this information to benefit students who might underperform on certain types of high-stakes or classroom tests (via interventions or other instructional techniques).

Both journalists (e.g., Bronson & Merryman, 2013) and researchers have explored why two students of similar ability may perform differently than each other on academic tests, focusing on such factors as working memory limitations (e.g., Beilock & Carr, 2001, 2005), stereotype threat concerns (e.g., Steele & Aronson, 1995), and genetically determined responses to stress (e.g., Yeh, Chang, Hu, Yeh, & Lin, 2009). However it is also critical to explore how students' motivation might affect these types of test performance discrepancies, because motivation is a critical determinant of students' academic performance above and beyond their intellectual abilities (see Wentzel & Miele, in press). One important motivational variable related to this issue is students' motivation to use certain strategies while they are pursuing their academic goals. If two students tend to prefer using different strategies in order to achieve a high test score, they may perform very differently on the test even if they have similar overall academic abilities.

This motivational explanation is derived from regulatory focus theory (Higgins, 1997), which has been the focus of much research in social psychology, but has received relatively little attention in educational psychology. As discussed in more detail in the next section, Higgins proposed that individuals tend to adopt one of two self-regulatory orientations while pursuing goals. Some individuals focus on advancement and achieving personal growth, whereas others focus on preserving their safety and security. These two regulatory orientations lead individuals to prefer different sets of cognitive and behavioral strategies for pursuing their goals. The aim of the present research was to explore how regulatory focus affects college students' academic test performance.

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1.1. Regulatory focus theory

Regulatory focus theory (see Higgins, 1997; Molden & Miele, 2008; Molden & Rosenzweig, in press; Scholer & Higgins, 2012, for reviews) builds on a distinction made by previous researchers (see Bowlby, 1969; Higgins, 1987; Maslow, 1955) between two fundamental motives that guide goal pursuit: the motive for growth and advancement and the motive for safety and security. All individuals are thought to possess both of these motives; however, individuals who are predominantly focused on growth concerns (i.e., who are promotion-oriented) tend to represent their goals as ideals they hope to attain and seek opportunities for gain that will move them closer to these ideals. In contrast, individuals who are more focused on security concerns (i.e., who are prevention-oriented) tend to represent their goals as responsibilities that they must uphold and vigilantly protect against potential losses that threaten these responsibilities.

Although all individuals possess both promotion and prevention motives, their behavior is likely to be influenced by whichever set of concerns is more salient or relevant at a particular moment (see Eitam, Miele, & Higgins, 2013). Salience is in some cases driven by environmental cues that temporarily strengthen growth or security concerns (e.g., Forster, Grant, Idson, & Higgins, 2001; Forster, Higgins, & Bianco, 2003; Higgins, 1997; Shah & Higgins, 1997). For instance, a student who notices that there are heavy deductions for wrong answers on a take-home test may adopt a prevention orientation on that test in order to guard against the threat of losing points (cf. Friedman & Forster, 2001).

Salience can also be determined by an individual's history of pursuing goals that have involved gains versus losses (e.g., Forster et al., 2001, & Forster et al., 2003; Higgins, 1997; Higgins et al., 2001; Moretti & Higgins, 1999; Shah & Higgins, 1997). For example, people's experiences of harsh punishment during childhood might lead them to perceive potential threats across a variety of contexts, even when environmental cues signaling threat are not overt (e.g., Manian, Papadakis, Strauman, & Essex, 2006). Thus, if a student's previous teachers frequently penalized her for bad quiz scores but did not reward her for good outcomes, she might become very concerned with classroom situations that could cause her to quiz performance to decrease, even when she finds herself in a classroom not focused on quizzes. Such people are said to have a *chronic* prevention orientation. Individual differences in people's chronic regulatory orientations are assumed to influence their behavior unless environmental cues make a particular orientation temporarily more relevant; if such cues occur, people will tend to act according to the orientation that has been activated by the environment instead of according to their chronic preferences (see Lisjak, Molden, & Lee, 2012, for more information about the interactions between temporary and chronic regulatory focus). In the present set of studies we explored the effects of both temporary regulatory focus (by inducing students to hold a particular orientation; Studies 1 and 2), and chronic individual differences in regulatory focus (by conducting a correlational study; Study 3).

Promotion and prevention orientations are related to, but distinct from, other constructs in the achievement motivation literature. Higgins (1997) and other regulatory focus theorists are concerned with individuals' motivations to pursue their goals in a particular manner, rather than the contents of the goals themselves or people's reasons for pursuing them. Thus, the promotion/prevention dimension posited by regulatory focus theory is distinct from the approach/avoidance dimension posited by achievement goal theory and other motivational frameworks, which is defined in terms of approaching desirable goal outcomes or avoiding undesirable outcomes (see Eliot, 1997; Moller & Elliot, 2006). That is, individuals can exhibit a promotion or prevention orientation when pursuing any type of goal, whether it involves approach or avoidance (see Molden & Miele, 2008, for a review). For example, two students who are both motivated to approach a desirable academic outcome, such as getting an A in a class, may actively move toward this desired end-state in different ways: One may vigilantly work to complete every course assignment with maximum accuracy and care (i.e., adopt a prevention orientation), while the other may prefer to eagerly seek out non-required readings or extra credit opportunities (i.e., adopt a promotion orientation). Researchers have shown that chronic regulatory focus is only modestly correlated with approach versus avoidance sensitivity (promotion and approach, $rs < .32$; prevention and avoidance, $rs < .20$; Haws, Dholakia, & Bearden, 2010; Summerville & Roese, 2008).

Promotion and prevention orientations can also be distinguished from performance and mastery goal orientations, even when these orientations are crossed with approach and avoidance goals (see Maehr & Zusho, 2009). While performance and mastery orientations address the reasons why students pursue specific academic outcomes, regulatory focus refers to how students would prefer to regulate themselves once an outcome has been chosen (for either a performance or mastery reason; see Molden & Miele, 2008, for review). For example, individuals who have a goal to develop and improve their abilities in an academic domain (i.e., who have a mastery approach goal) can pursue this by trying to learn new skills that relate to their interests (i.e., a promotion strategy) *or* by trying to make fewer mistakes when completing homework in that domain (i.e., a prevention strategy). Similarly, individuals who are more concerned with *demonstrating* that their abilities are as good or better than their classmates' abilities (i.e., who have a performance approach goal) may pursue this goal by looking for opportunities to say something smart in front of their peers (i.e., a promotion strategy) or by making sure that they answer questions carefully and accurately when they volunteer an answer (i.e., a prevention strategy). And, individuals who are concerned with not looking dumb in front of their classmates (i.e., who have a performance avoidance goal) may pursue this goal by trying to actively steer the topic toward something they know more about (i.e., a promotion strategy), or by refusing to participate in class in order to not say anything that is incorrect (i.e., a prevention strategy). In many contexts, the same promotion or prevention strategies could be pursued to help individuals accomplish either a performance approach or performance avoidance goal.

To date, there has been very little work that directly examines whether holding a promotion or prevention orientation leads to better performance on educationally-relevant tasks. Avnet and Sellier (2011), Grimm, Markman, and Maddox (2012), and Keller and Bless (2006) all considered regulatory focus and test performance from the perspective of regulatory *fit* theory (Higgins, 2000, 2005). According to this theory, people will be more engaged in a task (and perform better on it) if they are allowed or encouraged to approach the task with a strategy that matches and sustains their current motivational orientation (e.g., if they vigilantly approach a task while holding a prevention orientation). However, these studies did not focus on the potential advantages of the promotion- and prevention-oriented strategies themselves for taking tests (i.e., the advantages of solving problems in a particular way), irrespective of any increased engagement students may experience due to fit. In another study, Seibt and Forster (2004) implicated regulatory focus as a mechanism by which stereotypes affect test performance without measuring regulatory focus directly. Beyond this work, a few researchers examined the effects of holding promotion or prevention orientations on aspects of students' academic performance (e.g., proofreading and reading comprehension; Forster et al., 2003; Miele, Molden, & Gardner, 2009); however, none of these laboratory studies explored how regulatory focus might affect performance in realistic educational environments, with typical academic tests.

1.2. The effects of regulatory focus on information processing

Although few researchers have directly explored how regulatory focus affects *educational* outcomes, regulatory focus has been shown to affect many of the *cognitive* processes that underlie test performance and academic achievement. Numerous studies (mostly conducted on

undergraduate student populations) have shown that promotion-oriented individuals tend to prefer "eager" information processing strategies that involve seeking opportunities for gain, while prevention-oriented individuals prefer "vigilant" strategies that are aimed at protecting against potential losses (see Molden & Miele, 2008; Scholer & Higgins, 2012, for reviews). For instance, Crowe and Higgins (1997) conducted a recognition-memory study; in a signal-detection analysis they found that promotion-oriented individuals were biased toward maximizing hits (gains) and minimizing misses (non-gains), while prevention-oriented individuals were biased toward maximizing correct rejections (non-losses) and minimizing false alarms (losses).

Prevention-oriented individuals' sensitivity to losses leads them to solve problems using analytic and conservative tactics, in contrast to the more creative and flexible problem solving of promotion-oriented individuals. For instance, across several studies, prevention-oriented individuals generated fewer ideas about how to complete a problem-solving task and performed worse on tests measuring creative insight and creative problem solving than did promotion-oriented individuals (Friedman & Forster, 2001; Liberman, Molden, Idson, & Higgins, 2001; cf. Baas, De Dreu, & Nijstad, 2011).

Under certain conditions, prevention-oriented individuals' conservative approach to problem solving can help them to perform well on educational tasks that require analytic reasoning. Seibt and Forster (2004) conducted a study providing indirect support for this conclusion; this study is also pertinent to the present investigation because it examined students' performance on a standardized achievement test. The authors demonstrated that negative (as opposed to positive) stereotypes about performance, which are thought to induce a prevention orientation, led individuals to report higher levels of vigilance and to perform better on analytical reasoning questions taken from the analytic section of the old GRE exam. However, it is important to note that these questions were administered in a low-stakes laboratory context. Additionally, these researchers did not measure regulatory focus directly.

Promotion- and prevention-oriented individuals may also perform differently on tests because they show different strategic preferences for speed versus accuracy during problem solving. For instance, Forster et al. (2003) found that participants induced to have a prevention-orientation identified fewer errors than participants induced to have a promotion-orientation on a timed proofreading task. However, this was mostly because the promotion-oriented participants quickly scanned for surface errors (such as typos) and got through more of the text in the allotted time. Prevention-oriented participants, however, were better at identifying contextual errors (such as mistakes in subject-verb agreement), which required slow and careful processing.

Although vigilant processing may lower the performance of prevention-oriented individuals when tests are tightly time-constrained and reward speed, the increased accuracy associated with a prevention orientation may improve performance when there is plenty of time to complete the test. Miele et al. (2009) gave individuals with a chronic promotion or prevention orientation as much time as they needed to read a multi-paragraph text and then answer comprehension questions about it. When the text contained a subtle ambiguity, prevention-oriented participants were more likely to re-read the section of the text that helped resolve the ambiguity, and as a result they performed better on a set of reading comprehension questions about the text. These results suggest that, under certain conditions, the increased vigilance associated with a prevention orientation can be advantageous for performance on academic tests. This conclusion is supported by the fact that the reading task in this study was similar to what a student might encounter on a standardized test that assesses verbal competencies, such as the SAT.

1.3. Regulatory focus differences in test performance

Overall, it appears that prevention-oriented individuals are slower, more accurate, and more analytic than promotion-oriented individuals when it comes to processing new information. Thus, testing situations that reward carefulness and accuracy (such as those that require careful analytic reasoning and that provide ample time to engage in such reasoning) may lead prevention-oriented students to perform better than promotion-oriented students.

On the other hand, prevention-oriented individuals may actually perform worse in testing situations that are highly stressful and include strict time constraints (which is typically the case for tests like the SAT). Holding a prevention orientation is associated with feelings of anxiety, while holding a promotion orientation is not (e.g., Idson, Liberman, & Higgins, 2000; Liberman, Idson, & Higgins, 2005; see Molden, Lee, & Higgins, 2008 for review). If the stress of a testing situation leads prevention-oriented students to experience overly high levels of anxiety, this may cause them to perseverate on possible mistakes they have made (i.e., losses) and to move inefficiently or slowly through the timed test (e.g., Ashcraft & Kirk, 2001; Eysenck & Calvo, 1992); thus they might not have time to answer all of the questions and would receive a low test score.

1.4. The present research

The present research represents an initial examination of how regulatory focus affects students' performance on academic tests (standardized tests and college course exams). We initially hypothesized that promotion-oriented students would perform better than prevention-oriented students in testing situations that were perceived to be stressful and severely time-constrained, such as those associated with high-stakes standardized tests. However, we acknowledged that students may not find laboratory experiments to be particularly stressful and thus might not interpret the testing situation as high-stakes. We concluded that our studies would still be informative if this turned out to be the case, because no previous research has directly examined the effects of regulatory focus on either high- or low-stakes test performance. If prevention-oriented students did not perceive our laboratory exam as stressful or time-constrained, they may not have experienced heightened anxiety and, thus, would not necessarily be expected to perseverate and perform poorly in this setting. Instead, with sufficient time to complete the exam, prevention-oriented participants would be expected to engage in careful and analytic processing of the test items and perhaps outperform promotion-oriented participants.

We explored our hypotheses both by temporarily inducing promotion or prevention orientations and by measuring individual differences in students' chronic promotion and prevention orientations. In Studies 1 and 2, we brought individuals into the laboratory, induced them to hold either a promotion or prevention orientation by framing task instructions in terms of gains or losses, and then gave them two sections of an SAT to complete. Each study used a slightly different cover story in hopes of getting participants to experience the test as "high-stakes." However, our manipulation checks and informal observations indicated that neither testing situation was perceived to be particularly stressful or time-constrained. Thus, we treated both studies as investigations of regulatory focus differences in low-stakes testing situations. Finally, in Study 3, we examined the influence of regulatory focus on test performance in actual courses by measuring stable individual differences in students' chronic promotion and prevention orientations and then examining the association between these orientations and their exam scores.

2. Study 1

Study 1 was designed as a preliminary investigation of how regulatory focus affects students' standardized test performance. We brought participants into the laboratory, induced them to temporarily hold a promotion or prevention orientation, and then gave them two sections of an SAT practice test.

2.1. Method

2.1.1. Participants

Participants were 65 students (45 women) from a large university in a Mid-Atlantic state. Mean participant age was 19.83 years ($SD = 1.42$). Participants were approximately 65% European-American, 17% African-American, 12% Asian or Pacific Islander, 3% Hispanic, 2% biracial or multi-racial, and 1% unspecified. Participants received course credit for volunteering and were treated in accordance with APA ethical guidelines.

2.1.2. Materials

2.1.2.1. Regulatory focus induction. Participants were induced to hold either a promotion or prevention orientation using a version of a manipulation that has successfully evoked promotion and prevention concerns in a number of previous studies (e.g., Forster et al., 2003; Maddox, Baldwin, & Markman, 2006; Markman, Baldwin, & Maddox, 2005; Miele et al., 2009; Shah, Higgins, & Friedman, 1998). As part of the manipulation, all participants learned about a fifty-dollar lottery. Depending on whether participants had been randomly assigned to the promotion or prevention condition, the description of the lottery was framed in terms of either gains or losses. More specifically, participants in the prevention condition were told:

> "In order to encourage you to do your best on this test, we have entered you into a lottery with a $50 prize. However, you will lose your entry to the lottery (and lose the chance to win $50) if your performance is not above the 75th percentile for all participants at the [large Mid-Atlantic university] who have completed the upcoming task. If your performance is above the 75th percentile, you will not lose your entry to the lottery."

By framing the task in terms of losses, we expected participants to become relatively concerned with maintaining a sense of safety and security. In contrast, participants in the promotion condition were told:

> "In order to encourage you to do your best on this test, we are going to give you an opportunity to gain entry into a lottery with a $50 prize. If your performance is above the 75th percentile for all participants at the [large Mid-Atlantic university] who have completed the upcoming task, you will gain entry in the lottery (and the chance to win $50). If your performance is not above the 75th percentile, you will not gain entry to the lottery."

By framing the task in terms of gains, we expected participants in this condition to become concerned with seeking opportunities for growth and advancement.

It is important to note that both the performance goal (i.e., to perform well relative to one's peers taking the same test) and incentive amount (50 dollars) were identical across the two conditions. The only thing that differed between conditions was the use of loss- or gain-oriented language to describe the lottery. Importantly, the goal was always discussed in both approach and avoidance terms within each condition, so that prevention would not be confounded with avoidance and promotion would not be confounded with approach.

It is also worth noting that, in this version of the manipulation, incentives were framed in terms of the final outcome of the test (e.g., gaining entry to a lottery by scoring above the 75th percentile). Other versions of this manipulation (e.g., Grimm, Markman, & Maddox, 2012) have framed incentives in terms of performance on individual items (e.g., gaining points for each correct answer, or losing points for each incorrect answer). It is possible that inducing a prevention or promotion focus at the level of individual test items may lead students to use different testing strategies or experience different levels of engagement than having them adopt broader sets of promotion or prevention concerns.

2.1.2.2. Standardized test stimuli. The laboratory standardized test (which we called the PCRT) consisted of two 20-minute sections, one math and one verbal, taken from a College Board SAT practice test that was provided online at Collegeboard.com.[2] The math section included 16 multiple-choice questions (5 choices per question) of increasing difficulty that covered topics such as arithmetic operations, algebra, geometry, statistics, and probability. The verbal section included 19 multiple-choice questions (5 choices per question) of increasing difficulty that assessed vocabulary and reading comprehension. Participants were provided with a calculator, formula sheet, scrap paper, and pen to use when completing the math section, as is done in actual SAT administrations.

The original College Board test was designed to be taken with paper and pencil; however, we presented it to participants electronically using the Qualtrics Research Suite. All of the instructions and graphics were the same as in the pencil and paper version. Also, each question was presented on a separate screen and participants could move from one question to another by clicking the back ("≪") and next ("≫") buttons. The inclusion of a back button allowed participants to revisit questions they were uncertain about or that they had skipped. Qualtrics recorded the overall amount of time participants spent on each question, as well as the amount of time they spent when last viewing it. When participants reached the end of a section before the allotted time (20 min) had expired, the computer informed them not to continue until told to do so by the experimenter. When time expired while participants were still working on a section, the experimenter verbally informed participants that their time was up and that they could not go back and work on any more questions. The experimenter then waited while the participant advanced the questionnaire through to the next section of the test or to the end-of-test questions.

2.1.2.3. Engagement and anxiety questionnaires. To assess participants' levels of engagement and anxiety during the PCRT, we asked them to complete two brief questionnaires after they completed the test. The first questionnaire consisted of four self-report items that measured test engagement on a 0 to 100 scale. Participants answered by manipulating a visual analog slider ranging from 0 to 100; these types of scales have been shown to be equally or even more reliable than Likert-type scales (Cook, Heath, Thompson, & Thompson, 2001). Questions assessed how engaged participants felt, how focused they felt, how much effort they put into the task, and how attentive they were (e.g., "How focused did you feel during the test?"; 0 = "Not at all focused"; 100 = "Completely focused"). Composite engagement scores were computed by averaging ratings from the four items ($\alpha = .92$).

The second questionnaire consisted of three self-report items adapted from the Negative Affect subscale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The items measured anxiety on a 0 to 100 scale (e.g., "During the test, to what extent did you feel nervous?"; 0 = "Not at all nervous"; 100 = "Very nervous"). Composite scores were computed by averaging ratings from the three items ($\alpha = .79$).

2.1.2.4. Suspicion check. Participants completed a funneled debriefing that was designed to assess their suspicions about the PCRT. Participants were first asked whether they thought any part of the test was suspicious or strange and what they thought the true purpose of the test was. Next, they were asked whether they ever thought that the PCRT was fake and, if so, to explain what about the test led them to think this.

[2] Although the College Board granted permission to use the SAT® test items, the research was conducted independently of the College Board. SAT® is a trademark registered and/or owned by the College Board, which was not involved in the production of, and does not endorse this research.

2.1.3. Procedure

Participants were greeted by the experimenter and told that they would be taking part in a study about factors that influenced test performance. They were seated at a computer in a small room, either alone or with one other participant. The experimenter provided them with preliminary instructions and then launched the web-based test, which provided more detailed instructions. These instructions explained that they would be participating in a pilot test of a new standardized exam: the Post College Readiness Test (PCRT). To encourage participants to take the test seriously, they were told that scores on this standardized test had been shown to predict scores on other graduate entry exams such as the MCAT, LSAT, and GRE, as well as to predict future career earning potential. They were also told that, after the test, the experimenter would grade their exams and they would be able to see how they had performed.

As an additional manipulation of perceived test importance, participants were told that their exam scores would be averaged with scores from other students to determine their university's overall PCRT ranking within the Atlantic Coast Conference (ACC). They were shown a list of schools in the ACC to remind them of the schools against which they would be competing. The Atlantic Coast Conference consists of some schools that have superior academic reputations to the university where this research was conducted, as well as some schools with inferior reputations ("Best College Rankings," 2013). It was our hope that by introducing social and normative concerns, participants would perceive the test to be important and would experience levels of stress comparable to what they might experience when completing a genuine high-stakes exam.

After being told about the conference rankings, participants were exposed to the regulatory focus induction. They then completed the standardized test, which consisted of two 20-minute test sections (one math and one verbal) presented in a random order. The experimenter timed each test section and monitored participants' behavior. Next, participants completed the engagement and anxiety questionnaires, the suspicion check, and some demographic questions. Finally, they were fully debriefed about the study's purpose.

Data from this study (as well as Study 2) were collected during the middle of the semester; therefore, potential regulatory fit effects due to participants adopting a promotion orientation at the beginning of the semester and a prevention orientation at the end of the semester (Grimm, Markman, & Maddox, 2012) were not a concern for the present analyses.

2.2. Results

Eleven participants were excluded from analysis in this study: two for expressing doubts about the existence of the 50-dollar lottery, three for not paying attention or following instructions during the experiment, and six due to computer or software failure. The data from these individuals were eliminated, leaving 54 participant responses (37 women) for analysis.

2.2.1. Test stakes

Based on their responses to the funneled debriefing, participants in both conditions did not find the stated purpose of the test particularly convincing. Mean levels of reported test anxiety were low (M = 25.65, SD = 22.28; significantly lower than the scale's midpoint, $t(47) = 7.58$, $p < .001$) and not significantly affected by the manipulation of regulatory focus, $t(46) = -1.06$, $p = .30$, $d = 0.31$.[3] Additionally, we observed that out of the 70.4% of participants who answered every math question and the 92.6% who answered every verbal question, many stopped working on the test before the time limit expired for that section, which suggests that they were not overly concerned with performing their best. These findings indicated that our cover story was not successful at reproducing a high-stakes testing environment. Participants did, however, report being relatively engaged with the test ($M = 69.81$, $SD = 21.04$). The effect of regulatory focus on engagement was marginally significant, $t(46) = -1.81$, $p = .08$, $d = 0.53$, such that participants in the prevention condition reported marginally higher levels of engagement ($M = 75.41$, $SD = 17.46$) than did participants in the promotion condition ($M = 64.65$, $SD = 23.01$). Thus, although the cover story was not successful at reproducing a high-stakes testing environment, it seems that the nature of the test itself was stimulating enough to keep participants engaged.

2.2.2. Test performance

We computed test scores for the two SAT test sections based on a procedure used by the College Board. First, we calculated "raw scores" by subtracting 0.25 times the total number of mistakes from the total number of correct responses for each test section (we did not subtract points for omitted responses). Typically, the College Board converts these raw scores to numbers on a scale of 200 to 800 using a statistical process called "equating." However, this number can only be computed using data from a full SAT test, which includes three sections of each subject (math and verbal). Because participants in this study only completed one math and one verbal section, we computed final test scores by dividing participants' raw scores on each section by the total number of points possible for that section.

In order to determine the effects of regulatory focus on test performance, we submitted final test scores to a 2 (regulatory focus: promotion vs. prevention) × 2 (test section: math vs. verbal) mixed ANOVA, with repeated measures on the last factor. As shown in Fig. 1, the results revealed a main effect of regulatory focus at significance, $F(1, 52) = 3.91$, $p = .05$, $\eta^2_p = .07$, such that students in the prevention condition performed better on the exam than students in the promotion condition. Although the interaction was not significant, $F(1, 52) = 1.68$, $p = .20$, $\eta^2_p = .03$, follow-up tests showed that the main effect was driven primarily by participants in the prevention condition scoring higher than participants in the promotion condition on the math test section, $t(52) = 2.33$, $p = .02$, as opposed to the verbal section, $t(52) = 1.00$, $p = .32$. However, because the interaction was not significant, one should not assume the complete absence of an effect for the verbal section. There was also no main effect of test section (math versus verbal) on participant performance, $F(1, 52) = 2.04$, $p = .16$, $\eta^2_p = .04$.

Because we computed final test scores using both the percentage of questions answered correctly and the percentage of questions answered incorrectly (not including omissions), we submitted those variables to two additional mixed ANOVAs. The results mirrored those of the previous analysis: Participants in the prevention condition answered more questions correctly, $F(1, 52) = 4.04$, $p = .05$, $\eta^2_p = .07$, and fewer questions incorrectly, $F(1, 52) = 3.01$, $p = .09$, $\eta^2_p = .06$, than did participants in the promotion condition (though the latter effect was only marginally significant). Although there were no interactions ($ps > .19$) these effects were again driven by differences on the

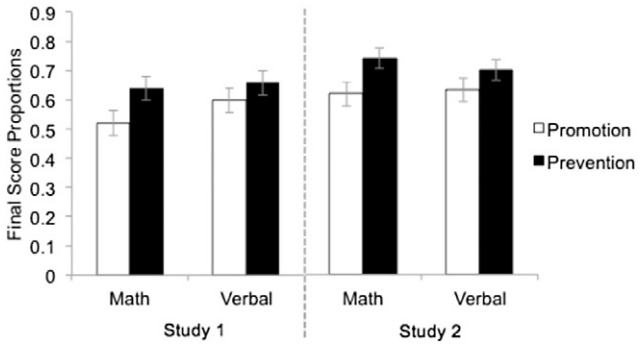

Fig. 1. Mean final test score proportions from Studies 1 and 2.

[3] Post-test questions about perceived test engagement and test anxiety were added to the study after 6 students had already participated, leaving 48 participants for analysis.

math section (percent correct, $t(52) = 2.37$, $p = .02$; percent incorrect, $t(52) = 2.02$, $p = .05$). Differences on the verbal section were not significant for either variable (percent correct, $t(52) = 1.00$, $p = .32$; percent incorrect, $t(52) = 0.94$, $p = .35$).

2.2.3. Strategy use

To determine whether the regulatory focus manipulation also influenced the type of information-processing strategies used by participants during the test, we first examined the amount of time participants spent on each test section. If the participants in the prevention condition were more vigilant in their information processing than participants in the promotion condition, it was possible that they took more time going through the questions. However, the results of a mixed ANOVA revealed only a main effect of test section, $F(1, 52) = 30.38$, $p < .001$, $\eta^2_p = .37$, such that participants generally spent more time on the math questions ($M = 1020.47$ s, $SD = 186.29$) than on the verbal questions ($M = 872.89$ s, $SD = 194.38$). Neither the main effect of regulatory focus, $F(1, 52) = 0.01$, $p = .93$, $\eta^2_p < .001$, nor the regulatory focus × test section interaction, $F(1, 52) = 0.07$, $p = .79$, $\eta^2_p = .001$, were significant.

Next, we examined whether participants in the prevention condition were more likely than participants in the promotion condition to vigilantly check their work by returning to questions they had previously viewed. The manner in which times were recorded in Study 1 allowed us to identify only whether or not participants had clicked back through any previously-viewed questions at any point during the study, although it did not allow us to determine how much time participants spent revisiting those questions, the order they moved through the questions, or which questions they revisited for a meaningful amount of time (as opposed to quickly clicking past one question on the way to re-read another). We created a dichotomous score, with "1" indicating that a participant had revisited at least one test question and "0" indicating that the student had not revisited any questions; we computed this measure without regard for whether students had actually answered a question the first time they viewed it.

To assess whether participants in the prevention condition were more likely than participants in the promotion condition to revisit at least one question during each test period, we conducted separate chi-square analyses for the math and verbal sections. Results showed that participants in the prevention condition were more likely to use a vigilant revisiting strategy (69.2%) than were participants in the promotion condition (39.3%) when completing the math section, $\chi^2 = 4.86$, $p = .03$, but not the verbal section (prevention: 42.3%; promotion: 46.4%), $\chi^2 = 0.09$, $p = .76$.

To test whether going back to questions mediated the relationship between regulatory focus and performance, we used MPlus to conduct a bootstrapping procedure with 5000 bootstrap resamples. Compared to tests that assume a normal distribution of indirect effects (e.g., the Sobel test), bootstrap methods are a more accurate means of assessing mediation for small- to moderately-sized samples (see Shrout & Bolger, 2002). This particular procedure, which was developed by Preacher and Hayes (2008), was designed to accommodate dichotomous mediators. It therefore allowed us to estimate the indirect effect of regulatory focus orientation on test performance in the math section (with whether or not participants revisited questions as a mediator), as well as a bias-corrected 95% confidence interval for the estimate. Because the confidence interval (which ranged from 0.02 to 0.25, $M = 0.11$), did not include zero, the indirect effect can be considered significant at $p < .05$ (Shrout & Bolger, 2002). Thus, returning to test questions at least partially mediated the relationship between regulatory focus and math test performance.

2.3. Discussion

Study 1 provides initial evidence that regulatory focus influences students' academic test performance. We originally attempted to make our experimental test resemble a high-stakes, strictly timed exam (i.e., an exam that most participants would not be able to complete within the time limits provided), but most participants finished their exams well within the time constraints and did not seem especially nervous or concerned while taking the test. Therefore, we considered this to be a relatively low stakes and low time–pressure testing situation and drew conclusions about the effects of regulatory focus accordingly. On the math test section, individuals in the prevention condition earned higher raw scores, answered more questions correctly, and were more likely to revisit questions, compared to individuals in the promotion condition.

Although these results may run counter to our original hypothesis for Study 1 (i.e., that individuals in the prevention condition would perform better in a high-stakes testing situation), they make sense when considering that our testing situation was low-stakes and low in perceived time pressure for participants. These findings are consistent with prior research from the regulatory focus literature suggesting that prevention-focused individuals might perform better on analytic tasks within settings that are low in stress and time pressure. That is, participants in the prevention condition, who were induced to prefer a careful and analytic style of processing, might have performed well on this consequence-free, low-anxiety laboratory exam because they had sufficient time to accurately complete each test question while vigilantly checking for mistakes. This interpretation is supported by the fact that, in the prevention condition, participants' more frequent revisiting of math questions partially mediated their better math performance (see Miele et al., 2009). By contrast, the eager processing style preferred by individuals in the promotion condition may not have been as conducive to carefully answering questions and checking for mistakes.

These data build on prior research to suggest that, in a low-stakes laboratory testing environment that was not strictly timed, holding a prevention orientation was more adaptive for performance on a typical academic test than was holding a promotion orientation. The goal for our next study was to investigate the effects of regulatory focus on test performance in a situation that we hoped students would perceive to be slightly more stressful than the situation of the previous study. Once again our interpretation of the results depended on how participants *actually* perceived the testing situation. If the cover story for the test led participants to experience it as high stakes, we would perhaps expect participants induced to hold a prevention orientation to perform worse than participants induced to hold a promotion orientation (or at least worse than they did in the previous study). However, if the participants once again experienced the test as low stakes, then results of the Study 2 should replicate the pattern of findings from Study 1.

3. Study 2

Study 2 utilized the same materials and time limit as in Study 1; however, we changed the test environment and test administration protocol to be more similar to what an individual would typically experience on a high-stakes standardized test. We also added self-report measures of test stress and perceived importance to our post-test questionnaire in order to check whether these changes were effective.

3.1. Method

3.1.1. Participants

Participants were 85 individuals (50 women) recruited from the campus of a large university in a Mid-Atlantic state. Mean participant age was 20.02 ($SD = 1.50$). Participants were approximately 46% European-American, 27% African-American, 21% Asian or Pacific Islander, and 6% biracial or multi-racial. Participants received payment for

volunteering and were treated in accordance with APA ethical guidelines.[4]

3.1.2. Materials

The regulatory focus induction and the standardized test stimuli were the same as in Study 1. However, a small change was made to the post-test questionnaires. Three single-item indicators were added in order to better assess how "high-stakes" participants found the laboratory standardized test. More specifically, these questions asked participants to report how seriously they took the test, how important it was for them to do well on the test, and how stressful they found the test, on a 0 to 100 scale (e.g., 0 = "Not at all important"; 100 = "Very important").

An additional change was made to the software used to record participants' test behaviors and responses. In the previous study, the software recorded the overall amount of time participants spend on each test question (regardless of whether or not they had viewed the same question multiple times), as well as the time they spent on the question when they last clicked on it. In the current study, the software recorded the number of seconds that passed each time participants viewed a particular question. This update to the software made it possible to map the specific path participants took through the test, as well as the amount of time they spent revisiting specific questions.

3.1.3. Procedure

The procedure was generally the same as in Study 1, except that additional steps were taken to raise the perceived stress levels or "stakes" of the standardized test. To begin with, instead of recruiting participants to participate in a study about test performance (as we did in Study 1), we told them that they would be evaluating a new test of post-college readiness. We hoped that participants would be more convinced by our description of the test if they did not think that our main purpose for administering it was to conduct psychological research. To make our original cover story (about measuring PCRT performance for all schools in the ACC) more convincing, we developed fake logos for the test and for the company ("Metrica Testing") that supposedly developed the test. We then displayed these logos on a large welcome sign and on one of the initial instruction screens. Experimenters for this study also dressed in business clothes and wore plastic nametags with Metrica Testing logos on them in order to give the appearance of professional test administrators. In order to simulate the testing environment of other "high stakes" tests that participants were likely to be familiar with (e.g., the SAT), we tested participants in groups of 10–15 within a large, modern-looking computer lab. We also asked participants to leave their backpacks and cell phones in one corner of the computer lab.

Once all of the participants completed their consent forms and were seated in the lab, an experimenter read an introduction to the PCRT from a prepared script. From this point forward, the procedure for the study was the same as in Study 1, with one exception: As opposed to waiting in the hallway while participants completed the test, the two experimenters walked around the testing room and watched participants as they completed the test questions.

3.2. Results

Four participants were excluded from analysis in this study: Two for expressing doubts about the 50-dollar lottery, one for sleeping, and one due to experimenter error. This left 81 participants for analysis (46 women).

[4] We initially conducted analyses on this data after 58 participants had completed the study. We expanded the sample to 85 participants in order to see if the absence of certain effects was due to a lack of power.

3.2.1. Test stakes

To assess whether participants perceived the stakes of the test to be high, we analyzed their ratings of test stress ($M = 38.10$, $SD = 30.46$), importance ($M = 55.80$, $SD = 28.73$), and anxiety ($M = 21.76$, $SD = 23.22$). Mean scores for these measures were low to moderate in magnitude. In fact, the mean levels of stress and anxiety were significantly lower than the midpoints of their respective scales (for stress, $t(80) = 3.52$, $p = .001$; for anxiety, $t(80) = 11.49$, $p < .001$). However, participants did report taking the test relatively seriously ($M = 78.17$, $SD = 18.36$; significantly higher than the scale's midpoint, $t(80) = 13.81$, $p < .001$). None of the measures were significantly affected by the manipulation of regulatory focus ($ts < 1.55$, $ps > .13$, $ds < 0.35$).[5] We also observed that out of the 76.5% of participants who answered every math question and the 96.3% who answered every verbal question, many students answered all of the questions and stopped working on the test before the time limit expired for that section, which suggests that they were not overly concerned with performing their best. These findings, combined with participants' post-test questionnaire responses, led us to conclude that (as in Study 1) our manipulation was not successful in raising the stress level or stakes of the experimental test from that of first study. However, participants once again reported being relatively engaged while taking the test ($\alpha = .85$, $M = 73.84$, $SD = 18.55$); individuals in the promotion and prevention conditions reported equal levels of engagement, $t(79) = 0.14$, $p = .89$, $d = 0.03$.

3.2.2. Test performance

We computed final test scores from this study in the same manner as in Study 1. Mean final test scores were submitted to a 2 (regulatory focus: promotion vs. prevention) × 2 (test section: math vs. verbal) mixed ANOVA, with repeated measures on the last factor. As shown in Fig. 1, the pattern of results was nearly identical to the pattern from Study 1. Specifically, there was a significant main effect of regulatory focus, $F(1, 79) = 5.86$, $p = .02$, $\eta^2_p = .07$, such that participants in the prevention condition performed significantly better than participants in the promotion condition. The interaction was not significant, $F(1, 79) = 0.89$, $p = .35$, $\eta^2_p = .01$, but follow-up tests showed that the main effect of regulatory focus was again driven by a significant difference between the prevention and promotion conditions for the math section, $t(79) = 2.31$, $p = .02$; although, unlike in Study 1, there was also a marginally significant difference in the verbal section, $t(79) = 1.82$, $p = .07$. There was no main effect of test section, math versus verbal, on final test scores, $F(1, 79) = 0.03$, $p = .86$, $\eta^2_p < .001$.

Consistent with the results of Study 1, participants in the prevention condition answered significantly more items correctly, $F(1, 79) = 5.97$, $p = .02$, $\eta^2_p = .07$, and made fewer mistakes, $F(1, 79) = 5.30$, $p = .02$, $\eta^2_p = .06$, than did participants in the promotion condition in Study 2. There were no interactions ($Fs < 0.95$, $ps > .33$, $ds < .01$), but all effects were driven by significant differences in the math section ($ts > 2.12$, $ps < .04$), with marginally significant differences in the verbal section ($ts > 1.78$, $ps < .08$).

3.2.3. Strategy use

In this study, computer software recorded the number of seconds that passed each time participants viewed a particular question.[6] This made it possible to analyze the time participants spent revisiting certain questions, and to map the order in which participants moved from one question to another. Because some participants would quickly click past

[5] Exploratory analyses revealed interactions between regulatory focus and both stress and anxiety in predicting test performance. Results of the interaction for anxiety suggested that the negative association between anxiety and performance was stronger for participants in the promotion condition than for those in the prevention condition. However the pattern of results from these analyses overall was not clearly interpretable; therefore these findings are not reported here (but are available upon request).

[6] A glitch in the time coding software left six participants with time data that was missing for some variables — those six individuals were excluded from analyses that utilized time-based variables, leaving 75 participants.

some of the test items on their way to view a specific question (e.g., clicking past questions 3 and 4 in order to get to question 2 from question 5), we set a threshold of 2 s as the criterion for determining whether a participant had actually viewed a particular question. When participants visited a question for less than 2 s, that timing information was excluded and did not count toward the total time participants spent on that question.

First, to test for differences in strategy use between promotion and prevention participants, we submitted total test times to another mixed ANOVA. As in Study 1, there was no effect of regulatory focus on overall total test time, $F(1, 73) = 0.02$, $p = .88$, $\eta^2_p < .001$, though there was a main effect of test section, $F(1, 73) = 68.63$, $p < .001$, $\eta^2_p = .49$. Once again, participants spent more time on the math questions overall ($M = 1032.77$ s, $SD = 165.22$) than on the verbal questions ($M = 868.04$ s, $SD = 184.93$). This effect was not qualified by a significant interaction, $F(1, 73) = 1.34$, $p = .25$, $\eta^2_p = .02$.

In contrast to Study 1, there was no evidence of individuals in the prevention condition revisiting questions more frequently than individuals in the promotion condition for either section of the test (on math, 44.7% of individuals in the prevention condition and 45.9% of individuals in the promotion condition revisited questions, $\chi^2 = 0.01$, $p = .92$; on verbal, 36.8% of individuals in the prevention condition and 29.7% of individuals in the promotion condition revisited questions, $\chi^2 = 0.43$, $p = .51$). Because we collected more advanced timing data, we analyzed two new measures of strategy use in Study 2: How much total time participants spent revisiting questions, and how many unique test questions participants revisited. The first measure was analyzed using a mixed ANOVA. Results were not significant, $F(1,73) = 0.16$, $p = .69$, $\eta^2_p = .002$, and there was no interaction, $F(1,73) = 0.32$, $p = .58$, $\eta^2_p = .004$, but there was a main effect of test section such that participants spent more time revisiting math questions than verbal questions, $F(1, 73) = 10.13$, $p = .002$, $\eta^2_p = .12$. We analyzed the measure of unique questions revisited using Poisson regressions with regulatory focus as a predictor (dummy-coded: promotion = 1; prevention = 0). This was because the data represented an event count with a positively skewed distribution and thus could not be as appropriately analyzed using a statistical method that assumed normality (see Gardner, Mulvey, & Shaw, 1995). Results demonstrated that regulatory focus did not significantly predict the number of questions revisited on the math section, $B = 0.18$, Wald = 1.324, $p = .25$, or the verbal section, $B = -0.01$, Wald = 0.002, $p = .97$.

3.3. Discussion

The aim of Study 2 was to determine whether individuals induced to hold a prevention orientation would perform worse than individuals induced to hold a promotion orientation in a higher-stakes exam setting. However, self-report ratings and observations of participants indicated that our attempted manipulation of test stakes was again ineffective (though participants did report moderate levels of perceived importance and high levels of engagement and seriousness). Therefore, it is unsurprising that results from Study 2 replicated those of Study 1, with individuals in the prevention condition outperforming individuals in the promotion condition on the exam. This study, then, can be thought to replicate the novel findings of Study 1 regarding individuals earning higher test scores when induced to hold a prevention orientation. Study 2 also extends the findings of Study 1 by suggesting that the advantage of a prevention orientation (induced using an outcome framing manipulation) for test performance in certain non-high-stakes, loosely timed settings applies to group testing environments.

We did not find any evidence that individuals in the promotion and prevention conditions used different information processing strategies (such as revisiting previous questions) in this study. This is somewhat surprising considering that revisiting partially explained the improved performance of prevention-oriented individuals in Study 1. It may be that the present behavioral measure of strategy use was not sensitive enough to consistently pick up on differences across studies (see the General discussion section).

The central aim of our next study was to extend our exploration of regulatory focus and testing to the classroom. Do prevention-oriented students outperform promotion-oriented students on tests that really matter to them, or are the effects observed in the previous two studies limited to laboratory tests that are perceived to be relatively unstressful and unimportant? In this study we measured students' chronic regulatory focus rather than temporarily inducing a promotion or prevention orientation.

4. Study 3

Study 3 considered the relationship between regulatory focus and academic test performance in the context of college students' course exams, which are considered to be stressful but do not typically include strict time-constraints (unlike many standardized tests). In this study, we measured students' chronic regulatory orientations rather than temporarily inducing them in order to see whether individual differences in students' regulatory orientations influenced test performance in the same way as did situational differences. This measure was administered, along with measures of test anxiety and overall academic performance, as part of an online survey that we sent early in the semester to students in two college courses. We followed these students throughout the semester as they took midterm and final exams, and then asked them to release their test data for analysis. Our aim was to assess whether a promotion or prevention orientation would be more beneficial for students' performance on consequential midterm and final exams.

Based on the results of the first two studies, it seemed possible that prevention-oriented students would benefit from the use of careful, analytic processing strategies on their exams and, thus, continue to perform better than promotion-oriented students even though they may find these tests to be highly stressful. At the same time, it was also possible that prevention-oriented students would perform worse than promotion-oriented students because the stress associated with a real college testing situation would lead them to become overly anxious and perseverate on challenging test questions.

4.1. Method

4.1.1. Participants

Participants were 119 students (88 women) from a large university in a Mid-Atlantic state. Participants were enrolled in one of two undergraduate courses in the college of education. Mean participant age was 20.82 ($SD = 2.23$). Participants were approximately 62% European-American, 10% African-American, 18% Asian or Pacific Islander, 7% Hispanic, and 3% biracial or multi-racial. Participants received extra course credit for volunteering and were treated in accordance with the APA ethical guidelines.

Students were recruited from two social science courses, each of which had two sections: Research Methods (85 students across the two sections) and Cognitive Development (53 students). Research Methods covers material on basic topics related to studying human behavior in a developmental context, with a focus on the hands-on design of studies and on scientific writing. Cognitive Development covers material about the development of cognitive processes pertaining to attention, memory, language, intelligence, etc.

4.1.2. Materials

4.1.2.1. Regulatory focus questionnaire. Students' chronic regulatory focus was measured using the Regulatory Focus Questionnaire (RFQ; Higgins et al., 2001). The questionnaire, which consists of eleven 5-point Likert-type items, assesses participants' past subjective history of successful promotion- and prevention-oriented behavior by asking them to rate how frequently different events (six promotion and five prevention)

have occurred in their lives (e.g., "I often obeyed rules and regulations that were established by my parents"; 1 = "never or seldom"; 5 = "very often"). Although the RFQ is not the only questionnaire used to assess individual differences in regulatory focus, it is one of the most frequently used and reliable measures of promotion and prevention orientations. In fact, in a recent study comparing the RFQ to several other measures of chronic regulatory focus, Haws et al. (2010) concluded: "Of the five measures, it alone is adequate in internal consistency, homogeneity, and stability, and it performs the best in terms of predictive validity and representativeness. Notably, it is the only scale to distinguish explicitly between approach and avoidance in each regulatory focus and to encapsulate the key tenets of regulatory focus theory" (p. 979).

Promotion and prevention indexes were created by reverse coding all items that assessed regulatory failure and then separately averaging each participant's promotion and prevention responses (promotion, $\alpha = .74$; prevention, $\alpha = .79$). According to regulatory focus theory, whichever set of strategic concerns happens to be the strongest for an individual at a given moment will predominantly influence that person's goal pursuit (see Higgins et al., 2001; Higgins, 1998). We therefore computed an index of each participant's predominant orientation by subtracting their prevention score from their promotion score, consistent with previous regulatory focus studies (e.g., Bohns et al., 2013; Cesario et al., 2004; Hong & Lee, 2008; Scholer, Ozaki, & Higgins, 2014). This index, which indicated strength of promotion orientation relative to prevention orientation, was the central predictor in our analyses because it indicated which orientation was likely to predominantly influence participants' academic pursuits.

4.1.2.2. Test anxiety questionnaire. Trait test anxiety was measured using two 10-item subscales (tension and worry) from the Reactions to Tests Questionnaire (Sarason, 1984), which consists of four subscales in all (tension, worry, test-irrelevant thinking, and bodily reactions). For both subscales, students were asked to rate their typical reaction to various test-taking situations using 4-point Likert-type scales (e.g., "I find myself becoming anxious the day of a test."; 1 = "Not Typical"; 4 = "Very Typical"). No items in this questionnaire needed to be reverse-coded, so tension and worry indexes were created by separately summing responses for each subscale such that scores ranged from 0–40 for each construct (for tension, $\alpha = .95$; for worry, $\alpha = .86$).

4.1.2.3. Academic achievement. Past academic achievement was assessed by asking participants to report their GPAs, their college majors, and whether or not they were members of the University's honors college. Students were told to refrain from answering these questions if they felt uncomfortable doing so. Although self-reported GPA may be less construct valid than many researchers believe, "self-reported grades can also be regarded with greater confidence when the nature of the sample and situation correspond to samples and situations found to yield more highly reliable information (e.g., students with stronger GPAs and college students)" (Kuncel, Crede, & Thomas, 2005, p. 78; see also Cassady, 2001). Additionally, Kuncel et al. (2005) have argued that self-reported GPAs generally predict outcomes as well as do actual GPAs. We therefore believe that this is an adequate measure of prior achievement. We also asked students to report their SAT scores, but too few students actually provided this information for us to include this measure in our analyses.

4.1.2.4. Post-test questionnaires. Students' impressions of test stakes immediately following the final exam were assessed by having them respond to the three items adapted from Study 2 (e.g., "How important was it for you to do well on this test?"; 0 = "Not at all important"; 100 = "Very important"). Students were also asked to write down how many hours they engaged in concentrated study when preparing for their final exam. Finally, students completed five items from Morris' (1981) Worry–Emotionality Scale to assess their state-level test anxiety. The items required participants to rate (using a 5-point Likert-type scale) the extent to which they were presently experiencing different attitudes and feelings regarding the exam (e.g. "I am afraid that I should have studied more for this test."; 1 = "The statement does not describe my present condition."; 5 = "The condition is very strong; the statement describes my feelings very well."). We created a composite score by summing participants' responses to the five items, creating a scale range of 5–25 ($\alpha = .90$).

4.1.2.5. Course exams. In both courses, data collected from students' midterm and final exams included the times that it took them to complete each exam and their overall exam scores. This data was collected for both midterm and final exams in both courses, and all exams included both multiple choice and short answer questions. In the Research Methods course, students completed one midterm exam and one final exam throughout the semester. In the Cognitive Development course, students completed two midterm exams and one final exam. Scores were collected for all three of the exams for this course, but complete timing data was only obtained for the final exam.

4.1.3. Procedure

Within the first six weeks of the semester, students in both courses were informed by e-mail about an opportunity to earn extra credit by completing an online questionnaire about factors that influence test performance. Students could click on a link provided in the e-mail, which directed them to the online questionnaire (described above). The questionnaire was administered electronically via the Qualtrics Research Suite.

In the middle of the semester, students took midterm exams in their courses. Course instructors recorded exam grades and times taken for each midterm exam. At the end of the semester, students took final exams. As they turned in their final exams, they were given a letter asking them to release information (times and scores) about their exams to the experimenters. The letter explained that this test information would be analyzed in conjunction with their responses to the online questionnaire. Students who agreed to release their exam information signed a consent form and then completed two short questionnaires assessing the stress and anxiety they experienced during the exam as well how important they perceived the exam to be.

4.2. Results

We received 119 complete online surveys early in the semester. Nine surveys were immediately excluded from analysis: seven could not be matched to specific students, one came from a student who knew the purpose of the study, and one came from a student who dropped the course before taking exams. Sixteen students completed the second part of the study but had not previously completed an online survey. Data from those individuals were not included in any analyses. Ninety-two students completed both parts of the study, the online questionnaire, and the post-test responses (75.5% of the students in Cognitive Development, and 68.2% of the students in Research Methods).

Of the 92 students who provided complete responses, 34 students came from the smaller Cognitive Development course and 58 were from the larger Research Methods course.[7] Two individuals provided data for the same ID number, so data associated with that ID number was excluded. This left 91 participants for analysis (68 women; 24 women in Cognitive Development and 44 women in Research Methods).

[7] Six students who completed both parts of the survey were enrolled in both courses. Data from these students were included in the analyses once, as part of the research methods course.

4.2.1. Courses and course sections

We conducted a number of analyses comparing the students from the two courses in order to ensure that it was appropriate to analyze data by collapsing across the two classes. There were no significant differences in proportion of males to females who participated in the study between the courses, $\chi^2 = 0.11$, $p = .74$. Additionally, there were no significant differences between the two courses in reported GPA,[8] $t(80) = 0.24$, $p = .81$, $d = 0.05$, chronic regulatory focus, $t(89) = -0.44$, $p = .66$, $d = 0.09$, trait test worry, $t(89) = 0.36$, $p = .72$, $d = 0.08$, or trait test tension, $t(89) = 0.17$, $p = .87$, $d = 0.04$.

Some significant differences did emerge between the two courses: students in Cognitive Development were marginally older than students in Research Methods, $t(89) = -1.76$, $p = .08$, $d = 0.39$. Additionally, compared to students in Research Methods, students in Cognitive Development rated their final exam as being significantly more stressful $t(88) = -4.74$, $p < .001$, $d = 1.05$, and important, $t(89) = -2.11$, $p = .04$, $d = 0.48$. Students in Cognitive Development also reported studying longer for their final exam, $t(88) = -5.03$, $p < .001$, $d = 0.97$. Finally, students in Cognitive Development earned lower average exam scores, $t(88) = 2.22$, $p = .03$, $d = 0.47$, and took longer on their exams (midterm: $t(72) = -3.61$, $p < .001$, $d = 1.12$; final: $t(88) = -12.28$, $p < .001$, $d = 2.68$) than students in Research Methods. Because the variables that differed between courses did not correlate with our measure of regulatory focus, we conducted our main data analysis by analyzing all participant responses together, collapsing across course.

4.2.2. Test stakes

Participants in Study 3 provided stress and importance ratings about their exams just as participants did in Study 2. However, Study 3 ratings were based on college course final exams, which are commonly associated with high stress and importance. Additionally, course exams have more implications for students' personal goals and academic ambitions than experimental studies do. Considering this, it was not surprising that students rated the final exam from Study 3 to be relatively stressful ($M = 58.06$, $SD = 30.14$; significantly higher than the scale's midpoint, $t(89) = 2.54$, $p = .01$) and important ($M = 85.08$, $SD = 19.43$, $t(90) = 17.22$, $p < .001$). They also reported taking the final exam from Study 3 quite seriously ($M = 84.16$, $SD = 17.68$, $t(90) = 18.44$, $p < .001$). In fact, participants rated the tests in this study as more stressful and important, and reported taking them more seriously, compared to how participants rated the tests in Study 2 (stress: $t(169) = 4.30$, $p < .001$, $d = 0.66$; importance: $t(170) = 7.90$, $p < .001$, $d = 1.19$; seriousness: $t(170) = 2.18$, $p = .03$, $d = 0.33$). Chronic regulatory focus was not significantly correlated with perceived final exam stress, $r = .01$, $p = .96$, perceived final exam importance, $r = .09$, $p = .41$, how seriously participants took the final exam, $r = .13$, $p = .24$, or how many hours students studied for the final exam, $r = .08$, $p = .46$.

4.2.3. Test anxiety

On average, students did not report experiencing high levels of state test anxiety after their final exams ($M = 10.16$, $SD = 4.39$; significantly lower than the scale's midpoint, $t(90) = 5.07$, $p < .001$). However, students did report relatively high levels of trait test anxiety (for tension, $M = 25.53$, $SD = 8.26$; significantly higher than the scale's midpoint, $t(90) = 6.39$, $p < .001$; for worry, $M = 22.77$, $SD = 6.27$, $t(90) = 4.21$, $p < .001$).

Intercorrelations between the variables of chronic regulatory focus, trait test anxiety, state test anxiety, GPA, and exam performance can be found in Table 1. Chronic regulatory focus was negatively related to trait test anxiety in terms of both perceived tension and worry, such that the more prevention-oriented (and less promotion-oriented) students were, the more tension and worry they reported about general test-taking. While tension was not correlated with exam performance in our sample, worry was negatively correlated with performance on students' midterm exams (see Table 1). State test anxiety was not correlated with regulatory focus, but it was negatively correlated with exam performance and GPA, and positively correlated with trait-level test anxiety.[9]

4.2.4. Test performance

Each performance measure was submitted to a hierarchical multiple regression analysis. For the final exam scores, chronic regulatory focus (mean-centered), course (effect-coded: Cognitive Development = −1, 1, Research Methods = 1), GPA, and hours spent studying for the final exam, were entered in the first step, and the regulatory focus × course interaction was added in the second step. GPA and hours spent studying were included as covariates in these analyses to rule out the possibility that individuals with a particular orientation performed better on exams because they generally perform better in their classes or because they spent more time preparing for this particular test.[10] The course × regulatory focus interaction was included because we wanted to determine whether the effect of regulatory focus on test performance was the same in both classes. Hours spent studying were only collected on the final exam, so for the midterm score analyses only GPA was used as a covariate.

4.2.4.1. Midterm scores. Midterm scores in Cognitive Development were computed by dividing the total number of points students received on each exam by the number of points possible for that exam and then averaging the two resulting percentages (in Research Methods students only took one midterm exam, and the corresponding percentage served as the midterm score). Results revealed a significant main effect of regulatory focus, $\beta = -0.20$, $t(77) = -2.38$, $p = .02$: The more prevention-oriented (and the less promotion-oriented) participants were, the better they performed on their midterm exams. A main effect of GPA was found, $\beta = 0.46$, $t(77) = 5.42$, $p < .001$, such that higher GPA led to higher midterm scores. A main effect of course was also found, $\beta = 0.39$, $t(77) = 4.59$, $p < .001$, such that students in Research Methods earned higher scores than did students in Cognitive Development. However, the main effects of course and regulatory focus were qualified by a significant course × regulatory focus interaction, $\beta = 0.25$, $t(76) = 2.81$, $p = .01$. In Cognitive Development, a stronger prevention orientation, relative to promotion, was associated with better test performance, $\beta = -0.55$, $t(76) = -3.71$, $p < .001$; however, in Research Methods, there was very little relationship between regulatory focus and test performance, $\beta = -0.05$, $t(76) = -0.51$, $p = .61$.

4.2.4.2. Final exam scores. Final exam scores were computed by dividing the total number of points each student received by the total number of points possible. The results of a regression analysis again revealed a significant main effect of regulatory focus, $\beta = -0.24$, $t(75) = -2.57$, $p = .01$, such that the more prevention-oriented (and the less promotion-oriented) participants were, the better they performed on the final course exam. There was also a significant main effect of GPA, $\beta = 0.51$, $t(75) = 5.37$, $p < .001$, but no main effect of hours studied, $\beta = -0.07$, $t(75) = -0.68$, $p = .50$. Unlike for midterm scores, there

[8] Some self-report data was missing: Nine participants did not report their GPAs, one declined to report how stressful he or she found the study, one declined to report time spent studying for his or her final exam, and midterm/final data from one was missing. All missing data is reflected in the degrees of freedom for each of the analyses that use those variables.

[9] We tested whether state and trait test anxiety interacted with regulatory focus to predict exam scores in an additional set of analyses. We found some interactions suggesting that the negative association between anxiety and performance was stronger for more promotion-oriented (and less prevention-oriented) students, but largely the results of the interactions were inconclusive (see the General discussion section). We therefore do not report these results in the manuscript, though they are available upon request.

[10] We also conducted a second set of analyses in which GPA and hours studied were excluded from the regression model. This was done to maximize statistical power, as only 82 participants reported their GPAs. These analyses yielded the same patterns of results as those reported below.

Table 1
Summary of intercorrelations from Study 3.

	1	2	3	4	5	6	7	8
1. Regulatory focus	–							
2. Trait test anxiety — tension	−.26**	–						
3. Trait test anxiety — worry	−.27*	.83**	–					
4. State test anxiety	−.07	.38**	.36**	–				
5. GPA	−.07	−.08	−.20	−.29**	–			
6. Hours spent studying for final exam	.08	.14	.25*	.26*	−.09	–		
7. Average midterm score	−.25*	−.11	−.21*	−.50**	.49**	−.37**	–	
8. Final exam score	−.24*	−.01	−.12	−.36**	.53**	−.07	.58**	–

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

was no main effect of course, $\beta = 0.01$, $t(75) = 0.05$, $p = .96$, and no course × regulatory focus interaction, $\beta = 0.10$, $t(74) = 0.97$, $p = .34$.[11]

4.2.5. Test timing

We next checked to see whether promotion- and prevention-oriented students spent different amounts of time on their final course exams. Total exam times were recorded in Research Methods for all participants' midterm and final exams. In Cognitive Development, times were recorded for participants' final exams,[12] but no times were collected on the first midterm exam. On the second midterm exam, time data was collected, but data from 17 participants was lost due to an administrative error. Therefore only 16 students from this course were included in analyses of midterm times. Generally speaking, most students completed their exams before the time limit expired for both their midterm and final exams, with 70 of the 74 students (94.6%) for whom time data were available completing their midterm exams, and 89 out of 90 students (98.9%) completing their final exams before the time periods ended.

4.2.5.1. Midterm times. The results of a regression analysis revealed that there was no main effect of regulatory focus, $\beta = -0.18$, $t(63) = -1.68$, $p = .10$, or GPA, $\beta = -0.14$, $t(63) = -1.31$, $p = .19$, on midterm test times. There was, however, a main effect of course, such that students in Cognitive Development took significantly longer on their exams than did students in Research Methods, $\beta = -0.47$, $t(63) = -4.31$, $p < .001$. This effect was not qualified by an interaction, $\beta = -0.10$, $t(62) = -0.66$, $p = .51$.

4.2.5.2. Final exam times. Results looked similar to those from midterm exam times. Regulatory focus was not significantly correlated with time taken on the final exam, $\beta = -0.08$, $t(76) = -1.36$, $p = .18$. A main effect of GPA was observed such that individuals with higher GPAs tended to take less time on the final exam, $\beta = -0.17$, $t(76) = -2.78$, $p = .01$. Additionally, a main effect of course was observed such that students in Cognitive Development took longer on their final exams than did students in Research Methods, $\beta = -0.78$, $t(76) = -11.62$, $p < .001$. There was no main effect of hours studied, $\beta = 0.09$, $t(76) = 0.10$, $p = .17$. Again, this effect was not qualified by a significant interaction, $\beta = 0.10$, $t(75) = 0.13$, $p = .13$.

4.3. Discussion

In Study 3, the stronger participants' prevention orientations (and the weaker their promotion orientations), the better they performed on their exams in an actual college course setting. For nearly all of the students in our sample, there was enough time to complete their midterm and final exams before the testing period ended (similar to Studies 1 and 2). Importantly, students reported their course exams to be both stressful and important, especially in comparison to what participants reported in the initial lab studies. Our results suggest that test stress on its own may not attenuate the difference in exam performance between promotion- and prevention-oriented students. Because prevention-oriented students had enough time to work through all of the items on the stressful exams, any perseveration they may have engaged in due to heightened stress (which does not appear to be much, considering that regulatory focus was not correlated with time spent completing the exams) did not appear to detract from their performance. Thus, prevention-oriented students seem to outperform promotion-oriented students on certain college exams without strict time constraints, even if those exams are perceived to be important and stressful.

5. General discussion

Students' academic test scores are strong determinants of educational and career success in the United States, so it is important to understand which variables might predict differences in test performance beyond the specific abilities that these tests are intended to measure. The present studies are the first to examine systematically the direct effects of regulatory focus on students' test performance, and represent one of the few investigations of regulatory focus within an educational context (cf. Forster et al., 2003; Grimm et al., 2012; Keller & Bless, 2006; Miele et al., 2009; Seibt & Forster, 2004). Our findings suggest that students who are equally competent and who have the same goal of doing well on an exam may perform at different levels if one has a promotion orientation and the other has a prevention orientation. The findings extend the literature on regulatory focus by demonstrating that this variable is relevant for predicting performance on typical academic tests. These findings also extend the literature on how achievement motivation affects testing by demonstrating that students' motivation to use certain regulatory strategies while completing academic tasks can influence their test performance in meaningful ways. These results have implications for understanding what variables beyond content knowledge and skills predict students' scores on different types of academic tests.

The current studies also suggest that holding a prevention orientation may be more adaptive than holding a promotion orientation in certain testing situations that involve low time pressure. When participants perceived that the testing situation was not particularly stressful or strictly timed (Studies 1 and 2), participants who were temporarily induced to have a prevention orientation, using a type of manipulation that has been successful in many previous studies, outperformed participants induced to have a promotion orientation on two sections of a standardized test. The fact that chronically prevention-oriented students outperformed promotion-oriented students on their college course exams was particularly interesting, both for practical reasons and because students reported experiencing more stress on these exams than they did in the research laboratory. This suggests that prevention-oriented individuals can perform well even in testing

[11] We also computed a measure of average exam scores that combined midterm and final scores for each student. This analysis revealed effects that looked similar to the effects from students' midterm exams.
[12] One participants' time data for the final exam was not provided.

contexts that are perceived to be stressful, so long as they have enough time to complete their exams.

5.1. Potential mechanisms explaining prevention-oriented students' performance advantage

These are some of the first studies to show the potential benefits of students holding a prevention orientation for their performance on different loosely-timed academic tests. To build on this work, it will be important for future research to explore more fully what processes may have resulted in these patterns of performance. Results provide some preliminary support for three mechanisms that may have caused prevention-oriented participants to perform better on the loosely-timed tests that we administered. First, students with a prevention orientation may have performed better by using certain types of vigilant information-processing strategies on the test. Preliminary evidence for this mechanism comes from the finding that students in the prevention condition in Study 1 were more likely than students in the promotion condition to revisit previous math questions, which in turn led them to score better on the math section overall. The idea that prevention-oriented individuals tend to revisit previous information in order to protect vigilantly against possible mistakes is consistent with prior research (Miele et al., 2009); however, the present studies extend this research, which was conducted using a reading task, to a more typical testing situation that included both math and verbal problems.

It is important to note that although this revisiting strategy partially mediated the effects of regulatory focus on math test performance in Study 1, it did not do so in Study 2 or in the verbal section of Study 1. It is possible that our revisiting measure was not sensitive enough to consistently pick up on differences in the use of this strategy. A second possibility is failure of random assignment. Perhaps many students in the promotion condition had a strong chronic prevention orientation and thus did not shift their test strategy use as much as students did in Study 1. This seems unlikely considering that we still found effects of regulatory focus on test performance, but we cannot rule the possibility out. It is also possible that revisiting was not the only information processing strategy that promotion- and prevention-oriented students used to different extents during the test. For instance, Förster and Higgins (2005) and Semin, Higgins, de Montes, Estourget, and Valencia (2005) have found that prevention- and promotion-oriented individuals differ in the extent to which they engage in local/concrete information processing versus global/abstract processing. Students in the prevention condition may have been better able to focus on specific details of individual questions within this laboratory experiment than students in the promotion condition, who may have been thinking more about the overall purpose of the test questions. Therefore it may be that students induced to hold a prevention orientation adopted a variety of different information processing strategies that helped them perform better on our exams, but these strategies were not fully captured by our assessments of viewing time and revisiting frequency.

Two other potential mechanisms underlying the observed effects in Studies 1 and 2 are students' task engagement (via the experience of regulatory fit, see Higgins, 2005; Higgins, 2006, for reviews) and their experiences of task anxiety (see Baas, De Dreu, & Nijstad, 2008). Regulatory fit theory (see Higgins, 2000, 2005, for reviews) posits that when peoples' preference for particular regulatory strategies (e.g., prevention-oriented students' preferences for vigilant strategies) match the types of strategies that they are encouraged to use or that they perceive to be important for completing a given task (e.g., a task requiring individuals to ignore distractions in order to succeed), those people will "feel right" about the way they are going about the task and will be more engaged with it. For instance, Freitas, Liberman, and Higgins (2002) demonstrated that prevention-oriented students who were asked to ignore distracting video clips while solving math problems enjoyed solving the problems more than promotion-oriented students, and solved more problems correctly; this advantage went away when the distraction was absent. It is possible that the loose time constraints of our laboratory tests, and the emphasis on earning a high score and thus performing accurately, matched prevention-oriented students' preferences, resulting in higher levels of engagement and better test scores. Support for the fit mechanism in our studies is mixed: In Study 1 individuals in the prevention condition reported marginally more engagement with the test than individuals did in the promotion condition. However, this effect was not found in Study 2 and we did not assess engagement in Study 3.

We also consider task anxiety as a mechanism potentially underlying our effects because even in non-stressful testing contexts, prevention-oriented individuals may experience more anxious arousal than promotion-oriented individuals; this in turn could affect test performance. We did not observe different levels of anxiety between individuals in the promotion or prevention conditions in Studies 1 or 2, or a significant correlation between test anxiety and holding a strong promotion (versus prevention) focus in Study 3, but we cannot rule out anxiety as a mechanism because our self-report measures of anxiety may not have been sensitive enough to pick up on physiological differences in arousal. Future research should explore the roles of both of these potential mechanisms in more detail.

The mechanisms underlying prevention-oriented students' better test performance are assumed to be similar across all three studies in this paper; however, as was previously discussed, additional mechanisms may also have affected prevention-oriented students' test performance in Study 3 beyond the more general mechanisms described above. We cannot determine whether prevention-oriented students' better exam performance in Study 3 was caused by their levels of engagement or use of certain information-processing strategies while they were *taking* their exams or their engagement or strategy use while they were *preparing for* these exams. Although we controlled for the number of hours that students reported studying for their final examinations, prevention-oriented students may have used different types of study strategies than promotion-oriented students, or they may have begun studying at different points before their exams began. These variables or others may in turn have differentially affected students' test performance above and beyond any effects that may have emerged from students' behavior during the exams.

5.2. Students' perceptions of time constraints versus actual time constraints

One might question whether the participants actually experienced the testing situations in Studies 1 and 2 as being loosely timed. Participants in the studies were given the same amount of time to complete the test sections as individuals are given on the actual SAT exam; however, our participants tended to finish the tests well before the time periods ended, whereas high school students often struggle to finish the SAT in the allotted time (e.g., Bridgeman, Trapani, & Curley, 2004). The average age of our samples was about 3 years older than the typical high school student taking the SAT. It is possible that the additional content and vocabulary knowledge accumulated over additional years of schooling, as well as fewer intrusive worries about performing well on the exam, led our participants to take less time than typical SAT test takers would. Ultimately, it seems that the amount of time pressure students experience is not entirely determined by the amount of time allocated for a test; it could also be a function of the testing situation (e.g., test difficulty and importance) and individual differences (e.g., education level). Thus, in order to determine how the testing situation was perceived by participants, we relied more on the time at which students finished their exams than on the objective amounts of time that students were provided to complete those exams.

5.3. Promotion and prevention trade-offs in test performance

Although the present studies suggest an advantage for prevention-oriented students in testing situations with relatively little time pressure, this does not mean that prevention-oriented individuals will

perform better on all tests in all types of testing situations. There are likely boundary conditions that limit prevention-oriented students' performance advantage in loosely-timed testing situations, such as the breadth of students' prevention or promotion concerns (e.g., prevention concerns about overall course performance, performance on a particular test, or performance on specific test questions). It is also likely that in testing situations that are perceived as both strictly timed and stressful such as the actual SATs, LSATs, or Advanced Placement Exams, prevention-oriented individuals will perform worse than promotion-oriented individuals due to excessive vigilance, perseveration, and negative arousal. Some preliminary evidence from our research group suggests that both boundary conditions and trade-offs in performance may exist, although our results are not yet conclusive on either point. These hypotheses should be tested in subsequent studies.

5.4. Implications and future directions

The present line of research holds promise for understanding why students might underperform on certain standardized tests or college course exams. Our regulatory focus induction in Studies 1 and 2 was simple and straightforward: Merely changing a few words in our description of performance incentives led to significant test score differences. Future research (using both manipulations and measures of regulatory focus) should seek to firmly establish the adaptiveness of holding a prevention versus promotion orientation in different types of loosely-timed testing settings, focusing on boundary conditions or testing situations that may lead promotion-oriented individuals to perform better than prevention-oriented individuals (such as situations with high stress and strict time constraints, or situations that induce normative pressure, e.g., Beilock & Carr, 2005). Once these conditions are better understood, researchers can begin to explore whether it is possible to induce a prevention orientation in students who might be chronically promotion-oriented (or a promotion orientation in chronically prevention-oriented students, depending on the testing situation in question) before a test and thus help students to perform better than they might have otherwise performed based on their chronic regulatory orientation.

Despite the important contributions of the present studies to research on motivation and education, there are some limitations that should be addressed in future work. First, as mentioned above, it will be important to investigate regulatory focus in test settings that are both highly stressful and strictly timed, as well as to investigate student factors that may influence their perceptions of stress or time pressure (such as their prior content knowledge and their study habits for particular academic subjects or exams). It will also be important to employ more sensitive measures of both stress and of eager versus vigilant strategy use during testing. Understanding precisely how eager and vigilant processing and stress differences might influence test performance can provide insights into how regulatory focus can be most effectively employed to improve educational outcomes.

We also note that although we had originally conceived of test anxiety as a potential mediator of the effects of regulatory focus on test performance, it may actually serve to moderate these effects. That is, even if promotion- and prevention-oriented students happen to experience similar levels of anxiety in certain testing contexts, they still might respond to this anxiety differently. For instance, when anxiety is low (which was the case for most participants in Studies 1 and 2), the vigilance exhibited by prevention-oriented students may lead to careful consideration of all the test problems and thus high levels of performance; but, when anxiety is high, this vigilance may lead to perseveration on challenging problems, which in turn may result in the students not finishing the test and answering fewer questions correctly. In all three studies, we tested for, but did not find evidence of, this moderating effect. In fact, some exploratory analyses from Studies 2 and 3 suggested that test anxiety might have been more negatively associated with performance for promotion-oriented individuals than for prevention-oriented individuals, perhaps because promotion-oriented individuals were aware of having performed somewhat poorly and thus reported experiencing more anxiety (see footnotes 5 and 9). However we do not believe that our results were conclusive on this point, and without a sensitive measure of state test anxiety, our results were difficult to interpret. It appears that test anxiety might moderate the effects of regulatory focus in complex ways that we did not adequately assess in the present studies, and exploring this is a critical direction for future research.

Finally, subsequent research should extend our initial exploration (Study 3) of the effects of regulatory focus on classroom exam performance. It is currently unclear whether these effects were mediated by differences in how students prepared for their exams, differences in what they did during the exams, or both. Additionally, the sample for Study 3 was limited to a small group of university students enrolled in two social science courses, and did not yield entirely consistent findings across the courses. It is also worth noting that the main effects of regulatory focus in our experimental studies were driven primarily by performance on math (as opposed to verbal) questions. While we also found that a prevention orientation led to better performance on social science exams, it may be the case that certain academic tasks, like those in math or the social sciences, require more analytic (or vigilant) processing than others, such as writing a creative essay on an English exam. This suggests that more research is needed to explore whether test topic may be an additional moderator of the effect of regulatory focus on test performance.

In conclusion, this research suggests that regulatory focus is important for predicting and explaining students' performance in different testing situations. More broadly, regulatory focus theory seems to be valuable for understanding and enhancing students' motivation. Along with other motivational constructs, regulatory focus seems to predict differences in students' test scores that many educators assume are only reflective of differences in those students' knowledge and skills. Furthermore, with more research on the relationship between regulatory focus and educational outcomes, it may be possible to develop effective teaching practices that target students' regulatory orientations in order to improve their achievement on various academic tasks.

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