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On the Experience of Feeling Powerful: Perceived Power Moderates the Effect of Stereotype Threat on Women's Math Performance

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Abstract

This research examined whether feeling powerful can eliminate the deleterious effect of stereotype threat (i.e., concerns about confirming a negative self-relevant stereotype) on women's math performance. In Experiments 1 and 2, priming women with high power buffered them from reduced math performance in response to stereotype threat instructions, whereas women in the low and control power conditions showed poorer math performance in response to threat. Experiment 3 found that working memory capacity is one mechanism through which power moderates the effect of threat on women's math performance. In the low and control power conditions, women showed reduced working memory capacity in response to stereotype threat, accounting for threat's effect on performance. In contrast, women in the high power condition did not show reductions in working memory capacity or math performance in response to threat. This work demonstrates that perceived power moderates stereotype threat–based performance effects and explains why this occurs.

Keywords

stereotype threat, power, gender, math performance, social cognition

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Performing well and proving oneself, both in academics and the workplace, can be difficult for anyone, as it requires high-level performance that demonstrates one's competence. However, proving oneself can be especially difficult for negatively stereotyped individuals because performance environments are not always straightforward evaluations of ability for them. Negatively stereotyped individuals must deal with pejorative stereotypes about their ingroup's ability in a particular performance domain, which can lead to adverse consequences for performance. For example, women who may wish to gain entrance into the field of technology must first demonstrate competence in math and science; however, they may worry about the negative stereotypes about women in these domains and their performance may suffer as a result (i.e., stereotype threat; see Steele, Spencer, & Aronson, 2002).

Yet, many people are able to rise above the pernicious consequences of negative self-relevant stereotypes by performing well in areas in which their group is negatively stereotyped. In furthering our understanding of how some individuals are able to "rise above," it is critical to determine what factors influence whether a potentially threatening performance situation actually harms negatively stereotyped group members' performance. The current work explores one of these factors, namely, how feelings of power individuals bring into a stereotype-relevant domain may interact with the stereotype to affect performance. More specifically, the present research examines how feeling powerful can protect women from the detrimental effects of performance-relevant stereotypes.

Contending With Negative Stereotypes: Stereotype Threat

A well-studied consequence of existing pejorative stereotypes about one's ingroup that may arise within performance situations such as those mentioned previously is stereotype threat (see Steele et al., 2002). Stereotype threat is a psychological

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state that occurs when awareness of a self-relevant negative stereotype leads to worries about confirming the stereotype (Steele, 1997; Steele & Aronson, 1995). Much research has found that women made aware of the negative stereotype that "women are bad at math" worry about confirming this negative stereotype and, therefore, show reduced performance on a later math task compared with either men or women not aware of the stereotype (e.g., Spencer, Steele, & Quinn, 1999).

Moreover, research has found that stereotype threat reduces women's working memory capacity (e.g., Beilock, Rydell, & McConnell, 2007; Rydell, McConnell, & Beilock, 2009; Schmader & Johns, 2003). Working memory allows for the temporary maintenance and manipulation of task-relevant information and the inhibition of task-irrelevant information that is necessary for successfully solving complex cognitive tasks, and thus is critical to math performance (see Schmader, Johns, & Forbes, 2008). When women experience stereotype threat, the accompanying physiological arousal (e.g., Murphy, Steele, & Gross, 2007) and unwanted negative thoughts (e.g., Cadinu, Maass, Rosabianca, & Kiesner, 2005) decrease their working memory capacity (e.g., Beilock et al., 2007). A growing body of research suggests that women's underperformance on math problems under threat is accounted for, at least in part, by reduced working memory capacity (Schmader & Beilock, 2012). Thus, stereotype threat can reduce the performance of stereotyped individuals (i.e., women) within a stereotyped domain (i.e., math) because threat reduces the working memory capacity stereotyped individuals have available to perform at a high level (see Schmader & Beilock, 2012; Schmader et al., 2008).

Given that stereotype threat can hurt women's math performance by decreasing working memory capacity, psychological factors that reduce the detrimental impact of threat on working memory capacity should protect women from threat-based performance decrements. The present work examines one such potentially protective factor: power. We expect that making stereotyped individuals feel powerful will protect them from underperformance in response to stereotype threat by buffering them from the reduced working memory capacity usually associated with experiencing stereotype threat. In contrast, stereotyped individuals induced to feel low in power or who do not have their feelings of power manipulated are expected to show impaired performance when experiencing stereotype threat, due in part to reduced working memory capacity.

The Transformative Influence of Power

In examining how power may protect women from underperformance in a negatively stereotyped domain, it is important to understand how power influences people's experiences. Recent research has shown that power effects are so ubiquitous they can have a psychological impact without individuals having actual possession of high or low power, outside an interactive situation in which power is relevant, and even outside individuals' awareness (by activating power's mental representation; see Smith & Galinsky, 2010). Power impacts nearly every aspect of our lives because it has ramifications that are physical (e.g., material resources), psychological (e.g., perceptions of control and freedom; see Keltner, Gruenfeld, & Anderson, 2003), and cognitive (e.g., working memory capacity; Smith, Jostmann, Galinsky, & van Dijk, 2008). Powerful people are afforded the freedom to think and act in line with their goals (e.g., Galinsky, Gruenfeld, & Magee, 2003). In contrast, powerless people constantly monitor more powerful individuals and their environment to anticipate the response that is expected from them at that time (Galinsky, Magee, Inesi, & Gruenfeld, 2006), thereby placing constraints upon them. These consequences of power thus influence the cognitive resources (i.e., working memory capacity) available to them. Fewer resources are afforded to low power individuals (Smith et al., 2008), whereas powerful people are better able to exert inhibitory control, a vital component of working memory (see Engle, 2002), as demonstrated by their being better able to selectively attend to task-relevant information and inhibit irrelevant or contextual and peripheral information compared with powerless individuals (Guinote, 2007; Smith & Trope, 2006).

Applied to the present concerns, it may be that women who feel powerful are protected from the working memory and math performance deficits typically associated with stereotype threat because of the protective influence of high power on cognitive resources. That is, working memory capacity may be one mechanism through which feeling high in power may reduce stereotype threat–based performance decrements. Because high power women can selectively attend to task-relevant information, it may be that, although possibly aware of the negative stereotype, they attend less to threatening information (i.e., render it secondary or peripheral) and instead are better able to focus their attention on problem solving. Feeling powerful, then, could shield women from having reduced working memory capacity, and thus worse math performance, when experiencing stereotype threat because they are still able to focus on the task at hand.

The current research represents an initial attempt to bridge the literatures on stereotype threat and on perceived power in its investigation of a common mechanism, working memory capacity, through which power may protect women from impaired performance in threatening performance situations. Although previous research has examined the possible impact of power and stereotype threat on performance in isolation, an investigation of their potential to interact is absent in the extant literatures: Power has not been examined as a moderator of stereotype threat effects on performance and, to our knowledge, much of the existing work on power has not looked at many moderating effects but has instead focused primarily on main effects of power. By finding that power does not simply help or hurt cognition, but instead can have a more sophisticated influence on performance by interacting with threats in one's environment, our research makes a unique contribution to the power literature. The present work therefore expands on both literatures by examining how the feelings of power that people bring into a situation and their response to negative stereotypes made accessible by the situation *interact* to affect stereotyped individuals' performance in the stereotyped domain.

Given the divergent psychological experiences individuals have as a consequence of feeling more or less powerful, women may experience a stereotype-laden math-testing environment differently as a function of power, affecting subsequent math performance. We expect women who enter a math performance situation feeling powerful to be buffered from the working memory capacity decrements typically associated with information explicitly stating the negative stereotype about women's math ability, and thus perform as well on a math task as women not provided with the negative stereotype. However, we expect that women who are feeling low in power or who are in a power control condition will show reduced math performance in a stereotype threat condition (relative to a no threat condition) because threat will have decreased their working memory capacity.

Overview of the Current Research

The primary goal of Experiments 1 and 2 was to examine whether feeling high in power leads women to be less vulnerable to math performance decrements in response to receiving explicit stereotype threat instructions. Experiment 1 used a purportedly unrelated scrambled sentence task to manipulate power, whereas Experiment 2 used a different manipulation of power that more directly addressed women's personal feelings of power (i.e., writing about times when they personally felt powerful or powerless) and also included a control condition for the manipulation of power (i.e., writing about what they did yesterday). In both experiments, we hypothesized that high power women exposed to stereotype threat would be buffered from the negative performance effects of stereotype threat and thus show similar levels of math performance to women who were not exposed to threat instructions. In contrast, we expected low power women to show susceptibility to stereotype threat effects, exhibiting the reductions in math performance typical of women under threat (e.g., Beilock et al., 2007).

Experiment 3 assessed the impact of stereotype threat and power on both a measure of working memory capacity and a math task to determine whether feeling powerful protects women from poor math performance when given stereotype threat instructions by eliminating the reductions in working memory capacity usually found for women experiencing stereotype threat. We expected women made to feel powerful to be buffered from working memory capacity decrements in response to stereotype threat instructions and therefore did not expect them to display strong stereotype threat–based performance effects. However, women in the low and control power conditions were expected to show decreased math performance when given stereotype threat instructions that would be accounted for by reductions in working memory capacity typical of stereotype threat. Therefore, we expected working memory capacity to mediate the relationship between the interaction of power and threat and math performance.

In addition, a measure of threat-based concern (TBC), or the extent to which one worries about confirming the negative self-relevant stereotype with one's performance (Marx, 2012), was included as a manipulation check of the stereotype threat instructions in all three experiments. While it is possible that an interaction of stereotype threat and power may obtain for TBC ratings similar to that expected for math performance (indicating that women high in power not only were protected from threat-related performance decrements, but also the experience of and worries associated with stereotype threat itself), we expected that *all* women who read the stereotype threat instructions would report greater TBC than women who read the no threat instructions. Given that participants in the stereotype threat conditions received information that explicitly reinforces gender differences in math performance, it is likely that the negative stereotype about women's math ability was accessible for women in these conditions and, when asked direct questions related to the stereotype, these women will report concern regarding the stereotype. Therefore, we expected all women in our stereotype threat conditions to express worries about confirming the negative stereotype about women and math because of their exposure to the stereotype information; however, any protection afforded by high power for women's math performance were expected to be due to being shielded from stereotype threat–based working memory deficits, which is explored in Experiment 3.

Experiment 1

The first experiment was an initial attempt to examine the moderating role of power on stereotype threat–based performance effects. Participants first learned how to complete a novel math task (modular arithmetic [MA]). They were then primed with high or low power (unrelated with the math domain) with a scrambled sentence task. After the priming manipulation, participants were exposed to either stereotype threat or the no threat instructions and completed a math test consisting of difficult MA problems. We posited that exposure to high power primes would buffer women from stereotype threat–based math performance decrements. In contrast, we predicted that women exposed to low power primes would be susceptible to performance deficits due to stereotype threat. A measure of TBC was also included as a manipulation check of the stereotype threat instructions. It was expected that women who read the stereotype threat instructions would report greater TBC than women who read the no threat instructions.

Method

Participants and Design. Participants were 114 undergraduate women participating in partial fulfillment of a class requirement. Women were randomly assigned to a 2 (power: high, low) × 2 (stereotype threat instructions: no threat, stereotype threat) between-subjects factorial. Following the procedure used by Beilock et al. (2007), 25 participants were excluded from data analysis because they did not demonstrate performance that was significantly above chance on the MA task (i.e., accuracy ≥ 60% on the MA task; where chance performance is 50%), indicating that they either did not learn MA or did not try on the test.[1] In addition, the data from two participants who reported suspicion about the power manipulation were excluded from the analysis. This left a final sample of 87 women.

Materials and Procedure. Participants were told the experiment assessed how people learn to solve quantitative problems. First, women learned how to solve MA problems by completing a step-by-step tutorial on the computer, taken from Beilock et al. (2007). MA is a math task that involves determining the validity of a math equation based on whether or not the answer is an integer. MA problems consist of mathematical statements in the form of $a = b$ (*mod c*), for example, 78 = 42 (*mod* 3), and require participants to determine whether the statement is "true" or "false." The validity of a MA problem is determined by subtracting the middle number, b (42), from the first number, a (78), and then dividing the solution, $a - b$ (36), by the last number, c (3). If the dividend is an integer, the problem is "true"; otherwise, the problem is "false." For example, the problem 78 = 42 (*mod* 3) is true because 78 − 42 = 36 and 36 / 3 = 12, which is an integer. However, if given the problem 78 = 42 (*mod* 5), the correct response would be false because 78 − 42 = 36 and 36 / 5 = 7.2, which is not an integer.

After completing the MA instructions, women were told that while the MA they had just learned "sunk in" they would take part in an unrelated language task meant to develop materials for future research. The scrambled sentence task (Srull & Wyer, 1979) was used to prime high power or low power. Women were presented with 16 scrambled sentences consisting of five words each (e.g., "happy is fun not work") and were told to make a grammatically correct sentence or phrase using four of the five words (e.g., "Work is not fun"). Fifteen of the 16 scrambled sentences contained either a high power word (e.g., dominate, control) embedded in each sentence (high power condition) or a low power word (e.g., subordinate, dependent) embedded in each sentence (low power condition).

Participants then received the stereotype threat manipulation as a part of the instructions for the math task. The no threat instructions did not mention gender. The stereotype threat instructions told participants that our lab was examining why women are generally worse at math than men (see Beilock et al., 2007). Participants then completed 36 difficult MA problems (i.e., MA problems using large numbers and requiring a borrow operation; see Beilock et al., 2007). For each problem, participants indicated whether the equations presented were "true" (by pressing the "t" key) or "false" (by pressing the "f" key). Accuracy was computed by dividing the number of problems answered correctly by the total number of items. Greater scores indicated better math performance. The amount of time taken to complete each problem was recorded and averaged to create a measure of math reaction time.

After completing the MA problems, participants responded to Marx's (2012) three-item TBC measure (α = .86; for example, "I worry that if I perform poorly on this test, the experimenter will attribute my poor performance to my gender.") on scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Participants were then asked questions to assess suspicion regarding the experimental manipulations and indicated their gender.

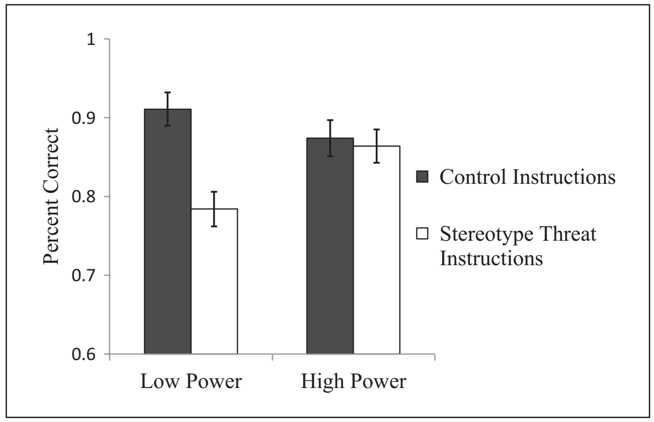

Figure 1. Accuracy on the modular arithmetic test in Experiment 1 as a function of power and stereotype threat
Note: Error bars indicate standard error.

Results

Math Performance. The effect of power and stereotype threat on participants' accuracy scores was examined by conducting a 2 (power: high power, low power) × 2 (stereotype threat instructions: no threat, stereotype threat) ANOVA. There was a significant main effect of stereotype threat on accuracy, $F(1, 83) = 9.88$, $p = .002$, $\eta^2_p = .11$. Importantly, this main effect was qualified by the predicted two-way interaction, $F(1, 83) = 7.03$, $p = .01$, $\eta^2_p = .08$ (see Figure 1). Low power women had lower accuracy scores in response to stereotype threat instructions than no threat instructions, $F(1, 83) = 17.47$, $p < .001$, $\eta^2_p = .17$. However, there was no difference in accuracy scores when under stereotype threat compared with when not under threat for women in the high power condition, $F(1, 83) = 0.12$, $p = .73$, $\eta^2_p = .001$.

We also analyzed the effect of power and stereotype threat on the amount of time taken to answer the MA problems. Neither of the main effects was statistically significant, Fs < 2.10, ps ≥ .15. Importantly, the two-way interaction did not reach significance, $F(1, 83) = 0.46$, $p = .50$, $\eta^2_p = .005$, indicating that the accuracy results were not due to a speed–accuracy trade-off.

TBC. We next assessed the effect of power and stereotype threat on participants' TBC scores. The only significant effect to obtain was the expected main effect of stereotype threat, $F(1, 83) = 19.73$, $p < .001$, $\eta^2_p = .19$. Women in the stereotype threat conditions showed greater TBC ($M = 2.98$) than women in the no threat conditions ($M = 1.76$), indicating that our manipulation of stereotype threat was effective.

Discussion

As predicted, Experiment 1 revealed that women primed with high power did not show decreased math performance in response to stereotype threat instructions. Women primed with high power and exposed to stereotype threat instructions performed as well on the MA task as women who received the no threat instructions. In contrast, women primed with low power and exposed to stereotype threat instructions performed more poorly on the MA task than women who received the no threat instructions. These results provide initial evidence that women's feelings of power impact their susceptibility to stereotype threat–based performance effects. In addition, women exposed to stereotype threat instructions reported greater TBC than women exposed to the no threat instructions, regardless of power condition. Thus, despite showing attenuated stereotype threat–based performance decrements when feeling high in power, women explicitly reminded of the stereotype still reported more worry about confirming the stereotype than women not reminded of the stereotype.

However, it is somewhat difficult to interpret the findings from Experiment 1 as it is unclear whether the high and low power primes were making women feel personally more or less powerful, respectively. Although recent work has argued for the nonconscious nature of power effects and that the influence of power can be examined via priming procedures (including the scrambled sentence task used in Experiment 1; Smith & Galinsky, 2010), this task nonetheless leaves some ambiguity regarding how women were affected by the power primes. Specifically, did the power primes affect women's personal perceptions of power? Experiment 1 also did not include a control condition for the manipulation of power. This omission makes it difficult to determine whether women in the high power condition showed improved performance in the face of stereotype threat or whether women in the low power condition were performing particularly poorly in response to stereotype threat. Furthermore, power may also impact other factors such as one's mood (Keltner et al., 2003), which may be responsible for the math performance results. Without a measure of mood in Experiment 1, we cannot be certain that our effects are not due to differences in mood between our high and low power conditions. Experiment 2 was designed to address these issues.

Experiment 2

The purpose of Experiment 2 was to replicate and extend the performance effects found in Experiment 1 using an essay-writing task that made explicit women's personal experiences of either high or low power to ensure that women were personally feeling more or less powerful. Experiment 2 also included a control condition for the power manipulation to examine how best to interpret differences in math performance between women in the high and low power conditions as a function of threat. We expected women assigned to write about a time in which they felt high in power would not show performance decrements in response to stereotype threat instructions; women made to feel high in power should perform well regardless of whether or not they are made aware of negative performance stereotypes. However, we expected women in the low power and control power writing conditions, consistent with past work on stereotype threat, to show poorer math performance when they received stereotype threat instructions than when they received the no threat instructions. This pattern of results would provide important evidence that feeling powerful can buffer women from reduced performance when exposed to stereotype threat information.

We also included a measure of mood in Experiment 2 to rule out the alternative explanation that power was impacting women's mood and thereby leading to differences in performance. We did not expect to find differences in mood as a function of power (e.g., Smith & Trope, 2006).

Method

Participants and Design. Ninety-five undergraduate women participated in the experiment in partial fulfillment of a class requirement. Participants were randomly assigned to a 3 (power: low, control, high) × 2 (stereotype threat instruction: no threat, stereotype threat) between-subjects factorial. Six participants were excluded from data analysis because they failed to demonstrate performance on the MA task that was significantly above chance (accuracy ≥ 60%; see Beilock et al., 2007),[2] leaving a final sample of 89 women.

Materials and Procedure. The materials and procedure were similar to those in Experiment 1. Participants were again told the experiment assessed how people learn to solve quantitative problems and first learned how to do MA. They then took part in an ostensibly unrelated essay-writing task in which power was manipulated (Galinsky et al., 2003).

Specifically, women were given the following instructions to induce feelings of high or low power (low power instructions are in parentheses):

> For this task, please recall a particular incident in which you (someone else) had power over another individual or individuals (you). By power, we mean a situation in which you (someone else) controlled the ability of another person or persons (you) to get something they (you) wanted, or you (they) were in a position to evaluate those individuals (you). Please describe this situation in which you (they) had power—what happened, how you felt, etc.

Women in the control power condition were prompted to write an essay in which any type of power was not likely to be actively thought about and therefore experienced during the task by recounting their day. Specifically, they were instructed as follows:

> For this task, please recall your day yesterday. Please describe your experiences yesterday—what happened, how you felt, etc.

Women were given 5 min to write their essay, after which they completed four power manipulation check questions (e.g., "While you were completing the writing task, to what extent did you feel powerful?") on scales ranging from 1 (*not at all*) to 7 (*extremely*) and completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) on scales ranging from 1 (*very slightly*) to 5 (*extremely*) to assess mood. As in Experiment 1, participants then received the stereotype threat manipulation as part of the instructions to the MA task and completed 36 difficult MA problems. Finally, participants completed the TBC measure ($\alpha = .84$) used in Experiment 1.

Results

Manipulation Check

Power rating. A composite of the four perceptions of power items ($\alpha = .76$) was created and entered into a 3 (power: low, control, high) × 2 (stereotype threat instructions: no threat, stereotype threat) ANOVA. There was a significant main effect of power, $F(2, 83) = 41.26$, $p < .001$, $\eta^2_p = .499$. Women in the low power conditions reported feeling significantly lower in power ($M = 3.65$) than those in the high power conditions ($M = 5.49$), $p < .001$, and than those in the control power conditions ($M = 5.48$), $p < .001$. The latter two conditions did not differ significantly from each other, $p = .99$. There was also a significant main effect of stereotype threat, $F(1, 83) = 4.36$, $p = .04$, $\eta^2_p = .05$, with women in the stereotype threat condition reporting feeling more powerful ($M = 5.08$) than women in the no threat condition ($M = 4.67$). Although we did not expect a main effect of stereotype threat on feelings of power, this main effect is difficult to interpret as the power manipulation check was completed *before* the manipulation of stereotype threat.[3] Nonetheless, the interaction of stereotype threat and power was not significant, $F(2, 83) = .29$, $p = .75$, $\eta^2_p = .007$.

Content analysis. The essays were content analyzed to further ensure that the power manipulation was effective. Two coders unaware of the hypotheses and to the experimental conditions rated each essay on how much power the participant expressed in her essay on a scale from −2 (*reporting a lot of low power*) to 2 (*reporting a lot of high power*). The coders' ratings were highly correlated, $r = .87$, and thus were averaged to create an index of power.

A 3 (power: low, control, high) × 2 (stereotype threat instructions: no threat, stereotype threat) ANOVA was conducted on the power index, finding only a significant main effect of power, $F(2, 83) = 355.99$, $p < .001$, $\eta^2_p = .90$. The essays of the women in the high power condition were rated as reporting significantly more high power ($M = 1.26$) than women in both the low power ($M = -1.52$), $p < .001$, and control power ($M = -0.44$), $p < .001$, conditions.[4] Women in the low power and control power conditions were also rated as significantly different from one another, $p < .001$, with women in the low power condition expressing less power in their essays than women in the control power condition. Neither a main effect of threat, $F(1, 83) = 0.11$, $p = .74$, $\eta^2_p = .001$, nor the interaction of threat and power, $F(2, 89) = 1.57$, $p = .22$, $\eta^2_p = .04$, were significant.

Mood

To compute participants' mood scores, we subtracted the composite of the 10 negative affect items ($\alpha = .79$) from the composite of the 10 positive affect items ($\alpha = .86$), with higher scores indicating more positive mood. There were no significant main or interactive effects of mood, Fs < 2.30, ps $> .10$.

Math Performance

Our analysis of the effect of power and stereotype threat on participants' accuracy scores revealed a significant main effect of stereotype threat, $F(1, 83) = 6.30$, $p = .014$, $\eta^2_p = .07$, and power, $F(2, 83) = 7.71$, $p = .001$, $\eta^2_p = .157$; importantly, however, the predicted two-way interaction was also significant, $F(2, 83) = 3.28$, $p = .04$, $\eta^2_p = .073$ (see Figure 2). MA accuracy scores were lower for women exposed to stereotype threat instructions compared with women exposed to the no threat instructions in the low power condition, $F(1, 83) = 4.48$, $p = .04$, $\eta^2_p = .051$, and the control power condition, $F(1, 83) = 7.92$, $p = .01$, $\eta^2_p = .087$. However, there was no difference on MA accuracy as a function of stereotype threat condition for high power women, $F(1, 83) = 0.36$, $p = .55$, $\eta^2_p = .004$; women exposed to stereotype threat instructions in the high power condition performed as well as women exposed to the no threat instructions.

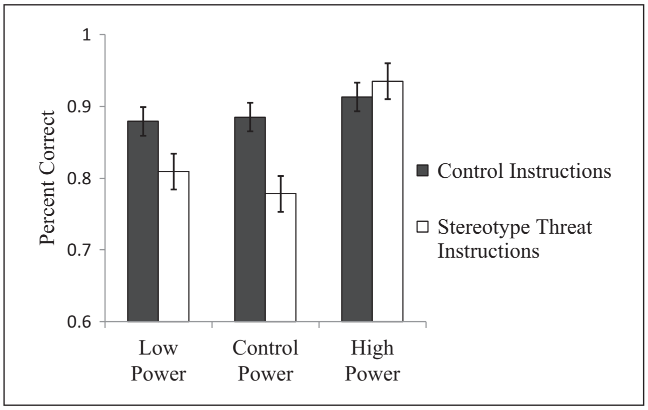

Figure 2. Accuracy on the modular arithmetic test in Experiment 2 as a function of power and stereotype threat
Note: Error bars indicate standard error.

We also analyzed the effect of power and stereotype threat on math reaction time. Neither of the main effects was statistically significant, Fs < 2.00, ps > .15. Importantly, the two-way interaction did not reach significance, $F(2, 83) = 1.67$, $p = .19$, $\eta^2_p = .04$, indicating that the accuracy results were not due to a speed–accuracy trade-off.

TBC

We assessed the effect of power and stereotype threat on participants' TBC scores. Only the main effect of stereotype threat was significant, $F(1, 83) = 10.79$, $p = .001$, $\eta^2_p = .12$. Those in the stereotype threat condition showed greater TBC ($M = 2.98$) than those in the no threat condition ($M = 2.04$).

Discussion

In Experiment 2, we were able to replicate and extend the findings from Experiment 1. As predicted, women made to feel high in power by writing about a time in which they had power over others performed equally well when exposed to stereotype threat instructions as when exposed to the no threat instructions. In contrast, women in the low power and control power conditions showed poorer performance when given stereotype threat instructions than when given the no threat instructions. The inclusion of the control power condition revealed that feeling powerful protects women's performance when exposed to threat, with low power and control power women exhibiting a typical stereotype threat effect of reduced math performance in response to stereotype threat instructions compared with the no threat instructions. Again, we found that women exposed to stereotype threat instructions, regardless of feelings of power, reported greater levels of TBC. In addition, Experiment 2 showed that these effects are likely not due to differences in mood.

Thus, Experiment 2 provided additional support for the interactive effect of power and stereotype threat on women's math performance. Furthermore, the use of a different manipulation of power that allowed for an explicit assessment of participants' personal feelings of high or low power and the addition of a control power condition strengthened the evidence for the influence of power and threat on performance. However, neither Experiment 1 nor 2 addressed the mechanism through which high power's buffering effect on performance may occur. Therefore, we set out to examine one possible mechanism, working memory capacity, underlying these effects in Experiment 3.

Experiment 3

Experiments 1 and 2 demonstrated that math performance is affected by the conjunction of power and stereotype threat, with women high in power being protected from the deleterious consequences of stereotype threat information on math performance. Consistent with previous research showing that power moderates working memory capacity (Smith et al., 2008) and stereotype threat impairs women's math performance by reducing working memory capacity (see Schmader & Beilock, 2012; Schmader et al., 2008, for reviews), we argue that our performance results in Experiments 1 and 2 are due to differences in working memory capacity. In the low power and control power conditions, we believe that women are showing reduced math performance in response to stereotype threat because threat reduces their working memory capacity. However, we believe that feeling high in power may protect women from reductions in working memory capacity that normally accompany receiving stereotype threat instructions, thereby eliminating the impact of threat on women's math performance.

In Experiment 3, we examined working memory capacity as a possible mediator that accounts for the interactive effect of power and stereotype threat on women's math performance. Similar to Experiment 2, following the learning of MA, power was manipulated with an essay-writing task, and women were exposed to stereotype threat instructions or the no threat instructions. Participants then completed a working memory task, followed by a math task. We predicted that when receiving stereotype threat, women in the high power condition would be protected from working memory decrements and impaired math performance. In contrast, we predicted that women in the control and low power conditions would show less working memory capacity and poorer math performance when given stereotype threat instructions than when given the no threat instructions. Moreover, we predicted that these differences in working memory capacity as a function of power and stereotype threat would account for math performance differences. Such results would suggest that differences in working memory capacity explain how feeling powerful eliminates the impact of stereotype threat information on women's math performance seen in our first two experiments.

Method

Participants and Design. One hundred forty-six undergraduate women participated in the experiment in partial fulfillment of a class requirement. Participants were randomly assigned to a 3 (power: low, control, high) × 2 (stereotype threat instructions: no threat, stereotype threat) between-subjects factorial. Fifteen participants were excluded from analysis because they failed to demonstrate performance on the MA task that was significantly above chance (accuracy ≥ 60%; see Beilock et al., 2007),[5] leaving a final sample of 131 women.

Materials and Procedure. The materials and procedure were similar to those in Experiment 2, except that a working memory task was completed before the math task. Participants first learned how to solve MA problems and then completed the ostensibly unrelated essay power manipulation task, the power manipulation check, and the PANAS used in Experiment 2. The same stereotype threat manipulation used in Experiments 1 and 2 was presented immediately prior to the instructions for the working memory task (introduced to participants as a "visual processing" task).

To measure working memory capacity, participants completed the letter-memory task (adapted from Morris & Jones, 1990; see Miyake et al., 2000). In this task, several letters are presented sequentially in the center of the computer screen for 2,500 ms each. Women were required to verbally rehearse and keep track of the three most recently presented letters (dropping any letters out of verbal rehearsal that appeared four or more letters before). When prompted by the computer, participants were asked to recall the last three letters presented in the trial by typing them into a response box. There were 12 trials in total. Each trial consisted of five, seven, or nine letters in length (4 trials of each length were presented). Working memory scores were computed by dividing the number of correctly recalled letter triads by 12, with a greater proportion of correctly recalled letter triads indicating greater working memory capacity.

After the working memory task, participants completed 36 difficult MA problems. Finally, participants completed the TBC measure ($\alpha = .85$) used in Experiments 1 and 2.

Results

Manipulation Check

Power Self-Report. The average of the four perceptions of power items ($\alpha = .60$) was entered into a 3 (power: low, control, high) × 2 (stereotype threat instructions: no threat, stereotype threat) ANOVA. There was a significant main effect of power, $F(2, 125) = 35.28$, $p < .001$, $\eta^2_p = .36$. Post hoc tests indicated that women in the low power conditions reported feeling significantly lower in power ($M = 3.64$) than those in the high power conditions ($M = 5.45$), $p < .001$, and those in the control power conditions ($M = 5.17$), $p < .001$. The latter two conditions did not differ significantly from each other, $p > .20$. As in Experiment 2, there was also a significant main effect of stereotype threat, $F(1, 125) = 5.06$, $p = .03$, $\eta^2_p = .04$, with women in the stereotype threat condition reporting feeling more powerful ($M = 4.96$) than women in the no stereotype threat condition ($M = 4.54$). Again, we did not expect a main effect of stereotype threat on feelings of power; however, this main effect is difficult to interpret as the power manipulation check was completed *before* the manipulation of stereotype threat. Nonetheless, the interaction of stereotype threat and power was not significant, $F(2, 125) = 1.59$, $p = .21$, $\eta^2_p = .03$.

Content Analysis. Participants' essays were content analyzed using the same procedure as Experiment 2. The coders' ratings ($r = .87$) were averaged to create a power index, with greater scores indicating greater power. A 3 (power: low, control, high) × 2 (stereotype threat instructions: no threat, stereotype threat) ANOVA was conducted on the power index, finding only a significant main effect of power, $F(2, 125) = 253.14$, $p < .001$, $\eta^2_p = .802$. The essays of the women in the high power condition were rated as reporting significantly more high power ($M = 1.16$) than women in both the low power ($M = -1.14$), $p < .001$, and control power ($M = -.11$), $p < .001$, conditions. Women in the low power and control power conditions were also rated as significantly different from one another, $p < .001$, with women in the low power condition expressing less power in their essays than women in the control power condition. Neither a main effect of threat, $F(1, 125) = 0.02$, $p = .90$, $\eta^2_p < .001$, nor the interaction of threat and power, $F(2, 125) = .04$, $p = .96$, $\eta^2_p = .001$, were significant.

Mood

Participants' mood scores were computed as in Experiment 2 (positive affect items, $\alpha = .86$; negative affect items, $\alpha = .90$). The mood measure showed a main effect of stereotype threat, $F(1, 125) = 5.30$, $p = .02$, $\eta^2_p = .04$. As with the power manipulation check, this main effect is difficult to interpret as the measure of mood was completed *before* the manipulation of stereotype threat.[6] There was no significant main effect of power or interaction of power and threat, $F\text{s} < 1.10$, $p\text{s} > .35$.

Working Memory

The effect of power and stereotype threat on participants' working memory capacity was examined. There was a significant main effect of stereotype threat, $F(1, 125) = 39.46$, $p < .001$, $\eta^2_p = .24$, and a significant main effect of power, $F(2, 125) = 8.75$, $p < .001$, $\eta^2_p = .12$. More importantly, the main effects were qualified by the predicted two-way interaction, $F(2, 125) = 13.38$, $p < .001$, $\eta^2_p = .18$ (see Figure 3). Women in the low power and control power conditions had lower working memory scores when exposed to stereotype

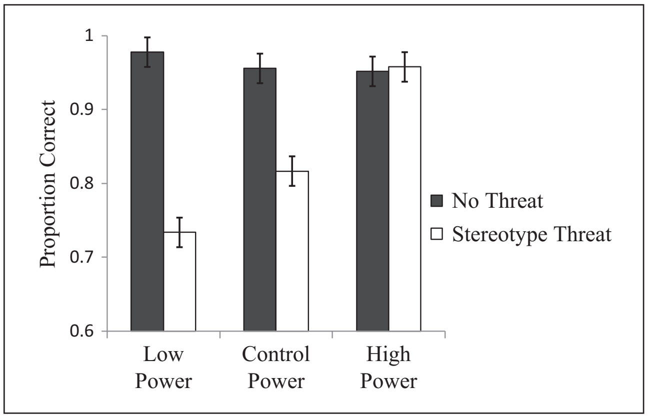

Figure 3. Proportion of letter triads correctly recalled on the working memory task in Experiment 3 as a function of power and stereotype threat
Note: Error bars indicate standard error.

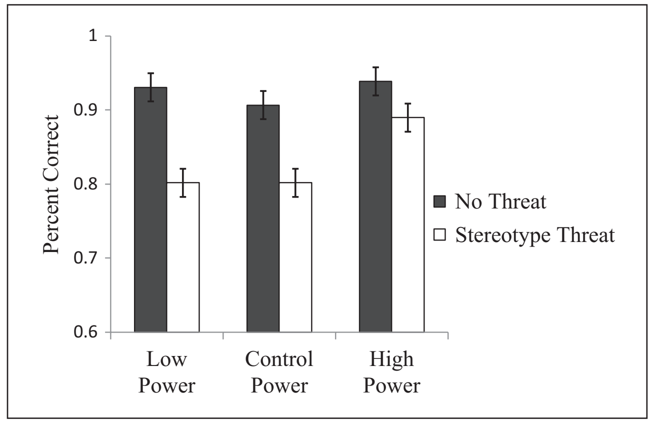

Figure 4. Accuracy on the modular arithmetic task in Experiment 3 as a function of power and stereotype threat
Note: Error bars indicate standard error.

threat instructions than when exposed to the no threat instructions, $F(1, 125) = 50.05$, $p < .001$, $\eta^2_p = .27$, and $F(1, 125) = 15.50$, $p < .001$, $\eta^2_p = .11$, respectively. In contrast, women in the high power condition did not show differences in accuracy on the working memory task when exposed to threat instructions than when exposed to the no threat instructions, $F(1, 125) = .03$, $p = .86$, $\eta^2_p < .001$.

Math Performance

Math performance was examined with a 3 (power) × 2 (stereotype threat) ANOVA, finding a significant main effect of stereotype threat, $F(1, 125) = 55.09$, $p < .001$, $\eta^2_p = .31$, and a significant main effect of power, $F(2, 125) = 9.45$, $p < .001$, $\eta^2_p = .13$. Importantly, the main effects were qualified by the predicted two-way interaction, $F(2, 125) = 6.96$, $p = .001$, $\eta^2_p = .10$ (see Figure 4). Women in the low power and control power conditions had lower scores on the math task when exposed to stereotype threat instructions than when exposed to the no threat instructions, $F(1, 125) = 50.04$, $p < .001$, $\eta^2_p = .29$, and $F(1, 125) = 15.20$, $p < .001$, $\eta^2_p = .11$, respectively. In contrast, women in the high power condition showed a much smaller (hence the two-way interaction), marginally significant decline in accuracy when exposed to stereotype threat instructions, $F(1, 125) = 3.50$, $p = .064$, $\eta^2_p = .03$.

We also analyzed the effect of power and stereotype threat on math reaction time. Neither of the main effects was statistically significant, Fs < 1.70, ps > .19. Importantly, the two-way interaction was far from significance, $F(2, 125) = 0.15$, $p = .86$, $\eta^2_p = .002$, indicating that the accuracy results were not due to a speed–accuracy trade-off.

TBC

We assessed the effect of power and stereotype threat on participants' TBC scores. Only the main effect of stereotype threat was obtained, $F(1, 125) = 14.21$, $p < .001$, $\eta^2_p = .102$. Women in the stereotype threat conditions showed greater TBC ($M = 2.81$) than women in the no threat conditions ($M = 1.91$).

Mediational Analyses

To examine whether working memory capacity mediated the effect of power and stereotype threat on women's math performance, we conducted a series of multiple regression analyses (Baron & Kenny, 1986; see Figure 5). First, we entered power (−1 = *low power*, 0 = *control power*, 1 = *high power*), stereotype threat instructions (1 = *no threat*, −1 = *stereotype threat*), and the interaction term (multiplicative function) into a regression predicting math performance (i.e., the dependent variable). Consistent with the ANOVA results presented earlier, the interaction of power and stereotype threat provided a unique contribution in predicting math performance, $\beta = -.26$, $p < .001$. A second regression predicting working memory capacity (i.e., the mediator variable) showed that, consistent with the ANOVA results, the interaction term made a unique contribution when both the main effects of power and stereotype threat were entered into the model, $\beta = -.36$, $p < .001$. A third regression showed that working memory capacity was positively and significantly related to math performance, $\beta = .62$, $p < .001$. In a fourth regression analysis, we simultaneously regressed math performance on power, stereotype threat, the interaction term, and working memory capacity. This analysis showed that when accuracy on the working memory task was included, the relation between the interaction term and math performance was reduced to marginal significance, $\beta = -.12$, $p = .09$. A Sobel test demonstrated that working memory capacity accounted for a significant amount of variance in the relation between math performance and the interaction of power and stereotype threat, $z = -3.53$, $p < .001$.

To more fully understand the mediation of working memory capacity for the relation of the interaction of power and

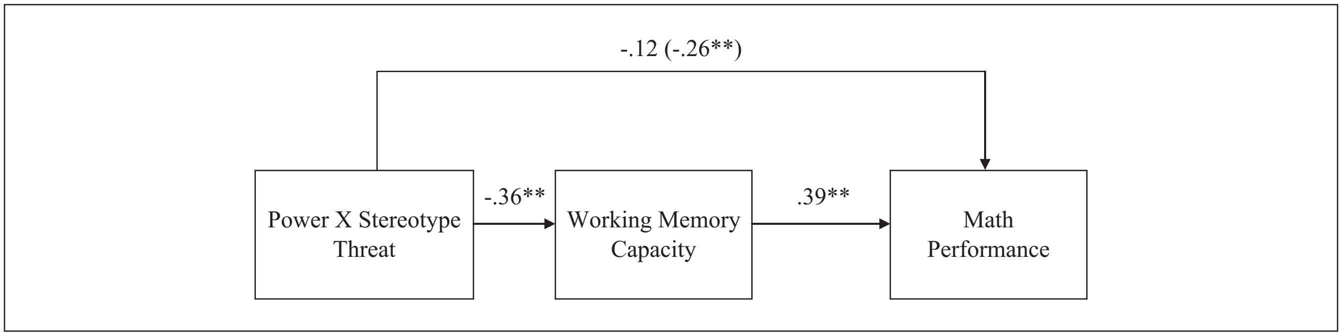

Figure 5. A path diagram showing the interaction of power and stereotype threat on math accuracy as mediated through working memory capacity (i.e., letter-memory task)
Note: All scores are standardized Beta weights. The direct relation between the interaction of power and stereotype threat and math performance is presented in parentheses.
$^{*}p < .01$. $^{**}p < .001$.

stereotype threat and math performance, we examined whether the relation between stereotype threat and math performance could be accounted for by working memory capacity in each of the power conditions. In the low power condition, the relation between stereotype threat and math performance, while still significant, was reduced when working memory capacity was included in the model, $\beta = .55$, $p < .001$ (which dropped from $\beta = .76$, $p < .001$); a Sobel test showed that this reduction was significant, $z = 2.41$, $p = .016$. In the control condition, the relation between stereotype threat and math performance was no longer significant when working memory capacity was included in the model, $\beta = .11$, $p = .40$ (which dropped from $\beta = .48$, $p < .001$), $z = 3.20$, $p = .001$. In contrast, in the high power condition, the relation between stereotype threat and math performance was essentially unaltered when working memory capacity was included in the model, $\beta = .29$, $p = .053$ ($\beta = .29$, $p = .052$), $z = -.21$, $p = .83$. These results indicate that working memory capacity accounted for a significant amount of variance in the relation between stereotype threat and math performance in the low and control power conditions, but not in the high power condition. Thus, working memory capacity served to mediate the relation between math performance and stereotype threat in the low power and control conditions, but not in the high power condition. Feeling powerful seemed to alleviate the impact of stereotype threat on working memory capacity, in turn reducing the impact of stereotype threat on math performance.

Discussion

Experiments 1 and 2 showed that women made to feel powerful were protected from the negative performance effects of stereotype threat that were shown by women not thinking about power (i.e., the control power condition) and women made to feel powerless. In Experiment 3, the underlying process of the performance effects seen in Experiments 1 and 2 was examined. We replicated our previous findings of math performance decrements when exposed to stereotype threat information for women feeling low in power or in the control power condition, but again did not find a significant impairment on math performance when women were exposed to threatening information and were feeling powerful. In addition, we found that, when exposed to stereotype threat instructions, women in the high power condition did not show reduced working memory capacity (relative to the no threat condition), whereas those in the low power and control power conditions did show reduced working memory capacity. Moreover, these differences in working memory capacity statistically accounted for the interaction of stereotype threat and power on math performance. These effects cannot be accounted for by mood.

We also replicated the main effect of stereotype threat on TBC, such that all women exposed to stereotype threat instructions reported greater levels of worry regarding confirming the negative stereotype than women who were exposed to the no threat instructions. The results from Experiment 3 provide evidence that the protective influence high power has on working memory capacity is one of the processes underlying the elimination of math performance effects found for women in this condition in Experiments 1 and 2.

General Discussion

The current work demonstrated that women's perceptions of power influenced their susceptibility to stereotype threat–based performance effects, finding that feeling powerful can protect women from the deleterious performance consequences normally associated with stereotype-laden performance environments by preserving working memory capacity. In Experiments 1 and 2, women primed with low power or in a control power condition showed poorer math performance when exposed to stereotype threat instructions than when given the no threat instructions, whereas women primed with high power did not show such performance decrements in response to stereotype threat. In addition, Experiment 3 provided evidence that reduced working memory capacity is at least one of the processes underlying how power and stereotype threat impact women's math performance. Women who were made to feel high in power did not show working memory capacity decrements when exposed to stereotype threat instructions, whereas women who were made to feel low in power and women in a control power condition showed diminished working memory capacity in response to stereotype threat instructions relative to the no threat instruction condition. Furthermore, these differences in math performance as a function of power and stereotype threat were accounted for by women's working memory capacity.

Interestingly, we found that all women exposed to explicit stereotype threat information were worried about confirming the stereotype with their performance; however, only those women made to feel high in power were protected from math performance decrements. Thus, women who feel high in power seem to be aware of the negative stereotype and may worry about it, especially when given explicit information reinforcing the stereotype, but because they did not show reductions in working memory capacity that women who do not feel powerful did, they are able to avoid the negative effects of stereotype threat on math performance.

The present research further illuminates the potential pitfalls of using negatively stereotyped group members' performance to determine their qualification for higher level positions, as well as suggests a way in which the negative impact of stereotype threat may be curbed. As Smith et al. (2008) warned, using performance as grounds for keeping relatively powerless individuals in their low power position is difficult to justify. Simply being low in power can impair people's cognitive resources. Moreover, stereotype threat can have performance consequences for negatively stereotyped group members (Steele, 1997). Indeed, the present experiments found that women who felt low in power exhibited impaired math performance when exposed to stereotype threat instructions, an effect also found for women in the control power condition and typical of women's response to experiencing stereotype threat. Thus, the performance of members of low power and negatively stereotyped groups may not be an accurate reflection of their ability, and evaluation based on this inaccurate reflection of ability could further impede these individuals' movement from lower to higher power positions. However, our findings also allude to a way to protect and prevent these harmful ramifications of belonging to a negatively stereotyped group from occurring. Increasing perceptions of one's power may provide the cognitive and psychological protection needed to overcome the negative consequences of stereotype threat on performance, as women who were made to feel powerful were afforded preserved working memory capacity that allowed them to perform successfully on a math task in our experiment. Encouraging women to think of a time in which they felt powerful, regardless of the domain in which they experienced the power, may serve to protect women from the potential negative effects of stereotype-laden performance environments, allowing them to engage in the math task unimpeded by the influence of threat.

We predicted that feeling powerful reduces women's susceptibility to showing reduced working memory capacity in response to stereotype threat. However, it could be argued that feeling powerful eliminated working memory capacity deficits in response to stereotype threat by high power boosting working memory and stereotype threat reducing it. By this "boost then reduce" account, an increase in working memory capacity from feeling powerful would compensate for the typical reductions in working memory associated with stereotype threat, thereby buffering high power women's math performance. We find this account unlikely because we did not find an increase in working memory for women in the high power–no threat condition. If feeling powerful increased working memory resources that were then reduced by threat, we would expect women in the high power–no threat condition to have greater working memory capacity than women in the high power–threat condition, but this did not occur. Instead, because power affects what types of information attract attention (e.g., Guinote, 2007; Smith & Trope, 2006), an attention-based process appears more likely. Power may lead to differences in what information women attend to, with high power women attending less to the stereotype-threatening experience and attending more to the math problems. Thus, even though we find that high power women under threat are worried about confirming the stereotype (i.e., report high TBC), similar to low power women experiencing threat, being high in power may allow them to still be able to focus on the math task, thereby protecting their performance.

Although our explanation for the influence of power on stereotype threat–based performance effects centers around a cognitive account, it is possible that multiple mechanisms may play a role in explaining this influence on math performance. For example, women's perceptions of the resources (e.g., energy, skills) they have to perform well in a demanding or threatening situation may vary as a function of how powerful they feel. Research on threat and challenge appraisals has shown that when participants perceive a task as challenging (i.e., perceive they have the resources to cope with an impending task), they exhibit better performance on cognitive tasks than those who perceive a task as threatening (i.e., perceive they do not have the necessary resources to cope with the impending task; Tomaka, Blascovich, Kelsey, & Leitten, 1993). High power women's appraisal of their resources may affect their ability to successfully negotiate the performance situation and execute the complex skills demanded by a difficult math task. Power may also lead women to perceive themselves differently and therefore influence how stereotype threat information may be applied to the self; that is, having power may change one's working self-concept in such a way that threatening information may be deemed as irrelevant to the self or cordoned off to a less central part of the self, thus protecting powerful women from threat-based performance effects. Processes such as how one construes the self or perceives the environment may be more likely to occur with subtle threat cues (e.g., being outnumbered, marking one's gender) compared with the relatively explicit manipulation used in our research, as their construal may be easier to alter, and therefore women may actually avoid altogether worries of confirming the stereotype.

Men and women have historically had different experiences with power. Therefore, although the present research focused on the stereotyped group of women, examining the effects of power and stereotype threat on men will be important for future research. Although it did not use traditional stereotype threat and power manipulations (participants watched videos of interactions where men, for example, acted dominantly toward women), we have other work that found no effects of power and threat on men's math performance (Van Loo & Rydell, 2012), suggesting that the protective influence of power is specific to the stereotype-threatened group.

While not primary to our hypotheses, we did not find an effect of power on working memory capacity in the no threat conditions, as would be expected based on previous work on power. Much of this work has found that priming low power leads to decreased performance on working memory tasks (e.g., Smith et al., 2008). It is unclear why we did not find these effects in our experiment. One possibility for not finding the decrease in working memory for low power is that our measure of working memory capacity was easier and therefore somewhat less sensitive to perceptions of power (at least when not presented in conjunction with the stereotype threat instructions). We used the letter-memory task, which is a measure of the executive function of updating (i.e., maintaining and manipulating relevant and dispelling irrelevant information in working memory), one of the executive functions underlying working memory. Smith et al. (2008) also looked at updating (Experiment 1) but used the two-back task which is likely more difficult than the letter-memory task. The difference in measures between our work and that of Smith et al. (2008) may explain why we did not replicate past research on low power and working memory. Our no threat conditions may also be exhibiting a ceiling effect, possibly accounting for our not finding a boost in working memory capacity for women high in power as Smith and Trope (2006) found in some of their experiments. That is, women in the high power condition, and in the no threat condition more generally, were showing very high performance on the working memory task. It is also possible that there is an important moderator, aside from stereotype threat, that influences when and how power does and does not impact working memory capacity. Future research may benefit from examining potential moderators of power effects on working memory capacity.

Conclusion

By studying power and stereotype threat in tandem, rather than independently, our work attempts to clarify how power can help to protect negatively stereotyped group members from performance effects. Feeling powerful buffered individuals from reduced performance due to stereotype threat, and this effect was accounted for by working memory capacity. The present research sheds light on power and stereotype threat, indicating that their relationship is more complex than previous research has implied. At the same time, our work provides evidence that perceptions of power in a stereotyped domain is sufficient for performance effects to emerge, and additional conditions, such as creating a patronizing environment (e.g., Vescio, Gervais, Snyder, & Hoover, 2005), are not necessary to elicit reduced performance.

Despite the challenging situation women (and other negatively stereotyped group members) face, many still enter into stereotyped fields or are responsible for tasks related to stereotyped disciplines. Understanding the consequences of simply being a member of a negatively stereotyped group, both in terms of low power and potential for stereotype threat, for cognition and complex skill execution is critical in evaluating women's performance, as well as in developing successful interventions aimed to reduce the deleterious effects of stereotype-relevant situations for women. Continuing to research the processes involved in and interventions directed at combating these harmful effects is imperative to creating a fair performance and evaluation environment, helping to allow women to have every opportunity to succeed.

Declaration of Conflicting Interests

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Notes

1. The distribution of excluded participants by condition is as follows: 10 from high power–no threat, 3 from high power–stereotype threat, 6 from low power–no threat, and 6 from low power–stereotype threat.
2. The distribution of excluded participants by condition is as follows: 1 from high power–no threat, 1 from high power–stereotype threat, 0 from low power–no threat, 0 from low power–stereotype threat, 2 from control power–no threat, and 2 from control power–stereotype threat.
3. The interaction of power and stereotype threat on math performance remains significant even when controlling for scores on the power manipulation check, $F(2, 82) = 3.70$, $p = .03$, $\eta^2_p = .08$.

4. In Experiments 2 and 3, we found the expected significant differences between power conditions in the content analyses of participants' essays but did not find a significant difference between the control and high power conditions on participants' self-reported levels of power. We think an upper limit to how powerful women are willing to rate themselves may exist, with high power women only reporting 5.4 on average on a 1(*low power*) to 7(*high power*) scale, that may be due to women feeling ambivalent toward feeling powerful possibly because they are used to occupying traditional roles or less powerful positions, or undergraduates not having extensive experience being powerful or are generally low in power in their daily lives (see Smith & Trope, 2006). Therefore, participants did not report feeling exceedingly powerful in the high power condition even though their essays were clearly about being high in power and the manipulation of power impacted working memory capacity and math performance as a function of stereotype threat.
5. The distribution of excluded participants by condition is as follows: 4 from high power–no threat, 1 from high power–stereotype threat, 1 from low power–no threat, 3 from low power–stereotype threat, 3 from control power–no threat, and 3 from control power–stereotype threat.
6. The interaction of power and stereotype threat on working memory accuracy and math performance remains significant even when controlling for mood and the power manipulation check measure, $F(2, 123) = 12.84$, $p < .001$, $\eta^2_p = .173$, and $F(2, 123) = 7.14$, $p = .001$, $\eta^2_p = .104$, respectively.

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