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# Forewarning and Forearming Stereotype-Threatened Students

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*This study investigated communicative strategies for helping female students cope with "stereotype threat". Participants completed a difficult math test after reading one of three coping messages: a control message encouraging perseverance, a "suppression" message describing stereotype threat and instructing participants to suppress associated thoughts, and a "replacement" message describing the phenomenon and presenting an alternative, self-relevant positive stereotype. As predicted, a performance gap favoring males was observed in the control condition. This gap widened when students attempted to suppress threatening thoughts but narrowed when they were primed with the alternative positive stereotype. Our results demonstrate that priming a positive achieved identity (e.g., private college student) can subdue stereotype threat associated with an ascribed identity (e.g., female).*

*Keywords: Stereotype Threat; Instructional Communication; Sex; Standardized Tests*

## Forewarning and Forearming Stereotype-Threatened Students

Female high school and college students tend not to perform as well as their male counterparts on difficult standardized math tests. Some interpret the performance gap as reflecting innate sex differences in mathematical ability (Benbow & Stanley, 1980, 1983). However, this account does not explain why the performance gap emerges so late in development or why males and females earn comparable grades in high school or early college math classes (Byrnes & Takahira, 1993; Hyde, Fennema, & Lamon, 1990; Hyde & Kling, 2001; Kimball, 1989; Leahey & Guo, 2001; Levine & Ornstein, 1983). The distinct relationships between sex and school grades on the one hand, and sex and standardized test scores on the other, have been interpreted in different ways. Some propose that math learning styles account for the observed

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differences. Autonomous learning behavior is presumed to facilitate males' performance on standardized tests, whereas rote learning is presumed to facilitate females' performance on classroom exams (Hyde et al., 1990). Others have proposed that boys and girls respond differently to novel and familiar achievement situations. For example, Kimball (1989) hypothesized that girls do better when dealing with familiar situations such as classroom exams, whereas boys do better when dealing with novel situations such as standardized tests.

All of the aforementioned proposals presume that performance differences reflect sex-role socialization, such that males, far more than females, are encouraged to participate in math activities (Eccles, 1987; Fennema & Sherman, 1978). Studies of socialization's influence on math achievement have found evidence for different math learning styles among adolescent males and females (Kianian, 1996). However, the factors underlying females' different performance tendencies in classroom and standardized test settings remain unclear (McGillicuddy-De Lisi & De Lisi, 2002).

Although socialization factors clearly contribute to the gender gap in standardized math test performance, recent research suggests that females' underperformance can be exacerbated by a phenomenon known as "stereotype threat" (Steele & Aronson, 1995). Stereotype threat is a situational phenomenon that occurs when targets of negative stereotypes contemplate the prospect of confirming the stereotype. Contemplation of this prospect creates a psychological threat that can impair the target's intellectual performance. In the case of gender and math, consider a male and female high school student taking the SAT for the first time. This test might be a challenge for both of them. However, as the female is taking the test, she has to contend with the stereotype that she, as a female, has inferior math skills. As a result, a negative performance on her part may be taken to substantiate the negative stereotype about women's math abilities in the eyes of others. Preoccupation with this prospect can interfere with intellectual performance and lead women to perform below their potential (McGlone & Aronson, 2006; Steele, 1997).

Instructional communication researchers have identified a myriad of environmental factors that can render academic settings inhospitable to women, from overt sexist language to more subtle cues that trivialize and devalue women's intellectual performance (Gabriel & Smithson, 1990; Glascock & Ruggiero, 2006; Lannutti & Laliker, 2001; Treichler & Kramarae, 1983). Consideration of these factors has informed the development of communicative strategies for raising educators' awareness of and commitment to gender sensitivity in the classroom (Karre, 1976; Wood & Lenze, 1991). However, the phenomenon of stereotype threat suggests that internal factors (e.g., one's fear of confirming a negative stereotype) can also contribute to women's perception of an antagonistic academic environment (Oswald & Harvey, 2000). To address this problem, educators must not only avoid messages that devalue (intentionally or not) women's learning, but also encourage female students to resist preoccupation with negative gender stereotypes. With this goal in mind, we explored the efficacy of explicit and implicit communicative strategies for advising women about how to cope with stereotype threat.

Spencer, Steele, and Quinn (1999) originally demonstrated the negative influence of stereotype threat on females' math performance. In the first of these studies, male and female college students with equivalent math backgrounds were asked to complete either an easy or a difficult math test. Women on average achieved lower scores than men only on the difficult test. To demonstrate that stereotype threat caused this underperformance, they administered the difficult test to a second group of male and female students under different conditions (Spencer et al., 1999, Study 2). The items comprising the difficult test were divided into two tests that were administered to participants sequentially. Half of the participants were told that the first test was one that had shown gender differences in the past and that the second test was one that had shown no gender differences. The other participants were told just the opposite: the first test had not shown gender differences, but the second test had. In line with Spencer et al.'s predictions, when the stereotype was characterized as inapplicable to the situation (i.e., when the test was characterized as "gender fair"), males and females performed equally well on the test. However, when stereotype threat was high (i.e., when the test was characterized as having shown gender differences in the past), females did not perform as well as the males. Thus women's scores suffered when they were in a situation in which the stereotype could be applied, relative to one in which the stereotype did not apply. Spencer et al. conclude that on difficult standardized math tests, the "normal" or standard state of affairs is for the situation to be high in stereotype threat for women.

Spencer et al.'s (1999) results are consistent with findings about how stereotype threat affects African Americans' test performance. Steele and Aronson (1995) demonstrated that making the stereotype inapplicable to a particular test by taking away the threat of judgment (manipulated by telling participants that the test was either diagnostic or nondiagnostic of verbal ability) increased African Americans' test performance. African American students, who had underperformed in comparison to European American students, performed equally well when they were not threatened by the stereotype of inferior verbal ability. In addition, priming race led to a decline in performance by African Americans (Steele & Aronson, 1995). In a similar vein, Shih, Pittinsky, and Ambady (1999) found that priming Asian American women's Asian identity (stereotypically associated with high math performance) prior to a math test improved their scores relative to a no-prime control, whereas priming their gender identity (stereotypically associated with low math performance) impaired their scores relative to the control. These studies demonstrate that identities, stereotypes, and evaluative contexts can interact in powerful ways to influence the test performance of students targeted by negative stereotypes about intellectual ability.

The numerous demonstrations of stereotype threat in college-aged populations all hinge on cues that increase the salience of a student's stigmatized identity in the testing environment. Such cues include a demographics question about ethnicity or sex, a statement about how test results will be used, or an overt reference to ethnic or gender stereotypes. Ascribed identities such as one's ethnicity or sex—the primary

stigmatized identities investigated in stereotype threat research—are already well-formed, pivotal aspects of the self-concept before the age of 5 (Aboud, 1989). Young children are not only cognizant of and conversant about their ascribed identities, but also familiar with the stereotypes associated with these identities by their early elementary school years (Bigler, Jones, & Lobliner, 1997; Ruble & Martin, 1998). By late adolescence, the longstanding centrality of sex and ethnicity to one's sense of self, combined with the stereotypical associations of these identities established during childhood (e.g., "Blacks aren't as smart as Whites," "boys are better at math than girls"), renders college students with stigmatized ascribed identities especially vulnerable to stereotype threat.

Despite this vulnerability, other aspects of personal identity that emerge relatively late in adolescence may mitigate ego threat (Marcia, 1966). In particular, domains of identity predicated on interpersonal interaction (e.g., college student), religion (e.g., Roman Catholic), ideology (e.g., liberal), intellectual interests (e.g., communication major), and occupational aspirations (e.g., prelaw) come to the fore as adolescents formulate a sense of self based on their own preferences, choices, and accomplishments (Hogg, 2005; Patterson, Sochting, & Marcia, 1992; Taijfel, 1981; Waterman, 1982). These *achieved* identities are adaptive for any adolescent as they negotiate the spheres of independence and nonfamilial interdependence associated with adulthood. However, achieved identities also provide a potential substrate specifically for female and ethnic minority adolescents to transcend the negative expectations associated with their stigmatized ascribed identities (Kobrynowicz & Biernat, 1998). The present research explored the possibility that the deficits in test performance caused by stereotype threat—a threat triggered by the salience of an ascribed identity—might be attenuated by shifting the test taker's focus to an achieved identity associated with positive performance expectations.

The pernicious effects of stereotype threat on female students' math performance clearly call for educators to communicate with their at-risk students about ways for coping with this threat. However, one obstacle to such efforts is the possibility that making students aware of the stereotype threat phenomenon might exacerbate rather than alleviate its ill effects. Forewarning does serve to forearm people against the negative consequences of certain psychosocial phenomena. For example, persuasion researchers have demonstrated that forewarning people that a speaker will attempt to persuade them of a proposition can make them more resistant to the appeal (Chen, Reardon, & Rea, 1992; Freedman & Sears, 1965; Pfau et al., 2001). In this case, forewarning counteracts persuasion attempts by increasing people's self-consciousness in a situation, prompting them to direct their thoughts inward to develop arguments to counter those offered by the speaker (Briñol, Rucker, Tormala, & Petty, 2004; Petty & Cacioppo, 1977). In the case of stereotype threat, however, a distracting preoccupation with self-related thoughts is its principal negative symptom. Moreover, one may question whether encouraging people to suppress negative self-related thoughts is ever likely to be successful. Although no research has directly examined the influence of forewarning on stereotype threat, psychological studies of thought suppression suggest that forewarning might have unintended ironic effects.

Thought suppression is often chosen as a mental control strategy in performance contexts. There are a variety of thoughts and actions individuals might not want to experience when their performance is being evaluated. For example, one might want to suppress thoughts of a previous bad performance (e.g., faltering in a presentation for a public speaking course) or a flaw in technique (e.g., hooking a golf shot). The desire to avoid performance flaws can be a compelling motive for suppression in a variety of performance settings. Thought-suppression strategies have also been recommended as forms of professional help. Thought stopping was introduced as a psychotherapeutic regimen in the contemporary literature by Wolpe and Lazarus (1966). Although numerous variations on the technique exist, in general a therapist recommends that a client suffering from some unwanted thought practice stopping the thought (usually first with the therapist, then later alone). In some variations, a client may be encouraged to say "stop" aloud, or even make a noise, move abruptly, or self-administer a mildly painful stimulus each time the thought recurs. In some cases, a therapist proposes that the client replace the thought with some specific distracter. The ostensible utility of this practice is that it helps people re-establish self-control when they experience internal conflict (i.e., whenever there is a schism between what they might naturally say, do, or feel, and what they would prefer to say, do, or feel).

Despite the popularity of thought-stopping techniques among psychotherapists, their efficacy is doubtful. Clinical reports that thought stopping can be effective in individual cases are balanced by others indicating its futility, and case research is often difficult to evaluate or summarize. More controlled clinical studies that compare thought stopping to other therapeutic strategies (e.g., desensitization, relaxation, or no strategy at all) commonly show null or negative results (Neziroglu & Neuman, 1990; Stern, 1978; Teasdale & Rezin, 1978). Summaries of the literature generally conclude that the technique remains unproven despite considerable research (Reed, 1985; Tryon, 1979). In sum, thought suppression, as a therapeutic regimen for people suffering from naturally occurring unwanted thoughts, does not appear to provide relief from those thoughts.

The actual suppression of a thought requires concerted effort by the suppressor, which can hinder one's ability to engage in other cognitive processes (Wegner, 1994). Thus, when taking a test, thoughts about stereotype threat are unwanted and, in and of themselves, can interfere with test performance. Because controlled thinking can be disrupted when demands are made on attention, a female student's concentration on a math problem could be broken by thoughts about the stereotype or by metathoughts about trying to suppress thinking about stereotypes. Her concentration shifts from test to suppression, and the more she tries to suppress such thoughts, the more concentration she will need in order to suppress the willful movement of her attention (Wegner & Erber, 1992). As a result, the attempt to suppress stereotype threat-related thoughts may impair performance and thereby create an apparent verification of the negative stereotype.

In sum, research suggests that the suppression of unwanted thoughts can be very difficult. By constantly focusing on these unwanted thoughts, we may actually

increase their presence. As a result, unwanted thoughts often rebound on us, having a greater influence than if we had never tried to suppress them. In light of this ironic consequence, merely forewarning at-risk students about stereotype threat is unlikely to improve their performance in a threatening evaluative context, and may very well impair their performance more. What, then, would be the best strategy to forearm at-risk students? The best solution might be to employ a thought-replacement strategy rather than one of thought suppression. According to Wegner (1994), people can control their thoughts but not the suppression of these thoughts. Merely not thinking about something is insufficient; one must instead replace a suppressed thought with something else. In the case of stereotype threat, this might be achieved by introducing people to an alternative, positive performance stereotype. Because contemplation of the new stereotype takes less concentration than forcing oneself to suppress thoughts of an old one, people should be less distracted from the task at hand (e.g, the math test). Additionally, since stress and thought suppression give rise to one another, the elimination of suppression from the equation should lower the level of stress for the participant.

The reported study examined the impact of thought-suppression and thought-replacement strategies in messages designed to help women cope with stereotype-related evaluation apprehension during a difficult standardized math test (a quantitative section of the GRE). In the past, researchers have attempted to mitigate stereotype threat concerns by downplaying the diagnosticity of the test (Croizet & Claire, 1998; Spencer et al., 1999). These attempts have been moderately successful, but their applicability to instructional communication is unclear. Under what circumstances might a class instructor actually denigrate the diagnosticity of a test prior to its administration? What perceptions of the testing enterprise might students form from such a message? A more pragmatic approach to mitigating stereotype threat might entail forewarning students about the phenomenon's pernicious effects. However, past research on thought suppression suggests that merely forewarning students about stereotype threat and telling them to suppress threatening thoughts are likely to be ineffective, and may perhaps exacerbate the evaluation apprehension they experience. A more promising threat-reducing strategy might entail reminding affected students of identities they possess that are associated with positive performance expectations. For example, a woman's identity as a student at an elite private college may mitigate the stereotype threat associated with her gender, and so reminding her of this identity might be sufficient to reduce the threat. This line of reasoning led us to formulate the following hypotheses:

H1: Female students will achieve lower math test scores than male students overall.

H2: Forewarning female students about stereotype threat and advising them to suppress stereotype-related thoughts will impair their math test scores (relative to a no-forewarning control condition).

H3: Forewarning female students about stereotype threat and reminding them of a self-relevant stereotype with positive performance expectations will improve their math test scores (relative to the control condition).

Based on past research in mathematics education (Kianian, 1996; Spencer et al., 1999), we hypothesized that male students would achieve a higher level of accuracy on a difficult math test than females overall. However, we also expected this main effect of gender to be moderated by the instructional message students were exposed to prior to the test. Specifically, we hypothesized that female students who were forewarned about the stereotype threat phenomenon and were instructed to suppress any stereotype threat-related thoughts when they encountered test difficulty would perform worse than female students in the control condition who were not so forewarned. This prediction is based on previous research demonstrating the ironic consequences of people's attempts to suppress thoughts (Wegner, 1994). In contrast, we expected that women who were forewarned about stereotype threat and then prompted to contemplate a self-relevant positive performance stereotype (e.g., private college students' alleged resistance to stereotype threat) would perform better than those in the control condition. This prediction is derived from McGlone and Aronson's (2006) observation that priming students' positive achieved identities can mitigate threat stemming from an ascribed identity (e.g., gender, ethnicity). Past research has not demonstrated a reliable positive or negative influence of contemplating gender stereotypes on male students' math performance, so we did not expect male participants' scores to be systematically influenced by the instructional message manipulation.



## Method

### *Participants*

One hundred twenty-eight undergraduate students (65 females, 63 males) enrolled at a private liberal arts college in the northeastern United States received course extra-credit for their participation in this study. All were native English speakers. The procedures for participant recruitment and data collection were approved by the college's institutional review board.

### *Materials*

Participants completed a quantitative subsection of a Graduate Records Examination's (2003) practice "General Test." The test was designed to measure respondents' basic mathematical skills, including their understanding of algebra, geometry, trigonometry, probability, and data analysis. Following GRE administration guidelines, we allotted 30 minutes for participants to complete the 30-item multiple-choice test.

### *Design and Procedure*

This study employed a $2 \times 3$ factorial design with sex (male or female) and instructional message (control, forewarning + stereotype suppression, forewarning + stereotype replacement) as between-participant factors. The dependent variable was

participants' performance (operationally defined as raw score percentage accuracy) on the aforementioned test.

Undergraduate students were recruited to participate in the study, which was characterized as part of a "standardized test evaluation study" being conducted in the campus community. Participants arrived in the laboratory in mixed groups of males and females, eight to 10 at a time. Although the composition of the groups varied from session to session, a minimum of four participants of each sex was present at all sessions. Each participant was seated at an individual desk, given a randomly assigned test packet, and instructed to read through all of the instructions before beginning the test. Although booklets were randomly assigned to participants, post-hoc inspection of the assignment schedule indicated that in no experimental session were all participants serendipitously assigned the same booklet.

In addition to basic instructions regarding test content, timing, and directions for filling out the answer sheet, each test packet also contained a sheet providing instructions for how students should cope with any difficulties they might encounter during the test. The content of this sheet constituted our manipulation of instructional message. Participants assigned to the *control message* condition (21 females, 20 males) read instructions telling them to simply persevere if and when they encounter difficulties on the test. Participants in the two forewarning message conditions were briefed about the phenomenon of stereotype threat and its potential negative influence on their standardized test performance. Those in the *forewarning + stereotype suppression* condition (22 females, 22 males) were subsequently instructed to cope with any threat they might experience during the test by attempting to suppress any thoughts about the stereotype. Participants in the *forewarning + stereotype replacement* condition (22 females, 21 males) were told that in past research, students enrolled at "elite private colleges such as ___ have been found to be far less vulnerable to the stereotype threat than students at less prestigious schools."

After reading their respective instruction pages, all participants completed a short multiple-choice test probing their comprehension and retention of the information in the instructions. This test served as a manipulation check to ensure that all were aware of the manipulated instructional message information prior to starting the test. All participants in a session were required to answer all 10 multiple-choice questions correctly before the group began the actual test. After completing these questions, each participant was escorted by one of the study administrators to a private cubicle. There, the administrator evaluated a participant's responses, informed her of any incorrect responses, and asked her to choose new responses when errors were identified. After all session participants completed this evaluation and returned to the main laboratory room, the test began. Participants had 30 minutes to complete the 30-item test. After the testing period ended, the administrators collected their test booklets and answer sheets, and then debriefed them regarding the true purpose of the study.

## Results

Eight participants (five females, three males) who required three or more tries to successfully complete the multiple-choice manipulation check were excluded from subsequent data analyses. Participants' scores on the GRE quantitative subsection were computed as a percentage of the 30 test items they answered correctly. The mean percentage accuracies on the test by instructional message condition and participant sex are presented in Table 1.

A $2 \times 3$ factorial analysis of variance on participants' test scores indicated a reliable main effect for sex $F(1, 114) = 7.58$, $p < .01$ ($\eta = .25$). Consistent with H1, males achieved higher scores on average than females overall (71.4% and 59.2%, respectively). This main effect was moderated by a significant sex $\times$ instructional message interaction, $F(2, 114) = 5.15$, $p < .01$ ($\eta = .28$). As we predicted, the gap in males' and females' mean test performance in the control condition (71.1% and 57.8%) appears to have widened when participants were forewarned about stereotype threat and told to suppress any threat-relevant thoughts (68.8% and 51.2%). The fact that this widening of the gap is attributable almost entirely to a drop in females' performance (and not a rise in males' performance) comports with H2. The drop in female performance also suggests that the instructions to suppress stereotype threat-relevant thoughts produced ironic rebound effects of the sort observed in past research on thought control (Wegner & Erber, 1992). Males' performance across the three experimental conditions did not differ significantly.

Although thought-suppression instructions appear to have widened the gender gap in test performance, priming a positive self-relevant stereotype appears to have substantially narrowed the gender gap relative to the control condition. When the stereotype threat forewarning was followed by an assertion that elite private college students were less vulnerable to the threat than others, the females' mean score ($M = 68.5\%$) was higher than in any other condition and was not reliably different from the mean score for males ($M = 74.2\%$) in this condition, Tukey's HSD = 8.6 ($\alpha = .05$). This finding comports with H3 and with McGlone and Aronson's (2006) claim that women's experience of stereotype threat in testing situations can be alleviated when their membership in *achieved* social categories (e.g., students at an elite private college) is made more salient than their

**Table 1** Mean Math Test Scores (*SD*) by Instructional Message and Participant Sex

| | Gender | |
|---|---|---|
| Instructional Message | Males | Females |
| Control | $71.1\%_b$ (10.1) | $57.8\%_a$ (8.6) |
| Forewarn + Suppress | $68.8\%_b$ (9.8) | $51.1\%_a$ (9.3) |
| Forewarn + Replace | $74.2\%_b$ (10.5) | $68.5\%_b$ (11.3) |

*Note*: Means that do not share subscripts are significantly different, as indicated by Tukey's HSD ($\alpha = .05$).

membership in an *ascribed* category (e.g., female). Males' performance in the *forewarning + stereotype* replacement condition did not differ reliably from those of males in the other experimental condition (see Table 1). That males did not exhibit a performance boost relative to males in the other experimental conditions may indicate that males across the conditions were operating near the top of their math performance potential (i.e., a ceiling effect). Thus it is possible that males might have exhibited a boost in this condition relative to other conditions had the math test we employed been less challenging. The present results neither substantiate nor disconfirm this possibility.

## Discussion

We draw three conclusions from these data regarding the impact of forewarning on students' experience of stereotype threat during difficult standardized math tests. First, merely forewarning students about the phenomenon and telling them to suppress stereotype-related thoughts are more likely to aggravate than alleviate self-consciousness. Consistent with Wegner's (1994) findings, we found that the most effective communicative strategy for ridding students of an unwanted thought (in this case, a negative self-relevant stereotype) was not to advise mere suppression, but to replace the unwanted thought (with a positive self-relevant stereotype).

Second, the salience of different social identities in the communicative context can exert an influence on female students' mathematics performance that is comparable to its influence on their spatial reasoning performance (McGlone & Aronson, 2006). Women primed to consider their status as private college students performed at a significantly higher level than those primed to consider their gender status. In contrast, priming private college student status did not reliably improve men's performance relative to a control prime. This finding strongly suggests that women may be more mindful of gender stereotypes pertaining to mathematical ability than men and thus are more affected by these stereotypes.

Third, our results demonstrate that social identities other than ascribed biological or cultural categories (e.g., male, female, African American, European American) can exert an influence on intellectual performance. During adolescence, people begin to seek out social connections that transcend ethnicity or sex based on their choices, preferences, and interpersonal interactions (Elder, 1980; Newman & Newman, 2001). The acquisition of these achieved identities by adolescents and young adults contributes not only to the formation of a mature, differentiated personal identity (Levitt, Guacci-Franco, & Levitt, 1993), but also to the repertoire of ego defense mechanisms one may draw upon when some facet of personal identity is threatened (Kobrynowicz & Biernat, 1998; McGlone & Aronson, 2006; McGlone, Kobrynowicz, & Aronson, 1999). Specifically, we contend that contemplating positive achieved identities one possesses can mitigate the threat of negative stereotypic expectations associated with an ascribed identity. The fact that females primed to contemplate their membership in the category of *private college students* performed at a higher level than those primed to contemplate their gender

suggests that pernicious influence of negative stereotypes associated with ascribed social categories may be overcome by reminding people that their identity is not bound by ethnicity or gender.

The male students in our sample did not exhibit the performance boost from contemplating their *private college student* identity that we observed among the females. Past research has not demonstrated a reliable positive or negative influence of contemplating gender stereotypes on male students' math performance (McGlone & Aronson, 2006; Spencer et al., 1999). Although our results are consistent with previous research in this respect, we cannot rule out the possibility of a ceiling effect (i.e., that males across the conditions were operating at the upper limits of their math performance potential). Priming a positive ascribed identity might have exerted a comparable influence on males' performance had we employed a less challenging math test. The explanatory value of this claim remains an issue for future research.

It would be ideal, of course, to eliminate the negative stereotypes associated with any social category, achieved or ascribed. However, current students cannot wait for that to occur while they become dis-identified from academic performance. Instead, these results point encouragingly to the priming of alternative social identities associated with positive academic expectations as a means of improving academic performance. In our view, predicating stereotype threat interventions on people's membership in multiple social categories is long overdue. Stereotype threat does not seem to be influenced by degree of identification with the relevant stigmatized social category (Osborne, 2001; Quinn & Spencer, 2001). Passing or dis-identification, then, is an insufficient means to confront the negative stereotypes associated with one's group and seems to leave individuals with little hope of academic success. We do not advocate the elimination of all overt messages about the negatively stereotyped identity; instead, our results suggest that reminding students of their achieved positive identities prior to the administration of an exam, rather than asking for disclosure of their sex or ethnicity, may be sufficient to subdue stereotype threat.

Two qualifications regarding the evidential import of our findings are in order. First, our demonstration of the differential efficacy of suppression versus replacement messages in mitigating stereotype threat was conducted with a sample of college students. In this respect, our study is similar to previous studies of stereotype threat; however, this characteristic of our sample renders it less representative of the diverse national samples in which the gender gap in math ability has been observed over the years (Benbow & Stanley, 1983; Fennema & Sherman, 1978; Kimball, 1989). Although stereotype threat can, in principle, occur in any individual for whom a stigmatized identity is contextually salient, it is most keenly experienced among those who strive to excel in evaluative contexts (Steele, 1997). This motivational profile may be more common among women in college than those in other age ranges and settings. Second, we have not explored individual differences in female students' perception of threat that stem from their general level of stigma consciousness, their chronic preoccupation with a stigmatized identity (Pinel, 1999). Stigma consciousness has been shown to moderate women's susceptibility to stereotype threat, such that highly stigma-conscious women

perform more poorly than those who exhibit low stigma consciousness under the same threat conditions (Brown & Pinel, 2003). In the evaluative context investigated here, stigma consciousness might moderate female students' impressions of the study administrators, as well as the effect these impressions have on their test performance. For example, a highly stigma-conscious woman might have been more inclined to (1) believe that the test administrators embraced the negative female stereotype, and (2) get distracted by these stereotype-related thoughts. These and other individual differences that aggravate or mitigate women's reactions to stereotype threat are important issues to address in subsequent research.

The technique for mitigating stereotype threat employed in the present study showed promise. This technique differs from that used in previous research, which involved downplaying the diagnosticity of the test (Croizet & Claire, 1998; Spencer et al., 1999). This study constitutes an important first step in demonstrating the impact of priming positive identities on the test performance of stereotype-threatened students. However, before we draw strong conclusions about the value of this technique as an instructional device, it is necessary to replicate the finding among other female groups using different positive identity primes such as *senior* or *upperclassman*. For the meantime, however, we are guardedly optimistic that priming positive achieved identities can mitigate the threat students experience as a consequence of their stigmatized ascribed identities.

These results add to the growing literature supporting the utility of the stereotype threat construct. When a social scientific construct parsimoniously explains data collected in different contexts and academic disciplines, it is fitting that the discussion turn from disparate phenomenologies to an integrated account of the necessary and sufficient conditions under which the construct can be used to predict and potentially intervene in behavior. As we and others have demonstrated, stereotype threat responses are predicated in large part on the social identity that is currently salient to a susceptible individual. The cues available to trigger one's social identity in a testing environment are numerous: a standard demographics question about gender or ethnicity; the use of a phrase associated with a particular cultural community; the difficulty of a test; and the faces of the other test takers and the teachers in a testing environment (Godley, 2003; Harris, 2003; Steele & Aronson, 1995). Any of these contextual dimensions has the potential to prompt a stereotype threat response. However, these same dimensions can also be transmuted to cue self-affirming identities, thereby thwarting threat responses, and in some cases even boosting an individual's performance (McGlone et al., 1999). The contextual salience of social identities thus appears to be not only the vector for stereotype threat phenomena but also an antidote for their ill effects.



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