Reports

The role of performance–avoidance goals and worry in mediating the relationship between stereotype threat and performance

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ABSTRACT

To understand the process underlying stereotype threat better, we developed and tested a model integrating the extant stereotype threat research with insights from achievement goal theory. The core tenet of this model is that stereotype threat impairs performance through performance–avoidance goal adoption and worry about one's performance. To test this model, women under stereotype threat and not under threat reported their test-related achievement goals before completing a difficult math test. In addition, participants reported their state test anxiety, including worry, immediately before or after completing the math test. Results revealed that performance–avoidance goals and worry mediated the effect of stereotype threat on performance. Contributions of this model to the stereotype threat literature are discussed.

Performance gaps between men and women in math (e.g., Hyde, Fennema, & Lamon, 1990) and Black and White students in academics (e.g., Steele, 1992) are well-documented. Several explanations have been offered to understand these gaps, ranging from genetically rooted explanations (e.g., Benbow & Stanley, 1983; Hernstein & Murray, 1994) to social structural ones (e.g., Frome & Eccles, 1998). Recent work in social psychology suggests that features of the testing situation may also contribute to these gaps. According to stereotype threat theory, women and minorities underperform on math and general academic tests, respectively, because of the concern that their poor performance may confirm culturally held stereotypes about their mathematical and intellectual abilities (Steele, 1997; Spencer, Steele, & Quinn, 1999). The societal implications of this work—that groups of people may not realize their full academic potential—has led social psychologists to devote a great deal of attention to identifying the moderators and mediators of stereotype threat.

Many moderators of stereotype threat have been identified. For example, an individual must be identified with the stereotyped group (e.g., Schmader, 2002) and the stereotyped domain (e.g., Aronson et al., 1999) to be most susceptible to stereotype threat. Other research revealed that stereotype threat effects emerged most strongly on tests that are believed to be diagnostic of ability in the stereotyped domain (e.g., Steele & Aronson, 1995) and difficult enough to create risk for confirming the stereotype (e.g., Spen-

cer et al., 1999). More recent work has uncovered a number of mediators explaining *why* stereotype threat impairs performance. For example, stereotype threat conditions are associated with deficits in cognitive capacity (Croizet et al., 2004; Schmader & Johns, 2003), increased anxiety (e.g., Osborne, 2001; Spencer et al., 1999), enhanced worry (Cadinu, Maass, Rosabianca, & Kiesner, 2005), and changes in self-regulatory behaviors (e.g., Seibt & Forster, 2004) which undermine performance. Only recently have attempts been made to integrate the individual mediators of stereotype threat into a stereotype threat *process* model (see Ryan & Ryan, 2005; Schmader, Johns, & Forbes, 2008; Smith, 2004); however, to date the mediators of stereotype threat have been tested only in isolation.

As such, the overarching goal of the present study is to articulate and empirically test a stereotype threat process model. We believe the development of such a model would be best achieved by integrating research exploring individual mediators of stereotype threat with insights gleaned from achievement goal theory (e.g., Dweck, 1986; Elliot & McGregor, 1999). We should note, however, that we are not the first to recognize the potential for achievement goal theory to inform the stereotype threat experience. For example, Smith (2004) proposed the Stereotyped Task Engagement Process (STEP) model, which demonstrated the importance of achievement goals in mediating expectancies about performance (Smith, 2006) and task interest (Smith, Sansone, & White, 2007) in the stereotype threat context. This work, however, did not provide evidence for achievement goals in mediating performance outcomes. In addition, although Ryan and Ryan (2005) proposed a model of stereotype threat from an achievement goal perspective, they offered no empirical support for their theoretical

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perspective. As such, the present analysis extends the Smith (2004) and Ryan and Ryan (2005) approaches as we provide the first empirical test of the mediating role of achievement goals and associated process variables on *performance* in the stereotype threat context. An empirical demonstration of this relationship is critical for underscoring the performance implications of achievement goals in the stereotype threat context. In what follows, we briefly review the achievement goal literature and how we believe it will contribute to a better understanding of the stereotype threat experience.

Achievement goal theory

Achievement goal theory (e.g., Dweck, 1986; Dweck & Leggett, 1988; Nicholls, 1979) was developed to predict motivation and performance in the classroom. A central issue in this literature is the extent to which different goal orientations facilitate or undermine performance and intrinsic motivation (e.g., Barron & Harackiewicz, 2001; Midgley, Kaplan, & Middleton, 2001). Researchers speculated that students could pursue a goal to learn and develop mastery for material or to demonstrate their ability (e.g., Dweck, 1986; Nicholls, 1979). Elliot and Harackiewicz (1996) developed measures of three achievement goals: *mastery goals* focused on developing competence or task mastery, *performance–approach goals* focused on demonstrating competence relative to others, and *performance–avoidance goals* focused on avoiding incompetence relative to others. In a classroom study, Elliot and Church (1997) found that mastery goals promoted intrinsic motivation, performance–approach goals promoted performance, and performance–avoidance goals undermined intrinsic motivation and performance.

To understand the process by which performance–avoidance goals undermine performance, Elliot and McGregor (1999) drew upon research on state test anxiety (TA). Two distinct components of state TA have been identified (e.g., Deffenbacher, 1980; Wine, 1980): *worry*, reflecting cognitive reactions to the testing situation (e.g., concern over performance), and *emotionality*, reflecting physiological and affective reactions (e.g., accelerated heart rate, nervousness). Research has revealed that worry undermines performance in testing situations—presumably because worry diverts attention from the task at hand—whereas emotionality does not (see Wine, 1980). Elliot and McGregor argued that an individual pursuing a performance–avoidance goal expects negative performance evaluation and likely failure. As such, pursuit of this goal is theorized to result in emotionality and worry. As the worry component undermines performance, Elliot and McGregor argued (and found) that worry accounts for the relationship between performance–avoidance goals and performance.

Model of stereotype threat

Integrating achievement goal theory and stereotype threat theory, we hypothesize that stereotype threat testing conditions lead to the situational adoption of performance–avoidance goals, as stereotype threat creates a concern about confirming the stereotype (i.e., performing poorly; see also Ryan & Ryan, 2005; Smith, 2004 for similar arguments). Drawing from Elliot and McGregor's (1999) work, we posit that performance–avoidance goals under threat undermine performance via the worry component of state TA. The aim of this study is to provide support for this model (see Fig. 1), in the context of women and math.

Although both avoidance motivation and state TA have been implicated as individual mediators of the stereotype threat process, they have yet to be linked theoretically. For example, using a regulatory focus framework, Seibt and Forster (2004) found that the activation of negative self-stereotypes induced a prevention focus, characterized by an avoidance motivation (see also Keller, 2007). This work, however, was neither considered in the context of achievement goal theory nor linked to research on state TA. In addition, although state TA has been an often explored mediator of stereotype threat (e.g., Spencer et al., 1999; Osborne, 2001), it has not been linked to achievement goal theory and only Cadinu and colleagues (2005) and Beilock, Rydell, and McConnell (2007) have isolated the worry component of state TA. Instead researchers typically confound the measurement of worry and emotionality (e.g., Spencer et al., 1999) or simply assess emotionality (e.g., Osborne, 2001). Thus, the use of these types of measures may mask the potential mediating role of worry, helping to account for the mixed results of state TA as a mediator of stereotype threat. By using separate measures of worry and emotionality and linking worry to achievement goal theory, we believe the present study will help to elucidate the psychological process underlying stereotype threat.

Study overview

In this study, women completed a math test under stereotype threat or no threat conditions. We used Schmader and Johns' (2003) stereotype threat manipulation in which participants under threat are told they are taking a test of *quantitative capacity*, whereas participants not under threat are told they are taking a test of *working memory capacity*. Participants completed a very challenging sample test item before completing an achievement goal questionnaire. As performance–avoidance, performance–approach, and mastery goals are often correlated (e.g., Elliot & Church, 1997), we included measures of all three goals to control for general performance concerns.

To assess state TA, following Elliot and McGregor's (1999) work, we used Morris, Davis, and Hutchings' (1981) worry and emotionality questionnaire. To determine when to assess state TA, we examined the extant research exploring anxiety as a mediator of stereotype threat. One strategy pursued in this literature is to measure state TA *before* the performance task (e.g., Spencer et al., 1999). However, it is possible that the act of reporting that they are anxious may contaminate participants' subsequent performance. Another strategy pursued in the literature is to measure state TA *after* the performance task (e.g., Osborne, 2001; Steele & Aronson, 1995). This approach, however, raises issues regarding: 1) causality, as it is possible that how an individual performed on the task could influence their anxiety, reversing the direction of the mediational chain; and 2) the accuracy of such recollections (see Nisbett & Wilson, 1977) as participants must retrospectively report how anxious they were at a previous point in time. While the timing of assessment of state TA does not systematically influence the significance of the tests of mediation, it is possible that neither approach yields the best results. To address this issue in the present study, participants completed this measure either *before* beginning or *after* completing the math test.

Threat Condition → Performance-avoidance goal → Worry → Performance

Figure 1. Proposed model.

Method

Design and participants

This study employed a 2 (Threat condition: Threat vs. No threat) × 2 (TA assessment: Before vs. After) between-participants design. 101 female introductory psychology students (94% White, 6% Asian American) participated in exchange for extra course credit. Because stereotype threat effects are strongest among those participants who are skilled in the stereotyped domain (Spencer et al., 1999), strongly group-identified (Schmader, 2002), and knowledgeable of the relevant stereotype (Schmader & Johns, 2003), we selected participants who possessed these qualities. Specifically, participants were selected if they scored at or above a 26 on the quantitative section of ACT (or SAT equivalent of 600), above the midpoint on a four item index reflecting the importance of gender to one's self-image (α = .76; e.g., ''Being a woman is an important reflection of who I am''; rated from 1 [strongly disagree] to 5 [strongly agree]), and at or above a 3 on the question ''Regardless of what you personally believe, do you think there is a stereotype about women having less mathematical ability than men?'' rated from 1 (not at all) to 7 (definitely). These variables were assessed during a mass testing session early in the semester.

Procedure

Eligible participants were contacted via email and invited to participate. One of four female experimenters, blind to participants' experimental condition, conducted each session. When participants arrived at the laboratory, they were informed that they would work on a randomly determined performance task.

The stereotype threat manipulation was presented on a computer screen and over headphones by a recorded male voice. Borrowing from Schmader and Johns (2003), participants in the no threat condition were told they would take a test ''designed to assess your natural memory ability, or as it is often called, your working memory capacity''. They were told some people were better able to do this than others and this test ''is a well-established measure of this ability''. In the stereotype threat condition, participants were told they would take a test ''designed to assess your natural mathematical ability, or as it is often called your quantitative capacity''. These participants were told some people were better able to do this than others and this test ''is a well-established measure of this ability''. They were also told there is ''evidence that gender differences in math performance on standardized tests might stem from underlying gender differences in quantitative capacity''. After the manipulation, participants answered a difficult sample test item and completed an achievement goals questionnaire. Half of the participants also completed the state TA measure at this time; the other half completed this measure after the math test.

Participants had 25 min to complete the math test. Each test item and five possible multiple-choice options appeared on the computer screen. Participants were provided with scratch paper to work out each problem; they made their final response on the computer keyboard. After completing the test, participants were probed for suspicion, fully debriefed, and awarded extra credit.

Measures

Achievement goals. An achievement goal questionnaire (adapted from Elliot & Church, 1997) assessed participants' endorsement of the three achievement goals. A sample performance–avoidance goal item is ''My goal is to avoid doing poorly on the test''; a sample performance–approach goal item is ''My goal on these problems is

to do better than most of the students in this study''; a sample mastery goal item is ''I want to master the material presented on this test''. Items were rated from 1 (not at all true of me) to 7 (very true of me), reverse scored as necessary, and averaged to create separate indices of performance–avoidance (α = .87, 6 items), performance–approach (α = .92, 5 items), and mastery (α = .62, 5 items) goal endorsement. An exploratory factor analysis on these items supported the three factor structure.[1]

State TA. To assess state TA, we used the Morris et al. (1981) scale. A sample worry item is ''I feel that I may not do as well on these problems as I could'' and a sample emotionality item is ''I am nervous''. Items were rated from 1 (does not describe my current condition) to 5 (describes my current condition very well). Worry (α = .87) and emotionality (α = .85) indices were formed by averaging participants' responses to the five items comprising each scale.

Math test. The primary dependent measure was a 20-item multiple-choice math test of word problems taken from the quantitative section of the GRE (from Schmader, 2002).

Results

Three participants had outlying math performance scores (+/- 3 standard deviations from the mean). We lost three participants' data due to equipment failure and we had incomplete data for one participant. We eliminated these seven participants from analyses; however, the pattern of results is identical when we include the 4 participants for whom we had some data.

Achievement goal endorsement

To examine the effects of threat condition and timing of assessment on achievement goal endorsement, we conducted a 2 (Threat condition: Threat vs. No threat) × 2 (TA assessment: Before vs. After) between-participants ANCOVA on each achievement goal index, controlling for the other achievement goal indices. Because the three achievement goal indices were highly correlated with each other (rs from .49 to .60), we thought it was important to control for the other achievement goals when examining the effects of threat condition and timing of assessment on each achievement goal.[2] Adjusted means and standard deviations are presented in Table 1.

Performance–avoidance goal. The analysis on the performance–avoidance goal revealed that both the performance–approach goal, $F(1,88) = 23.62$, $p < .001$, and the mastery goal, $F(1,88) = 7.43$, $p = .008$, were significant covariates. Consistent with expectations, participants under threat more strongly endorsed performance–avoidance goals as compared to those not under threat, $F(1,88) = 10.41$, $p = .002$, $d = -.47$. No other effects were significant, $ps > .16$.

Performance–approach goal. The analysis on the performance–approach goal revealed that both the performance–avoidance goal, $F(1,88) = 23.62$, $p < .001$, and the mastery goal, $F(1,88) = 14.03$, $p < .001$, were significant covariates. No other effects were significant, $ps > .19$.

Mastery goal. The analysis on the mastery goal revealed that the

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[1] The 16 items were included in a principle-components analysis with an oblimin rotation. This analysis revealed three factors with eigenvalues over 1.00; in addition, the scree plot was consistent with a three factor structure. Factor 1 accounted for 44% of the variance (eigenvalue = 7.03) and consisted of the five performance-approach goal items. Factor 2 accounted for 15% of the variance (eigenvalue = 2.40) and consisted of the six performance–avoidance goal items. Factor 3 accounted for 10% of the variance (eigenvalue = 1.59) and consisted of the five mastery goal items. All items loaded higher than .60 on their primary factor and less than .30 on the other two factors.

[2] The effects of threat condition and timing of assessment on achievement goals are identical when covariates are not included in these analyses.

performance–approach goal, $F(1,88) = 14.03$, $p < .001$, and the performance–avoidance goal, $F(1,88) = 7.43$, $p = .008$, were significant covariates. Participants under threat somewhat less strongly endorsed mastery goals compared to participants not under threat, $F(1,88) = 3.33$, $p = .07$, $d = .31$. No other effects were significant, $ps > .29$.

State TA

To examine the effects of threat condition and timing of assessment on state TA, we conducted a 2 (Threat condition: Threat vs. No threat) × 2 (TA assessment: Before vs. After) between-participants ANOVAs on the worry and emotionality indices separately.[3] Means and standard deviations are presented in Table 1.

Worry. As expected, participants under threat reported more worry as compared to those not under threat, $F(1,90) = 4.70$, $p = .03$, $d = -.42$. In addition, participants reported more worry if they completed the state TA measure after the test as compared to before the test, $F(1,90) = 34.37$, $p < .001$, $d = -1.03$. The threat condition × TA assessment interaction was non-significant, $F(1,90) = .03$, $p = .86$.

Emotionality. Participants reported more emotionality if they completed the state TA measure after the test as compared to before the test, $F(1,90) = 8.78$, $p = .004$, $d = -.61$. No other effects were significant, $ps > .26$.

Math test performance

To test the stereotype threat effect on performance, we conducted a 2 (Threat condition: Threat vs. No threat) × 2 (TA assessment: Before vs. After) between-participants ANOVA on number correct.[4] As expected, participants under threat answered fewer problems correctly as compared to those not under threat, $F(1,90) = 3.85$, $p = .05$, $d = .33$. In addition, participants who reported state TA before taking the test answered fewer problems correctly as compared to those who reported it after taking the test, $F(1,90) = 21.29$, $p < .001$, $d = -.84$. The threat condition × TA assessment interaction was not significant, $p = .99$. Means and standard deviations are presented in Table 1.

Mediational analyses

To test the proposed model that performance–avoidance goals under stereotype threat undermine performance via the worry component of state TA, we used structural equation modeling (SEM).[5] SEM is advantageous for two primary reasons. First, it provides a test of the model in one statistical analysis; and second, it provides fit statistics regarding how well the model fits the observed data.

Because TA assessment condition did not interact with threat condition in predicting any of the key variables in the model, we collapsed across this condition in following analysis. In addition, to consider the independent effects of performance–avoidance goals, we computed a residualized performance–avoidance goal index in which the variance accounted for by the performance–ap-

Table 1
Achievement goal indices, state TA, and performance as a function of threat condition and TA assessment

	No threat condition	Threat condition	
Achievement goals			
Perform–avoidance goal	$M = 4.08^a$ (1.08)	$M = 4.68^b$ (1.29)	
State TA before	$M = 4.31$ (1.03)	$M = 4.72$ (1.42)	$M = 4.51^1$ (1.23)
State TA after	$M = 3.86$ (1.15)	$M = 4.64$ (1.15)	$M = 4.25^1$ (1.17)
Performance–approach goal	$M = 4.24^a$ (1.17)	$M = 4.00^a$ (1.29)	
State TA before	$M = 4.09$ (1.03)	$M = 3.92$ (1.48)	$M = 4.00^1$ (1.25)
State TA after	$M = 4.39$ (1.30)	$M = 4.10$ (1.12)	$M = 4.25^1$ (1.20)
Mastery goal	$M = 5.02^a$ (0.72)	$M = 4.78^a$ (0.82)	
State TA before	$M = 4.92$ (0.86)	$M = 4.82$ (0.71)	$M = 4.87^1$ (0.78)
State TA after	$M = 5.12$ (0.53)	$M = 4.74$ (0.92)	$M = 4.93^1$ (0.76)
State TA			
Worry	$M = 2.51^a$ (0.82)	$M = 2.88^b$ (0.91)	
State TA before	$M = 2.10$ (0.56)	$M = 2.40$ (0.62)	$M = 2.24^1$ (0.60)
State TA after	$M = 2.97$ (0.82)	$M = 3.33$ (0.91)	$M = 3.15^2$ (0.88)
Emotionality	$M = 2.00^a$ (0.73)	$M = 2.18^a$ (0.71)	
State TA before	$M = 1.80$ (0.61)	$M = 1.95$ (0.63)	$M = 1.87^1$ (0.64)
State TA after	$M = 2.22$ (0.81)	$M = 2.39$ (0.73)	$M = 2.31^2$ (0.77)
Performance			
Number correct	$M = 6.94^a$ (2.93)	$M = 6.00^b$ (2.72)	
State TA before	$M = 5.76$ (2.22)	$M = 4.73$ (2.07)	$M = 5.28^1$ (2.19)
State TA after	$M = 8.22$ (3.10)	$M = 7.17$ (2.75)	$M = 7.68^2$ (2.94)

$N = 94$, row and column means with different superscripts are significantly different, $p < .05$.

proach and mastery goal were covaried out of the performance–avoidance goal. Thus, in this analysis, we are able to examine the independent effects of performance–avoidance goals controlling for performance–approach and mastery goals (see Table 2 for zero-order correlations among the key variables in this study).

In this SEM, we allowed each variable to predict only the subsequent variable in the model. Threat condition predicted residualized performance–avoidance goals, $\beta = .31$, $z = 3.15$, $p < .001$; residualized performance–avoidance goals predicted worry, $\beta = .39$, $z = 4.00$, $p < .001$; worry predicted performance, $\beta = -.33$, $z = -3.32$, $p < .001$, (see Fig. 2). This model provided an excellent fit to the data. The chi-square test was non-significant, $\chi^2(3, N = 94) = 5.01$, $p = .17$; the Root Mean Square Error of Approximation (RMSEA = .080) and Standardized Root Mean Square Residual (SRMR = .076) were very close to the .05 criterion, and the Comparative Fit (CFI = .96) and Goodness of Fit Indices (GFI = .97) were above the .95 criterion for good fit. Together these results suggest that performance–avoidance goals and worry mediated the relationship between stereotype threat and performance.

Discussion

By integrating the stereotype threat literature with research in achievement goal theory, we developed a model of the process underlying stereotype threat (see also Ryan & Ryan, 2005; Smith, 2004). The goal of this study was to provide support for the proposed model: stereotype threat impairs performance through the adoption of performance–avoidance goals and the experience of worry. Consistent with the proposed model, results revealed that stereotype threat testing conditions led to increased adoption of performance–avoidance goals, increased worry, and impaired performance as compared to no threat testing conditions. Further, an SEM was consistent with the proposed model, providing empirical support for the role of performance–avoidance goals and worry in mediating the stereotype threat effect in performance.

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[3] Although the worry and emotionality components of state TA are highly correlated ($r = .68$), we believe they are best considered as two distinct constructs. Our reasoning for this distinction is twofold. First, worry and emotionality have a long history of being conceptualized as distinct constructs (see Deffenbacher, 1980; Wine, 1980). Second, the theorized effects only emerged on worry—the component of state TA theorized to play an important role in the stereotype threat process.

[4] Analyses on accuracy yielded a similar pattern of results.

[5] In addition to using SEM, we tested the proposed theoretical model using a regression-based bootstrapping technique (see Preacher & Hayes, 2004) which also provided support for the mediating role of performance–avoidance goals and worry.

Table 2
Zero-order correlations among variables

	M	SD	1	2	3	4	5	6
1. Threat condition	−0.02	1.00	—					
2. Performance–avoidance goal	4.38	1.20	.201*	—				
3. Performance–approach goal	4.13	1.23	−.038	.600**	—			
4. Mastery goal	4.90	0.77	−.111	.498**	.589**	—		
5. Worry index	2.69	0.88	.212*	.432**	.178	.219*	—	
6. Emotionality index	2.09	0.73	.127	.416**	.333*	.285**	.679**	—
7. Overall performance	6.48	2.85	−.203*	−.188[t]	.054	.025	−.328**	−.159

$N = 94$, [t]$p = .07$, *$p < .05$, **$p < .01$.

$N = 94$ ** $p < .001$
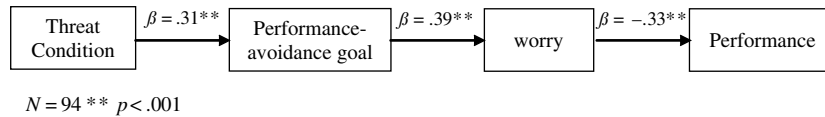
Figure 2. Full structural equation model.

We believe this study is noteworthy as it extends the stereotype threat literature in several important ways. First, the present work represents the first empirical demonstration of the mediating role of performance–avoidance goals on performance in the stereotype threat context. Second, this work represents the first replication of the Cadinu et al. (2005) finding that the worry component of state TA mediates the stereotype threat process. This replication is important given the conflicting findings regarding the role of anxiety in the stereotype threat context. Finally, although a number of recent review papers have proposed integrative models of stereotype threat (Ryan & Ryan, 2005; Schmader et al., 2008; Smith, 2004), this is the first study to provide empirical support for theoretically-based linkages among individual mediators of stereotype threat.

While our work underscores the importance of worry in the stereotype threat process, it also hints at a potentially complex and dynamic interplay between worry and performance. We suspect that worry initially hinders performance because worrying about one's performance diverts attention to the task at hand (e.g., Eysenck & Calvo, 1992). However, the subjective perception that one is not performing well provides just the type of negative feedback that would enhance worry. This enhanced worry may further divert attention from the task at hand, continuing to impair performance, and perhaps creating even more worry. This sequence of events suggests a cyclical relationship between worry and impaired performance. We suspect this type of analysis may help to account for the finding that participants in this study who were asked about their state TA after the test reported more worry as compared to those who were asked it before the test. Although empirical support for this type of reciprocal relationship between worry and performance would be difficult to document experimentally, it would be important for furthering our understanding of the stereotype threat process.

Several interesting findings emerged with respect to the timing of assessment of state TA. To date, only one research team (Marx & Stapel, 2006) has manipulated the timing of assessment of emotional state in the stereotype threat context. Marx and Stapel (2006) demonstrated that participants reported a different quality of affect as a function of when their emotional state was assessed—participants reported greater anxiety when their emotional state was assessed before the test, whereas greater frustration when reported after the test. However, Marx and Stapel found no performance differences as a function of the timing assessment of participants' emotional state. In the present study, when participants rated their state TA before the test, they performed significantly worse than if they rated their state TA after the test—a

difference of over 2.5 points! We speculate that being asked if they were nervous or worried may have triggered these responses in participants, leading to their impaired performance. Because we only assessed worry and emotionality, we could not explore if the quality of affect varied as a function of when these variables were assessed. However, these findings in conjunction with those of Marx and Stapel underscore the importance of being attentive to the timing of assessment of variables as their measurement may alter the psychological process being modeled.

Limitations and future directions

We should note some potential limitations of the present study. First, this study was conducted on female participants only. Although this approach to understanding mediation of stereotype threat effects has a precedent in the literature (e.g., Ben-Zeev, Fein, & Inzlicht, 2005; Cadinu et al., 2005), it would be useful to include men in future research, as examining achievement goals in the stereotype threat context is a relatively new theoretical integration. We suspect that men's endorsement of achievement goals and their effects on performance would not vary as a function of stereotype threat condition. This type of finding would be important for establishing that performance–avoidance goals and worry are heightened only among those individuals susceptible to stereotype threat—in this context, women (not men) performing a math test under stereotype threat conditions.

A related limitation of the present work is that we explored the proposed mediational chain only in the context of women performing a math test. Future research should explore the extent to which this process applies to other groups for which negative stereotypes exist. As women tend to engage in rumination (worry) more than men (e.g., Nolem-Hoeksema & Corte, 2004), it is possible that women may simply worry more than other groups susceptible to stereotype threat. Thus, in future work we are interested in exploring whether or not the proposed model applies equally well to other groups susceptible to the negative effects of stereotype threat (e.g., African American students in academics). It is possible, however, that the mediational process underlying stereotype threat might vary as a function of the group to which one belongs and the domain in which the group is negatively stereotyped (see Shapiro & Neuberg, 2007).

In future work, we hope to explore the link between worry and impaired performance. Drawing from Eysenck and Calvo's (1992) processing efficiency theory (and more recent attentional control theory [Eysenck, Derakshan, Santos, & Calvo, 2007]), we speculate that worry undermines performance through reduced working

memory resources. That is, when individuals worry about their performance, there are fewer working memory resources to devote to that performance. This proposed link between worry and performance fits nicely with existing research implicating deficits in the working memory system as an important mediator of stereotype threat (Beilock et al., 2007; Croizet et al., 2004; Schmader & Johns, 2003). Thus, we believe incorporating working memory deficits into the present model would help to elucidate the stereotype threat process.

Conclusion

By integrating mediators identified in the stereotype threat literature with insights from achievement goal theory, we developed a model articulating the process underlying stereotype threat (see also Ryan & Ryan, 2005; Smith, 2004). We believe providing empirical support for the theoretical integration of the stereotype threat and achievement goal literatures offers an important advance within the stereotype threat literature. Specifically, by providing evidence that performance–avoidance goals and worry serve as key mediators of the process underlying stereotype threat, researchers can work toward developing interventions that target these key process variables. The success of such interventions will allow well-prepared women to perform up to their ability and to excel in the traditionally male-dominated fields of math and science. Accordingly, we believe our work makes an important contribution to this field.

Acknowledgments

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