Differential Effects of a Motivational Intervention on Male and Female Students in STEM Disciplines

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Objective

Pre-medical college students are expected to successfully deal with constant academic stress and heightened competition[1]. Overconfident students are at risk of developing negative emotions in the face of failure (perceived or standardized), and consequently disengage from their studies[2].

To date, no studies were found to explore the role downgrading expectations as a motivational strategy in pre-medical students' academic performance. The goal of the present study is therefore to explore the effects of adopting more realistic expectations on overconfident students' perceived control and motivation. It is anticipated that by downgrading their expectations, students will adopt more realistic over their academic future, and experience increased (and more adaptive) motivation and motivational strategies. This is consequently expected to contribute to better overall well-being and improved performance[3,4,5].

Theoretical Framework

This study was informed by the motivational theory of life-span development[6,7] and more specifically by the assumption that the selection of adaptive goals leads to optimization of motivational resources. That is, by selecting goals that are congruent with environment opportunities and the individual's abilities, the individual increases their capacity to control the environment and be able to achieve desired goals within it.

Method

Participants
The study sample consists of 52 pre-medicine college students (mean age= 18.25, *SD*=.52, 34.5% male) enrolled in foundational biological and physical sciences courses in the University of California, Irvine.

Procedure
During winter 2007, participants were randomly assigned to an intervention or control group. All participants completed an online questionnaire which included demographic measures and assessed participants' motivation, emotions, and well-being (15 minutes). This was followed by an in-person intervention (simulated failure experience followed by a text and a writing exercise) to encourage potentially overconfident students to adopt more realistic expectations (30 minutes). Finally, participants' motivation, emotions, and well-being were assessed once again three months post-intervention.

Method (cont.)

Intervention Conditions
Participants attended one of two intervention conditions in groups of 25 during which they were administered the following:

(1) A GRE-type aptitude test (Abstract Reasoning and Abilities Test) intended as a simulated failure experience. The test includes 5 verbal and analogy quantitative items (5 minutes). After completing the ARAT, participants were immediately debriefed.
(2) A handout specific to the experimental condition to be completed individually. For the intervention group, the text outlined the benefits of downgrading one's expectations when thinking about future academic performance. For example, rather than thinking "anything less than the best is failure", participants were offered a more realistic alternative such as "overly high goals can make you feel like a failure even when you succeed". Participants in the control group received a handout discussing medical facts vs. myths.
(3) A writing exercise, based on elaborative learning, in which participants were asked to summarize the reading, provide related personal examples, indicate how they feel about the reading, as well as how they could apply the information in the future (10 minutes)

Dependent Measure
Achievement motivation. This was assessed using an 8-item scale adapted from Pintrich, Smith, and McKeachie (1989) and included items such as "I prefer course material that really challenges me so I can learn new things" (mastery goal orientation) and "If I can, I want to get better grades in my classes than most of the other students" (performance goal orientation)
Grade point average (GPA). Five sessional GPAs were obtained from the registrar's office for Winter 2007, Spring 2007, Fall 2007, Winter 2008, and Spring 2008 semesters.
Perceived control. Assessed using measures based on Perry et al.'s (2001) Academic Control Scale, with items such as "the more effort I put into my courses, the better I do".
Course load. Sessional course load was obtained from the registrar's office for Winter 2007, Spring 2007, Fall 2007, Winter 2008, and Spring 2008 semesters.

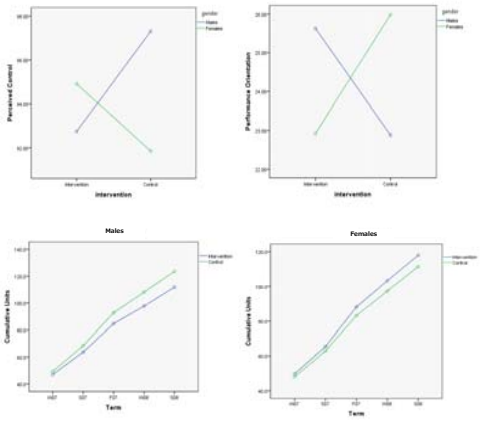
Analysis

The analyses used consisted of four two-way ANCOVAs on participants' post-intervention, self-reported academic achievement motivation and perceived control, as well as GPA and course load over five terms. Literature-informed covariates were chosen to control for potentially confounding variables including baseline levels of the self-report measures at Time 1, as well as academic variables including high school grades and cumulative units completed (i.e., level of study) to control for prior academic experience and aptitude.

Analysis (cont.)

Results

The analyses revealed significant interaction effects of the downgrading intervention and gender on participants' performance orientation (i.e., competitiveness)[F (1, 24) = 4.880, p = .037], perceived control [F (1, 26) = 10.404, p = .003], and the number of units taken by males vs. females across six academic terms post-intervention [F (1, 30) = 6.344, p = .017].



Conclusion

The present findings revealed that encouraging college students at risk of overconfidence to downgrade their expectations and adopt more realistic expectations about their academic future had a significant impact on participants' academic performance orientation, perceived control, and number of units taken. However, the results were differential for male and female students. Specifically, the intervention was effective for female STEM students, who demonstrated lower performance orientation and higher perceived control. Although no significant differences were found for overall GPAs, females demonstrated a more adaptive pattern of motivational strategies by increasing their course load post-intervention in order to more successfully keep up with their major's demands.

Conclusion (cont.)

These results demonstrate that females in STEM programs are particularly receptive to motivational programs encouraging realistic aspirations, and a brief intervention can yield long-term motivational benefits. The present results are scientifically significant in that they expand our understanding of the potential consequences of motivational programs encouraging realistic aspirations among female students in challenging degree programs (e.g., at risk for overconfidence) in higher education, and it warrants future research to further evaluate the emotional, behavioural, and other motivational effects of these measures in larger samples in order to better tailor motivational programs to the unique experience of females in STEM disciplines.

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