


# Capitalizing on Multiple Social Identities to Prevent Stereotype Threat: The Moderating Role of Self-Esteem

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## Abstract

One troubling aspect of membership in a stigmatized group is that negative stereotypes about the group's performance affect one's personal performance (i.e., stereotype threat). Women who are made aware of the negative stereotype that "women are bad at math" perform worse than women who are not made aware of this stereotype. However, women can use an "escape hatch" to avoid stereotype threat by identifying with another social identity (i.e., college students) that has positive stereotypes for math performance and having greater feelings of self-worth. This research shows that women who had greater self-esteem and were presented with an alternative, positive social identity were buffered from stereotype threat by eliminating working memory decrements responsible for poor math performance. Women lower in self-esteem, however, did not benefit from a positive, alternative social identity when it was available and thus fell prey to stereotype-based working memory and performance decrements.

## Keywords

stereotype threat, multiple social identities, self-esteem, working memory, social identity accessibility

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Members of stigmatized groups have to overcome a seemingly endless number of obstacles to succeed. Society at large holds negative attitudes and negative stereotypes about them that can often lead to poor interpersonal, economic, and health-related outcomes (Crocker, Major, & Steele, 1998). One thing is sure, being stigmatized has its costs, especially when the stigmatized group identity is made salient (Major & O'Brien, 2005). The current work explores one of these costs, stereotype threat (Steele, Spencer, & Aronson, 2002), and how members of negatively stereotyped groups can eliminate it. In this work, we examine the conditions under which women's math performance is affected by the availability of negative stereotypes (i.e., stereotype threat; Spencer, Steele, & Quinn, 1999). More importantly, we examine how combining situational and personal factors allows women to deal effectively with the stereotype that "women are bad at math" and retain valuable working memory resources necessary for higher level math performance (Beilock, Rydell, & McConnell, 2007; Schmader & Johns, 2003).

Research suggests that stereotype threat stems from the cognitive imbalance that occurs when people's positive sense of self is inconsistent with the expectation that a social group to which they identify should fail in a given performance domain (Schmader, Johns, & Forbes, 2008). Relevant to the

current work, Shih, Pittinsky, and Ambady (1999) examined how performance is affected when people hold multiple social identities that may have contradictory stereotypes about ability for the same performance domain. Shih et al. showed that Asian females' math performance depended on which of two social categories, Asian or female, was made accessible by an identity manipulation. When the social category Asian was accessible, math performance increased relative to a control group. When the social category female was accessible, math performance decreased relative to a control condition. Decreased math performance when Asian females' gender identity was accessible could have created an imbalance between people's propositions between the self (e.g., "I am a good person"), their group (e.g., "I am a woman"), and the ability domain (e.g., "Women are bad at math"). However, Shih et al. did not examine what happened when both identities were simultaneously activated.

In an extension of work by Shih et al. (1999), Rydell, McConnell, and Beilock (2009) showed that when only

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negative stereotypes about women's math performance were given, female college students' math performance (Spencer et al., 1999) and working memory suffered (see Beilock et al., 2007; Schmader & Johns, 2003). However, when a positive, self-relevant stereotype (i.e., college students are good at math relative to noncollege students) was presented alongside the negative stereotype about women's math ability, women's math performance and working memory did not suffer (i.e., their performance was identical to women who received no stereotypes). Thus, when women were faced with both positive and negative self-relevant stereotypes about their math ability, they did not show stereotype threat performance or working memory deficits (Rydell et al., 2009).

More specifically, women eliminated the impact of negative stereotypes by subjectively leaving the group women (Rydell et al., 2009). This subjective exit occurred through lowered identification with the negatively stereotyped group and increased identification with the alternative, positively stereotyped group (Tajfel & Turner, 1986). Rydell et al. (2009) demonstrated that women were more strongly identified with being a college student (an available positive social identity) as opposed to a woman (an available negative social identity) when both identities were available (Mussweiler, Gabriel, & Bodenhausen, 2000; Roccas, 2003a, 2003b). Moreover, reduced accessibility of the female identity and the retention of working memory capacity accounted for better performance when both the college student and female stereotypes were available.

In the current work, we examined whether the elimination of stereotype threat in situations where both positive and negative performance stereotypes were accessible was moderated by self-esteem. We expected that not all negatively stereotyped individuals would benefit from the availability of a positively stereotyped domain-relevant social identity and thus would not avoid stereotype threat. More to the point, we predicted that women would need to have a positive, performance-relevant social identity (i.e., being a college student) available to them as well as greater self-esteem to avoid the negative impact of the stereotype that women are bad at math. If a positive identity was not available or self-esteem was relatively low, it was predicted that negative stereotypes would impair women's math performance, increase identification with the negatively stereotyped (i.e., female) identity (e.g., Mussweiler et al., 2000), and reduce working memory capacity (e.g., Rydell et al., 2009).

However, why would self-esteem moderate the impact of stereotype threat when both positive and negative domain-relevant performance stereotypes are made available? Research on self-enhancement, self-construal and self-esteem, self-affirmation, and social identity theory all provide rationale for this prediction—and we review each of these perspectives and their implications for self-esteem and stereotype threat effects when positive and negative self-relevant performance stereotypes are presented simultaneously.

People have a general tendency to self-enhance, and this tendency is especially strong for those with greater levels of self-esteem (e.g., Tesser, 1988). For instance, people with higher self-esteem (as opposed to those with lower self-esteem) are more likely to present themselves in an overly positive light (Baumeister, 1982) and to perceive positive evaluators as more accurate than negative evaluators (Bosson & Swann, 1999). To enhance the self, Swann and Read (1981) found that people with greater self-esteem scrutinize information they expect to be negative and those with lower self-esteem scrutinize information they expect to be positive; however, people with greater self-esteem remember more favorable self-relevant information, but those with lower self-esteem remember more unfavorable self-relevant information. In relation to the simultaneous presentation of positive and negative stereotypes about math performance, the self-enhancement literature suggests several strategies that people with greater self-esteem (but not those with lower self-esteem) might use to avoid stereotype threat. Namely, those greater in self-esteem: (a) may present themselves positively (i.e., as a college student), (b) may more closely scrutinize negative information about the self (i.e., the stereotype that women are bad at math), (c) may discount the negative stereotype (e.g., by thinking of counterstereotypic exemplars), and (d) may recall more information given about the positive stereotype than the negative stereotype. On the other hand, those lower in self-esteem may be more likely to closely scrutinize positive self-relevant information about the self, may discount the positive stereotype given (e.g., by thinking of college students who are bad at math), and may recall more information related to the negative as opposed to the positive stereotype.

Self-esteem does not just affect self-enhancement processes; it also affects the way people construe their actions (e.g., Brown & Dutton, 1995). People with greater levels of self-esteem build on personal strengths to succeed, whereas people with lower levels of self-esteem attempt to deal with their flaws to be accepted (Baumeister & Tice, 1985; Brown & Dutton, 1995). This work predicts that people under stereotype threat with high versus low self-esteem will attempt to approach gains or avoid losses, respectively (for reviews, see Higgins, 1997; Seibt & Förster, 2004). Thus, when female college students are faced with the stereotype that women are bad at math at the same time as the stereotype that college students are good at math, those with greater self-esteem may approach their strengths by focusing on the positive stereotype about college students. Those with lower self-esteem may attempt to deal with their inadequacies by focusing on the negative stereotype about females. This difference in how people construe the self as a function of self-esteem may also affect stereotype threat. That is, self-esteem should moderate stereotype threat effects when positive and negative self-relevant stereotypes are concurrently presented because those high in self-esteem should

perceive themselves as college students and not perceive the situation as threatening; those low in self-esteem should perceive themselves as women and experience stereotype threat.

Research on self-affirmation (Steele, 1988) and group affirmation (Sherman, Kinias, Major, Kim, & Prenovost, 2007) also suggests that when confronted with positive and negative stereotypes about math performance, self-esteem could moderate whether stereotype threat effects are obtained. Past research has shown that self-affirmation eliminates stereotype threat effects (Martens, Johns, Greenberg, & Schimel, 2006) and drastically reduces the achievement gap between African American and Caucasian middle schoolers (Cohen, Garcia, Apfel, & Master, 2006). From a self-affirmation perspective, simultaneously presenting women with positively and negatively stereotyped groups they belong to will allow them to affirm the positive social identity, buffering them from the impact of stereotype threat. To the extent that individuals have greater self-esteem, they may have more affirmational resources (e.g., Fein & Spencer, 1997) and be more likely to use the positive social identity to self-affirm.

Finally, social identity theory has shown that level of self-esteem moderates how people respond to potentially threatening situations (Hogg, 2007; Roccas, 2003a, 2003b). That is, people with greater self-esteem were more likely to subjectively leave a negative social identity and identify with a neutral social identity that allowed them to view themselves more positively (Mussweiler et al., 2000; Roccas, 2003a). Those lower in self-esteem did not subjectively leave the group and thus remained identified with a negative social group despite the deleterious consequences of this identification for self-esteem. In line with research demonstrating the moderating role of self-esteem on the ability to subjectively leave a negative social identity, we expected people to focus on different identities as a function of self-esteem when both positively and negatively stereotyped social identities were concurrently available. The lack of a subjective exit from the group female among those with lower self-esteem should increase stereotype threat and lead to lower performance, greater identification with being a woman, and lowered working memory capacity. Because those greater in self-esteem may more effectively subjectively exit the group, they could avoid stereotype threat and its impact by identifying with being a college student as opposed to identifying with being a woman.

Thus, there appears to be broad support for our prediction that self-esteem will moderate the impact of a negative stereotype on domain-relevant performance when a positive stereotype is also presented—and one of the main foci of the current work is to test this prediction. However, our work also focuses on more nuanced predictions than the moderation of stereotype threat effects by self-esteem in conditions where positive and negative stereotypes are concurrently available. More specifically, we also want to address, in this

“multiple identities” condition, why greater levels of self-esteem would be related to better math performance. Consistent with past work on stereotype threat, we predicted that greater working memory capacity (e.g., Beilock et al., 2007; Schmader & Johns, 2003) could account for the better math performance by women in the multiple identities condition, who had greater self-esteem (see Rydell et al., 2009).<sup>1</sup>

## Experiment 1

Experiments 1 and 2 had female college students complete a math test after receiving no information about social identities or math performance stereotypes (control condition), information highlighting a group membership (i.e., female) associated with negative math performance (gender identity condition), information highlighting a group membership (i.e., college student) associated with positive math performance (college identity condition), or information highlighting both group memberships (multiple identities condition). In Experiment 1, we examined whether those greater in self-esteem would perform better than those lower in self-esteem on a math test and subjectively exit the negatively stereotyped group (i.e., show reduced identification with the negatively stereotyped group) in the multiple identities condition. Because social identities are activated or inhibited depending on the situation (Hugenberg & Bodenhausen, 2004) and people with higher (vs. lower) self-esteem are especially motivated to utilize social identities that allow them to view themselves in a positive light (e.g., Mussweiler et al., 2000; Roccas, 2003a, 2003b), we expected that women with greater self-esteem would show reduced activation of the female social identity in the multiple identities condition, whereas women lower in self-esteem would show greater activation of this identity in the same condition.

## Method

**Participants and design.** Female ( $N = 186$ ) undergraduates at Indiana University participated for research credit. They were randomly assigned to a 2 (college student stereotype: absent, present)  $\times$  2 (gender stereotype: absent, present) between-subjects factorial design.

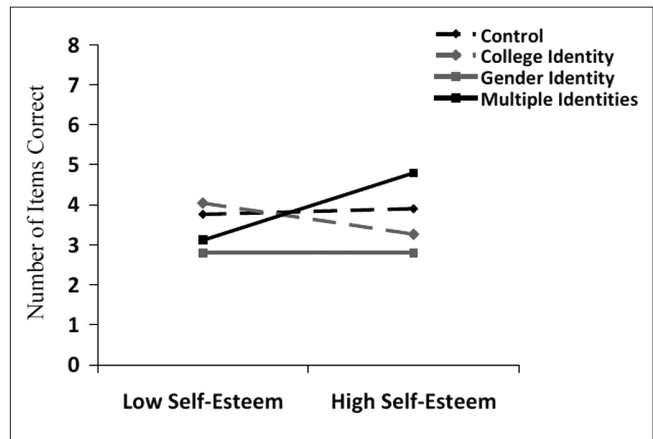
**Procedure.** Participants were seated at a computer in a private room and asked to complete a problem-solving task. Before starting the problem-solving task, participants completed a 10-item trait self-esteem scale (Rosenberg, 1965;  $\alpha = .83$ ) that was ostensibly unrelated to the main task.<sup>2</sup> After completing this scale, the computer program informed them of the ostensible reasoning for the research, which served to highlight group memberships associated with positive (i.e., college student) and negative (i.e., female) self-relevant math stereotypes.

**Manipulations of math stereotypes.** Participants received one of four sets of instructions to manipulate the availability

of self-relevant social identities and their math-related stereotypes. Participants were told that the purpose of the experiment was to investigate why some people are better at math than others (wording was adapted from Aronson et al., 1999, p. 37; see Rydell et al., 2009). In the *control condition* (college student and gender stereotypes absent), no reference was made to gender or college student status. In the *gender identity condition* (college student stereotype absent, gender stereotype present), participants were informed that the research was investigating why women are generally worse at math than men. In the *college identity condition* (college student stereotype present, gender stereotype absent), participants were informed that the research was investigating why college students are better at math than those who are not in college. In the *multiple identities condition* (college student and gender stereotype present), participants were told that the research was investigating why women are generally worse at math than men and why college students are generally better at math than those not in college.

**Female identity accessibility task.** After reading the purported purpose for the research, participants completed an identity accessibility task. Specifically, to examine the relative accessibility of their female identity, participants completed a Me/Not Me task. This task consisted of 80 trials in which a target word was presented at the center of the computer monitor and participants indicated whether the word was related to the self (Me) by pressing the *m* key on the keyboard or unrelated to the self (Not Me) by pressing the *n* key on the keyboard. The response latencies for the different types of target words were the dependent variable of interest. Specifically, there were two types of words presented: five female words (*gal, girl, woman, female, lady*) and eight unrelated words (e.g., *grip, feather*). Each female word was presented eight times (40 total presentations), and each of the eight unrelated words was presented five times for a total of 40 unrelated word trials. We only report the results for response latencies from the female words in which a “Me” response was given (95% of trials in which female words were presented) to ensure that these words were indeed associated with the self.<sup>3</sup> The accessibility of the female identity was assessed by examining the response latencies for the female words, with faster responses indicating greater female identity accessibility.

**Math problems.** Next, participants completed 10 math problems used in past stereotype threat research (Schmader & Johns, 2003). All of the questions were difficult word problems that involved relatively high-level math skills and logical ability. Participants chose their answer from five possible solutions that were presented under the problem and labeled from *a* to *e* for each of the 10 math problems. The math problems were presented in a random order, and participants had to give an answer to a problem to advance to the next question.<sup>4</sup>



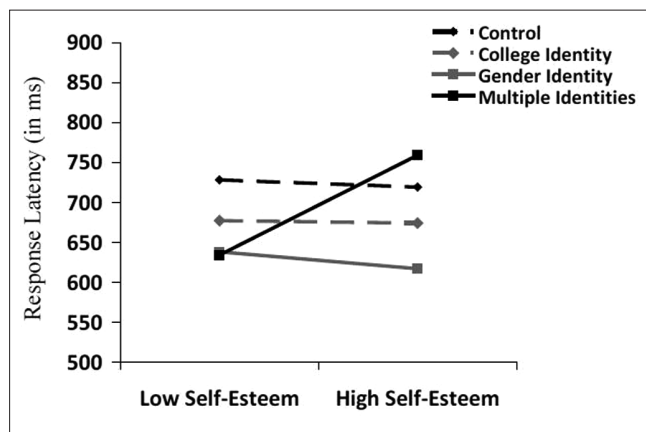
**Figure 1.** The relation between the number of math items answered correctly and self-esteem as a function of the experimental conditions in Experiment 1

## Results

Because an interaction between college student stereotypes, female stereotypes, and self-esteem was predicted for both math performance and female identity accessibility, two multiple-regression analyses were conducted. Centered ratings of self-esteem, the manipulation of college student stereotypes (comparing the absent, coded 0, and the present, coded +1, conditions), the manipulation of female stereotypes (comparing the absent, coded 0, and the present, coded +1, conditions), all possible two-way interactions (multiplicative functions), and the three-way interaction of the centered self-esteem, the manipulation of college student stereotypes, and the manipulation of female stereotypes (multiplicative function) were regressed on participants' math performance and female identity accessibility. The results of these analyses are plotted as a function of self-esteem (1 *SD* below the mean, 4.07, or “low self-esteem,” and 1 *SD* above the mean, 5.53, or “high self-esteem”) and math performance (Figure 1) or female identity accessibility (Figure 2) for each of the experimental conditions.

The regression analysis for math performance showed the predicted three-way interaction,  $B(178) = 1.66$ ,  $\beta = .29$ ,  $t = 2.27$ ,  $p = .02$ . When the college student stereotype was absent, the two-way interaction of self-esteem and female stereotype was not significant,  $B(178) = -.11$ ,  $\beta = -.03$ ,  $t = -.22$ ,  $p = .82$ . However, replicating past stereotype threat work, the main effect of female stereotype was significant,  $B(178) = -1.03$ ,  $\beta = -.29$ ,  $t = -2.87$ ,  $p = .01$ . There was no correlation between self-esteem and math performance in the control condition,  $B(178) = .10$ ,  $\beta = .04$ ,  $t = .34$ ,  $p = .73$ , or the gender identity condition,  $B(178) = -.01$ ,  $\beta = .00$ ,  $t(178) = -.01$ ,  $p = .99$ . More importantly, when the college student stereotype was present,





**Figure 2.** The relation between the activation of the female social identity (response latency in milliseconds) and self-esteem as a function of the experimental conditions in Experiment 1

the two-way interaction of self-esteem and female stereotype was significant,  $B(178) = -1.55$ ,  $\beta = -.49$ ,  $t = -2.85$ ,  $p = .01$ . This interaction showed a significant positive correlation between self-esteem and math performance in the multiple identities condition,  $B(178) = 1.01$ ,  $\beta = .41$ ,  $t = 2.46$ ,  $p = .02$ , but no correlation in the college identity condition,  $B(178) = -.54$ ,  $\beta = -.22$ ,  $t = -1.51$ ,  $p = .13$  (see Figure 1).

The regression analysis for female identity accessibility also showed the predicted three-way interaction,  $B(178) = 93.02$ ,  $\beta = .27$ ,  $t = 2.15$ ,  $p = .03$ . When the college student stereotype was absent, the two-way interaction of self-esteem and female stereotype was not significant,  $B(178) = -5.12$ ,  $\beta = -.02$ ,  $t = -.18$ ,  $p = .86$ . However, replicating past stereotype threat work, the main effect of female stereotype was significant,  $B(178) = -49.16$ ,  $\beta = -.23$ ,  $t(178) = -2.33$ ,  $p = .02$ . There was no correlation between self-esteem and female identity accessibility in the control condition,  $B(178) = -6.32$ ,  $\beta = -.04$ ,  $t = -.36$ ,  $p = .72$ , or the gender identity condition,  $B(178) = -11.44$ ,  $\beta = -.08$ ,  $t(178) = -.51$ ,  $p = .61$ . More importantly, when the college student stereotype was present, the two-way interaction of self-esteem and female stereotype was significant,  $B(178) = -87.91$ ,  $\beta = -.47$ ,  $t = -2.71$ ,  $p = .01$ . This interaction showed a significant positive correlation between self-esteem and female identity accessibility in the multiple identities condition,  $B = 85.88$ ,  $\beta = .59$ ,  $t = 3.47$ ,  $p = .001$ , but no correlation in the college identity condition,  $B(178) = -2.04$ ,  $\beta = -.01$ ,  $t = -.10$ ,  $p = .92$  (see Figure 2).

We also examined whether the relation between self-esteem and number of math problems answered correctly was accounted for by female identity accessibility in the multiple identities condition by conducting additional multiple regression analyses. However, female identity accessibility did not mediate this relation.<sup>5</sup>

## Discussion

Experiment 1 supports our predictions that self-esteem moderates the utilization of positive, alternative social identities and math performance in the multiple identities condition. Thus, those greater in self-esteem, when given both positive and negative self-relevant math stereotypes, did not have their female social identity as accessible as individuals with lower self-esteem and performed better on a difficult math test. Those lower in self-esteem performed as poorly as those who received only a negative stereotype about women's math ability. Self-esteem did not affect math performance or identity activation in any other experimental condition, showing that self-esteem moderates stereotype threat effects when multiple social identities with conflicting stereotypic information are available, but not in other situations. The latter, nonsignificant findings are consistent with stereotype threat research showing that self-esteem does not predict performance decrements induced via stereotype threat (e.g., Steele et al., 2002).

One problematic aspect of Experiment 1 is that we cannot explain why greater self-esteem in the multiple identities condition was correlated with better math performance. Although we found a marginally significant relation between female identity accessibility and math performance (see Note 5), female identity accessibility did not account for the relation between self-esteem and math performance in the multiple identities condition. In retrospect, the lack of mediation by female identity accessibility is not surprising when considering that stereotype activation (i.e., women are bad at math) and subsequent group categorization (i.e., "I am a woman, so I am bad at math") occur early on in process models that explain stereotype threat's effects on performance (Schmader et al., 2008). The direct impact of female identity accessibility on math performance could be muted by responses to physiological arousal or by outcomes of monitoring (Beilock et al., 2007) and suppression processes (Johns, Inzlicht, & Schmader, 2008) that follow stereotype activation and categorization. Participants' math performance in Experiment 1 was likely affected by their monitoring (e.g., Beilock et al., 2007), ruminations (e.g., Cadinu, Maass, Rosabianca, & Kiesner, 2005), and negative emotions (Johns et al., 2008), which occurred in part because of their identification with their negatively stereotyped gender group. Because we did not include measures to capture these additional processes implicated in performance decrements due to stereotype threat in Experiment 1, we cannot delineate the impact of identity accessibility on math performance from the influences of later processes on math performance.

Given the ambiguities in understanding the processes underlying the positive relation between self-esteem and math performance in the multiple identities condition of Experiment 1, we examined a more proximal mediator for this relation in Experiment 2: working memory capacity.

Working memory capacity is a more promising mediator than identity accessibility because recent work has directly linked performance decrements on tasks that require controlled processing (e.g., solving mathematical problems) to compromised working memory capacity (see Miyake & Shah, 1999). Additionally, working memory capacity can become taxed because of the consumption of working memory resources by earlier cognitive, affective, and physiological processes, thereby suggesting that it influences performance at a later step in the chain of events (Schmader et al., 2008). For these reasons, a measure of working memory capacity was introduced in Experiment 2 to more closely examine why greater levels of self-esteem would be related to better math performance.

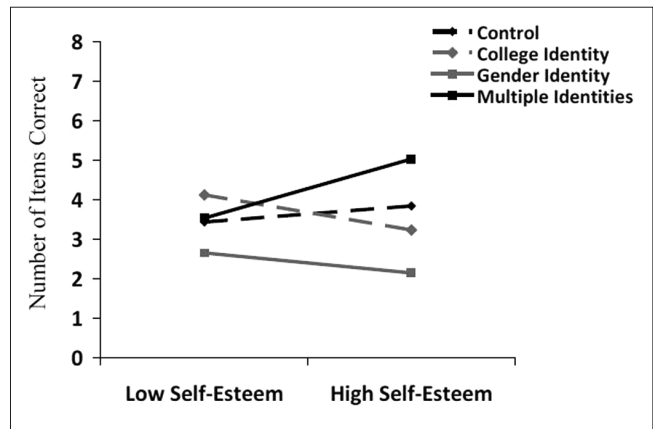
## Experiment 2

In Experiment 2, we examined how self-esteem affects the cognitive resources that are compromised when women's math performance suffers because of stereotype threat. It is well documented that stereotype threat affects women's math performance by increasing verbal ruminations or worries about performance and confirming the pejorative stereotype that reduces working memory resources required to solve difficult math problems (Beilock et al., 2007; Cadinu et al., 2005; Croizet, Despres, Gauzins, Huguot, & Leyens, 2004; Schmader & Johns, 2003). Rydell et al. (2009) showed that when social identities were available with positive and negative stereotypic implications for females in math, working memory resources were not compromised and math performance was not affected by the stereotype that women are bad at math. However, here we examined whether women in the multiple identities condition might still experience compromised working memory resources, despite the presence of a positive self-relevant math stereotype, when they had lower self-esteem (but not when they had greater self-esteem). Therefore, we expected that greater self-esteem would again buffer against stereotype threat in the multiple identities condition by lessening the impact of the negative stereotype on working memory resources and math performance. Furthermore, we predicted that the positive correlation between self-esteem and math performance in the multiple identities condition would be accounted for by working memory capacity.

## Method

**Participants and design.** Female ( $N = 140$ ) undergraduates at Indiana University participated for research credit. They were randomly assigned to a 2 (college student stereotype: absent, present)  $\times$  2 (gender stereotype: absent, present) between-subjects factorial design.

**Procedure.** The self-esteem measure ( $\alpha = .87$ ), stereotype manipulations, and math task were the same as Experiment 1.



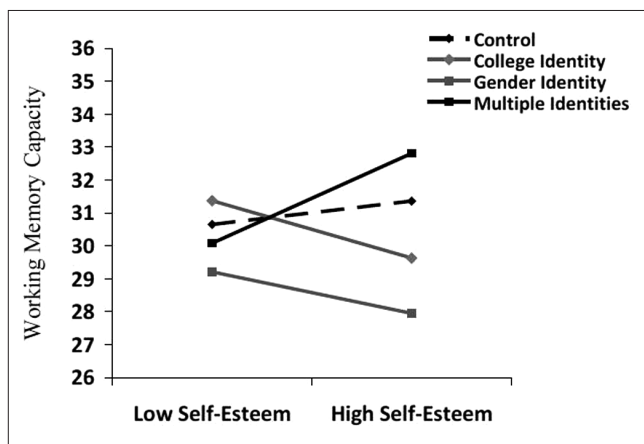
**Figure 3.** The relation between the number of math items answered correctly and self-esteem as a function of the experimental conditions in Experiment 2

The only change from Experiment 1 was that a working memory task was given in place of the Me/Not Me task.

**Working memory task.** A shortened version of the verbal ("vowel counting") task used by Schmader and Johns (2003) assessed working memory capacity. In this task, participants were first asked to count the number of vowels in a simple sentence and report that number in a response box below the sentence. After giving their answer to the vowel-counting portion of the trial, participants then saw a word presented for 1 s that they were instructed to remember for recall. Each trial consisted of the two activities completed consecutively: vowel counting followed by a word to memorize. After a certain number of trials, unbeknownst to participants (i.e., a set), individuals were asked to recall all of the words presented in that set (i.e., since the last time of recall). Participants were presented with eight sets that were composed of either four or five trials per set (four sets had four trials, four sets had five trials; the order of presentation was randomly determined). Thus, participants could recall up to 36 words correctly (i.e., 1 per trial). Working memory was examined by looking at the number of words recalled, with greater recall indicating greater working memory capacity (see Conway et al., 2005).

## Results

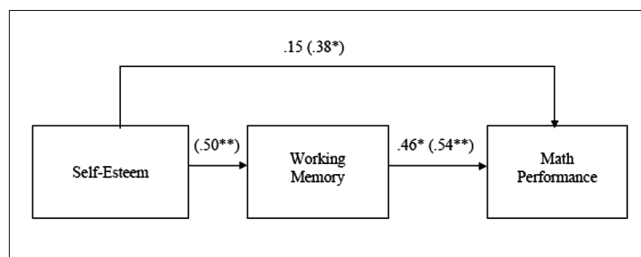
Because an interaction between college student stereotypes, female stereotypes, and self-esteem was predicted for both math performance and working memory capacity, two multiple-regression analyses were conducted following the same procedures as in Experiment 1. Again, the results of these analyses are plotted as a function of self-esteem (1 *SD* below the mean, 3.91, or "low self-esteem," and 1 *SD* above the mean, 5.61, or "high self-esteem") and math performance (Figure 3) or working memory capacity (Figure 4) for each of the experimental conditions.



**Figure 4.** The relation between working memory capacity and self-esteem as a function of the experimental conditions in Experiment 2

The regression analysis for math performance showed the predicted three-way interaction,  $B(132) = 1.78$ ,  $\beta = .49$ ,  $t = 2.88$ ,  $p = .01$ . When the college student stereotype was absent, the two-way interaction of self-esteem and female stereotype was not significant,  $B(132) = -.55$ ,  $\beta = -.22$ ,  $t = -1.27$ ,  $p = .21$ . However, replicating past stereotype threat work, the main effect of female stereotype was significant,  $B(132) = -1.23$ ,  $\beta = -.38$ ,  $t = -3.44$ ,  $p = .001$ . There was no correlation between self-esteem and math performance in the control condition,  $B(132) = .04$ ,  $\beta = .01$ ,  $t = .74$ ,  $p = .46$ , or the gender identity condition,  $B(132) = -.30$ ,  $\beta = -.16$ ,  $t = -1.11$ ,  $p = .27$ . More importantly, when the college student stereotype was present, the two-way interaction of self-esteem and female stereotype was significant,  $B(132) = 1.23$ ,  $\beta = -.42$ ,  $t = -2.67$ ,  $p = .01$ . This interaction showed a significant positive correlation between self-esteem and math performance in the multiple identities condition,  $B(132) = .71$ ,  $\beta = .37$ ,  $t = -2.45$ ,  $p = .02$ , but no correlation in the college identity condition,  $B(132) = -.53$ ,  $\beta = -.28$ ,  $t = -1.55$ ,  $p = .12$  (see Figure 3).

The regression analysis for working memory capacity showed the predicted three-way interaction,  $B(132) = 3.77$ ,  $\beta = .40$ ,  $t = 2.23$ ,  $p = .03$ . When the college student stereotype was absent, the two-way interaction of self-esteem and female stereotype was not significant,  $B(132) = -1.15$ ,  $\beta = -.18$ ,  $t = -.99$ ,  $p = .33$ . However, replicating past stereotype threat work, the main effect of female stereotype was significant,  $B(132) = -2.43$ ,  $\beta = -.29$ ,  $t = -2.47$ ,  $p = .02$ . There was no correlation between self-esteem and working memory capacity in the control condition,  $B(132) = .42$ ,  $\beta = .08$ ,  $t = .46$ ,  $p = .64$ , or the gender identity condition,  $B(132) = -.74$ ,  $\beta = -.15$ ,  $t = -.99$ ,  $p = .33$ . More importantly, when the college student stereotype was present, the two-way interaction of self-esteem and female stereotype was significant,  $B(132) = -2.62$ ,  $\beta = -.50$ ,  $t = -2.90$ ,  $p = .01$ . This interaction



**Figure 5.** The mediation of the relation between self-esteem and math performance by working memory capacity for participants in the multiple identities condition

Standardized beta weights for the direct relations between variables are presented in parentheses. Standardized beta weights for the indirect relations between variables are presented outside parentheses.

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

showed a significant positive correlation between self-esteem and working memory capacity in the multiple identities condition,  $B(132) = 1.60$ ,  $\beta = .32$ ,  $t(132) = 2.03$ ,  $p = .04$ , but no correlation in the college identity condition,  $B(132) = -1.02$ ,  $\beta = -.21$ ,  $t = -1.10$ ,  $p = .28$  (see Figure 4).

Because the relation between self-esteem and number of math problems answered correctly differed as a function of the college student and gender stereotypes and was only significant in the multiple identities condition (as well as the necessary correlation between self-esteem working memory capacity; see the preceding findings), we only examined the prospect of mediation in this condition.

The conditions necessary to examine whether working memory capacity mediated the relation between self-esteem and number of math problems answered correctly were obtained (see Baron & Kenny, 1986). Namely, the mediator variable (i.e., working memory capacity) was correlated with the independent (i.e., self-esteem) and the dependent (i.e., number of math problems answered correctly) variables in the multiple identities condition (see Figure 5). Thus, participants had the number of math problems answered correctly simultaneously regressed on self-esteem and working memory capacity. These multiple regressions revealed that when working memory capacity was included, the relation between self-esteem and number of math problems answered correctly was nonsignificant,  $B(33) = .28$ ,  $\beta = .15$ ,  $t = .86$ ,  $p = .39$ . A Sobel test demonstrated that working memory capacity accounted for a significant amount of variance in the relation between self-esteem and number of math problems answered correctly,  $z = 2.14$ ,  $p = .03$ .

## Discussion

Experiment 2 showed *why* the capacity of those with greater self-esteem to shift their identification away from “being female” affected math performance in the multiple identities condition: They were able to avoid the working memory

decrements usually experienced in response to the presence of negative performance stereotypes. Indeed, there was strong support for this logic because mediational analyses in the multiple identities condition showed that the positive relation between self-esteem and performance was accounted for by working memory capacity. Thus, for those with greater self-esteem, when both positive and negative self-relevant performance stereotypes were available, their working memory capacity was not compromised, and performance did not suffer. However, for individuals lower in self-esteem, the availability of an additional identity associated with positive performance stereotypes did not reduce the consumption of working memory resources by a negative stereotype (see also Beilock et al., 2007; Croizet et al., 2004; Rydell et al., 2009; Schmader & Johns, 2003), and accordingly, performance suffered despite the availability of a positive stereotype.

## General Discussion

The current work elucidates the importance of self-esteem for utilizing situational information (i.e., a concurrently available, positively stereotyped social identity) to reduce the impact of stereotype threat on performance and working memory capacity. Consistent with the impact of self-esteem on how people deal with negative information about the self (e.g., Baumeister & Tice, 1985; Bosson & Swann, 1999; Mussweiler et al., 2000; Sherman et al., 2007; Swann & Read, 1981), we showed that participants with greater self-esteem were less likely to perceive themselves as women (and presumably more likely to perceive themselves as college students), whereas participants with lower self-esteem perceived themselves as women despite having a positive and domain-relevant social identity available: This difference in self-focus was important for dealing with stereotype threat, but only in particular situations.

Specifically, when both positive and negative self-relevant stereotypes about math performance were available, women with higher self-esteem distanced themselves from the identity related to the negative stereotype (Mussweiler et al., 2000; Roccas, 2003a). In the same situation, women with lower self-esteem activated the identity related to the negative stereotype. Indeed, in the multiple identities condition, the cognitions and behaviors of women with greater self-esteem were identical to people who were not under stereotype threat, whereas as the cognitions and behaviors of women with lower self-esteem were identical to people facing stereotype threat. That is, women who received both positive and negative self-relevant stereotypes were more likely to perform poorly and show lower working memory resources when they were lower in self-esteem, but those high in self-esteem with conflicting stereotypes available performed well and showed no working memory decrement from having a negative math stereotype available.

These results have important implications for research on stereotype threat. First, they further define the role of self-esteem in reducing the impact of stereotype threat on stigmatized individuals. The role of self-esteem is poorly understood in research on stereotype threat, often showing no impact on people's susceptibility to performance decrements (Steele et al., 2002). This work shows that under certain situations, specifically those in which both positive and negative self-relevant information is available, self-esteem decreases the extent to which people will be affected by negative information provided about their group's ability.

Second, the results show the boundary conditions for research demonstrating that priming a positive social identity (Shih et al., 1999), presenting an alternate positive stereotype (Rydell et al., 2009), or increasing the accessibility of people's personal identity can prevent stereotype threat (Ambady, Parker, Steele, Owen-Smith, & Mitchell, 2004). Most research on stereotype threat has dealt with either how to reduce the arousal of stereotype threat situations (e.g., Ben-Zeev, Fein, & Inzlicht, 2005) or how to guide individuals to using other social identities or their personal identities to define the self (e.g., Ambady et al., 2004). This research shows that the latter strategies are likely affected by self-esteem. Specifically, the current work shows that concurrently presenting positive and negative social identities is only effective in warding off stereotype threat when the stereotyped individual has ample self-esteem. It should also hold that the impact of manipulations designed to focus an individual on her personal as opposed to social identity to ameliorate stereotype threat effects should be more effective for those greater in self-esteem.

Third, this work provides information that should help create more nuanced interventions to eradicate stereotype threat. Any intervention to negate the impact of stereotype threat should account not only for the impact of other performance-relevant stereotypes and identities, whether they are social or personal, that people can use to increase performance but should also include a component that enhances self-esteem to make the strategies that are effective in reducing stereotype threat more likely to be used.

Despite the important implications of the current work for stereotype threat research, there are two lingering conceptual issues that should be examined in future work. First, it is unclear from the current results whether people in the multiple identities condition are seizing the positive social identity (i.e., college student) or deemphasizing the negative social identity (i.e., woman). Rydell et al. (2009) showed that both decreased activation of the negative social identity and increased activation of the positive social identity were related to stereotype threat effects. Capitalizing on the positive social identity or disidentifying with the negative social identity can occur together or independently to reduce stereotype threat effects when both positive and



negative performance stereotypes are self-relevant in the same domain. Future research should address when these different processes occur.

Second, we did not show that identification accounted for math performance in Experiment 1 (see Note 5), and we never measured identification with being a woman and working memory capacity in the same experiment. Given these limitations, it is unclear to what extent increased identification and decreased working memory are related to one another, or whether changes in identification with being a woman led to decrements in math performance by reducing working memory capacity. Although a direct link has not been shown, the model guiding this work (Schmader et al., 2008) and our own reasoning predict such a relation. Indirect evidence for the negative relation between identification with the stereotyped group and working memory capacity is found in the extant literature. Much of the research linking stereotype threat effects to reduced working memory capacity for women in math has utilized only women who are highly identified with being their gender (Beilock et al., 2007; Schmader & Johns, 2003). The justification for this is that women who are not highly identified with being a woman would not show performance decrements or working memory reductions when under stereotype threat. This practice seems warranted because Schmader (2002) found that women who are not identified with their gender did not show reduced math performance while under stereotype threat. Because those lower in identification with being a woman do not show performance decrements (relative to men or unthreatened women), it is unlikely that they have reduced working memory capacity (or they would have a hard time doing well on the math test). Again, these results are consistent with the link between greater identification and reduced working memory capacity while under stereotype threat, but future research should examine this link directly.

Nonetheless, the current work can inform research on stereotype threat that examines the processes through which people combat threats to the self by changing, perhaps only momentarily, the content and/or structure of the self. In our work, a combination of a positive social identity and high self-esteem eradicated stereotype threat and reduced the extent to which information associated with the negatively stereotyped group was accessible in memory. How might these elements, by themselves or in combination, help to further elucidate how certain aspects of the self or of one's group identification protect people from negative, group-relevant information? Thinking about our work in these terms may help complement stereotype threat research by: (a) focusing on how the activation of aspects of the self or aspects of available social identities can accentuate or reduce stereotype threat effects and (b) attempting to understand the role of self-esteem in these processes.

Stereotype threat has been shown to lead to changes in the actual structure of the self-concept (Pronin, Steele, &

Ross, 2004). In work on identity bifurcation, women who were highly identified with mathematics and under stereotype threat identified less with feminine characteristics that were high in relevance to the stereotype that women are bad at math (e.g., emotional, gossipy, leaving work to raise children) but did not show lowered identification to female characteristics that were not relevant to this stereotype (e.g., sensitive, empathetic, fashionable). In the context of the current work, identity bifurcation may not be necessary to protect women from stereotype threat when they are provided a positive social identity related to math, especially when they have high self-esteem. Namely, because women who have an available positive math identity and greater self-esteem would categorize themselves in line with the positive social identity presented, there would be less of a need to compartmentalize and restructure their self-concept into aspects of the self that are and are not relevant to women's performance in math to protect the self from threat.

Whereas identity bifurcation may be unnecessary when a positive social identity is available and self-esteem is high, self-esteem itself may moderate the extent of identity bifurcation. That is, we would also predict that self-esteem could affect identity bifurcation by accentuating bifurcation for those higher in self-esteem. High self-esteem could enhance bifurcation and thus buffer women who are highly identified with math from stereotype threat—allowing them to maintain their feelings of self-worth and to maintain high levels of performance. It would be interesting to examine whether those with higher levels of self-esteem could be protected from threat and performance decrements by altering the structure of the self more than for those with lower levels of self-esteem. Future research should examine not only whether having a positive, stereotype-relevant social identity made available eliminates identity bifurcation but also for whom identity bifurcation is most likely and when and how it eliminates stereotype threat.

In addition, because the aspects of the self that are active make up the content of the self at any point in time and stereotype threat is more likely to occur to the extent that people are identified with the negatively stereotyped group (Schmader, 2002) and their personal identity (Ambady et al., 2004), research on construal orientation and stereotype threat (Marx, Stapel, & Muller, 2005) is important for understanding when positive social identities and self-esteem can reduce stereotype threat effects. Construal orientation and social comparison research involving stereotype threat has found that when females adopted a collective self-construal orientation (i.e., seeing the self as a group member as opposed to an individual), they assimilated an outgroup member with high math ability into the self-concept and, by doing so, eliminated stereotype-threat-based math decrements. Again, because making a positive social identity available along with greater levels of self-esteem lead to categorizing the self in line with the positive social identity,

comparing the self to a high-performing outgroup may not be necessary to reduce stereotype threat, and assimilation of an outgroup member would be less likely to occur (as would personal identification). Furthermore, an interesting question arises when simply considering individual differences in self-esteem with the work on construal orientation and social comparison. Would participants who are low in self-esteem show enhanced math performance when they are in a group orientation because they: (a) would assimilate being a college student into their self-concept and/or (b) would assimilate being male into their self-concept? These issues should be addressed in future research.

Related to work on construal level and social comparison, future work should address how the ingroup or outgroup status of the individuals receiving the negative and/or positive stereotypic information influences stereotype-threat-related phenomenon. Our findings of who is more likely to utilize positively stereotyped identities can be extended by linking this research with work on stereotype lift or the positive impact of being exposed to a negative performance stereotype about a group to which one does not belong on performance related to the stereotyped task (Walton & Cohen, 2003). We did not find any evidence of stereotype lift in the current work (i.e., performance in the college student identity condition was not superior to performance in the control condition), and self-esteem did not seem to have any impact on performance, identification, or working memory in the college student identity condition. Consistent with Shih, Ambady, Richeson, Fujita, and Gray (2002), we found that stereotype lift did not occur when the manipulation of performance stereotypes was explicit.

As mentioned in Rydell et al. (2009), there are a couple of issues to consider when interpreting research that presents both positive and negative performance stereotypes only to members of the stereotyped group in line with research on stereotype lift. Stereotype lift effects are small and rarely detected in any one experiment with explicit stereotype threat manipulations (Walton & Cohen, 2003). Stereotype lift occurs when information about an outgroup (e.g., women are bad at math) has implications for the performance of a different group (e.g., men). Stereotype lift may be less likely when the outgroup is less clearly defined and the nontargeted group membership is not made highly accessible (Marx & Stapel, 2006). Thus, perhaps increasing the differentiation between "college students" and "college age people that do not attend school" or increasing the accessibility of the social identity "college student" would produce stereotype lift effects. However, theoretically, if people are highly motivated to increase self-esteem, then stereotype lift may be more likely for those greater in self-esteem when they receive negative performance stereotypes about clear outgroups.

Negative stereotypes and stigma affect the thoughts, feelings, and behaviors of underprivileged group members. They

can mold people in profound ways. These negative stereotypes can determine what activities one enjoys, what one does for a living, and in a certain sense "who" an individual is (Steele, 1997). The current work examines under what conditions these negative stereotypes can be stripped of their power and which individuals are most likely to be resilient to their impact. Examining the role of self-esteem in different stereotype threat situations provides hope for further understanding and the elimination of the impact of negative stereotypes on their targets.

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### Notes

1. By focusing our mediational analyses on identification with the positively stereotyped group (Experiment 1) and working memory capacity (Experiment 2), we do not mean to imply that they are the only mechanisms underlying stereotype threat. Indeed, the impact of stereotype threat on performance could also be due to trying to control normally automated tasks (Beilock, Jellison, Rydell, McConnell, & Carr, 2006), effort (Jamieson & Harkins, 2007), or anxiety (Bosson, Haymovitz, & Pinel, 2004).
2. Consistent with past research, we did find relatively high levels of self-esteem in our samples. On a 6-point scale, participants' self-esteem scores were  $M = 4.80$ ,  $SD = .73$  (range = 2.30-6) in Experiment 1 and  $M = 4.76$ ,  $SD = .85$  (range = 2.70-6) in Experiment 2. Also in line with past work, the distribution of self-esteem scores was negatively skewed.
3. We also examined the control words. We found no main or interactive effects when self-esteem, the manipulation of positive stereotypes, the manipulation of negative stereotypes, all possible two-way interactions, and the three-way interaction were regressed on the latency for the control words ( $M_{\text{overall}} = 831$  ms,  $SD = 128$ ),  $t_s < 1.72$ ,  $p_s > .09$  (three-way interaction,  $t = -.22$ ,  $p = .82$ ). Thus, the latency data for the control words are not discussed further.
4. We also examined the amount of time it took participants to complete each math question ( $M = 89.68$  s,  $SD = 22.11$ ) in Experiment 1 and ( $M = 89.57$  s,  $SD = 18.76$ ) in Experiment 2. Importantly, we found that when self-esteem, the manipulation of positive stereotypes, the manipulation of negative stereotypes, all possible two-way interactions, and the three-way interaction were regressed on the average amount of time spent solving a math problem, there were no significant effects in either experiment ( $|t_s| > 1.49$ ,  $p_s > .14$ ). These findings show that the results presented in the main text were not due to a speed-accuracy trade-off in either experiment or enhanced motivation when under stereotype threat (cf. Jamieson & Harkins, 2007).

5. As stated, we examined whether the relation between self-esteem and number of math problems answered correctly was accounted for by female identity accessibility by conducting additional multiple regression analyses in the multiple identities condition, as well as the necessary correlation between self-esteem and female identity accessibility (see the Results section of Experiment 1) in this condition. The conditions necessary to examine whether female identity accessibility mediated the relation between self-esteem and number of math problems answered correctly were not obtained (see Baron & Kenny, 1986). Although the mediator variable (i.e., female identity accessibility) showed a significant correlation with the independent variable (i.e., self-esteem), the correlation between the mediator variable and the dependent variable (i.e., number of math problems answered correctly) was only marginally significant,  $B(43) = 18.65$ ,  $\beta = .27$ ,  $t = 1.83$ ,  $p = .07$ . Therefore, the mediational analysis could not be conducted. Despite this, when the number of math problems answered correctly was simultaneously regressed on self-esteem and female identity accessibility, neither self-esteem nor female identity accessibility were significant predictors of the number of math problems answered correctly,  $B(43) = .77$ ,  $\beta = .26$ ,  $t = 1.66$ ,  $p = .11$ , and  $B(43) = .002$ ,  $\beta = .16$ ,  $t = .96$ ,  $p = .34$ , respectively. Furthermore, using the bootstrapping procedure of Preacher and Hayes (2008), we did not observe mediation of the relation between self-esteem and number of math problems answered correctly by female identity accessibility (i.e., the 95% confidence interval for the mediational effect of female identity accessibility,  $-.18$  to  $1.05$ , included zero).

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