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Stereotype threat and stereotype endorsement: their joint influence on women's math performance

Menace du stéréotype et adhésion au stéréotype: leur influence conjointe sur la performance des femmes en mathématiques

*Virginie Bonnot**
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Abstract

Stereotypes may influence performance of stereotyped individuals by means of stereotype internalization and/or by means of stereotype threatening situations. The present study investigated the joint influence of those mechanisms on women's math performance, taking stereotype endorsement as a proxy for internalization. Results show that, congruent with our hypotheses, women's performance was lowest when they were led to endorse the stereotype that their group lacks math ability and they were placed in a stereotype threat situation. However, a more equalitarian environment resulted in women endorsing less their group stereotype and in a better math performance in an otherwise threatening situation.

Résumé

Les stéréotypes peuvent influencer la performance des individus stéréotypés par le biais de l'intériorisation de ces stéréotypes et/ou par le biais de situations de menace du stéréotype. L'étude présentée investigue l'influence conjointe de ces mécanismes sur la performance des femmes en mathématiques, en considérant l'adhésion au stéréotype comme indicateur de l'intériorisation. En accord avec nos hypothèses, les résultats montrent que la performance féminine est la plus faible lorsqu'elles sont amenées à adhérer au stéréotype selon lequel leur groupe manque de capacités mathématiques et qu'elles sont placées en situation de menace du stéréotype. Néanmoins, un environnement plus égalitaire conduit ces femmes à moins adhérer au stéréotype et à mieux réussir dans une situation par ailleurs menaçante.

Key-words
Stereotype threat, stereotype internalization, stereotype endorsement, gender, math performance

Mots-clés
Menace du stéréotype, intériorisation du stéréotype, adhésion au stéréotype, genre, performance mathématique

The research presented in this article is based on the doctoral dissertation presented by Virginie Bonnot under the supervision of Jean-Claude Croizet at the University Blaise Pascal at Clermont-Ferrand. It has been presented at the 15th General Meeting of the European Association of Experimental Social Psychology (Opatija, 10-14 juin 2008).

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Despite the closing gender gap in math achievement reached in some countries, Else-Quest, Hyde and Linn (2010) still found gender discrepancies in some others, such as France. Studies show that a considerable number of factors moderate the gender math performance gap: population's characteristics (i.e., age, general population vs. population selected for their high academic achievement or ethnicity), type of evaluation (i.e., standardized tests or grades), country considered, or historical evolution (e.g., Else-Quest et al., 2010; Hyde, Fennema, & Lamon, 1990). These variations in the gender gap cannot be accounted for by genetic and evolutionary explanations; they stress the role that culture plays in shaping group differences. Researchers in social psychology have proposed that social stereotypes, which portray women as less competent at math than men, constitute a key determinant in the social construction of the gap.

Stereotypes may impact women's math performance by means of their internalization of the stereotype and/or by means of situations inducing stereotype threat. This research intends to examine the joint influence of these two mechanisms, and to examine the conditions under which an evaluative situation might no more be perceived as a threat. We postulate that a situation where both internalization (in the form of high degree of stereotype endorsement) and stereotype threat are present is most deleterious for performance, while altering stereotype internalization, by leading women to lower their degree of stereotype endorsement, may buffer their performance in situations that could otherwise be perceived as threatening.

Stereotype internalization and stereotype endorsement

Traditionally, socialization theories propose that stereotype is internalized by women in the form of a distorted (i.e., low) perception of their math competence (e.g., Allport, 1954; Bourdieu, 1998; Eccles, 1994). The observed performance differences are no more considered as the expression of innate capabilities, but as the result of a social construction of self- and abilities- representations, in accordance with the stereotype (e.g., Allport, 1954; Clark & Clark, 1939). Indeed, the social context

within which a stigmatized individual lives is marked by accumulated pressures (at home, in the media or at school; e.g., Coltrane & Adams, 1997) to conform to stereotypes (e.g., Eccles, 1994; Fiske, 1998). This social devaluation ends up by being internalized (e.g., Eccles, 1994; Jost & Banaji, 1994). In the case of women in math, it takes the form of low group- and ultimately low self-perceptions of their math abilities. Once those self-conceptions are crystallised, cognitive performance is thought to be relatively stable from one context to another. Thus, gender becomes a sort of constant self-fulfilling prophecy (according to Crawford, Chaffin, & Fitton's, 1995, expression), which dooms women to invariably confirm the incompetence stereotype. The increased internalization of the stereotype would then explain the occurrence of the growing performance gap with age (e.g., Hyde et al., 1990), and different experiences in socialization would account for the sensitivity of the gap to social and cultural contexts (e.g., Byrnes, Hong, & Xing, 1997; OECD-PISA, 2004).

Math stereotype internalization may be defined as women's incorporation of beliefs concerning their social group's competencies into their self-concept of capacity, that is their evaluation of their competence in math (e.g., Eccles, 1994; Nosek, Banaji, & Greenwald, 2002). Bonnot and Croizet (2007) examined the relationship between stereotype endorsement, math self-concept and women's math performance after controlling for prior achievement. We demonstrated that the more female psychology students endorsed the belief that their group's math competence was lower compared to men's, the lower their own math self-perception was, and the lower their performance in statistic classes was. A similar link between stereotype endorsement and self-assessments of math abilities was obtained at an implicit level (Nosek et al., 2002). In other words, scientific evidence gives credit to the hypothesis of the internalization of math inability. Yet because of the correlational nature of most research on this issue (e.g., Bonnot & Croizet, 2007), the causal relationship between stereotype internalization and performance is not documented. Since internalization may refer to the process leading to stereotype endorsement and low self-concept of capacity, we focus in the present study on stereotype endorsement as a proxy for stereotype internalization. Thus, we wish to examine whether

moderating the degree to which women support the stereotype impacts their math performance.

Stereotype Threat

Social psychology has also recently documented that the impact of stereotypes on performance can follow a more contingent route. Indeed, numerous experiments have shown that gender behaviors are sensitive to the situations in which they are expressed (e.g., Sinclair, Huntsinger, Skorinko, & Hardin, 2005; Zanna & Park, 1975) and theoretical models have thus integrated the fact that behaviors of stigmatised individuals may be variable from one context to the other (e.g., Crocker, Major, & Steele, 1998; Deaux & Major, 1987; Monteil & Huguet, 1999). In this perspective, the stigmatised target is not conceptualized as a passive victim: he/she actively fights his/her stigma to resist its influence (Crocker et al., 1998; Link & Phelan, 2001; Steele, Spencer, & Aronson, 2002). In some situations however, resisting the stereotype can be costly enough to actually lead to its confirmation. Research on stereotype threat has widely documented this possibility. According to Steele (1997), when the situation leads individuals to fear the possibility to be judged based on the stereotype, stigmatized targets underperform (e.g., Spencer, Steele, & Quinn, 1999; Steele, 1997; Steele & Aronson, 1995). Ironically, research has shown that the populations that are more highly susceptible to stereotype threat effects are constituted by individuals at the vanguard of their group in terms of achievement in the stereotyped domain, that is, the ones the less likely to have internalized the stereotype (Steele, 1997). As such, most of the studies testing the stereotype threat hypothesis are based upon data from populations selected for their high math level or their high math identification (e.g., Aronson, Lustina, Keough, Steele, & Brown, 1999; Schmader & Johns, 2003; Spencer et al., 1999). Stereotype threat helps to understand why performance gaps are found on standardized test scores more than on grades (e.g., Hyde et al., 1990) and when highly selected populations are considered (i.e., gifted students or students who take university admission tests; e.g., PISA, 2004).

Thus, stereotype threat and stereotype internalization have been treated quite separately in the literature, to explain math underperformance for two different categories of women: those who internalized the stereotype, who are likely to underperform in math regardless of the situation, and those who did not but who may suffer from stereotype threat. However, we suspect that most women may be at risk of both stereotype internalization, taking the form of stereotype endorsement, and stereotype threat, with additive deleterious effects on performance. So far very little research has examined how stereotype endorsement and stereotype threat may jointly influence performance. One exception is a study by Schmader, Johns, and Barquissau (2004). They proposed that stereotype threat could affect math performance of women who endorse the stereotype because they would be concerned by the possibility of confirming their own beliefs about their social group's math incompetence. Results confirmed this hypothesis: women who highly endorsed the stereotype obtained lower performance when the situation was evaluative of their group's abilities than when the situation was evaluative of their personal abilities, whereas women who slightly endorsed the stereotype displayed the same performance in both conditions. In other words, people could experience drop in performance because the evaluative situation could trigger different concerns about confirming the stereotype (i.e., a fear of confirming others' stereotyped beliefs and/or their own beliefs). Shapiro and Neuberg (2007) recently proposed a multi-threat framework to account for apparent inconsistencies found in the stereotype threat literature and suggested that targets of stereotypes may indeed experience different threats. However, in Schmader et al.'s research, stereotype endorsement was measured as an individual difference variable.

The current study is aimed at extending these findings by demonstrating that situationally inducing higher stereotype endorsement can disrupt women's performance in stereotype threat situations. On the contrary, leading women to reject the stereotype, by exposure to an environment in which people do not hold the stereotype, may prevent the deleterious impact of stereotype threat on performance. To this end, psychology students were asked to take a statistical task presented either as non-evaluative

or as evaluative of individual's and group's abilities and were then led to endorse or not the stereotype concerning their group's math competences through presentation of egalitarian versus non-egalitarian in-group's (i.e., psychology students) norm (i.e., the stereotype is generally shared or not by psychology students). We expected that presentation of an egalitarian norm, leading to lower endorsement of the stereotype, would alleviate threat for women in a diagnostic condition compared to when they are led to endorse the stereotype. Consequently, performance for women experiencing both stereotype threat and momentary stereotype endorsement would be especially low relative to women's performance in the remaining conditions.

Method

Participants

Forty three first year female undergraduate students in psychology participated in this study in exchange for course credit.

Procedure

A female experimenter greeted the participants by groups of around 10 persons. She asked them to carefully read the instructions and to make sufficient efforts to complete the task. After participants had read the instructions and completed the first pages constituting the stereotype threat and stereotype endorsement manipulations, the experimenter stated that they would have 25 minutes to complete the statistical test, in any order they would choose, and without any calculator. After the task completion, participants were debriefed and thanked.

Material. The first page of the booklet stated the general purpose of the study, common to the different experimental groups. The study was supposed to be part of a research project ordered by the Organisation for Economic Co-operation and Development (OECD) and by the University. For this reason, they were asked to make real and sustained efforts during the whole experiment. They were then asked to give the first letters of their first and last names.

Stereotype threat manipulation was then introduced. In the diagnostic condition, participants could read that the purpose of the study was to evaluate psychology students' statistical level as well as to compare men's and women's level. In the non-diagnostic condition, participants could read that the purpose was to evaluate the exercises so as to verify they would not produce any gender bias.

The third page of the questionnaire introduced the stereotype endorsement manipulation. The second objective of the study was supposedly to evaluate and to estimate the evolution of students' beliefs concerning men and women's abilities discrepancy in mathematics. The stereotype endorsement manipulation was based upon the presentation of the psychology students' beliefs at the beginning of the year, inducing an egalitarian norm ("low endorsement" condition) or a non-egalitarian norm ("high endorsement" condition). Thus, participants in the "low endorsement" condition could read that students in general think there are no differences between women's and men's level in math, while in the "high endorsement condition" they could read that students in general think there is a slight difference favouring men. Afterwards, participants were invited to answer two items measuring their degree of stereotype endorsement ($r(43) = .64$, $p < .001$), and three items to measure their perception of math competence ($\alpha = .94$; e.g., *"Your math level is..."* from (1) *rather poor* to (7) *rather excellent*). Concerning the stereotype endorsement measure, items concerned the general domain of mathematics. They had to choose the option they most agreed with among five options. The first item was worded this way: (1) *"Males are much better at math than females"*; (2) *"Males are slightly better at math than females"*; (3) *"Males and females are equally good at math"*; (4) *"Females are slightly better at math than males"* and (5) *"Females are much better at math than males"*. The wording of the second item was as follow: *"Males are much more talented at math than females".*

The experimental manipulations were followed by the statistical task which was constituted of 15 multiple-choice questions, aggregated into 3 exercises. These exercises were drawn from the Graduate Record Examination (1994).

Results

The experiment followed a 2 (Task presentation: diagnostic *versus* non-diagnostic) x 2 (Stereotype endorsement: low *versus* high) between-subjects design.

Stereotype endorsement manipulation check

Results showed that our manipulation was successful in altering participants' stereotype endorsement scores. Indeed, participants were found to more strongly endorse the stereotype in the "high endorsement" condition (M = 2.45; SD = .52) than in the "low endorsement" condition (M = 2.80; SD = .52), $F(1, 39)$ = 4.72, p = .036, η^2 = .11. In fact, while participants in the "high endorsement" condition were highly endorsing the stereotype (compared to neutral value 3 meaning no gender difference, $t(22)$ = -5.01, $p < .001$), participants in the "low endorsement" stereotype did not (compared to neutral value 3, $t(19)$ = -1.71, *ns*).

For 39 students in our sample, a mass pre-screening taking place at the beginning of the academic year allowed us to collect previous stereotype endorsement scores. The items were the same as in the present study (α = .73) and participants generally endorsed the stereotype (M = 2.51; SD = .53, compared to neutral value 3, $t(38)$ = -5.72, $p < .001$). We obtained the same results when running the analysis while controlling for these scores, $F(1, 34)$ = 4.06, p = .052, η^2 = .10, suggesting even more strongly that our manipulation was successful.

Stereotype endorsement manipulation was also found to alter students' competence perceptions in math. Indeed, participants in the "low endorsement" condition tended to have higher math self-perceptions (M = 3.95; SD = 1.62) than participants in the "high endorsement" condition, (M = 3.14; SD = 1.25), $F(1, 39)$ = 3.28, p = .08, η^2 = .08. Again, controlling for previous stereotype endorsement level, results were the same, $F(1, 34)$ = 3.78, p = .06, η^2 = .10.

Number of correct answers

To precisely test our hypotheses, we conducted three focused contrasts. The first contrast examined whether women led to endorse the stereotype and placed in a diagnostic situation (M = 6.08) would experience a performance decrement compared to all the other participants. It was significant, $t(39) = 2.65$, $p = .012$ (effect size $r = .41$; see Figure 1). A second contrast purposely tested whether presenting an egalitarian environment (i.e., the condition in which women's stereotype endorsement was weaker) buffered performance against the negative impact of stereotype threat. Results showed that it was the case as women's performance in the diagnostic situation was marginally better in the low endorsement condition (M = 7.89) than in the high endorsement condition (M = 6.08), $t(39) = -1.93$, $p = .06$ (effect size $r = .31$). Finally, a third contrast revealed no significant difference in performance between the non diagnostic situations (M = 7.63 in the high endorsement condition; M = 8.45 in the low endorsement condition), $t(39) < 1$.

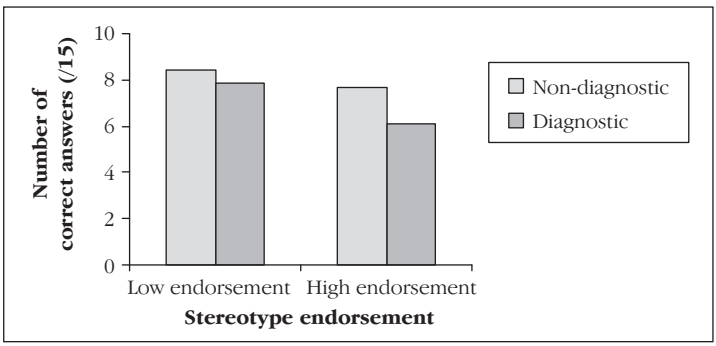

FIGURE 1:
Number of correct answers as a function of stereotype endorsement manipulation and task presentation.

Discussion

This study was designed to test, using a full experimental design, the hypothesized joint effect of stereotype endorsement and stereotype threat on women's math performance and whether leading women to reject the stereotype would buffer their performance in a stereotype threat situation. Consistent with the first hypothesis, results show that, compared to all the other conditions, women's math performance is lowest when the test

is characterized as diagnostic of math ability and when they are led to endorse their group stereotype. Moreover, consistent with the second hypothesis, inducing lower endorsement of the stereotype (and consequently higher self-perceptions of competence) allow performance to be restored in an otherwise threatening situation. Taken together, these findings also reveal that stereotype internalization may not have irreversible detrimental effects. Indeed, manipulating the degree to which women endorse the stereotype may counteract stereotype internalization long-term effects.

These results are of practical importance for female psychology students. Indeed, these students take mandatory statistics classes, a subject matter that they frequently dislike and in which they obtain poor results (e.g., Bonnot & Croizet, 2007; Onwuegbuzie & Wilson, 2003; Tremblay, Gardner, & Heipel, 2000). The current study used a statistical test as an index for math performance and confirmed that women may be at risk of both stereotype internalization and stereotype threat effects in that domain. However, certain methods exist to alleviate the self-evaluative implications of those situations (e.g., by activating learning compared to performance goals; e.g., Elliott & Dweck, 1988). Our results show that it is necessary to question the beliefs concerning women's and men's math abilities (Eccles, 1989). Indeed, women, in our studies (Bonnot & Croizet, 2007, and this study) as well as in others (e.g., Blanton, Christie, & Dye, 2002), generally endorsed the idea of a masculine superiority in mathematics.

Nevertheless, when the manipulation of the social norm led to decreased women's endorsement of the negative group stereotype, their math performance increased under conditions of stereotype threat. Thus, the presentation of a less sexist, more equalitarian, environment, by reconsidering the validity of gender gap in math, and consequently, by altering the applicability of the stereotype to psychology students, allowed to counteract stereotype threat effects induced by the diagnostic condition. Consequently, women in this condition achieved a better performance in an otherwise threatening situation. These results are in line with research showing that exposure to the stereotype threat theory (Johns, Schmader, & Martens, 2005) or exposure to a

successful woman (Marx & Roman, 2002) lessens stereotype threat effects. Still, it must be noted that, contrary to Marx and Roman's (2002) solution, we do not simply allow women to take some distance from the stereotype (and the group) through exposure to a role model who may be seen as an "exception to the rule", and who may stress individual strategies to overcome stereotypes' deleterious impact. Instead, we emphasize the collective strategy of seeing one's entire group, including oneself, as competent as anybody else in the stereotyped domain.

The fact that the stereotype, by means of its internalization and its impact in test situations, alters women's math performance is not without social consequences. Indeed, it allows for the reinforcement of the social structure as it is. By doing this, it actively contributes to the reproduction of women's math performance, and, beyond, to the reproduction of unequal social structures. Our results are in line with the system justification hypothesis which proposes that stereotypes function as essentialist instruments allowing justification and reinforcement of inequalities (Glick & Fiske, 2001; Jackman, 1994; Jost & Banaji, 1994; Tajfel, 1981; Yzerbyt, Rocher, & Schadron, 1997). The fact that women generally endorse the stereotype show that pressure of socialization is so efficacious that women themselves may sometimes contribute to their own devaluation and outgroup favoritism which may be explained by the need to rationalize their situation within the social structure (Jost & Banaji, 1994). Beyond the need to justify inequalities in a specific domain, it is the need to legitimize the whole social system that may be in part responsible for women's math performance conforming to the prescription of the stereotype. The large number of studies showing that stereotype threat effects may be found when threatening women's whole identity and not only their competence in a stereotyped domain indicate that it might be the case. For instance, showing sexist advertisements (Davies, Spencer, Quinn, & Gerhardstein, 2002), triggering female body image concerns (Kiefer, Sekaquaptewa, & Barczyk, 2006), or alleging that the test giver is sexist (Adams, Garcia, Purdie-Vaughns, & Steele, 2006) increase stereotype threat effects while listing similarities between the sexes overrides its deleterious impact (Rosenthal & Crisp, 2006). It would be particularly interesting to consider the way stereo-

types alleging the incompetence of certain groups become integrated in the need to justify unequal social relations (see Bonnot & Jost, 2010). We may hypothesize that the need to justify social hierarchies constitutes a necessary condition to the emergence of the effect of incompetence stereotypes on stigmatized group members' performance. The fact that we obtain similar performance in threatening and non-threatening situations when the existence of math level discrepancies between men and women is questioned supports this hypothesis. Acknowledging larger institutional influences, such as legitimization ideologies, on performance, may be particularly important to apprehend social dynamics at play in the social regulation of cognitive functioning.

References

Adams, G., Garcia, D. M., Purdie-Vaughns, V., & Steele, C. M. (2006). The detrimental effects of a suggestion of sexism in an instruction situation. *Journal of Experimental Social Psychology, 42*(5), 602-615.

Allport, G. W. (1954). Traits due to victimization. In G. W. Allport (Eds.), *The nature of prejudice* (pp. 142-162). Oxford, UK: Addison-Wesley.

Aronson, J., Lustina, M. J., Keough, K., Steele, C. M., & Brown, J. (1999). When white men can't do math: Necessary and sufficient factors in stereotype threat. *Journal of Experimental Social Psychology, 35*, 29-46.

Blanton, H., Christie, C., & Dye, M. (2002). Social identity versus reference frame comparisons: The moderating role of stereotype endorsement. *Journal of Experimental Social Psychology, 38,* 253-267.

Bonnot, V., & Croizet, J.-C. (2007). Stereotype internalization and women's math performance: The role of interference in working memory. *Journal of Experimental Social Psychology, 43,* 857-866.

Bonnot, V., & Jost, J. T. (2010). *Divergent effects of system justification salience on the academic self-assessments of men and women*. Unpublished manuscript.

Bourdieu, P. (1998). *La domination masculine*. Paris: Seuil.

Byrnes, J., Hong, L., & Xing, S. (1997). Gender differences on the math subtest of the Scholastic Aptitude Test may be culture-specific. *Educational Studies in Mathematics, 34*, 49-66.

Clark, K. B., & Clark, M. K. (1939). The development of consciousness of self and the emergence of racial identification in negro preschool children. *Journal of Social Psychology, 10,* 591-599.

Coltrane, S., & Adams, M. (1997). Work-family imagery and gender stereotypes: Television and the reproduction of difference. *Journal of Vocational Behavior, 50*(2), 323-347.

Crawford, M., Chaffin, R., & Fitton, L. (1995). Cognition in social context. *Learning and individual differences, 7,* 341-362.

Crocker, J., Major, B., & Steele, C. (1998). Social stigma. In S. Fiske, D. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (Vol. 2, pp. 504-553). Boston: McGraw Hill.

Davies, P. G., Spencer, S. J., Quinn, D. M., & Gerhardstein, R. (2002). Consuming images: How television commercials that elicit stereotype threat can restrain women academically and professionally. *Personality and Social Psychology Bulletin, 28,* 1615-1628.

Deaux, K., & Major, B. (1987). Putting gender into context: An interactive model of gender-related behavior. *Psychological Review, 94,* 369-389.

Eccles, J. S. (1989). Bringing young women to math and science. In M. Crawford, & M. E. Gentry (Eds.), *Gender and Thought: Psychological Perspectives* (pp. 36-58). New York: Springer-Verlag.

Eccles, J. S. (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly, 18,* 585–609.

Elliott, A. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54,* 5-12.

Else-Quest, N., Hyde, J., & Linn, M. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. *Psychological Bulletin*, *136*(1), 103-127.

Fiske, S. T. (1998). Stereotyping, prejudice, and discrimination. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.). *The handbook of social psychology* (pp. 357-411). New York: McGraw-Hill.

Glick, P., & Fiske, S. T. (2001). An ambivalent alliance. Hostile and benevolent sexism as complementary justifications for gender inequality. *American Psychologist, 56,* 109-118.

Graduate Record Examination (G.R.E.) (1994). *Practicing to take the general test (9th ed.)*. Princeton, NJ: Educational Testing Service.

Hyde, J. S., Fennema, E., & Lamon, S. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin, 107,* 139-155.

Jackman, M. R. (1994). *The velvet glove. Paternalism and conflict in gender, class, and race relations*. Berkeley, UC: University of California Press.

Johns, M., Schmader, T., & Martens, A. (2005). Knowing is half the battle. Teaching stereotype threat as a means of improving women's math performance. *Psychological Science, 16,* 175-179.

Jost, J. T., & Banaji, M. R. (1994). The role of stereotyping in system-justification and the production of false consciousness. *British Journal of Social Psychology, 33,* 1-27.

Kiefer, A., Sekaquaptewa, D., & Barczyk, A. (2006). When appearance concerns make women look bad: Solo status and body image concerns diminish women's academic performance. *Journal of Experimental Social Psychology, 42*(1), 78-86.

Link, B. G., & Phelan, J. C. (2001). Conceptualizing stigma. *Annual Review of Sociology, 27*, 363-385.

Marx, D. M., & Roman, J. S. (2002). Female role models: protecting women's math test performance. *Personality and Social Psychology Bulletin, 28,* 1183-1193.

Monteil, J. M., & Huguet, P. (1999). *Social context and cognitive performance: Toward a social psychology of cognition.* Hove, UK: Psychology Press.

Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Math = male, me = female, therefore math ≠ me. *Journal of Personality and Social Psychology, 83,* 44-59.

Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics Anxiety: Nature, etiology, antecedents, effects, and treatments - a comprehensive review of the literature. *Teaching in Higher Education, 8*(2), 195-210.

Organization for Economic Co-operation and Development, Program for International Student Assessment 2003 (OECD PISA) (2004). Retrieved March 24, 2005, from http://www.pisa.oecd.org/

Rosenthal, H. E. S., & Crisp, R. J. (2006). Reducing stereotype threat by blurring intergroup boundaries. *Personality and Social Psychology Bulletin, 32*(4), 501-511.

Sinclair, S., Huntsinger, J., Skorinko, J., & Hardin, C. D. (2005). Social tuning of the self: Consequences for the self-evaluations of stereotype targets. *Journal of Personality and Social Psychology, 89(2),* 160-175.

Schmader, T., & Johns, M. (2003). Converging evidence that stereotype threat reduces working memory capacity. *Journal of Personality and Social Psychology, 85*, 440-452.

Schmader, T., Johns, M., & Barquissau, M. (2004). The costs of accepting gender differences: The role of stereotype endorsement in women's experience in the math domain. *Sex Roles, 50,* 835-850.

Shapiro, J. R., & Neuberg, S. L. (2007). From stereotype threat to stereotype threats: Implications of a multi-threat framework for causes, moderators, mediators, consequences, and interventions. *Personality and Social Psychology Review, 11*, 107-130.

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35,* 4-28.

Steele, C. M. (1997). A threat in the air. How stereotypes shape intellectual identity and performance. *American Psychologist, 52,* 613-629.

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69,* 797-811.

Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image : The psychology of stereotype threat and social identity threat. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 34, pp. 379-440). San Diego, CA: Academic Press.

Tajfel, H. (1981). *Human Groups and Social Categories.* Cambridge, MA: Cambridge University Press.

Tremblay, P. F., Gardner, R. C., & Heipel, G. (2000). A model of the relationship among measures of affect, aptitude, and performance in introductory statistics. *Canadian Journal of Behavioural Science, 32*, 40-48.

Yzerbyt, V. Y., Rocher, S., & Schadron, G. (1997). Stereotypes as explanations: A subjective essentialistic view of group perception. In R. Spears, P. J. Oakes, N. Ellemers, & S. A. Haslam (Eds.), *The social psychology of stereotyping and group life* (pp. 20-49). Oxford, UK: Blackwell.

Zanna, M. P., & Park, S. J. (1975). On the self-fulfilling nature of apparent sex differences in behavior. *Journal of Experimental Social Psychology, 11*(6), 583-591.