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Research article

Competition in stereotyped domains: Competition, social comparison, and stereotype threat

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Abstract

The current work examines a novel and specific way in which competition can hurt the performance of negatively stereotyped individuals: by evoking stereotype threat. In four experiments, we demonstrate that women's underperformance in math when primed with competition was due to feeling worried about confirming negative stereotypes about women's math ability (i.e., stereotype threat), that the activation of negative performance stereotypes for women primed with competition was due to increased group-level social comparisons (i.e., comparing the self with men and women), and that priming competition led men to perform more poorly than women in a domain where they are negatively stereotyped (i.e., verbal ability). This research suggests that priming people with competition in contexts where they are negatively stereotyped leads to greater social comparison, activation of negative stereotypes, and concern about confirming these stereotypes, thereby decreasing stereotyped individuals' performance in the stereotyped domain. Copyright © 2013 John Wiley & Sons, Ltd.

Competition, defined as a negative interdependence between the outcomes or goals of the self or one's in-group and the outcomes or goals of a competitor or an out-group (see Johnson & Johnson, 1989), is an inherent part of social life (e.g., Deutsch, 1949). The need to compete and to successfully beat out one's competitors is ever-present in our society, with the pressure to outperform competitors especially salient when desired resources or opportunities are limited. For example, the need to "be the best" can be felt when applying for college or for a job, especially during times of economic downturns and uncertainty. An increasingly important question, then, is does feeling competitive improve our ability to demonstrate that we should win that college scholarship or new job, or might it trigger more harmful processes that could hurt our performance? That is, what is the impact of a sense of competition on people's performance?

A venerable history of research on competition and performance exists (see Johnson & Johnson, 1989; Stanne, Johnson, & Johnson, 1999). We know that competition is almost by definition comparative (e.g., Festinger, 1954; Tesser, 1988), with people becoming concerned with outperforming others in competitive situations (e.g., Deutsch, 1949; Tauer & Harackiewicz, 2004), even in the absence of tangible rewards (e.g., Deci, Betley, Kahle, Abrams, & Porac, 1981). During competition, individuals need to evaluate their competitors with respect to the self (i.e., engage in social comparison) in order to determine their subjective likelihood of winning or obtaining desired resources. However, the consequences for performance due to competition and its subsequent social comparison are less clear: Sometimes competition can improve performance, and sometimes competition can hurt performance (see Stanne et al., 1999), with meta-analyses showing that, on average, competition is not detrimental to performance (Johnson & Johnson, 1989; Stanne et al., 1999) or has no effect on performance relative to a control group (Murayama & Elliot, 2012). The current work proposes one yet to be examined situation in which competition could lead to *reduced* performance, that is, when feeling competitive and having to perform within a domain where one's in-group's performance is negatively stereotyped. In such a domain, a sense of competition may lead a member of the negatively stereotyped group to engage in social comparisons that are group-based and relevant to the stereotype (i.e., comparing the self with one's in-group and to the out-group, as defined by a stereotype-relevant dimension), a comparison process that may ultimately harm performance.

Specifically, when a sense of competition and performance occurs within a stereotyped domain, we believe that this creates a situation that may trigger a specific experience for certain individuals, namely stereotype threat for individuals for whom the stereotype is self-relevant in that domain. Stereotype threat is a psychological state marked by worries and concerns about confirming a negative stereotype about one's in-group with one's performance within the stereotyped domain (Steele, 1997). When stereotyped individuals are made to feel competitive in a stereotype-relevant domain, they may

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engage in greater social comparison with potential competitors on the dimension relevant to the stereotype than individuals who are not targeted by the group stereotype (von Hippel, Issa, Ma, & Stokes, 2011), which may activate relevant performance information. That is, as a result of engaging in greater social comparison when feeling competitive, culturally held stereotypes about how a member of an individual's in-group should perform (i.e., "women are bad at math") may serve as the source of expectations about their and others' performance (i.e., women expect themselves and other women to perform more poorly than they expect men to perform).

Feeling competitive should lead women to make comparisons with men, who serve as salient standards within the math domain (e.g., von Hippel et al., 2011), as well as to other women, who are the most psychologically similar comparison standard (e.g., Festinger, 1954). Indeed, women have been found to engage in greater social comparisons with both men and women in a potentially threatening domain, and these social comparative tendencies were both positively associated with reported stereotype threat concerns (von Hippel et al., 2011). Competition will likely also increase social comparison for men; however, because men are not negatively stereotyped in the math domain, they may be less likely to have gender salient and to use it as a source for comparison, focusing more on personal comparisons (i.e., comparing themselves with other individuals) or other group-based comparisons than gender-based group comparisons.

Importantly, the differing foci of comparisons should have differing implications for later performance in the math domain. For women, comparing oneself with men is threatening because women are likely particularly concerned about their ability to perform on par with men (i.e., not confirm the stereotype in relation to men). Furthermore, female participants may feel that they may be individually judged against other women and that the collective performance of all women may be reflected upon them (e.g., Cohen & Garcia, 2005). Therefore, women who feel competitive in the math domain may be particularly concerned about their ability to perform better than other women (i.e., be the woman who does not confirm the stereotype) and/or to demonstrate that they, and by extension, their gender, *can* perform well in math (i.e., disconfirm the stereotype in relation to women). Having concerns about the negative stereotype about women and math as a result of increased social comparisons with men *and* women should induce threat particularly for women who feel competitive within the math domain (see Schmader, Johns, & Forbes, 2008), thereby decreasing their math performance (e.g., Beilock, Rydell, & McConnell, 2007). As for men, their comparisons should not lead them to be threatened; therefore, their performance is not expected to be negatively impacted by competition.

The present work explores a new way that feeling competitive can undermine performance, by inducing stereotype threat, and aims to provide evidence for the process through which this occurs. We predict that women primed with competition in the stereotyped domain of math will engage in group-based social comparisons (see Brewer & Weber, 1994), comparing themselves more with both other women and men. This increased utilization of gendered social comparisons could activate the negative stereotype that "women are bad at math" and lead these women to experience stereotype threat and threat-based math performance decrements. Therefore, the present work provides an initial examination of one situation in which competition may hurt performance.

Competition, Stereotype Threat, and Performance: What Do We Know?

While the primary aim of this research is to posit and test a specific process model as to how competition could influence performance, specifically by eliciting stereotype threat when competition and performance occur in a stereotyped domain, the present work is also one of the first efforts in the stereotype threat literature to *directly* examine the role of competition in stereotype threat effects. That is, relevant previous research does not directly manipulate feelings of competition or measures perceptions of competition to demonstrate that competition is at play in stereotype threat-based performance effects. The first relevant area of work is that which has focused on the influence of specific individuals (e.g., role models) on those in stereotype threat situations. This research implicitly provides participants with a comparison standard, as participants are given information (in various ways) about an individual with the goal of delineating the conditions under which role models are (in)effective, but does not directly manipulate competition. This role model research has shown that the consideration of low performing in-group exemplars leads to lower self-esteem and performance in the stereotyped domain, whereas the consideration of high-achieving similar others (i.e., role models) attenuates stereotype threat effects on these outcomes (e.g., Blanton, Crocker, & Miller, 2000; Cohen & Garcia, 2005; Marx & Roman, 2002; Marx, Ko, & Friedman, 2009). This work involves *individual* social comparisons mainly with *in-group* members who have confirmed or disconfirmed the negative group stereotype, and a sense of competition may be inferred as a consequence from these provided social comparisons. However, the choice to often describe exemplars as older students who have already reached attainable accomplishments suggests that this past work has aimed to reduce the likelihood that participants in this type of study see themselves in direct competition with presented exemplars.

The second type of work relevant to ours is that which looks directly at stereotype threat effects on performance. This research manipulates features of the task instructions (e.g., instructions informing participants that men perform better than women on the test; Beilock et al., 2007), the performance task (e.g., test diagnosticity; e.g., Spencer, Steele, & Quinn, 1999), and the environment (e.g., being outnumbered by men; Inzlicht & Ben-Zeev, 2000) to better understand the underlying processes and effects of stereotype threat (Steele, Spencer, & Aronson, 2002). While the manipulations used in stereotype threat studies may influence perceptions of competition (e.g., trying to perform better than men or those in the testing room and/or trying to invalidate the stereotype), which in turn could reduce performance by reducing attentional resources allocated to the test questions (Schmader & Beilock, 2012) and/or pushing them to exert intense effort (Jamieson & Harkins, 2007), other processes may also be involved, such as increased evaluation apprehension

(Beilock, 2008) or increased rumination regarding the negative self-relevant stereotype (see Schmader et al., 2008). Moreover, it is unclear if these manipulations of stereotype threat systematically lead women to feel especially competitive, thereby accounting for any reduced math performance exhibited, as these stereotype threat manipulations are not exclusively manipulations of competition. Although it has been assumed by some, past work on stereotype threat has not clearly demonstrated the role competition may play in stereotype threat effects.

Because both of these lines of related work do not typically involve measuring perceived competition following the manipulation of interest and have not directly varied participants' perceived level of competition, it is difficult to ascertain the extent to which competition is involved in the stereotype threat experience. The current work directly examines the role of competition in stereotype threat effects by manipulating women's level of perceived competition and measuring the extent of social comparison between the self and the stereotype-relevant groups (i.e., comparisons with men and with women) that women engage in and how this accounts for their performance in the stereotyped domain of math. Thus, the current research is able to be among the first to specifically test how feeling competitive may play a role in women's experience of stereotype threat.

Overview and Predictions

The current work presents four experiments examining one way in which competition might hurt performance, specifically investigating if feeling competitive can impair stereotyped individuals' performance in the stereotyped domain by increasing group-based social comparisons that lead to stereotype threat. In each experiment, we brought men and women into the lab and manipulated whether the concept of competition was accessible in memory by presenting half of the participants with primes related to competition and the other half with neutral primes. We did not expect threat-based math performance decrements when competition was not primed, as stereotype threat research usually does not find group differences in the absence of threatening cues (e.g., Inzlicht & Ben-Zeev, 2000; Schmader, 2002). Moreover, our participants were primarily first-year undergraduates and therefore likely not highly math-identified, a factor that makes finding group differences in the absence of stereotype threat more likely (Spencer et al., 1999). However, we predicted that priming competition in the stereotyped domain of math would lead women, but not men, to show threat-based performance decrements.

In Experiment 1, we aimed to provide experimental evidence that feeling competitive and performing in a domain in which one's in-group is negatively stereotyped impairs stereotyped individuals' performance. Importantly, we also sought to demonstrate that this decrease in performance for stereotyped individuals who feel competitive is due to anxiety and worries about confirming that stereotype (i.e., stereotype threat), which would suggest that feeling competitive for stereotyped individuals activates the negative stereotype that "women are bad at math." Women made to feel competitive in a math context should perform more poorly on a math test than men because of concerns that their performance could confirm the negative gender-math stereotype, which is logically preceded by activation of that stereotype. However, consistent with the proposed role of stereotype threat in response to competition primes, we expected that informing participants that the math test they are completing does not show gender differences (a manipulation that has been shown to reduce stereotype threat; e.g., Spencer et al., 1999) would alleviate these concerns and worries about confirming the negative stereotype of women primed with competition and thus reduce gender differences in math performance.

In Experiment 2, we sought to provide empirical support for the role social comparisons play in competition's impact on performance. We examined whether increases in social comparison with the groups men and women can explain why priming competition within a stereotyped domain reduces women's math performance. We directly assessed social comparison with men and women by having participants report with whom they were comparing themselves, expecting women primed with competition to engage in more extensive social comparison with both men and women and that this increase in social comparisons would account for women's performance decrements when primed with competition.

In Experiment 3, we examined the specificity of perceived competition's influence on performance in the stereotyped domain. We were particularly interested in determining whether threat-based performance decrements are dependent upon priming competition when the domain of competition is already known (i.e., priming competition after introducing a math context), as opposed to priming competition prior to knowing the competitive domain (i.e., priming competition before introducing a math context). Considering that social comparisons evoked by competition are guided by the competition domain, activating competition after the domain of math is known should make salient stereotype-relevant dimensions (i.e., gender) on which social comparisons are made. However, activating competition before the domain is known should not elicit strong stereotype-relevant group-level comparisons, and thus, relevant stereotypes about women in math should not be activated at all or to the same extent. We expected then that the math context in concert with competition primes would be needed to hurt women's math performance because priming competition devoid of a context relevant to the stereotype should not evoke stereotype threat.

In Experiment 4, we attempted to eliminate an alternative explanation for our findings based on research on socialization and evolutionary psychology (e.g., Buss, 1999; Ruble, Martin, & Berenbaum, 2006); namely, that competition may lead women to perform poorly across all performance domains not just stereotyped domains. These alternative explanations predict that women would be more sensitive than men to the impact of competition on performance regardless of the domain. We predicted that men primed with competition would experience stereotype threat, and thus perform more poorly than women, if performance occurs in a domain where men are negatively stereotyped (i.e., verbal ability; Keller, 2007). Such a finding would provide strong evidence that competition can impair performance by evoking worries about confirming negative performance stereotypes.

EXPERIMENT 1

The purpose of this experiment was to demonstrate that feeling competitive in a stereotype-relevant domain would elicit stereotype threat for women. We examined if priming competition in the math domain led women to perform more poorly on a math test than men and whether this reduced performance was due to competition evoking concerns about confirming the negative math stereotype for women in this condition. To further support that women who feel competitive in the math domain are experiencing stereotype threat, we included a manipulation of the gender fairness of the math test. If women primed with competition are experiencing stereotype threat, telling them that the test does not show gender differences should alleviate their stereotype threat concerns and therefore prevent math performance decrements. Thus, we had male and female participants in this experiment learn a novel math task and then receive either competition or control primes. Participants then received the instructions for the math test in which we manipulated the gender fairness of the test. Half of the participants were informed that the math task was "gender fair" (i.e., men and women perform equally well on the math task) and half were not given this information (or any information about the expectations for this task). Participants then completed a measure of math performance and a measure assessing the extent to which they were worried about confirming math-related gender stereotypes (i.e., threat-based concern; Marx, 2012).

Because we expected that the competition prime condition would activate negative performance stereotypes and lead women to worry about confirming gender-based math stereotypes, we predicted that women would perform more poorly and show greater threat-based concern than men in the competition prime condition when no information about the test's "gender fairness" was provided; however, we expected that women and men would show equivalent levels of performance and threat-based concern in the competition prime condition when worries about confirming gender-based performance stereotypes were abated by the "gender fair" information. In addition, we did not expect the manipulation of "gender fairness" to affect men's or women's math performance or threat-based concern in the control prime condition because stereotype threat should not be experienced in this condition.

Method

Participants and Procedure

Male ($n = 111$) and female ($n = 121$) undergraduates participated for course credit. They were randomly assigned to condition in a 2 (competition prime: control prime condition, competition prime condition) × 2 (perceived gender fairness: no "gender fair" information, "gender fair" information) between-subjects factorial.

Participants were first taught how to solve modular arithmetic (MA) problems that they expected to complete later in the experiment. MA is a math task that most undergraduates have not learned that involves determining if a math equation containing three numbers is "true" (i.e., the answer is an integer) or "false" (i.e., the answer is not an integer).

In MA, an equation that takes the form of $a \equiv b \ (mod\ c)$ [e.g., $94 \equiv 38 \ (mod\ 4)$] is solved by subtracting b (38) from a (94) and then dividing the solution of $a - b$ (56) by c (4). Because the solution of $a - b$ (56) divided by c (4) equals 14 (an integer), the correct answer is "true." If one solved the equation $94 \equiv 38 \ (mod\ 6)$, the correct answer would be "false" because $94–38 = 56$ and $56 \div 6 = 9.33$ (not an integer). Participants learned MA by reading a detailed tutorial (Beilock et al., 2007).

Scrambled Sentence Tasks. After completing the MA tutorial, participants were told: "While the modular arithmetic you have just learned 'sinks in', we will have you take part in a scrambled sentence task to help us develop materials for future research." Participants were then presented with 16 scrambled sentences containing five words and were told to make a grammatically correct sentence or phrase using four of the words (by typing into a text box on the computer screen). In the control condition, none of the scrambled sentences contained words related to competition; in the competition prime condition, 15 scrambled sentences each contained one word related to competition (e.g., rival and contest) (Srull & Wyer, 1979).

Gender Fair Manipulation. Next, half of the participants were given "gender fair" information (indicating that the math test they were going to complete does not reveal gender differences) by reading that "Today you have been randomly assigned to learn and work on a math problem solving task that does NOT show gender differences. This means that men and women both perform equally well on the math task you are completing today." (Spencer et al., 1999) before completing the MA problems; the other half of the participants were not given these instructions before completing the MA problems.

Math Performance. Participants solved 36 MA problems by indicating whether the equations presented were "true" (by pressing the "t" key) or "false" (by pressing the "f" key). All of the problems used larger numbers (i.e., 19–99) and required a borrow operation, making them relatively difficult (Beilock et al., 2007). Accuracy was tabulated by dividing the number of problems answered correctly by 36. Greater scores indicated better math performance. The amount of time taken to complete each problem was recorded and averaged to measure math reaction time.

Threat-Based Concern. Next, the participants completed Marx's (2012) three-item measure of threat-based concern ($\alpha = .74$; e.g., "I worry that my ability to perform well on math tests is affected by my gender.") on scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Responses on these items were averaged, with greater scores indicating greater concern about confirming negative, math-related gender stereotypes.

Participants then indicated how competitive they felt while completing the math task on two items ("When completing the math task, I was feeling competitive." and "When completing the math test, I felt I had to prove I was better than others.") with scales ranging from 1 (*strongly disagree*) to 7 (*strongly*

agree). Responses on these items were averaged ($\alpha = .70$), with greater scores indicating greater perceived competition. Finally, participants reported their gender.

Results

Contrary to predictions, perceived competition was not impacted by the manipulation of competition, $F < 1$. Although this indicates that our competition manipulation did not have the expected effect on self-reported feelings of competition, as discussed in the subsequent paragraphs, it had a large influence on math performance and threat-based concern. Further, this same manipulation influenced perceived competition as expected in the remaining three experiments.

Math performance showed the expected three-way interaction of competition prime, perceived gender fairness, and gender, $F(1, 224) = 11.01$, $p = .001$, $\eta_p^2 = .047$ (Figure 1). For men, there were no significant effects, Fs < 3.26. For women, the two-way interaction of perceived gender fairness and competition on math performance was significant, $F(1, 117) = 8.86$, $p = .004$, $\eta_p^2 = .070$. When women did not receive "gender fair" information, they performed worse when primed with competition than when not primed with competition, $F(1, 117) = 30.34$, $p < .001$, $\eta_p^2 = .206$; competition priming did not influence women's performance when the task was described as "gender fair," $F(1, 117) = 1.60$, $p = .21$, $\eta_p^2 = .014$.

Math reaction time showed only a main effect of gender, $F(1, 224) = 11.23$, $p = .001$, $\eta_p^2 = .048$. Women took longer ($M = 9.27$ seconds) than men ($M = 7.83$ seconds) to complete an MA problem. However, the three-way interaction was not significant, $F < 1$, indicating that the performance results were not due to a speed–accuracy trade-off.

Threat-based concern showed the expected three-way interaction of competition prime, perceived gender fairness, and gender, $F(1, 224) = 5.75$, $p = .017$, $\eta_p^2 = .025$ (Figure 2). For men, there were no significant effects, Fs < 3.29. For women, the two-way interaction of perceived gender fairness and competition on threat-based concern was significant, $F(1, 117) = 5.138$, $p = .025$, $\eta_p^2 = .042$. When women did not receive "gender fair" information, they had greater threat-based concern when primed with competition than when not primed with competition, $F(1, 117) = 19.60$, $p < .001$, $\eta_p^2 = .143$; competition priming did not influence women's threat-based concern when the task was described as "gender fair," $F(1, 117) = 1.42$, $p = .24$, $\eta_p^2 = .012$.[1]

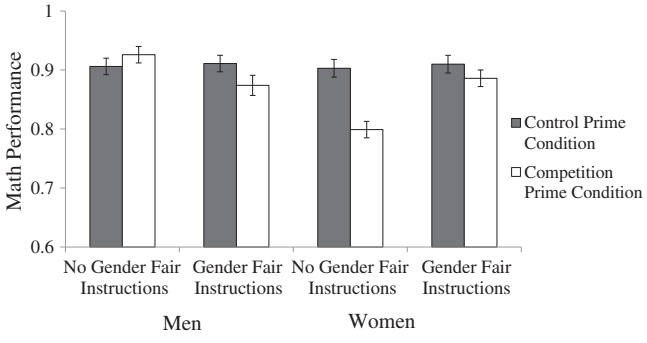


Figure 1. Math performance in Experiment 1 as a function of competition prime, perceptions of gender fairness, and gender. The error bars represent the standard error of the mean

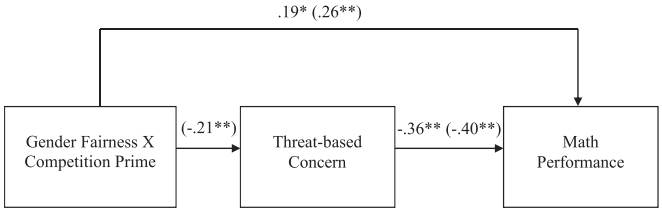
Figure 2. Threat-based concern in Experiment 1 as a function of competition prime, perceptions of gender fairness, and gender. The error bars represent the standard error of the mean

Mediational Analyses

Using Preacher and Hayes's (2008) bias-corrected bootstrapping procedure, we examined if threat-based concern accounted for the relationship between the gender fairness by competition prime interaction and math performance for women.[2] The gender fairness by competition prime interaction still predicted math performance when threat-based concern was added to the model, $\beta = .19$, $p = .03$, but was substantially reduced (Figure 3). Importantly, the bias-corrected 95% confidence interval for the indirect effect of threat-based concern on the relation between the interaction gender fairness and competition prime and math performance for women did not include 0 (0.001 to 0.017), indicating mediation. When this mediational analysis was conducted for men, the bias-corrected 95% confidence interval for the indirect effect included 0 (−0.003 to 0.001), indicating no mediation.

[1]To ensure that the threat-based concern results were not due to attributions for poor performance in Experiment 1, male ($n = 45$) and female ($n = 25$) undergraduates completed the same procedures as the participants in the no gender fair instruction conditions of Experiment 1 except that they only completed the measure of threat-based concern and did not complete the MA problems. The results for the threat-based concern measure showed the expected interaction of competition prime and gender, $F(1, 66) = 8.67$, $p = .004$, $\eta_p^2 = .116$. Men ($M = 2.02$) and women ($M = 2.02$) had equivalent levels of threat-based concern in the control prime condition, $F < 1$, but women showed greater levels of threat-based concern ($M = 3.56$) than men ($M = 1.89$) in the competition prime condition, $F(1, 33) = 15.41$, $p < .001$, $\eta_p^2 = .189$.

[2]To examine whether threat-based concern mediated the interaction of gender and competition on math performance, the gender and competition manipulations were recoded (gender fairness: −1, no gender fairness, and +1, gender fairness; and competition prime: −1, control condition, and +1, competition prime), and regressions were conducted in which (i) the interaction of gender and competition (multiplicative function) predicted threat-based concern; (ii) threat-based concern predicted math performance; (iii) the interaction of gender and competition prime predicted math performance; and (iv) the interaction of gender and competition prime and threat-based concern both predicted math performance (Figure 3). This same coding (replacing female for no gender fairness and male for gender fairness) and strategy was followed for social comparison with men and women in Experiment 2.



Note. Direct relations are presented in parentheses. * = p<.05, ** = p<.005.

Figure 3. The results of mediational analyses in which the relation between interaction of gender fairness and competition prime and math performance is accounted for by threat-based concern for women in Experiment 1

Discussion

Experiment 1 provides strong support for the hypothesis that priming women with competition leads them to underperform because they experience worry and concern about confirming the stereotype that "women are bad at math" (i.e., they experience stereotype threat). When participants were primed with competition, (i) women who did not receive the "gender fair" information performed more poorly and showed greater threat-based concern than men in this condition and (ii) providing participants with information indicating that the math task was "gender fair" before completing the math test eliminated differences in math performance and threat-based concern between men and women. Because manipulating whether participants expected the test to show gender differences affected the extent to which women underperformed relative to men in the competition prime condition, it is clear that the impact of competition primes on women's math performance was due to worries about confirming gender-based math stereotypes (i.e., due to the experience of stereotype threat)—as also indicated in the mediational analyses.

EXPERIMENT 2

We reasoned that feeling competitive increases social comparison on dimensions that are relevant for task performance (e.g., Tesser, 1988), and that such comparisons may make salient relevant performance information, including negative performance stereotypes. When women receive information about the math performance domain (a stereotype-relevant domain) and are then primed with competition, they should be more likely to engage in social comparisons with men and women (i.e., along the stereotype-relevant dimension of gender) and experience stereotype threat as a consequence of such comparisons. In Experiment 2, we investigated this hypothesis by having participants indicate how much they compared themselves with men and women after receiving the competition manipulation. Finally, participants completed difficult MA problems. We expected that women primed with competition would be especially likely to report engaging in social comparisons with men and women. Moreover, if competition primes elicit social comparisons that eventually activate pejorative stereotypes about women in math, then we would expect that engaging in social comparison with men and women should account for the effect of gender and competition prime on math performance.

Method

Participants and Procedure

Male ($n = 60$) and female ($n = 43$) undergraduates participated for course credit. Participants were randomly assigned to a control prime condition or a competition prime condition. The procedures from Experiment 1 were used to teach participants about MA and manipulate competition. Then, participants completed questions assessing the extent to which they engaged in social comparisons with men and women.

Social Comparison Questions Participants completed the four items that assessed the extent to which they compared themselves with men and women (adapted from von Hippel et al. (2011)). Two items examined social comparisons with men (e.g., "When you think about your ability to perform the upcoming modular arithmetic task, how much do you compare yourself to the MEN who have or will complete the modular arithmetic task?"), and two assessed comparisons with women (i.e., the word "men" was replaced by "women") on scales ranging from 1 (*not at all*) to 7 (*a lot*). The items indicating social comparison with men ($\alpha = .97$) and women ($\alpha = .98$) were, respectively, averaged together; in both cases, greater scores indicated greater social comparison with the gender group.

Next, participants completed the MA problems and competition items ($\alpha = .70$) from Experiment 1. Participants then reported their gender.

Results

Perceived competition was greater in the competition prime condition ($M = 4.51$) than the control prime condition ($M = 3.52$), $F(1, 99) = 9.68$, $p = .002$, $\eta_p^2 = .089$.[3] There were no other significant effects on this measure, Fs < 1 (Table 1).

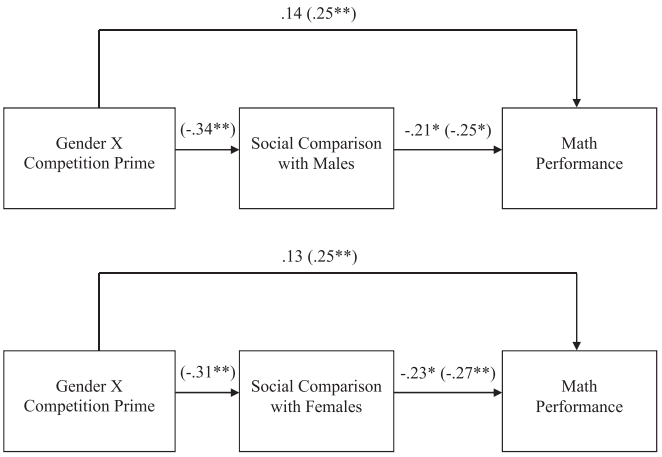
Social comparison with men showed the predicted two-way interaction of competition prime and gender, $F(1, 99) = 12.87$, $p = .001$, $\eta_p^2 = .115$. Women showed greater social comparison with men when primed with competition than when not primed, $F(1, 99) = 16.63$, $p < .001$, $\eta_p^2 = .144$; however, competition primes did not affect men's social comparison with men, $F < 1$. The competition prime by gender interaction was also obtained

[3]Research on achievement goals has found that stereotype threat leads to more performance-avoidance goals than performance-approach goals (Brodish & Devine, 2009). Performance-avoidance goals are characterized by wanting to avoid doing poorly, whereas performance-approach goals are characterized by wanting to do better than others (Elliot & Harackiewicz, 1996). Women in our competition prime condition (where stereotype threat is expected) report more agreement with items in our manipulation check that may seem similar to performance-approach goals (e.g., "When completing the math test, I felt like I had to prove I was better than others."), which may seem to contradict Brodish and Devine's findings. However, our competition items most relevant to achievement goals imply that proving oneself is an obligation (i.e., just trying not to do poorly), consistent with performance-avoidance goals, rather than a motivation to approach a challenge. Thus, we see our work as in line with theirs.

Table 1. Dependent variables in Experiment 2 as a function of competition prime and gender

		Control prime		Competition prime	
		Men	Women	Men	Women
Perceived competition	*M*	3.38_{a}	$3.66_{a,b}$	4.41_{b}	4.61_{b}
	SD	1.46	1.95	1.23	1.56
Male social comparisons	*M*	3.61_{a}	2.13_{b}	$3.23_{a,b}$	4.57_{c}
	SD	2.29	1.38	1.91	1.99
Female social comparisons	*M*	$3.04_{a,c}$	2.55_{a}	2.36_{a}	4.30_{c}
	SD	2.00	1.84	1.66	2.03
Math performance	*M*	0.92_{a}	0.91_{a}	0.89_{a}	0.80_{b}
	SD	0.07	0.08	0.10	0.11
Math reaction time	*M*	8.65_{a}	7.73_{a}	9.46_{a}	8.35_{a}
	SD	2.59	2.82	4.31	3.28

Note: Means in a row with different subscripts were significantly different at the $p < .05$ level according to Tukey's Honestly Significant Difference (HSD). Reaction times are presented in seconds.
M, mean; *SD*, standard deviation.



Note. Direct relations are presented in parentheses. * = p<.05, ** = p<.001.

Figure 4. The results of mediational analyses in which the relation between interaction of gender and competition prime and math performance is accounted for by social comparison with men (top panel) and by social comparison with women (bottom panel) in Experiment 2

for social comparison with women, $F(1, 99) = 10.46$, $p = .002$, $\eta_p^2 = .096$. Women engaged in more social comparison with women when primed with competition than when not primed, $F(1, 99) = 9.36$, $p = .003$, $\eta_p^2 = .086$, whereas men's level of social comparison with women was not impacted by competition primes, $F(1, 99) = 1.94$, $p = .17$, $\eta_p^2 = .019$.

Math performance showed a two-way interaction of competition prime and gender, $F(1, 99) = 7.58$, $p = .007$, $\eta_p^2 = .071$. Men were unaffected by the manipulation of competition prime, $F(1, 99) = 1.08$, $p = .30$, $\eta_p^2 = .011$, but women primed with competition performed more poorly than women not primed with competition, $F(1, 99) = 20.15$, $p < .001$, $\eta_p^2 = .169$.

Math reaction time did not show any significant effects, Fs < 2.34, ps $> .12$. The two-way interaction was not significant, $F < 1$, indicating that a speed–accuracy trade-off cannot account for the performance effects.

Mediational Analyses

The bootstrapping procedure from Experiment 1 was used (see Footnote 2) to conduct mediational analyses examining if social comparison with men accounted for the relationship between the competition by prime interaction and math performance. The gender by competition prime interaction no longer predicted math performance when social comparison with men was added to the model, $\beta = .14$, $p = .17$ (see Figure 4, top panel). Importantly, the bias-corrected 95% confidence interval for the indirect effect of social comparison with men on the relation between the interaction of competition prime and gender and math performance did not include 0 (0.011 to .0160), indicating mediation. The same analysis was conducted using social comparison with women as the mediating variable, and the bias-corrected 95% confidence interval also did not include 0 (0.0011 to 0.0171). Social comparison with women also accounted for the relation between the interaction of competition prime and gender and math performance, with the latter relation reduced to non-significance $\beta = .13$, $p = .18$ (see Figure 4, bottom panel).

Discussion

Women primed with competition in a math context were more likely to engage in group-level social comparison (i.e., comparing themselves with women and men) than women who were not primed with competition or men in either condition. Furthermore, this increased level of comparison with men and women accounted for differences in women's math performance as a function of competition prime. These findings support our prediction that feeling competitive evokes stereotype threat by leading stereotyped individuals to engage in group-level social comparisons. We argue that the context in which competition is evoked (in this case after learning about a math task that will be completed later in the session) may provide information relevant to the comparison process (i.e., on what dimension is it useful to compare oneself with others) and that feeling competitive leads women to engage in greater gendered social comparison (e.g., Tesser, 1988). When competition occurs in domains in which an in-group's ability is negatively stereotyped (e.g., women in math), this increased comparison should lead to worries about confirming the negative stereotype and reduce performance.

The results of Experiments 1 and 2 provide converging support for our proposed model of how feeling competitive induces stereotype threat for women in math. In Experiment 1, we showed that women in a context where their in-group is negatively stereotyped experience stereotype threat when primed with competition. In Experiment 2, we demonstrated that evoking competition after introducing a math task led to increased group-level social comparison that accounted for women's reduced math performance. Although these experiments suggest that the context in which competition is primed may be an important component in triggering the process we argue leads to stereotype threat, we did not compare the experiences of our participants with those who did not have such a context. Given the importance of the context for guiding social comparisons, when a stereotype-relevant math context is not provided before priming competition, there is no compelling reason for women to engage in greater social comparison with men and women when subsequently asked to complete math problems. Moreover,

without this increased group-level comparison as a function of the math context being made salient before priming, gender-based math stereotypes should not be strongly activated, and thus, women should not experience stereotype threat during testing. Thus, we examine the importance of context in Experiment 3.

EXPERIMENT 3

While Experiments 1 and 2 provide support for our contention that the context in which competition is evoked plays a meaningful role in eliciting stereotype threat by guiding women's social comparisons to be gender-based, we wanted to directly test the importance of context in Experiment 3. To the extent that social comparison processes and resultant stereotype threat can explain performance deficits for women in math, these deficits should be stronger or perhaps only occur when stereotyped individuals are primed with competition *and* the stereotyped domain is made salient (i.e., by learning the math task before priming; see Higgins, 1996). Therefore, we would expect that priming competition would only impact women's math performance if they were exposed to math-relevant information before priming, but not if women are simply primed with competition in a context devoid of math cues, and later asked to complete a math test. Contrary to these predictions, one could argue that simply knowing the performance domain could elicit stereotype threat even without competition being primed; this account would predict that women would underperform when the math context is known and irrespective of prime condition. Given our evidence of the importance of social comparisons in Experiment 2, we would not predict this because knowing the performance domain likely does not systematically constrain comparisons to be group-level and gender-based.

In Experiment 3, participants were either presented with information about the problem solving task that they would complete later in the session (i.e., they were shown sample math word problems from the Graduate Record Examinations (GRE)) or were not given any information about the problem solving task. Then, in a purportedly unrelated task, they completed the competition prime task from Experiments 1 and 2. Lastly, participants answered difficult math word problems and the previous questionnaire items. We expected that women's math performance would only be reduced when competition primes were presented after sample math problems because this provides information that guides social comparisons. This would show that competition primes only impact women's performance when they are presented within the context of the negatively stereotyped domain. Additionally, we expected that the math context alone would not evoke stereotype threat, for the combination of feeling competitive in a math context should be necessary for gender differences in performance to be found.

Method

Participants and Procedure

Male ($n = 92$) and female ($n = 94$) undergraduates participated for course credit. Participants were randomly assigned to condition in a 2 (competition prime: control, competition) × 2 (sample problem: present, absent) between-subjects factorial.

Half of the participants were shown two sample math problems that they were told were similar to the types of problems they would complete later in the experiment (GRE problems that were not used in the subsequent math test). Participants were not given the option to solve the problems, as no response options were provided, but rather continued to the next screen when they were done reviewing the sample problems. The other half of the participants did not receive any sample problems nor were they told that they would be completing a problem solving task. Then, all participants completed the scrambled sentence task from Experiment 1 to manipulate competition.

Math Task. After completing the scrambled sentence task, participants had 10 minutes to complete a 15-problem math test using word problems from past versions of the GRE (Schmader & Johns, 2003). Each problem had five potential answers, and, in addition, participants had the option of skipping a question if they did not want to work on it. Math performance was assessed by examining the percentage of correct responses, computed by taking the number of correct answers divided by the number of problems attempted (i.e., a problem that had a response and that was not skipped).

Participants then completed the perceived competition items ($\alpha = .72$) from Experiment 1 and indicated their gender.

Results

The manipulation of competition was effective, with perceived competition greater in the competition prime condition ($M = 4.53$) than the control prime condition ($M = 2.84$), $F(1, 178) = 8.61$, $p = .004$, $\eta_p^2 = .046$. No other effects were significant, Fs < 2.20, ps $> .13$.

Math performance (percent correct) showed a three-way interaction of gender, competition prime, and sample problem, $F(1, 178) = 6.87$, $p = .010$, $\eta_p^2 = .037$ (Figure 5). Women showed a significant interaction of the manipulation of sample problems and competition, $F(1, 90) = 4.58$, $p = .035$, $\eta_p^2 = .048$. When sample problems were presented, women scored marginally worse when primed with competition than when

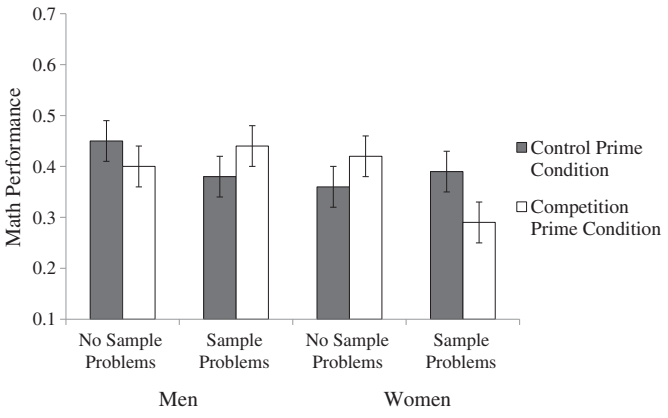


Figure 5. Math performance (percent correct) in Experiment 3 as a function of competition prime, sample problems, and gender. The error bars represent the standard error of the mean

not primed, $F(1, 90) = 3.39$, $p = .069$, $\eta_p^2 = .036$. When there were no sample problems, women's performance was not influenced by competition primes, $F(1, 90) = 1.41$, $p = .239$, $\eta_p^2 = .015$. Men did not show a significant sample problem by competition interaction, $F(1, 88) = 2.44$, $p = .12$, $\eta_p^2 = .027$.

For the number of math problems attempted, there was only a marginally significant effect of gender, $F(1, 178) = 3.36$, $p = .068$, $\eta_p^2 = .019$. Men tended to attempt more math problems ($M = 12.33$) than women ($M = 11.44$). No other effects were significant for the number of problems attempted, Fs < 1.67, ps $> .19$.

Discussion

This experiment shows that introducing math-related information before priming competition was necessary for competition primes to reduce women's math performance. Two key conclusions follow from these results. First, it is not the case that simply priming competition leads to underperformance by women on math problems. Instead, it appears that activating competition has to occur within the context of a potentially threatening, stereotype-relevant domain to reduce stereotyped individuals' performance, and both the competition primes and contextual cues are necessary to observe performance decrements. These findings are consistent with the proposed social comparison account. That is, it appears it was necessary to provide information about the context of the problem solving task for increased group-level social comparisons with men and women to be made by women primed with competition. In the absence of this contextual information, women primed with competition did not seem to make comparisons that activated negative performance stereotypes. Second, knowledge of the performance domain alone was not sufficient to elicit stereotype threat. When women were given sample math problems but competition was not primed, performance decrements were not observed. We would argue that only having information about the performance domain in the absence of competition is less likely to result in group-level social comparisons based on gender and therefore would not strongly evoke stereotype threat.

In support of our proposed process, both the contexts of the potentially threatening performance domain (i.e., math context) and competition are required to elicit stereotype threat. Thus, these results also suggest that it is not just when women are feeling competitive that they will underperform, as might be expected by an evolutionary psychology perspective (e.g., Buss, 1999), for example. We set out to directly rule out this alternative explanation in Experiment 4.

EXPERIMENT 4

An alternative explanation for the impact of gender and competition prime on math performance is based on research examining socialization (e.g., Ruble et al., 2006), gender roles (e.g., Eagly & Crowly, 1986), and evolutionary psychology (e.g., Buss, 1999). It could be argued that women will perform worse than men in competitive situations, or when competition is primed, regardless of the performance domain. Indeed, many societies, consistent with prevailing gender roles, encourage men to be assertive and competitive but encourage women to be empathetic and cooperative, leading women to be presumably less competitive and less interested in competition than men (Ruble et al., 2006). Further, because some theories argue that men increase their chances for reproductive success by competing, whereas women hurt their chances for reproductive success by competing, natural selection could favor competitive men and cooperative women (e.g., Buss, 1999).

These perspectives predict that when competition is primed, women should underperform relative to men across most domains, even in domains where men and women are expected to perform equally or in domains where women are expected to outperform men. Contrary to these explanations, we did not expect women to underperform across most domains for several reasons. First, past work has shown that women do not experience stereotype threat in domains in which men are stereotypically poor performers (i.e., verbal tasks; Keller, 2007). Second, in Experiment 3, we found that women who were primed with competition but did not see the sample math problems performed as well as men, if not marginally better than them. Although these findings suggest that this alternative explanation is unlikely to explain why competition impacts math performance for women, this alternative explanation was not directly tested. Thus, in Experiment 4, we attempted to rule out this alternative by demonstrating that men primed with competition could experience stereotype threat and show poorer performance than women primed with competition.

Method

Participants and Procedure

Male ($n = 35$) and female ($n = 30$) undergraduates participated for course credit. Participants were randomly assigned to a control prime condition or a competition prime condition.

Participants learned that they would be completing a measure of verbal ability. Then, competition was manipulated as in Experiment 1. Next, participants completed 24 moderately difficult verbal analogy questions that were taken from various GRE preparation books (each with five possible answers). The verbal test was scored by taking the total number of questions answered correctly divided by the total number of questions (all participants answered all questions), with greater scores indicating better performance. Finally, participants in both conditions completed the perceptions of competition items from Experiment 1 that were modified to refer to "a verbal test" ($\alpha = .89$) and reported their gender.

Results

Verifying the manipulation of competition, perceived competition was greater in the competition prime condition ($M = 4.53$) than the control prime condition ($M = 2.84$), $F(1, 61) = 31.12$, $p < .001$, $\eta_p^2 = .338$. No other effects were significant, Fs < 1.

Verbal performance showed the expected interaction of competition prime and gender, $F(1, 61) = 4.24$, $p = .044$, $\eta_p^2 = .065$.

Although there was no difference in women's performance as a function of competition prime, $F < 1$, men showed *lower* levels of verbal performance when primed with competition than when not primed, $F(1, 61) = 5.22$, $p = .026$, $\eta_p^2 = .079$ (Table 2).

Discussion

Experiment 4 shows that priming competition led men to perform *worse* than women on a verbal task. Thus, men showed a stereotype threat effect when primed with competition in a domain where negative stereotypes exist about their in-group's ability. Contrary to one alternative explanation for the performance results of Experiments 1–3, women do not generally perform worse than men in competitive situations regardless of the performance domain. When performance occurs in a domain where men are stereotyped to have low ability (i.e., a verbal task), men feeling competitive performed more poorly than women feeling competitive. In this work, competition did not simply affect women's performance regardless of the domain, but rather, the effect of competition on women's (and men's) performance was specific to the domains in which their performance was negatively stereotyped.

GENERAL DISCUSSION

This work demonstrates that feeling competitive can hurt stereotyped individuals' performance by evoking stereotype threat. This research also provides evidence for the process through which a sense of competition can elicit threat and hinder the performance of negatively stereotyped individuals. Specifically, we found support for our proposed social comparison process that posited that when competition is activated within the negatively stereotyped performance domain, stereotyped individuals engage in more social comparisons with others on the dimension relevant to the stereotype (e.g., Festinger, 1954; Tesser, 1988), and these social comparisons with and between the in-group and the out-group activate from memory, among other things, performance expectations in the form of negative performance stereotypes (e.g., "women are bad at math"). The activation of these stereotypes leads stereotyped individuals to feel anxious and worried about confirming them with their performance, and these worries and anxieties ultimately lead stereotyped individuals to perform more poorly on a task within the stereotyped domain.

Table 2. Dependent variables in Experiment 4 as a function of competition prime and gender

		Control prime		Competition prime	
		Men	Women	Men	Women
Perceived competition	*M*	3.03_a	2.64_a	4.39_b	4.63_b
	SD	1.25	1.20	0.87	1.47
Verbal performance	*M*	0.38_a	0.36_a	0.29_b	0.39_a
	SD	0.08	0.14	0.08	0.16

Note: Means in a row with different subscripts were significantly different at the $p < .05$ level according to Tukey's HSD.
M, mean; *SD*, standard deviation.

Experiment 1 provided evidence that priming competition within the context of a stereotyped domain reduced women's math performance by increasing worries about confirming the stereotype that "women are bad at math." Women primed with competition performed more poorly and were more anxious and preoccupied with thoughts that their performance would serve to validate the negative stereotype about women's math ability than men primed with competition on a math test. Moreover, reduced math performance and worries about confirming the stereotype that "women are bad at math" among women primed with competition were eliminated when they were told that the math test they were going to complete was "gender fair" (Spencer et al., 1999), providing strong evidence, along with mediational analyses showing that women's performance results were accounted for by threat-based concern, that anxieties and worries about validating negative math stereotypes are responsible for women's performance deficits in response to competition primes.

Experiment 2 provided evidence that competition led stereotyped individuals to engage in increased social comparison with men and women. Presenting competition primes led women to report comparing themselves more with both gender categories, and this increased social comparison with both men and women accounted for the reduced math performance among these women primed with competition. This suggests that group-level social comparison leads to reduced math performance. Moreover, Experiment 3 showed that introducing the stereotyped domain (in this case math) before activating competition was necessary to reduce women's math performance. These findings demonstrate that it was not simply the case that activating competition led to poorer performance by women on a math test. Instead, competition had to be introduced in a domain that was applicable to the stereotype. If the domain is unknown when competition is primed, we argue that women subsequently faced with a math test are less likely to engage in increased gender-based social comparison and thus are less likely to have the negative performance stereotype activated.

The results from Experiments 2 and 3, therefore, help to demonstrate that being primed with competition leads women to engage in greater group-based social comparisons with both men and women and that these comparisons are threatening only in the context of the math domain. While we believe these social comparisons are threatening in the math domain because they likely make accessible performance expectations in the form of the negative stereotype about women's poorer performance in math than men's, thereby triggering stereotype threat and leading to reduced math performance, we do not have data that can speak to the specific aspects of social comparisons with men and with women that led to stereotype threat (i.e., the specific man/woman or type of man/woman to which participants are comparing themselves). It could be that when women who feel competitive are comparing themselves with men and women, they are specifically bringing to mind high-math-achieving men and low-math-achieving women (e.g., Huguet & Regner, 2007), which may activate the negative stereotype. Or, it could be that comparisons with men lead to stereotype threat through a different process than comparisons with women do. That is, comparing oneself with men may activate

the negative stereotype in a similar way as some stereotype threat manipulations (i.e., by more or less stating the stereotype; e.g., Beilock et al., 2007), whereas comparing oneself with other women may make more salient the stereotyped identity (i.e., woman), which ironically could trigger stereotype threat (e.g., Steele et al., 2002). Given this, future work should more closely examine the specific comparisons that are made accessible after priming competition as the relationships of the comparison standards to participants and participants' performance expectations for these individuals should importantly shape how this comparison process leads to the activation of negative performance stereotypes to trigger stereotype threat (e.g., Cohen & Garcia, 2005; Tesser & Campbell, 1982). Furthermore, exploring the role of gender and math identification for the availability of comparison standards and delineating the specific motivations that these comparisons inspire (i.e., not confirm or disconfirm the negative group stereotype) will help to fully assess the validity of our proposed process and to fill in details of the broader framework we set forth in this work (e.g., Crocker & Major, 1989; Nussbaum & Steele, 2007).

In addition, Experiment 3 helps to further clarify the conditions necessary for competition to undermine women's math performance. Presenting practice problems or teaching women a novel math task alone was not sufficient to reduce women's math performance. In all of the experiments involving the math task, women in the control prime condition who received information about how to complete a novel math task and/or sample problems did not show poorer performance than men, implying that these particular women were not experiencing stereotype threat merely as a function of being in a math context. Thus, it was necessary for a relevant stereotyped context to be coupled with feeling competitive to elicit stereotype threat-based performance effects in this research.

Experiment 4 provided evidence that the detrimental impact of competition in stereotyped domains does not simply hold for women. Priming competition hurt men's performance when it occurred in a domain where negative stereotypes about men's ability exist: verbal ability. The detrimental impact of competition on men's performance eliminates an alternative explanation for our findings based on socialization, gender roles, or evolutionary processes (e.g., Buss, 1999; Ruble et al., 2006). Thus, these experiments provide strong evidence that one way in which competition can hinder performance for women in math domains (or men in verbal domains) is by leading them to worry about confirming negative, gender-based stereotypes (i.e., experience stereotype threat).

Showing that competition can evoke stereotype threat when it is introduced in the context of a stereotyped domain adds to the literature showing that competition can sometimes lead to performance deficits (e.g., Sanders, Baron, & Moore, 1978). Our work shows that competition may impact some individuals (i.e., negatively stereotyped individuals) more than others, at least in certain situations. Further, some of the processes underlying the general impact of competition on performance appear to be similar to those that we propose underlie the effect of competition primes on stereotyped individuals' performance in the stereotyped domain. Specifically, competition can induce social comparison (e.g., Tesser, 1988), and competition can lead people to feel worried about their performance (e.g., Beilock, 2008). Here, we propose that group-level social comparison processes activate negative performance stereotypes that can lead to concerns and worries about confirming these stereotypes. Thus, this work shows new ways in which the processes already shown to reduce performance in response to competition may operate in stereotyped domains and affect the targets of performance stereotypes.

Although we have argued for and provided evidence of the importance of considering the social comparisons evoked when non-stereotyped and stereotyped individuals perform in the stereotyped domain, future work should explore additional mechanisms through which competition has its impact on performance in stereotyped domains. Specifically, increased evaluation apprehension (Beilock, 2008) or reduced belonging in the domain (Murphy, Steele, & Gross, 2007) may also contribute to competition's negative impact on performance. These additional processes may be implicated in a variety of ways—as a result of, in addition to, or instead of social comparisons—in understanding competition's impact on performance. Moreover, which of these processes, in addition to social comparisons, may be especially likely or play a more significant role in influencing performance may vary with the competitive situation. Exploring these processes and their possible interplay will be important in understanding the relationship between competition and performance and provides a fruitful avenue for future research.

More generally, the present work allows for better prediction regarding when competition will impair performance for certain individuals (i.e., when stereotyped individuals compete in a stereotyped domain) and why this happens. Given the mixed findings in past research and the results of meta-analyses on competition and performance, this added predictive power and increased clarity regarding the competition–performance relationship provides obvious benefit to the extant body of literature.

Has the Role of Competition in Stereotype Threat Effects Been Demonstrated Before?

The current research is the first to directly test and demonstrate that competition can be involved in stereotype threat effects. Until now, it has been assumed by some that competition plays a role in the stereotype threat experience. Primarily this assumption considers competition as a consequence of the stereotype threat manipulation. That is, the effect of common stereotype threat manipulations on performance has sometimes been interpreted as being at least partially explained by the manipulations inducing feelings of competition. As discussed earlier, although common manipulations of stereotype threat may increase perceived competition, it is, by and large, unclear exactly how these manipulations lead stereotyped individuals to feel threatened. These manipulations could also be argued to induce threat and lead to underperformance for reasons that do not involve competition, such as evaluation apprehension (Beilock, 2008), increased rumination (see Schmader et al., 2008), arousal (Murphy et al., 2007), lowered expectations for performance (e.g., Stangor, Carr, & Kiang, 1998), or reduced feelings of belongingness in the stereotyped domain (Murphy et al., 2007), to name a few.

Thus, on the basis of the past work, it was not clear if competition played a causal role in stereotype threat effects. Competition could be important for stereotyped individuals to show reduced performance in response to threat, and yet threatened individuals need not feel competition or perceive that they are competing with non-stereotyped individuals to experience stereotype threat, as many other processes could explain stereotype threat-based underperformance. The present work is the first to verify that perceived competition can play an important, causal role in stereotype threat effects, finding that competition can be an *antecedent* to stereotype threat effects. Although we believe that stereotype threat does not always involve feelings of competition with one's in-group and the out-group, it is clear from this work that making stereotyped group members feel competitive is sufficient to elicit stereotype threat-based performance decrements.

Attenuating Competition's Negative Impact on Performance

Evidence for this newfound role of competition potentially complicates the relationship between the performance situation and its elicitation of stereotype threat, rendering the elimination of the negative impact of stereotype threat a more complicated endeavor. Further, the timing of the competition prime could be a strong determinant as to whether competition elicits stereotype threat. For instance, it is a little unclear what would happen in performance situations involving competition when these situations are "cleared" of threat prior to feeling competitive (i.e., giving the "gender fair" manipulation prior to the competition prime). That is, even if care is taken to make a threatening performance setting less threatening, if the setting involves competition and leads individuals belonging to the negatively stereotyped group to perceive the situation as competitive, performance may still be reduced by social comparisons that activate pejorative stereotypes.

Thus, the impact of competition on threat and performance may make eradicating the negative impact of stereotype threat on performance more difficult than was previously presumed. Also, the timing of the onset of competitive feelings could occur at different time points with differing impacts. If the experience of threat has been evoked in a particular context by competition in the past, then the context itself, based on this prior experience, may subsequently elicit threat even if competition is not present at the time. Importantly, however, the newfound complexity brought forth by this evidence of competition's role in stereotype threat effects should not discourage but rather equip researchers with more specific predictions and challenge them to be more careful and thoughtful in the creation and testing of interventions aimed at ameliorating the deleterious impact of negative stereotypes on performance.

One such possible point of successful intervention at which our work hints is at the point of engaging in social comparison. That is, while it is the case that feeling competitive induces increased social comparisons, it may not always be the case that these comparisons will activate negative performance stereotypes. By changing the dimension of comparison to one that is less likely to activate negative performance stereotypes, stereotyped individuals may avoid the subsequent negative effects of these negative stereotypes on their performance. Cues in the stereotype-relevant domain may guide comparisons in such a way that they do not activate negative performance stereotypes. For example, environmental cues indicating that stereotyped individuals belong in stereotyped domains (i.e., that women belong in math domains; e.g., Murphy et al., 2007) may lead to comparisons irrelevant to the negative stereotype. If women in a math-related domain are feeling like they do not or might not belong there, they may be more likely to compare themselves with men and women (i.e., on the stereotype-relevant dimension) when they are feeling competitive, leading them to underperform. However, if women are feeling like they belong in a math-related domain, competition may not necessarily lead them to engage in gender-based comparisons. Instead, if women truly feel that they belong in a domain in which they have traditionally been negatively stereotyped, they may be more likely to compare themselves with people who are not interested in that domain (e.g., people who are studying the humanities) when they are feeling competitive. These comparison targets would still differ from the self, but they would not evoke negative self-relevant stereotypes or negative performance expectations. By understanding what types of social comparisons competition will elicit, we can better tailor the types of interventions employed when we know competition may be the primary culprit in impaired performance due to stereotype threat.

In sum, our finding that competition plays a critical role in impairing performance through social comparison processes suggests the importance of future research to address the various factors that may make threatening group-based comparisons less accessible, thereby diminishing the likelihood that pervasive negative stereotypes will harm performance. Directly connecting competition and stereotype threat may help researchers to better understand when and how threat undermines negatively stereotyped individuals' performance, as well as illuminate additional strategies that can be used to combat the injurious effects of stereotype threat on performance.

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