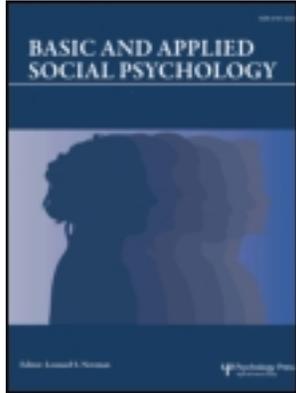


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End-of-Semester Syndrome: How Situational Regulatory Fit Affects Test Performance Over an Academic Semester

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End-of-Semester Syndrome: How Situational Regulatory Fit Affects Test Performance Over an Academic Semester

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Psychology researchers often avoid running participants from subject pools at the end of the semester because they are “unmotivated.” We suggest that the end of the semester induces a situational prevention focus (i.e., sensitive to losses) unlike the beginning of the semester, which may induce a situational promotion focus (i.e., sensitive to gains). In two experiments, we presented participants with math problems at the beginning or end of an academic semester. End-of-semester participants performed better minimizing losses as compared to maximizing gains, whereas the opposite was true for beginning-of-semester participants.

Anecdotal evidence suggests that students who participate in research studies for course credit at the beginning of the semester are different from those who participate at the end of the semester (Blatt & Quinlan, 1967). Researchers have documented how students tested at these different points in the semester differ. Women sign up sooner (Cooper, Baumgardner, & Strathman, 1991; Harber, Zimbardo, & Boyd, 2003; Roman, Moskowitz, Stein, & Eisenberg, 1995; Witt, Donnellan, & Orlando, 2011) and feel more positively about the research requirement than men (Evans & Donnerstein, 1974). Students who sign up earlier have a higher need for personal structure (Roman et al., 1995) and are more compliant (Aviv, Zelenski, Rallo, & Larsen, 2002) than those who sign up at the end, who are more likely to be extraverts (Aviv et al., 2002).

In addition to highlighting differences between beginning-of-semester and end-of-semester participants, the literature also provides evidence that end-of-semester participants tend to perform worse on laboratory tasks. For example, Richert and Ward (1976) gave students a visual search task or a hidden figures task, and found that performance declined over the course

of the semester for the visual search task but not for the hidden figures task. Richter, Wilson, Milner, and Senter (1981) gave students a serial learning task and a symbol substitution task and found worse performance on both tasks at the end of the semester relative to the beginning.

In this article, we argue that the findings in the literature can be clarified by considering the role of motivation. Hom (1987) argued that early-semester participants are likely more intrinsically motivated than late-semester participants as their performance is detrimentally affected by the presence of an external reward.

Building off this work on intrinsic motivation, we draw from work on regulatory focus (Higgins, 1997) and regulatory fit (Forster, Higgins, & Idson, 1998; Grimm, Markman, Maddox, & Baldwin, 2008; Shah, Higgins, & Friedman, 1998). We argue that end-of-semester students are not unmotivated but instead are in a different motivational state than those at the beginning of the semester, and moreover that the motivational states are situational factors induced by the time of semester.

Regulatory focus is a mechanism that influences how sensitive people are to potential gains and losses in their environment (Higgins, 1997). Individuals who are promotion focused are sensitive to potential gains and

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nongains, whereas those who are prevention focused are sensitive to potential losses and non-losses. Research on regulatory focus suggests that foci are chronic but can be overridden by salient situational elements, such as earning or losing raffle ticket entries (Grimm et al., 2008; Maddox, Baldwin, & Markman, 2006; Shah et al., 1998) or activating a stereotype (Grimm, Markman, Maddox, & Baldwin, 2009).

Furthermore, regulatory focus interacts with salient task components to influence performance. Higgins (2000) argued that the influence of regulatory focus can be enhanced when the means of performing a task matches the underlying motivational state. For example, Keller and Bless (2006) found improved math test performance when students' chronic focus state matched the task framing, and Spiegel, Grant-Pillow, and Higgins (2004) clearly showed that giving promotion or prevention-focused participants either an eagerness or a vigilant means of completing the task changed performance. Specifically, in Experiment 1, they found that the regulatory fit participants (e.g., promotion/eagerness and prevention/vigilance) were more likely to complete the assigned task than regulatory misfit participants (e.g., prevention/eagerness and promotion/vigilance).

Regulatory fit can also be created by situationally inducing regulatory focus and manipulating eager or vigilant strategies for completing the task, such as emphasizing a focus on maximizing gained points or minimizing lost points, respectively. For example, Maddox et al. (2006) demonstrated that situational promotion-focused participants performed better on a task when they focused on maximizing points (i.e., regulatory fit) instead of minimizing lost points (i.e., regulatory misfit), whereas situational prevention-focused participants performed better on the task that required minimizing lost points. This regulatory fit between the situational regulatory focus and the point reward structure of the task has been shown to influence classification learning (Grimm et al., 2008; Maddox et al., 2006) and math performance (Grimm et al., 2009). This recent work argues that regulatory fit influences performance because of the cognitive flexibility that is afforded when a person experiences a regulatory fit. Maddox et al. (2006) and Grimm et al. (2009) showed that regulatory fit participants were more able to flexibly generate and test strategies that would yield good task performance, and Grimm et al. (2009) demonstrated that this increased cognitive flexibility produced improved performance on difficult math problems from the Graduate Record Examination (GRE).

In the current article, we argue that students tested at different points in the semester have different motivational states. Specifically, we believe that the end of the semester creates a prevention motivational state in students, whereas the beginning of the semester

may create a mild promotion motivation. As such, we were interested in examining students who elected to participate in our studies at the beginning or end of the academic semester. Academic researchers rarely control for the time of the semester of testing by randomly assigning students across the semester. Instead, psychologists rely on participant pools that allow students to select and sign up for studies at their convenience. We were interested in documenting the regulatory focus differences that exist in participants at different points in the semester, which are likely creating the *end-of-semester syndrome* (i.e., worse performance by students at the end of the semester), possibly in concert with other individual difference variables. If we were correct to assume that motivational state differences are created by the time of semester, the regulatory fit approach predicts how to improve the performance of students at the end of an academic semester by doing something counterintuitive—by getting students to focus on minimizing their losses as opposed to maximizing their gains during task performance. This would provide researchers with a means of improving performance of participants at the end of the semester and provide students with a test-framing strategy to use for difficult end-of-semester exams.

We chose to study students at the very beginning and at the very end of the academic semester. As Cooper et al. (1991) suggested, these student populations may be ideal to study because they represent students very eager to participate and those for whom the experimental requirement is the most unpleasant. Simply, we posited that students at the beginning of the semester may have a situational promotion focus, whereas those at the end of the semester have a situational prevention focus. At the end of the semester students are truly worried about failing to complete assignments, not completing the research requirement, and doing poorly in their classes. At the beginning of the semester students may be excited about having new experiences, taking new courses, and meeting new people. As such, participants at the beginning of the semester are more focused on hopes and aspirations, consistent with a promotion focus, and participants at the end of the semester are more focused on obligations and responsibilities, consistent with a prevention focus.

In addition to considering the influence of situational regulatory focus, we conducted analyses to test for the influence of chronic regulatory focus. It may be the case that both chronic and situational foci affect test performance at the beginning or end of the academic semester. For example, it could be the case that more chronically prevention-focused participants choose to participate later in the semester and, as such, chronic focus could substitute for time of semester. Furthermore, chronic focus could have an impact at the beginning of the

TABLE 1
Schematic Representation of Regulatory Fit and Misfits

	Reward Structure	
	Gains	Losses
Beginning of semester ("promotion")	Fit	Misfit
End of semester ("prevention")	Misfit	Fit

semester when a weaker situational motivational state may allow chronic focus to have a greater influence on test performance. Therefore, we considered whether chronic regulatory focus and situational regulatory focus are both influencing performance independently or if they influence performance by interacting.

In two experiments, we examined the relationship between the time participants are tested in the semester and the reward structure of the test (see Table 1). All participants completed problems from the quantitative section of the GRE. Half of the participants gained points for correct responses and half lost fewer points for correct responses. In addition, half of the participants completed the study during the first 2 weeks of an academic semester and half completed the study during the last 2 weeks. The time-in-semester of testing was used to situationally induce a motivational state, whereas the task framing (gains or losses) was used to manipulate eager or vigilant strategies for the task that fit or misfit the motivational state. Borrowing from the work on regulatory fit, we predicted that students at the beginning of the semester would likely perform better on the gains version of the test, whereas students at the end of the semester would perform better on the losses version of the test. In Experiment 1, we confirmed these predictions. In Experiment 2, we replicated the findings of Experiment 1 and demonstrated that students were more promotion focused at the beginning of the semester and more prevention focused at the end of the semester using an assessment of situational regulatory focus.

EXPERIMENT 1

Method

Participants and Design

Ninety undergraduate students at the University of Texas at Austin participated for course credit (48 in the first 2 weeks and 42 in the last 2 weeks of an academic semester). Half of the participants from each time in the semester were randomly assigned to the gains or losses reward structure yielding a 2 (Time in Semester: Beginning, End) \times 2 (Reward Structure: Gains, Losses) between-participants design.

Materials and Procedure

Participants were tested individually. Participants first completed the Regulatory Focus Questionnaire (RFQ; Higgins et al., 2001), a measure of chronic focus, then the Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988), the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, & Metzger, 1990), and the E and P Scales (Eysenck, Eysenck, & Barrett, 1985), as measures of Extraversion and Impulsive Antisocial Sensation Seeking (IMPASS), respectively (Pickering & Gray, 2001). These were used to determine if there were group differences prior to telling participants about the study purpose and because they were likely candidates for individual differences across our time-of-semester groups. Of particular importance to our study, the RFQ asks participants to record the frequency of different events relating to promotion and prevention goals in their lives. For example, a promotion item is, "How often have you accomplished things that got you 'psyched' to work even harder?" and a prevention item is, "How often did you obey rules and regulations that were established by your parents?" Each of the 11 items is rated on a 1-to-5 scale as a measure of the frequency of the event.

Next, participants were told that they were going to take a math test. Participants in the gains condition were informed they would earn 0 points for each incorrect answer and 2 points for each correct answer, and that their goal was to get 36 points (e.g., 90% correct). Participants in the losses condition were told they would lose 3 points for each incorrect response and lose 1 point for each correct response, and that their goal was to lose no more than 24 points (e.g., 90% correct).¹

After reading about the test reward structure, participants answered several questions. "How well do you think you will perform in this task on a scale of 1 to 9, where 1 = very bad and 9 = very good?" "How much do you like the task (1 = not at all, 9 = very much)?" and "How motivated are you to do well on the task (1 to 9)?" Next, the participants completed the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988) to measure affect prior to completing the math problems.

Participants completed 20 questions from the quantitative section of the general section of the GRE, which assumes knowledge of arithmetic, algebra, trigonometry, and geometry (Educational Testing Service, 2004). Each problem was multiple choice with five possible answers. Problems were presented in a box on the left side of the screen one at a time. Participants tracked their progress

¹Maddox, Baldwin, and Markman (2006) demonstrated that a gains structure with 2 points for a correct response and 0 points for an incorrect response produces the same pattern of results as 3 points for a correct response and 1 point for an incorrect response.

using a vertically oriented “point meter” on the right side of the screen. The 0 point was marked on the meter as was the 90% criterion line. In the gains task, the point meter started at 0, located at the bottom of the point meter, and the 90% criterion line was labeled “36 points.” In the losses task, the point meter started at 0, but 0 was located at the top of the point meter and the bonus criterion was labeled “-24 points.” Samples of the gains and losses task screens are in Figure 1. When participants correctly answered a question, they heard a *ching* sound and the word “Correct” appeared on the screen. When participants were incorrect, they heard a buzzer and the word “Incorrect” appeared.

Results

First we present the interaction of Time in Semester and Reward Structure and then we discuss whether individual differences affected our results. When considering the influence of individual differences as assessed by our questionnaires, we used centered continuous variables created by subtracting the mean. An alpha level of .05 was used to

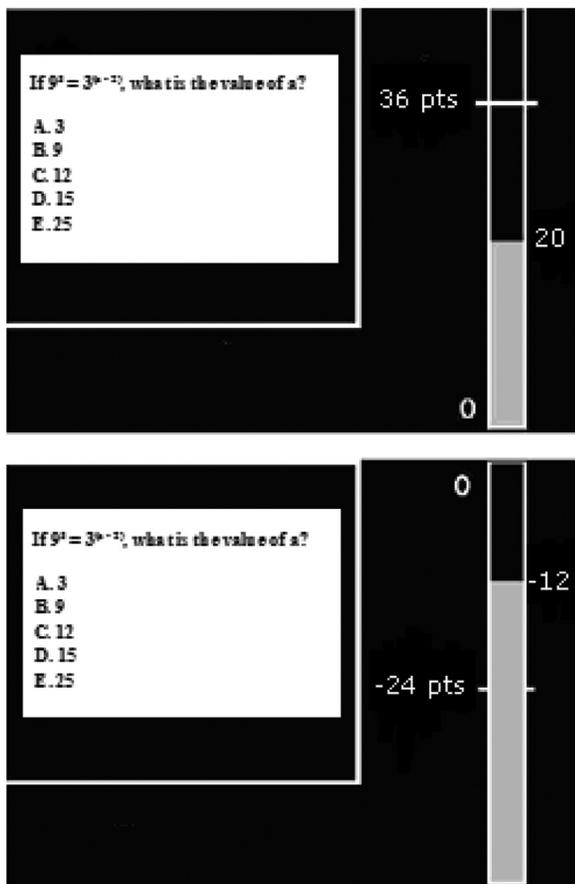


FIGURE 1 Sample gains and losses screens with point meter and the large box in the left corner where problems appeared. *Note.* A sample problem has been provided.

test for statistical significance. The data were analyzed using an analysis of variance (ANOVA) with Time in Semester (Beginning, End) and Reward Structure (Gains, Losses) as between-participants factors. The dependent measure was the percentage of problems correctly solved out of the 20 attempted. All participants attempted all 20 problems. This analysis revealed a two-way interaction between Time in Semester and Reward Structure, $F(1, 86) = 5.35, p = .02, \text{partial } \eta^2 = .06$ (Figure 2). As predicted, the beginning-of-semester participants who completed the gains GRE test performed better ($M = 52.5$) than participants who completed the losses GRE test ($M = 46.25$), though this difference was not statistically reliable, $F(1, 86) = 1.36, p = .24$. However, the end-of-semester participants who completed the gains GRE test performed worse ($M = 42.38$) than participants who completed the losses GRE test ($M = 54.29$), $F(1, 86) = 4.32, p = .04, \text{partial } \eta^2 = .09$.

Possible Mediators

Chronic focus. We predicted that the time in semester induced motivational states. Thus, a person’s chronic regulatory focus should not have affected performance, because the situational influences should have overridden chronic focus states. To test this hypothesis, we included the Promotion and Prevention subscales of the RFQ in our analyses. First, we performed an analysis of covariance (ANCOVA) with Time in Semester (Beginning, End) and Reward Structure (Gains, Losses) as between-participants factors and Promotion and Prevention as covariates of GRE performance to determine if either Promotion or Prevention could account for our

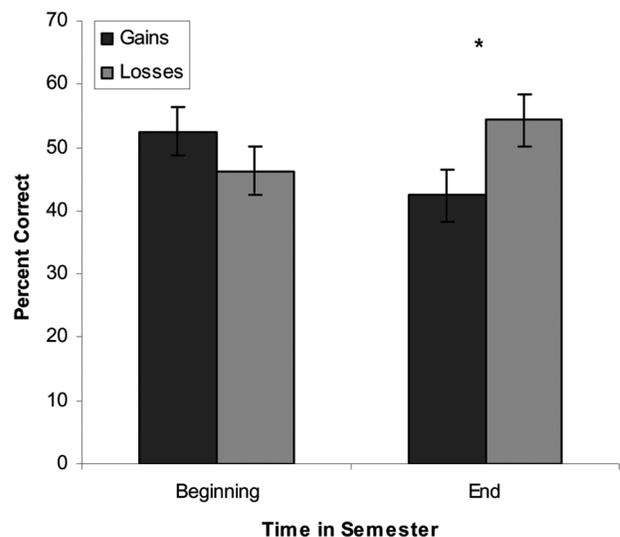


FIGURE 2 Percentage correct for beginning and end of semester participants in the gains and losses tests in Experiment 1. *Note.* Error bars represent standard error.

Time \times Reward interaction. That is, we tested whether either Promotion or Prevention would be a significant covariate and reduce or eliminate our interaction. We found that neither Promotion nor Prevention scores covaried with our effect, $F(1, 84) = 0.92, p = .34$, and $F(1, 84) = 1.88, p = .17$, respectively, and the Time \times Reward interaction remained significant, $F(1, 84) = 5.53, p = .02$.

Furthermore, we tested for whether chronic focus could substitute for time of semester and included the following variables in our regression model: Promotion, Prevention, Reward, the Promotion \times Prevention interaction, the Promotion \times Reward interaction, the Prevention \times Reward interaction, and the Promotion \times Prevention \times Reward interaction. The regression was not statistically significant, $F(7, 82) = 1.58, p = .16$, but there was an interaction of Promotion and Prevention, $t(82) = 2.62, p = .01$, such that people who were high on both promotion and prevention or low on both promotion and prevention performed better on the test.

Last, we used multiple regression to determine if chronic focus interacted with time of semester. We included the following variables in our model: Promotion, Prevention, Time, Promotion \times Prevention, Promotion \times Time, Prevention \times Time, and Promotion \times Prevention \times Time. The regression was statistically significant, $F(1, 82) = 3.19, p = .005$. There was a Promotion \times Prevention interaction, $t(82) = 2.12, p = .04$, with the same data pattern just discussed and a Prevention \times Time interaction, $t(82) = 2.71, p = .008$. Students tested at the beginning of the semester who were low on prevention performed as well as students tested at the end of the semester who were high on prevention.

Despite finding some effects of chronic regulatory focus, none of the results just described account for the interaction of Time in Semester and Reward. Chronic focus did not account for the fact that participants performed better with a gains reward structure than a losses reward structure at the beginning of the semester, with the opposite pattern of data at the end of the semester.

Time-of-semester self-selection. Because participants self-selected time in semester (i.e., chose when they signed up for experimental participation), we considered whether beginning-of-semester participants differed from end-of-semester participants on any of our questionnaires. First, we tested whether more chronically promotion-focused participants choose to participate at the beginning whereas prevention-focused participants choose to participate at the end. Levels of chronic promotion and prevention did not change based on time of semester: for Promotion, beginning ($M = 19.9$) and end ($M = 19.4$), $t(88) = .89, p = .37$; for Prevention, beginning ($M = 17.7$) and end

($M = 17.2$), $t(88) = .70, p = .48$. We also completed two ANCOVAs to test for this effect. Using time of semester to predict promotion while controlling for prevention, there is neither a main effect of Time, $F(1, 87) = .93, p = .34$, nor an effect of Prevention, $F(1, 87) = .92, p = .34$. Using time of semester to predict prevention while controlling for promotion, there is neither a main effect of Time, $F(1, 87) = .62, p = .44$, nor an effect of Promotion, $F(1, 87) = .92, p = .34$.

Participants at the beginning of the semester did not differ from those at the end on how much they expected to like the task ($p = .34$), how well they expected to perform ($p = .39$), how motivated they were to perform the task ($p = .75$), positive ($p = .35$) or negative mood ($p = .55$), anxiety ($p = .70$), worry ($p = .38$), or extraversion ($p = .36$). All of these findings suggest that our participants were equally motivated and tried equally hard to perform well on our task. Our groups only differed on impulsivity. Using IMPASS scores, beginning-of-semester participants were less impulsive ($M = 2.1$) than end-of-semester participants ($M = 3.0$), $F(1, 86) = 5.21, p = .02$, partial $\eta^2 = .06$.

To determine whether impulsivity could account for our Time in Semester \times Reward interaction, we completed an ANCOVA with Time in Semester and Reward, and impulsivity as a covariate of GRE performance. We included the interaction between impulsivity and reward to make sure that our Time in Semester \times Reward interaction was estimated without bias (see Yzerbyt, Muller, & Judd, 2004). There was a significant interaction of Time in Semester and Reward, $F(1, 85) = 5.33, p = .02$, partial $\eta^2 = .06$, and no statistically significant influence of impulsivity, $F(1, 85) = 0.23, p = .64$.

Other possible moderator and mediators. We also considered whether Gender influenced our Time in Semester \times Reward interaction. We analyzed our performance data in an ANOVA with Time in Semester, Reward, and Gender (Male, Female) as between-participants factors. There were 25 women and 23 men at the beginning of the semester, and 17 women and 25 men at the end of the semester, approximately divided equally between gains and losses tasks. There was an interaction of Time in Semester and Reward, $F(1, 82) = 5.15, p = .03$, partial $\eta^2 = .06$, and a main effect of Gender, $F(1, 82) = 7.77, p = .001$, partial $\eta^2 = .09$. Men performed better ($M = 54.23$) than women ($M = 43.54$). However, there was neither an interaction of Gender and Reward, $F(1, 82) = .21, p = .65$, nor a three-way interaction of Time in Semester, Reward, and Gender, $F(1, 82) = 1.40, p = .24$.

Last, we computed correlations between GRE performance and our questionnaire scores. Worry ($r = -.33$), expected performance ($r = .32$), expected liking ($r = .32$), and positive mood ($r = .26$) were all statistically

correlated with GRE performance ($p < .05$). We used each of these variables as covariates in ANCOVAs and in each case still found an interaction of Time in Semester and Reward: PSWQ (i.e., worry), $F(1, 84) = 4.04$, $p = .05$, partial $\eta^2 = .05$; Expected Performance, $F(1, 84) = 9.98$, $p = .002$, partial $\eta^2 = .11$; Expected Liking: $F(1, 84) = 5.26$, $p = .03$, partial $\eta^2 = .06$; Positive Mood: $F(1, 84) = 3.65$, $p = .06$, partial $\eta^2 = .04$. As expected from the correlations, there was also a main effect of each of these variables, $F(1, 84) = 9.73$, $p = .002$, partial $\eta^2 = .10$; $F(1, 84) = 13.49$, $p = .001$, partial $\eta^2 = .14$; $F(1, 84) = 9.50$, $p = .002$, partial $\eta^2 = .10$; $F(1, 84) = 4.61$, $p = .04$, partial $\eta^2 = .05$, respectively. These analyses demonstrate that the Time in Semester \times Reward interaction is robust even after controlling for potential covariates.

Discussion

Students in the first and last 2 weeks of the semester completed problems from the quantitative GRE while trying to maximize gains or minimize losses. As predicted, students at the end of the semester performed better when they tried to minimize losses rather than maximize gains. This finding suggests that these students had a situational prevention focus at the end of the semester. In contrast, students at the beginning of the semester were predicted to be relatively more promotion focused and did perform better on the gains test relative to the losses test, although this difference was not statistically reliable.

We present Experiment 2 to address two main concerns with Experiment 1. First, given our lack of a simple effect between gains and losses at the beginning of the semester, we ran Experiment 2 as a replication. To foreshadow, in Experiment 2, we did find better performance by students in the gains version of the task at the beginning of the semester and better performance by those in the losses task at the end of the semester. Second, Experiment 1 did not allow us to assess whether aspiration and obligation concerns, consistent with promotion and prevention foci, respectively, were in fact different for students tested at different times in the semester as we assumed. In Experiment 2, we directly assessed these concerns and found evidence for our claim.

EXPERIMENT 2

Method

Participants and Design

Sixty-four undergraduate students at the University of Texas at Austin participated for course credit (32 in

the first 2 weeks and 32 in the last 2 weeks of an academic semester). We collected data only from women, because they are more easily accessible from our participant pool, and Experiment 1 demonstrated only a main effect of Gender. Seventeen participants from each time in the semester were randomly assigned to the gains, and 15 were assigned to losses reward structure yielding a 2 (Time in Semester: Beginning, End) \times 2 (Reward Structure: Gains, Losses) between-participants design. Thought-listing data were collected for 62 participants to assess situational regulatory focus; the remaining two participants did not receive a packet as a result of experimenter error.

Materials and Procedure

Our methods and procedure were identical to Experiment 1 with two exceptions. Prior to completing any other materials or learning anything about the study, participants completed a thought-listing task. In this task, participants wrote down five thoughts about the semester, rated the thoughts as negative or positive (using a 5-point Likert scale, where 1 = *very negative* and 5 = *very positive*), and justified their rating for each thought. Two coders, who were completely unaware of the study design and purpose, coded the promotion and prevention content in the justifications in a manner consistent with many prior studies on regulatory focus. Each thought was coded as promotion or prevention. For example, Higgins, Roney, Crowe, and Hymes (1994) provided an early demonstration that asking individuals to think about their goals or ideals places them into a promotion focus whereas asking individuals to think about their responsibilities places them into a prevention focus. Our task similarly used the thoughts to assess participants' situational focus state.

Thoughts were coded as promotion if the focus was on ideals, hopes, and goals such as "I want to do well in college," "I am the first person in my family to go to college. Nothing would excite my family and I more than for me to be placed on the Dean's List," and "I love meeting people and now I have my friends from last semester, plus the ones I'm making this semester in new classes." Thoughts were coded as prevention if the focus was on obligations, responsibilities, or concerns, such as "I am not a very social person and I need to work on it," "I have a huge problem with doing things at the last minute," and "It's very hard to get up early and continue to do something you don't want to." The inter-coder reliability was .81. To create promotion and prevention scores for each participant, we averaged the scores of each coder. All of the results reported next obtain for the averages as well as for each coder's scores used separately.

Results

We first report the results of our thought-listing task and then present the interaction of Time in Semester and Reward Structure results. We conclude by examining whether individual differences influenced our results.

The thought-listing data were analyzed using independent samples t tests to compare the promotion and prevention codes at the beginning and end of the semester. At the beginning of the semester more participants' thoughts were coded as promotion ($M = 3.62$) than at the end of the semester ($M = 2.61$), whereas at the end of the semester more participants' thoughts were coded as prevention ($M = 2.39$) than at the beginning of the semester ($M = 1.38$), $t(60) = 3.49$, $p = .001$, $d = .89$ (the t tests for promotion and prevention are identical because codes sum to 5 for any individual; see Figure 3). We also analyzed participants' ratings of the valences of their thoughts using an independent samples t test. Participants rated their thoughts as more positive at the beginning of the semester ($M = 3.59$) than at the end of the semester ($M = 2.83$), $t(60) = 4.71$, $p = .001$, $d = 1.22$. As can be seen in Figure 3, the pattern of responses clearly differed based on the time of the semester.

The GRE task data were analyzed using an ANOVA with Time in Semester (Beginning, End) and Reward Structure (Gains, Losses) as between-participants' factors. The dependent measure was the percentage of problems correctly solved out of the 20 attempted. All participants attempted all 20 problems. This analysis revealed a two-way interaction between Time in Semester and Reward Structure, $F(1, 60) = 5.66$, $p = .03$, partial $\eta^2 = .09$ (Figure 4). As predicted, the beginning-of-semester

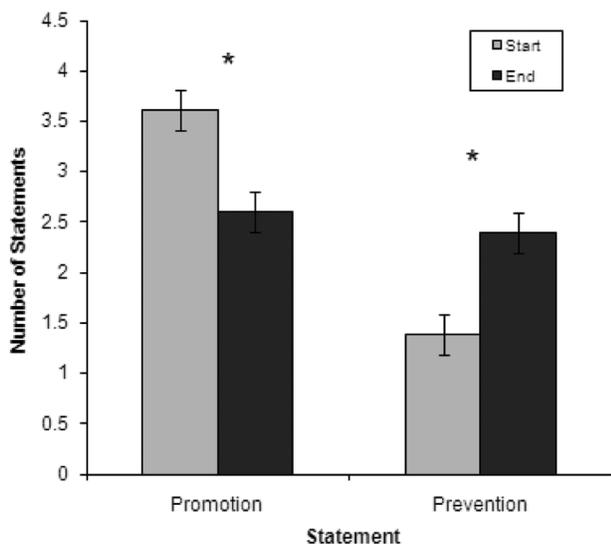


FIGURE 3 Number of promotion and prevention statements for participants at the beginning and the end of the semester in Experiment 2. Note. Error bars represent standard error.

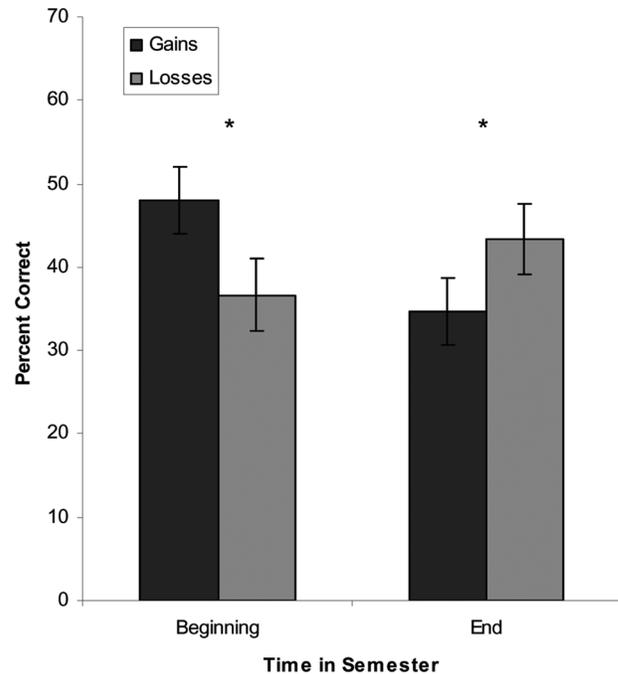


FIGURE 4 Percentage correct for beginning and end of semester participants in the gains and losses tests in Experiment 2. Note. Error bars represent standard error.

participants who completed the gains GRE test performed better ($M = 47.9$) than participants who completed the losses GRE test ($M = 36.67$), $t(60) = 2.70$, $p = .004$, $d = .7$. At the end of the semester, participants who completed the gains GRE test performed worse ($M = 34.71$) than participants who completed the losses GRE test ($M = 43.33$), $t(60) = 2.07$, $p = .04$, $d = .53$. Overall performance in Experiment 2 may look worse than that in Experiment 1, but only women participated in Experiment 2, and the performance of the participants in this study is at about the level of the women in Experiment 1.

Including our promotion/prevention thought-list codes as a covariate, we performed an ANCOVA with Time in Semester (Beginning, End) and Reward Structure (Gains, Losses) as between-participants' factors and promotion/prevention as a covariate of GRE performance. Because the promotion and prevention codes sum to 5, using promotion codes or using prevention codes yields the same results. We found that promotion/prevention codes did not covary with our effect as expected, $F(1, 57) = 0.004$, $p = .95$, and the Time \times Reward interaction remained significant, $F(1, 57) = 4.82$, $p = .03$. Given that we expected the promotion/prevention codes to covary with our effect, we expected the Time \times Reward interaction to no longer be significant. As we point out in the General Discussion section, this may reflect a restriction of range in our thought-listing data.

Possible Mediators

Chronic focus. As in Experiment 1, we predicted that time-of-semester effects are independent of a person's chronic regulatory focus. As in Experiment 1, we performed an ANCOVA with Time in Semester (Beginning, End) and Reward Structure (Gains, Losses) as between-participants' factors and Promotion and Prevention as covariates of GRE performance to determine if either promotion or prevention could account for our Time \times Reward interaction. We found that neither promotion nor prevention scores covaried with our effect, $F(1, 58) = 0.13$, $p = .73$, and $F(1, 58) = 0.62$, $p = .43$, respectively, and the Time \times Reward interaction remained significant, $F(1, 58) = 4.91$, $p = .03$. We also computed correlations between thought listings, and promotion and prevention separately at the beginning and the end of the semester. Although there were no significant correlations involving promotion or end-of-semester participants, at the beginning of the semester, participants higher in prevention wrote more prevention thoughts than those lower in prevention ($r = .44$, $p < .05$).

Furthermore, we tested for whether chronic focus could substitute for time of semester and if chronic focus interacted with time of semester. In each case we included the same variables in our regression models as in Experiment 1. Neither regression was statistically significant, $F(7, 56) = .46$ and $.39$, respectively; $R^2 = .06$ and $.05$, respectively.

Time-of-semester self-selection. As in Experiment 1, we also considered time in semester as an individual difference variable. We tested whether more chronically promotion-focused participants choose to participate at the beginning, whereas prevention-focused participants choose to participate at the end. Levels of chronic promotion did change, whereas prevention did not change based on time of semester: Promotion, beginning ($M = 19.7$) and end ($M = 20.1$), $t(62) = 2.01$, $p = .05$; Prevention, beginning ($M = 18.8$) and end ($M = 18.7$), $t(62) = .28$, $p = .86$. We also completed two ANCOVAs to test for this effect. Using time of semester to predict promotion while controlling for prevention, there is a main effect of Time, $F(1, 61) = 4.01$, $p = .05$, but not an effect of Prevention, $F(1, 61) = .02$, $p = .88$. Using time of semester to predict for prevention while controlling for promotion, there is neither a main effect of Time, $F(1, 61) = .09$, $p = .76$, nor an effect of Promotion, $F(1, 61) = .02$, $p = .88$.

Participants at the beginning and end of the semester did not differ on how much they expected to like the task ($p = .14$), how well they expected to perform ($p = .22$), how motivated they were to perform the task ($p = .27$), positive ($p = .76$) or negative mood ($p = .53$),

anxiety ($p = .38$), worry ($p = .21$), extraversion ($p = .28$), or impulsivity ($p = .11$).

Other possible mediators. In addition, we correlated the questionnaire measures with GRE performance. Expected performance ($r = .31$), expected liking ($r = .32$), and motivation to do well ($r = .25$) were all statistically correlated with GRE performance ($p < .05$). We used each of these variables as covariates in separate ANCOVAs and found the predicted interaction of Time in Semester and Reward: expected performance, $F(1, 59) = 4.43$, $p = .04$, partial $\eta^2 = .07$; expected liking, $F(1, 59) = 4.31$, $p = .04$, partial $\eta^2 = .068$; motivation, $F(1, 59) = 4.60$, $p = .04$, partial $\eta^2 = .072$. There were main effects of expected performance, $F(1, 59) = 4.61$, $p = .04$, partial $\eta^2 = .072$, and expected liking, $F(1, 59) = 4.91$, $p = .03$, partial $\eta^2 = .077$. As in Experiment 1, these analyses demonstrate that our Time in Semester \times Reward interaction is robust even after controlling for potential covariates.

GENERAL DISCUSSION

In two experiments, students in the first and last 2 weeks of an academic semester completed problems from the quantitative GRE. Half of the students tried to maximize gains, whereas half tried to minimize losses. Students at the beginning of the semester performed better when they tried to maximize gains rather than minimize losses, whereas students at the end of the semester performed better when they tried to minimize losses. These findings suggest, somewhat counterintuitively, that focusing students on losses at the end of the semester improves GRE performance.

Experiment 2 provides evidence that our time-of-semester effect results from students being in different situational regulatory states at different points in the semester. The thought-listing task suggests that at the beginning of the semester, students' academic goals tend to be focused on promotion concerns, whereas at the end of the semester, students are more focused on prevention concerns. We interpret our results using the regulatory fit framework. On tests that require flexible processing, like the quantitative GRE, regulatory fit states produce better performance than regulatory misfit states. Simply, students at the beginning of the semester are promotion focused and perform better on the gains task relative to the losses task because the gains version matches their global motivational state, whereas the losses version is a misfit. The opposite is true for prevention-focused students at the end of the semester.

We do not find much evidence that chronic regulatory focus influenced performance on our task. Levels of

chronic focus did not really differ based on time of semester, which suggests that chronic focus likely had minimal influence on participation time choice. In Experiment 2, participants did have a slightly higher promotion focus at the end of the semester relative to the beginning. We believe that the time that students are tested during the semester is a strong-enough situational variable to override any influence of chronic focus. This is why in Experiment 2 we found improved performance for losses relative to gains—the situational and not the chronic focus interacted with reward to influence performance. It is reasonable to assume that past work on chronic focus has selected participants from across an entire academic semester. As such, chronic focus effects are not masked by strong situational primes as in our studies.

That said, future research should examine how chronic focus influences this form of self-regulation. We did find that individuals higher in chronic prevention wrote more prevention thoughts at the beginning of the semester (Experiment 2) and that chronic prevention interacted with time of semester (Experiment 1). Chronic focus may have a small effect on participation selection relative to other factors and therefore would only be statistically reliable in very large samples. In addition, it would be interesting to conduct a within-participants study examining the same participants at the beginning and end of the semester. This test would provide another means to consider the separate influence of chronic and situational regulatory focus. Moreover, we did find differences in how chronic promotion and chronic prevention related to our task. In Experiment 1, participants low in prevention performed as well at the beginning of the semester as did participants high in prevention at the end of the semester, whereas there was no relationship between promotion and task performance. This does suggest that chronic foci exist independently and that promotion and prevention could act separately as mechanisms to influence performance. Future research should examine this possibility.

One discrepant result is that we would have expected that our thought-listing task would explain the Time in Semester \times Reward interaction on GRE performance. We designed our thought-listing task to identify those in a situational promotion or prevention focus, but we needed the task to be easy enough to perform that there would also be time for participants to complete 20 difficult GRE problems. Having people list five thoughts about the semester was sufficient to allow us to get a sense of the relative contribution of promotion and prevention in people's thoughts, but it provided only a narrow range of data for use in an ANCOVA. We suspect that this restricted range obscured the relationship between thoughts and GRE task performance. Future research should explore this possibility.

A limitation of the current work is that participants were not randomly assigned to participate at the beginning or end of the semester. However, our quasi-experimental design does provide evidence that participants tested at different times of the semester do have different motivational states induced by the time-of-semester context. These motivational states are independent of chronic motivational dispositions.²

Our results suggest that cognitive flexibility is possible for end-of-semester participants given the correct context. This has important implications for real-world situations, such as when students elect to take the GRE at the end of the semester. Our work argues that there are two options to improve their performance. One is to match the reward structure to the expected regulatory focus of the participants, using gains at the beginning of the semester and losses at the end. A second possibility is to use a situational manipulation of regulatory focus as part of the task instructions (e.g., by offering the chance to win raffle tickets). In our studies, a strong situational manipulation of regulatory focus can override chronic factors that may be influencing participants' regulatory focus. Future research could explicitly examine the role of other possible situational factors and the role of individual differences in inducing promotion and prevention foci.

This research paradigm also might explain why time-in-semester researchers have not always found performance decrements for end-of-semester participants. Grimm et al. (2009) argued that many tasks are explicitly or implicitly gains tasks. Furthermore, research on regulatory fit suggests that a regulatory match allows for more flexible processing than a regulatory misfit, but this is only beneficial when tasks require flexible processing (Grimm et al., 2008; Maddox et al., 2006). Therefore, tasks that require more flexibility should show performance decrements at the end of the semester. This decrement appears in interview question formation and impression formation (Casa de Calvo & Reich, 2007), visual search (Richert & Ward, 1976), and serial learning and symbol substitution (Richter et al., 1981). In contrast, tasks that might not require as much flexibility should not show end-of-semester decrements, as has been documented for a hidden figures task (Richert & Ward, 1976), cued recall (Wang & Jentsch, 1998), and signal detection (Langston, Ohnesorge, Kruley, & Haase, 1994).

Finally, although influences of time in semester on performance are potentially interesting for their own sake, they also reflect the effects that culturally shared

²Practically, it is very difficult in large participant pools to randomly assign participants to specific appointment times. Participants would need to keep appointments scheduled months in advance, and the participant database would need to be capable of handling appointments scheduled that far in advance.

factors may have on the motivational states of a group. Similar effects might also be observed during economic recessions, or following natural disasters. Further work is needed to determine the kinds of large-scale events that may have a persistent influence on the regulatory focus of group members.

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REFERENCES

- Aviv, A. L., Zelenski, J. M., Rallo, L., & Larsen, R. J. (2002). Who comes when: personality differences in early and later participation in a university subject pool. *Personality and Individual Differences*, 33, 487–496.
- Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, 56, 893–897.
- Blatt, S. J., & Quinlan, P. (1967). Punctual and procrastinating students: A study of temporal parameters. *Journal of Consulting Psychology*, 31, 169–174.
- Casa de Calvo, M. P., & Reich, D. A. (2007). Spontaneous correction in the behavioral confirmation process: The role of naturally-occurring variations in self-regulatory resources. *Basic and Applied Social Psychology*, 29, 351–364.
- Cooper, H., Baumgardner, A. H., & Strathman, A. (1991). Do students with different characteristics take part in psychology experiments at different times of the semester. *Journal of Personality*, 59, 109–127.
- Educational Testing Service. (2004). *GRE General Test practice book*. Princeton, NJ: Author.
- Evans, R., & Donnerstein, E. (1974). Some implications for psychological research of early versus late term participation by college students. *Journal of Research in Personality*, 8, 102–109.
- Eysenck, S. B. G., Eysenck, H. J., & Barrett, P. (1985). A revised version of the Psychoticism Scale. *Personality and Individual Differences*, 6, 21–29.
- Forster, J., Higgins, E. T., & Idson, L. C. (1998). Approach and avoidance strength during goal attainment: Regulatory focus and the “goal looms larger” effect. *Journal of Personality and Social Psychology*, 75, 1115–1131.
- Grimm, L. R., Markman, A. B., Maddox, W. T., & Baldwin, G. C. (2008). Differential effects of regulatory fit on category learning. *Journal of Experimental Social Psychology*, 44, 920–927.
- Grimm, L. R., Markman, A. B., Maddox, W. T., & Baldwin, G. C. (2009). Stereotype threat reinterpreted as a regulatory mismatch. *Journal of Personality and Social Psychology*, 96, 288–304.
- Harber, K. D., Zimbardo, P. G., & Boyd, J. N. (2003). Participant self-selection biases as a function of individual differences in time perspective. *Basic and Applied Social Psychology*, 25, 255–264.
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, 52, 1280–1300.
- Higgins, E. T. (2000). Making a good decision: Value from fit. *American Psychologist*, 55, 1217–1230.
- Higgins, E. T., Friedman, R. S., Harlow, R. E., Idson, L. C., Ayduk, O. N., & Taylor, A. (2001). Achievement orientations from subjective histories of success: promotion pride versus prevention pride. *European Journal of Social Psychology*, 31, 3–23.
- Higgins, E. T., Roney, C. J. R., Crowe, E., & Hymes, C. (1994). Ideal versus ought predilections for approach and avoidance: Distinct self-regulatory systems. *Journal of Personality and Social Psychology*, 66, 276–286.
- Hom, H. L., Jr. (1987). A methodological note: Time of participation effects on intrinsic motivation. *Personality and Social Psychology Bulletin*, 13, 210–215.
- Keller, J., & Bless, H. (2006). Regulatory fit and cognitive performance: The interactive effect of chronic and situationally induced self-regulatory mechanisms on test performance. *European Journal of Social Psychology*, 36, 393–405.
- Langston, W., Ohnesorge, C., Kruley, P., & Haase, S. J. (1994). Changes in subject performance during the semester: An empirical investigation. *Psychonomic Bulletin & Review*, 1, 258–263.
- Maddox, W. T., Baldwin, G. C., & Markman, A. B. (2006). A test of the regulatory fit hypothesis in perceptual classification learning. *Memory and Cognition*, 34, 1377–1397.
- Meyer, T. J., Miller, M. L., & Metzger, R. L. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, 28, 487–495.
- Pickering, A. D., & Gray, J. A. (2001). Dopamine, appetitive reinforcement, and the neuropsychology of human learning: An individual differences approach. In A. Elias & A. Angleitner (Eds.), *Advances in individual differences research* (pp. 113–149). Lengerich, Germany: PABST Science.
- Richert, A. J., & Ward, E. F. (1976). Experimental performance and self-evaluation of subjects sampled early, middle, and late in an academic term: Sex and task. *Psychological Reports*, 39, 135–142.
- Richert, D. O., Wilson, S. D., Milner, M., & Senter, R. J. (1981). Some differences among students volunteering as research subjects. *Bulletin of the Psychonomic Society*, 17, 261–263.
- Roman, R. J., Moskowitz, G. B., Stein, M. I., & Eisenberg, R. F. (1995). Individual-differences in experiment participation: Structure, autonomy, and the time of the semester. *Journal of Personality*, 63, 113–138.
- Shah, J., Higgins, E. T., & Friedman, R. S. (1998). Performance incentives and means: How regulatory focus influences goal attainment. *Journal of Personality and Social Psychology*, 74, 285–293.
- Spiegel, S., Grant-Pillow, H., & Higgins, E. T. (2004). How regulatory fit enhances motivational strength during goal pursuit. *European Journal of Social Psychology*, 34, 39–54.
- Wang, A. Y., & Jentsch, F. G. (1998). Point-of-time effects across the semester: Is there a sampling bias? *Journal of Psychology*, 132, 211–219.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of belief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.
- Witt, E. A., Donnellan, M. B., & Orlando, M. J. (2011). Timing and selection effects within a psychology subject pool: Personality and sex matter. *Personality and Individual Differences*, 50, 355–359.
- Yzerbyt, V. Y., Muller, D., & Judd, C. M. (2004). Adjusting researchers’ approach to adjustment: On the use of covariates when testing interactions. *Journal of Experimental Social Psychology*, 40, 424–431.