CONSUMING IMAGES: HOW TELEVISION COMMERCIALS THAT ELICIT STEREOTYPE THREAT CAN RESTRAIN WOMEN ACADEMICALLY AND PROFESSIONALLY

by

Paul G. Davies

A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Psychology

Waterloo, Ontario, Canada, 2000

©Paul G. Davies, 2000

National Library of Canada
Acquisitions and Bibliographic Services
395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale du Canada
Acquisitions et services bibliographiques
395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-53990-3

Canada

The University of Waterloo requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

Consuming Images: How Television Commercials that Elicit Stereotype Threat can Restrain Women Academically and Professionally

Abstract

Women in traditionally masculine domains must deal with the shadow of doubt that accompanies stereotypes alleging a sex-based inability. The threat of being personally reduced to one of these negative gender stereotypes can evoke a disruptive apprehension among women—a situational predicament we call "stereotype threat." The risk of experiencing stereotype threat in traditionally masculine fields may lead women to avoid those stereotype-relevant domains in an attempt to cope with the self-evaluative threat they impose. Employing gender-stereotypic commercials to elicit the female stereotype, the present research examined the insidious effects that stereotype threat can have on women's achievement-related choices. A series of five studies demonstrated that exposure to stereotypic commercials persuades women to withdraw from domains that evoke stereotype threat, and seek domains in which they are immune to stereotype threat. Study 1 revealed that only those women exposed to the gender-stereotypic commercials avoided math items in favor of verbal items on a subsequent aptitude test. Viewing those commercials also led women in Study 2 to indicate diminished educational and vocational aspirations in quantitative domains, while indicating increased aspirations in verbal domains. Study 3 demonstrated the stifling effect that stereotype threat has on women's leadership aspirations—only women who viewed the gender-stereotypic commercials avoided leadership positions on an impending task. By making the leadership-

inability stereotype irrelevant to that impending task, which eliminated stereotype threat from the situation, Study 4 verified that women's interest in leadership could be restored even after they had viewed the stereotypic commercials. Finally, Study 5 established that varying the stereotype relevance of the leadership task moderated whether activation of the female stereotype mediated the noxious effects of those commercials on women's leadership aspirations.

Acknowledgments

First and foremost, I would like to thank my advisor, Steven Spencer, for his selfless guidance and support over the past three years. I am also grateful to the members of my dissertation committee, Ziva Kunda and Dov Cohen, for their insightful recommendations throughout this research. Finally, I wish to thank John Isaak, Michael Dahlin, and Josh Correll for their cherished friendship.

Dedication

For Leanne Isaak, the love of my life, who made this possible.

Table of Contents

Introduction....1

Study 1....14

Method....14

Participants and Design....14

Materials....15

Procedure....17

Results and Discussion....19

Attempts....19

Performance....20

Study 2....24

Method....24

Participants and Design....24

Materials....25

Procedure....25

Results and Discussion....26

Preferences....27

Study 3....29

Method....31

Participants and Design....31

Materials....31

Pretests....32

Procedure....33

Results and Discussion....33
Study 4....36
Method....36
Participants and Design....36
Materials....37
Procedure....37
Results and Discussion....38
Study 5....41
Method....41
Participants and Design....41
Materials....42
Procedure....43
Results and Discussion....44
Role Preference....44
Stereotype Activation....46
Mediation....47
Moderation of Mediation....48
General Discussion....51
References....58
Endnotes....64

List of Tables

Table 1. The 57 majors/careers and the 3 factors on which they load, items under each factor appear in descending order of factor loadings.....65

List of Illustrations

Figure 1. Math and Verbal Attempts as a Function of Gender and Commercial Type.....66

Figure 2. Math and Verbal Performance as a Function of Gender and Commercial Type.....67

Figure 3. Preference for Majors/Careers in Quantitative/Verbal Domains as a Function of Gender and Commercial Type.....68

Figure 4. Leader/Problem-Solver Preference as a Function of Gender and Commercial Type.....69

Figure 5. Leader/Problem-Solver Preference as a Function of Gender and Task Description Type.....70

Figure 6. Leader/Problem Solver Preference among Males as a Function of Commercial Type and Task Description Type.....71

Figure 7. Leader/Problem Solver Preference among Females as a Function of Commercial Type and Task Description Type.....72

Figure 8. Activation of the Female Stereotype as a Function of Gender and Commercial Type.....73

Figure 9. Level of Stereotype Activation among Women Mediates the Effect of Commercial Type on Role Preference.....74

Introduction

Living in our mass-media culture, it is inevitable that members of our society become acutely aware of negative stereotypes targeted at stigmatized groups. This is not meant to imply that most people in our society personally endorse those stereotypes; in fact, research has found no relationship between personal endorsement and knowledge of stereotypes (e.g., Devine, 1989). Unfortunately, stereotypes are so pervasive in our culture that the stigmatized have detailed knowledge of the negative accusations that specifically devalue their group's social identity. "African-Americans, for example, are likely to be well aware that stereotypes accuse them of being intellectually inferior and aggressive; and women are well aware that stereotypes accuse them of being emotional, bad at math, and lacking leadership aptitude" (Crocker, Major, & Steele, 1997, p. 518).

Compounding the problem, this detailed knowledge of the negative stereotypes linked to one's social identity can create a situational predicament for the stigmatized, particularly if those stereotypes provide a plausible explanation for their behavior in a given domain (Crocker et al., 1997; Steele, 1997). When members of a stigmatized group find themselves in a stereotype-relevant situation, the risk of being personally reduced to a negative stereotype can evoke a disruptive apprehension. Claude Steele and his colleagues have termed this situational predicament "stereotype threat" (Steele, 1997; Steele & Aronson, 1995; Spencer, Steele, & Quinn, 1999). Steele maintains that stereotype threat can cause enough distress and apprehension to interfere with an individual's performance and pleasure in any alleged stereotype-relevant domain (Steele, 1997). While susceptibility to stereotype threat requires targets to have specific knowledge of

negative stereotypes and the domains to which they apply, this situational predicament does not require targets to have any internal doubts about their ability, or their group's ability, in those domains (Steele, 1997). In fact, the effects of stereotype threat may be most acutely felt by those individuals who are invested and skilled in the targeted domain, or by those individuals who at least care about the social consequences of being judged incompetent in that domain (Aronson et al., 1999; Steele, 1997).

Imagine taking a difficult academic test that is at the upper limits of your ability. If you are a White male and you find yourself having difficulty, you may begin to worry about failing the test. If you are a Black male, however, any difficulty elicits a cloud of suspicion regarding the intellectual-inferiority stereotype. Therefore, struggling with the test becomes doubly threatening, as you begin to worry not only about failing the test, but also about failing your race by confirming a negative stereotype. This threat of being personally reduced to a negative stereotype can undermine the performance of stigmatized groups in any stereotype-relevant domain (Steele & Aronson, 1995). There is room for optimism, however. If this situational predicament is the root of underperformance, then eliminating the situational factors that give rise to stereotype threat should enable the stigmatized to perform to their full potential.

Steele and Aronson (1995) tested this promising notion by varying the degree of stereotype threat that Black students experienced during a difficult verbal test. As predicted, when participants were told the test was non-diagnostic of intellectual ability, thereby negating any threat of confirming the intellectual-inferiority stereotype, Black and White students performed equally well on the

difficult verbal test. When participants were told the test was diagnostic of intellectual ability, however, the well-documented gap in performance between Black and White students resurfaced. Employing an implicit measure of stereotype activation in a subsequent study, Steele and Aronson (1995) found that simply anticipating a diagnostic test activated the racial stereotype among Black participants. "Clearly the diagnostic instructions caused these participants to experience a strong apprehension, a distinct sense of stereotype threat" (Steele & Aronson, 1995, p. 805). The researchers then examined whether priming participants to think about their race would expose them to the detrimental effects of stereotype threat on a non-diagnostic test. Steele and Aronson (1995) confirmed that making race salient, which elicits a sense of being judged in terms of the racial stereotype, undermined the Black students' performance even on a non-diagnostic verbal test. Evidently, the primed racial stereotype evoked a cloud of suspicion that the intellectual-inferiority stereotype was somehow relevant to this academic situation.

The above research established that a specific psychological state is directly associated with stereotype threat—the cognitive activation of applicable stereotypes. It should be made clear, however, that stereotype activation does not necessitate stereotype threat. For stereotype activation to lead to stereotype threat, the target must be experiencing, or at least contemplating, a situation in which stereotypes allege a group-based inability. Thus, stereotype activation is necessary, but not sufficient, to evoke stereotype threat. For example, priming Black participants to think about their race prior to a test of artistic ability would result in stereotype activation, but not stereotype threat—since stereotypes do not

accuse Blacks of having inferior artistic ability. Replace the test of artistic ability with a test of academic ability, and you have a situation that has been shown to elicit stereotype threat (Steele & Aronson, 1995).

Susceptibility to stereotype threat, however, is not limited to Blacks in academic settings. Members of any stigmatized group are susceptible to stereotype threat when they risk fulfilling, or being judged by, a negative stereotype that provides a plausible explanation for their behavior in a given domain (Aronson, Quinn, & Spencer, 1998; Crocker et al., 1997, Croizet & Claire, 1998; Spencer et al., 1999; Steele, 1997). Since susceptibility to this predicament requires a detailed knowledge of pertinent stereotypes, researchers maintain that stereotype threat derives from the broad dissemination of cultural stereotypes in our society (e.g., Spencer et al., 1999; Steele, 1997). Cultural stereotypes are prevailing attitudes about the attributes of stigmatized groups that are conveyed through societal-level images such as those broadcast by the mass media (Ashmore, Del Boca, & Wohlers, 1986). For example, cultural stereotypes regarding gender-related attributes have historically questioned women's abilities to succeed in any traditionally masculine domain. Therefore, women are susceptible to stereotype threat in any domain that cultural stereotypes target as being inherently masculine.

> Do you know of anything that is practiced by human beings in which the class of men doesn't excel that of women? Or shall we draw it out at length by speaking of weaving and the care of baked and boiled dishes—just those activities on which the reputation of the female sex is based and where its defeat is most ridiculous of all?
>
> Socrates (cited in Bloom, 1968)

> They just don't know how to act with women students. They don't know what to do with you. Their whole attitude, and facial expressions and body language says, "You belong in the kitchen. What are you doing here?" . . . There's a perceived threat that feeds male anger about bright women. People tell jokes that are negative to women, which just fuels it. And it encourages the women to pull back into safer ground—to choose more traditional majors, or to adopt a more neutral style—as a way of protecting themselves from that anger.
>
> Female science majors (cited in Seymour & Hewitt, 1997)

Judging from the above quotes, beliefs about the nature of masculinity and femininity have remained alarmingly stable over the past 25 centuries. Further support for this notion is found in research revealing that cultural stereotypes regarding the attributes of men and women are particularly resistance to change (e.g., Bergen & Williams, 1991; Leuptow, Garovich, & Leuptow, 1995). Raised in a mass-media culture saturated with stereotypic images, even 3-year-old girls in our society have knowledge of gender stereotypes (Best et al., 1977). Considering all of the above, it should come as no surprise that there is broad consensus in our society regarding the attributes of men and women (Broverman, Vogel, Broverman, Clarkson, Rosenkrantz, 1972). Across sex, age, and educational level, members of our society list the following items as characteristic of the average adult woman: emotional, gentle, subjective, easily influenced, passive, dependent, illogical, excitable in minor crises, unable to separate feelings from ideas, difficulty making decisions, dislike of math and science, not skilled in business, rarely act as a leader, etc. (Broverman et al., 1972).

One factor that may play a critical role in the perpetuation of these gender stereotypes is the mass media's persistent dissemination of stereotypic images. For

example, although the explicit messages contained in television commercials are intended to sell products, the implicit gender stereotyping contained in those media images could have more global effects on the viewers' perceptions, beliefs, and attitudes (Pollay, 1986). As numerous researchers have chronicled, males in advertisements are generally portrayed as being powerful, assertive, authorities, experts, and leaders; in sharp contrast, women are portrayed as being weak, emotional, passive, consumers, and subordinates (e.g., Goffman, 1976; Lovdal, 1989). Few people would contest the notion that the mass media continues to broadcast gender-stereotypic images; however, the debate gets heated when discussing the potential effects of those images on consumers. But considering that the average American watches over 35 hours of television a week, which translates into more than 37,000 commercials consumed per year, it is safe to conclude that television commercials are, at the very least, a ubiquitous source of cultural information (Bretl & Cantor, 1988).

Researchers have expressed grave concern over the implications of a steady diet of gender-stereotypic media images. For example, Lynn Lovdal (1989) argues that exposure to television commercials reinforces sex-role stereotypes. Correspondingly, Lavine, Sweeney, and Wagner (1999) suggest that commercials are a highly pervasive medium within which gender stereotypes can be formed, strengthened, and activated. And according to Elliot Aronson (1999), exposure to the mass media leads consumers to conclude that all women "prefer the laundry room to the boardroom"(p. 331). Considering this widespread concern, there has been remarkably little experimental research conducted on the consequences of exposure to gender-stereotypic media images. Numerous correlational studies,

however, have documented the potential effects of heavy television consumption. For example, Gerbner and his colleagues (1993) found that individuals who watch a great deal of television, compared to light viewers, believe that women have limited abilities and interests compared to men. These researchers also found that heavy viewers expressed more stereotypic views regarding what professions are best suited for women. Even more damning, a naturalistic experiment found that after television was introduced to a small community, the children's attitudes became more gender stereotypic—mirroring those of children raised on television (Kimball, 1986).

Geis, Brown, Jennings, and Porter (1984) conducted more rigorous experiments that focused on the target's perspective of this value-laden reality transmitted by the mass media. Specifically, the researchers examined whether gender-stereotypic television commercials could inhibit women's achievement aspirations. They exposed female undergraduates to replicas of gender-stereotypic commercials, or to replicas that reversed the gender roles. So the stereotypic commercials portrayed dominant men and submissive women, whereas the reversed-role commercials portrayed dominant women and submissive men. Geis and her colleagues found that women exposed to the stereotypic ads indicated fewer career aspirations than women exposed to the counter-stereotypic ads. The researchers concluded that implicit sex stereotyping contained in television commercials can serve as an achievement script, which can inhibit the aspirations of women.

Geis and her colleagues were the first researchers to confirm that exposure to gender-stereotypic images can directly affect women's achievement aspirations

(e.g., Geis et al, 1984; Jennings, Geis, & Brown, 1980). In the years since their research, gender roles have continued to blur, yet there remains an unmistakable gender divide in achievement-related choices (Stangor & Sechrist, 1998). For example, a striking and persistent gender disparity is found in the selection of college majors. Women, including those who are equally skilled and experienced in high school mathematics as their male counterparts, still avoid majors involving moderate to high levels of math (Lefevre, Kulak, & Heymans, 1992). Lefevre and her colleagues (1992) found that among these equally gifted students only 19% of females reported taking majors that involved even a moderate level of mathematics (e.g., architecture, business, and economics), while 43% of males reported taking majors in these domains. This gender divide was magnified when the researchers focused on majors considered high in math content (e.g., computer science, engineering, and mathematics), in which men are four and a half times more likely than women to pursue majors. Exacerbating this problem, the college dropout rate for women is two and a half times that of men in the physical sciences, engineering, and mathematics (Hewitt & Seymour, 1991).

These striking gender differences extend beyond the classroom to the workplace, where disproportionate numbers of men and women enter careers in quantitative fields (Eccles, 1994; Fitzgerald & Crites, 1980; Stangor & Sechrist, 1998). Even though there has been a major increase in the participation of women in the general workforce, some traditionally masculine domains (e.g., engineering and physics) have seen no significant increase in women's participation over the past 50 years (Culotta & Gibbons, 1992). These gender differences in career selection are most pronounced in the fields of math, engineering, and the physical

sciences; in which women only occupy 10% of the jobs and earn just 75% of what their male counterparts earn (Crocker et al., 1997; Hewitt & Seymour, 1991; Seymour & Hewitt, 1997).

Regardless of the field, the situation is even more dismal for women striving for leadership roles. Ragins and Sundstrom (1989) concluded that the path to power for women in our culture contains numerous impediments and barriers, characterized by the researchers as an obstacle course. Moreover, Morrison and Von Glinow (1990) made it clear that women in our society still encounter a glass ceiling that limits their access to leadership positions. This glass ceiling is an invisible barrier of discrimination that restricts women's access to elite leadership roles. For example, women hold only 4% of all higher-level leadership positions in Fortune 500 companies, and a measly 0.6% of CEO positions (Catalyst, 1998). This despite the fact that numerous researchers have shown that there are no pervasive sex differences in leadership effectiveness (e.g., Hollander, 1992; Powell, 1993). Eagly, Karau, and Makhijani (1995) conducted a meta-analysis of 96 studies comparing the leadership effectiveness of men and women, which, when aggregated over all the studies, revealed no gender differences in effectiveness. So despite all the hurdles they must face, women who achieve leadership positions perform just as well as their male counterparts (Eagly et al., 1995).

This link between cultural stereotypes and the gender divide in achievement-related choices is obviously multi-determined, which is reflected in the complexity of the models that have proposed links between the two (e.g., Eagly, 1987; Eccles, 1994). Discussing all the possible mediating variables between gender stereotypes and achievement-related choices is well beyond the scope of

this paper. Therefore, while acknowledging the complexity of the relationship, we will focus on the role that stereotype threat plays in maintaining and exacerbating this gender divide. We propose that women in traditionally masculine domains must deal with a shadow of doubt that accompanies cultural stereotypes alleging a sex-based inability. Apprehension over potentially confirming these negative gender stereotypes can hinder women's performance, enjoyment, and aspirations in any traditionally masculine domain (Crocker et al., 1997; Spencer et al., 1999; Steele, 1997).

Naturally, if stereotype threat is responsible for the underperformance of women in traditionally masculine domains, removing stereotype threat from those situations should eliminate women's performance deficit. Spencer, Steele, and Quinn (1999) directly tested this hypothesis by manipulating the level of stereotype threat that their female participants experienced during a difficult math test. Half the participants were told the math test had revealed no gender differences in the past, which nullified any threat of confirming the math-inferiority stereotype. While participants in the control condition were provided with no information about the relative past performance of men and women on the test. Replicating the well-documented gender gap in math performance, women in the control condition underperformed compared to men. In the no-gender-difference condition, however, the women's performance deficit was completely eliminated. That is, women and men performed equally well on the difficult math test. This research by Spencer and his colleagues provides compelling evidence that women's performance in traditionally masculine

domains can be significantly improved by removing stereotype threat from the situation.

We have recently extended this line of research by subtly manipulating stereotype threat through exposure to gender-stereotypic television commercials (Spencer, Quinn, Davies, & Gerhardstein, under review). Since stereotype threat stems from the broad dissemination of cultural stereotypes, it seemed fitting to employ actual media images to help create this situational predicament in the laboratory. Prior to taking a non-diagnostic math test, which is normally a non-threatening situation for women (Spencer et al., under review), participants were exposed to either gender-stereotypic or counter-stereotypic television commercials. Replicating our previous findings (Spencer et al., under review), only women exposed to the gender-stereotypic commercials underperformed relative to men on the non-diagnostic math test. As measured by a lexical decision task, exposure to the gender-stereotypic ads resulted in the activation of the female stereotype among participants. More importantly, that level of stereotype activation among the female participants mediated the performance-inhibiting effect of those commercials (Spencer et al., under review). This research provides direct evidence that exposure to gender-stereotypic commercials can elicit stereotype threat among women in previously non-threatening situations, and consequently undermine their performance in those domains.

It is disturbing that these studies involving stereotype threat consistently show that women, who risk being personally reduced to a negative stereotype, underperform on math tests compared to similarly qualified men. Even more troubling, we suspect that trying to avoid this situational predicament can lead to

more far-reaching consequences than just performance deficits. The risk of experiencing stereotype threat in traditionally masculine domains may lead women to avoid those fields in an attempt to cope with the self-evaluative threat they impose (Aronson et al., 1998; Major, Spencer, Schmader, Wolfe, & Crocker, 1998). Consequently, stereotype threat may govern women's achievement aspirations. As Stangor and Sechrist (1998) suggest, individuals make achievement-related choices "on the basis of their perceptions about their likely success in a domain, the extent to which the domain seems appropriate and interesting to them, as well as the perceived likelihood of being stereotyped by others in the domain" (p.106).

In a series of five studies, the present research investigates whether stereotype threat can influence women's achievement-related choices. The assumption underlying all five studies is that stereotype threat can lead women to withdraw from traditionally masculine domains, while seeking domains in which they do not risk being personally reduced to a negative stereotype. Throughout this research, gender-stereotypic commercials will be employed to elicit the female stereotype, which should remind women of the risk of being negatively stereotyped in traditionally masculine domains. Therefore, after viewing the gender-stereotypic commercials, women are expected to avoid domains that are susceptible to stereotype threat, and seek domains that are immune to stereotype threat. For example, we predict that exposure to gender-stereotypic commercials prior to a difficult non-diagnostic aptitude test will induce women to avoid math items in favor of verbal items. As Steele (1997) succinctly put it, "women may reduce their stereotype threat substantially by moving across the hall from math

to English class" (p. 618). Women exposed to gender-stereotypic commercials are also expected to subsequently indicate less interest in educational and vocational options in which they risk being negatively stereotyped, while indicating more interest in non-threatening options. Finally, we also assume that situational pressures can persuade women to avoid traditionally masculine leadership roles in favor of subordinate roles—where they are safe from the noxious effects of stereotype threat.

Study 1

The goal of our first study was to explore whether stereotype threat could lead women to avoid the domain of math, while seeking a domain that is immune to stereotype threat. Since cultural stereotypes do not accuse women of having inferior verbal skills, women in verbal domains do not risk being personally reduced to a negative stereotype. Therefore, we decided to examine whether stereotype threat could persuade women to leave quantitative domains in favor of verbal domains, which required that we partially replicate our previous research. Spencer, Quinn, Davies, and Gerhardstein (under review) discovered that exposure to gender-stereotypic commercials, which prime the female stereotype, evokes stereotype threat among women taking a non-diagnostic math test. Consequently, we hypothesized that exposure to gender-stereotypic commercials would induce women taking a non-diagnostic aptitude test to avoid math items in favor of verbal items. With gender stereotypes made salient by the commercials, we assumed women would avoid the math items in an attempt to cope with the self-evaluative threat they now imposed. Of secondary interest, we also expected to replicate our previous finding that only women experiencing stereotype threat underperform in the domain of math.

Method

Participants and Design

Participants were 67 undergraduates (33 men, 34 women) at the University of Waterloo, who participated for credit in an introductory psychology class. On a mass testing questionnaire, administered earlier in the term, selected participants indicated that they strongly agreed with both of the following statements: 1) I am

good at math, and 2) It is important to me that I am good at math. As mentioned earlier, the effects of stereotype threat may be most acutely felt by those individuals who are skilled in the domain, or at least care about the stigma of being labeled incompetent in that domain (Aronson et al., 1999; Steele, 1997). Approximately equal numbers of men and women were randomly assigned to the 2 X 2 X 2 mixed-model design, which had two between–participants factors (gender and commercial type) and one within-participants factor (question type). The primary dependent variable was relative number of verbal and math items attempted, and the secondary dependent variable was relative performance on the verbal and math portions of the aptitude test.

It should be noted that participants were recruited for both Study 1 and Study 2 from the same subject pool at the University of Waterloo, a highly selective school known for its math, engineering, and science programs. In fact, mathematics, engineering, and computer science are the three most popular majors at the University of Waterloo. As characterized by the staff of The Yale Daily News: "Often termed the MIT of the North, first and foremost, Waterloo is a serious, technologically oriented university" (Fogg, 1991, p. 722). Considering the above, it is not surprising that over 80 percent of the male and female students who completed the mass testing questionnaire indicated that they were good at math, and that being good at math was important to them.

Materials

The 24 verbal and 24 math questions contained in the aptitude test were compiled from several previous versions of the GRE General Test (Educational Testing Service, 1992). Only questions with an Educational Testing Service (ETS)

correct response rate ranging from 20 to 70 percent were selected for the aptitude test, which guaranteed that the participants would find the test sufficiently difficult. To ensure that the verbal questions were no more appealing than the math questions, the verbal portion of the exam was constructed to be slightly more difficult than the math portion. The mean ETS correct response rate was 47% for the verbal portion and 52% for the math portion. The test was composed of four verbal sections and four math sections, each consisting of six questions. The math and verbal sections were alternated, and which came first was counter-balanced.

All six television commercials employed in this study aired during December, 1998. The four advertisements viewed in the neutral-commercial condition do not advertise any gender-stereotypic products or companies, nor are any humans depicted in the commercials. The products and companies advertised in these commercials include a cellular phone, a gas station, a pharmacy, and finally an insurance company. The set of advertisements viewed in the stereotypic-commercial condition, included the same four neutral commercials intermixed with two additional gender-stereotypic commercials. One of the stereotypic commercials portrays a young woman who is so excited about being a consumer of a new acne product that she bounces on her bed with joy. The other portrays a male college administrator interviewing a potential female student who conveys that her primary aspiration in college is to meet "cute guys." In should be noted that neither of the gender-stereotypic commercials make any reference to alleged gender differences in math ability, leadership aptitude, or major/career selection.

Procedure

Prior to the participants reporting to the laboratory, the female experimenter randomly chose one of two unmarked videos for the upcoming session. One video contained the neutral set of commercials, and the other contained the stereotypic set of commercials. The experimenter ran the participants in mixed-gender groups ranging in size from two to five people. As the participants arrived, they were informed that the experimenter was interested in testing their long-term memory of details contained in television commercials. Ostensibly to achieve this goal, the experimenter asked the participants to watch a short video consisting of several commercials. We have found in previous research that this cover story ensures that participants pay close attention while viewing the commercials. The experimenter then turned on the television, cued the previously selected video on the VCR, and left the room. The first 10 seconds of both videos revealed only a blue screen, providing ample time for the experimenter to vacate the room prior to the start of the commercials. When the experimenter returned to the laboratory after the allotted 3 minutes, the commercials were finished and both videos again revealed only a blue-screen. This design enabled the experimenter to remain blind to the participants' condition throughout the study.

Upon her return to the laboratory, the experimenter informed the participants that approximately 20 minutes had to elapse before their long-term memory of the commercials could be accurately tested. The experimenter told the participants that rather than having them waste their time on a filler task, she would appreciate them volunteering to participate in the creation of a new

standardized test being developed at the University of Waterloo. They were informed that this research was just beginning and the developers were trying to determine which questions should be included in future versions of the test. The participants were also explicitly told that the current version of the test was non-diagnostic of ability. The non-diagnostic instructions should negate any threat of confirming the math-inferiority stereotype among women in the neutral-commercial condition (Spencer et al., under review). For women in the stereotypic-commercial condition, however, exposure to the commercials should elicit the female stereotype and evoke a sense of being judged in terms of that negative gender stereotype.

All participants volunteered to take the test. Prior to starting, the participants were instructed to carefully read the test's coversheet, which explained the composition of the test and informed the participants that they had 20 minutes to attempt as many questions as possible. The coversheet also indicated that the standard ETS scoring formula would be employed for the test; correct items receive 1 point, incorrect items receive 1/5 point deduction, and items left blank receive neither points nor deductions. The final instructions read by the participants were as follows:

> To accurately evaluate this problem set, we need to know which questions you worked on, and which questions you skipped. So if you work on a problem, but decide not to answer it, please put a checkmark next to that item. Having a record of the items not attempted by students (i.e., no checkmark or answer) will provide us with extremely helpful information when determining which questions should be included in future versions of this test.

After the participants had worked on the test for the allocated 20 minutes, the tests were collected and the participants were thoroughly debriefed and thanked for their participation.

Results and Discussion

The relative number of math and verbal items attempted by women in the neutral-commercial condition was expected to be similar to that of men in either condition. Whereas, women exposed to the gender-stereotypic commercials were expected to avoid the math items in favor of the verbal items. Secondarily, we also expected that women in the stereotypic-commercial condition would replicate our previous findings by underperforming on the math portion of the aptitude test. To test these predictions two separate dependent variables were required: 1) the relative number of math and verbal items attempted (i.e., checkmark or answer), and 2) the performance score calculated using the standard ETS scoring formula. We will begin by analyzing the attempt data.

Attempts

We hypothesized that our math-invested participants would naturally attempt more math items than verbal items on the aptitude test. In comparison, women exposed to the gender-stereotypic commercials were expected to avoid the math questions in favor of the verbal questions. A three-way ANOVA (Gender X Commercial Type X Question Type) on the number of items attempted revealed the predicted main effect for question type, F (1, 63) = 4.40, $p < .05$, revealing the participants' natural tendency to attempt more math than verbal questions on an aptitude test. That main effect, however, was qualified by a marginal two-way interaction between commercial type and question type, F (1, 63) = 3.65, $p = .057$,

which in turn was qualified by a significant three-way interaction between gender, commercial type, and question type, F (1, 63) = 6.43, p = .01.

We expected men's behavior not to be influenced by our commercial-type manipulation; therefore, we broke down the above triple interaction by gender, and separately analyzed the data for our male and female participants. Examining the men's data, a two-way ANOVA (Commercial Type X Question Type) on the number of items attempted revealed only the predicted main effect for question type, F (1, 63) = 6.63, p = .01. That is, regardless of condition, men attempted significantly more math questions than verbal questions. In contrast, a two-way ANOVA (Commercial Type X Question Type) on the number of items attempted by women revealed only the predicted two-way interaction between commercial type and question type, F (1, 63) = 10.04, p < .01.

Simple-effect tests on the females' data revealed that women exposed to neutral commercials, like men in either condition, attempted significantly more math than verbal questions, F (1, 63) = 6.28, p = .01. Whereas women exposed to gender-stereotypic commercials revealed the exact opposite pattern of results, attempting significantly more verbal than math questions, F (1, 63) = 3.90, p < .05. Additional simple-effect tests indicated that women in the stereotypic-commercial condition attempted marginally fewer math questions, F (1, 63) = 3.01, p = .08, but more verbal questions, F (1, 63) = 3.95, p < .05, than women in the neutral-commercial condition (see Figure 1).

Performance

Since all the participants selected for this study were highly invested in the domain of math, we expected their math performance on the aptitude test would

naturally be stronger than their verbal performance. Based on our previous research (Spencer et al., under review), however, we predicted that women in the stereotypic-commercial condition would underperform on the math portion of the test. A three-way ANOVA (Gender X Commercial Type X Question Type) on the performance data revealed a main effect for question type, F (1, 63) = 61.98, p < .001. This main effect verified that the participants' math performance on average was indeed stronger than their verbal performance. But this main effect was qualified by a significant two-way interaction between gender and question type, F (1, 63) = 8.11, p < .01, which in turn was qualified by a significant three-way interaction between gender, commercial type, and question type, F (1, 63) = 6.91, p =.01.

Once again, we broke down this triple interaction by gender, and separately analyzed the performance data for our male and female participants. A two-way ANOVA (Commercial Type X Question Type) on the men's performance data revealed only the predicted main effect for question type, F (1, 63) = 56.59, p < .001. That is, regardless of condition, men did significantly better on the math portion of the aptitude test than on the verbal portion. Turning to the women's data, a two-way ANOVA (Commercial Type X Question Type) on the performance data also revealed a main effect for question type, F (1, 63) = 12.82, p < .001, but that main effect was qualified by a significant two-way interaction between commercial type and question type, F (1, 63) = 9.09, p < .01.

Simple-effect tests on the women's performance data revealed that women exposed to the neutral commercials, like men in either condition, did significantly better on the math portion of the exam than the verbal portion, F (1, 63) = 21.75,

$p<.001$. Exposure to the gender-stereotypic commercials, however, completely eliminated this math bias, $F < 1$. Further simple-effect tests confirmed that women in the stereotypic-commercial condition underperformed on the math portion of the test compared to women in the neutral-commercial condition, $F(1, 63) = 7.02$, $p < .01$. No performance differences were found on the verbal portion of the exam; thus, the significant increase in verbal attempts by women exposed to the gender-stereotypic commercials did not translate into a significant increase in verbal performance (see Figure 2). It should be noted that these performance results are not simply a byproduct of the number of items attempted. In fact, when controlling for number of attempts, a very similar pattern of data emerges—including the finding that exposure to gender-stereotypic commercials undermines women's math performance.[1]

Taken together, these findings provide strong initial evidence that stereotype threat can lead women to avoid traditionally masculine domains, and seek domains where they do not risk being personally reduced to a negative stereotype. Specifically, it was shown that exposure to gender-stereotypic television commercials led women to avoid math items, in favor of verbal items, on a subsequent non-diagnostic aptitude test. Replicating our previous research, women exposed to these gender-stereotypic commercials also underperformed on the math portion of that non-diagnostic test (Spencer et al., under review). While cultural stereotypes accuse women of having inferior math skills, no such stereotypes allege inferior verbal skills; therefore, women are not vulnerable to stereotype threat in verbal domains. One unresolved issue is whether women in the stereotypic-commercial condition were avoiding a domain in which they are

susceptible to stereotype threat, seeking a domain in which they are immune to stereotype threat, or both. The design of Study 1 is not conducive to answering this question, since avoiding one domain necessitates seeking the other. The following studies will help to clarify this issue.

Study 2

The primary objective of Study 2 was to expand our paradigm to test whether stereotype threat could also influence women's educational and vocational aspirations. The assumption being that stereotype threat could lead women to avoid traditionally masculine domains in favor of domains in which stereotypes do not allege a sex-based inability. In order to examine this issue we partially replicated Study 1, replacing the aptitude test with a survey in which participants indicated their current interest in a range of college majors and careers. Women exposed to the gender-stereotypic commercials were expected to subsequently indicate less interest in pursuing educational/vocational options in which they would likely experience stereotype threat (i.e., quantitative domains), and more interest in those options in which they are immune to stereotype threat (i.e., verbal domains).

Method

Participants and Design

Participants were 62 undergraduates (30 men, 32 women) at the University of Waterloo, who participated for credit in an introductory psychology class. The participants were drawn from the same subject pool utilized in Study 1. Approximately equal numbers of men and women were randomly assigned to the 2 X 2 X 2 mixed-model design, which had two between–participants factors (gender and commercial type) and one within-participants factor (domain type). The primary dependent variable was degree of interest indicated for majors/careers in quantitative domains relative to verbal domains.

Materials

The identical sets of neutral and gender-stereotypic commercials used in Study 1 were also employed in Study 2. After watching their assigned set of commercials, the participants all completed a survey. The survey asked participants to indicate their current degree of interest in dozens of educational and vocational alternatives. Participants indicated their preferences using a scale ranging from 1 (no interest) to 7 (strong interest). Apart from the filler items, the majors and careers selected for the survey were intended to represent a cross-section from quantitative and verbal domains. For example, alternatives drawn from the fields of mathematics, engineering, and computer science were countered with alternatives drawn from the fields of creative writing, communications, and linguistics.

Procedure

The procedures for Study 1 and Study 2 were identical up to the point at which the female experimenter (blind to condition) returned to the laboratory after the participants had viewed their randomly assigned set of commercials. The participants, who were run in mixed-gender groups ranging in size from two to five people, were informed by the researcher that 20 minutes had to elapse before their long-term memory for the commercials could be accurately tested. Supposedly to fill those 20 minutes, the students were asked to voluntarily participate in an important survey ostensibly being conducted by Career Services at the University of Waterloo. The survey's coversheet claimed that the results of the campus-wide survey would directly affect students by determining future services and programs to be offered by the university. All participants volunteered

to complete the survey. Once they had completed the survey, the participants were thoroughly debriefed and thanked for their participation.

Results and Discussion

With dozens of educational and vocational alternatives listed on the survey, we decided to employ factor analysis to help us identify a relatively small number of meaningful factors within that data. To allow for correlations among the underlying factors, we conducted a factor analysis with an oblimin-rotated solution on the preference data for 57 educational/vocational alternatives. The scree plot of the resulting eigenvalues indicated that a three-factor solution would be most appropriate for the preference data. Two of the three resulting factors represent polar opposite domains with respect to stereotype-threat susceptibility. The "Quantitative Domain" encompasses 25 educational/vocational alternatives (Cronbach's α = .91) that require mathematical skills to succeed (e.g., Computer Engineering, Mathematics, Financial Analyst, Economics, Statistics, Physics, etc.). The "Verbal Domain" is composed of 20 educational/vocational alternatives (Cronbach's α = .92) that rely more heavily on verbal skills for success (e.g., Author of Novels, Linguistics, Journalist, Creative Writing, Communications, Editor, etc.). The third factor to emerge, the "Health Domain," consists of 12 educational/vocational alternatives in the health sciences (Cronbach's α = .92). All three factors in their entirety are reported in Table 1. Since our primary interest in this study was to determine whether exposure to gender-stereotypic commercials could undermine women's aspirations in traditionally masculine fields, while encouraging them to pursue fields in which they are immune to stereotype threat, we will limit our analyses to the Quantitative and Verbal Domains.[2]

Preferences

We expected women in the neutral-commercial condition to reveal a similar pattern of interest as men in either condition. That is, a preference for the Quantitative Domain, which encompasses the most popular majors at the University of Waterloo. Women in the stereotypic-commercial condition, however, were expected to reveal less interest in the Quantitative Domain and more interest in the Verbal Domain. A three-way ANOVA (Gender X Commercial Type X Domain Type) on the preference data revealed a significant two-way interaction between gender and domain type, F (1, 58) = 22.05, $p < .001$, and a significant two-way interaction between commercial type and domain type, F (1, 58) = 17.98, $p < .001$, which were both qualified by a significant three-way interaction between gender, commercial type, and domain type, F (1, 58) = 4.05, $p < .05$.

Since we expected men's preferences not to be influenced by our commercial-type manipulation, we broke down the above triple interaction by gender, separately analyzing the data for our male and female participants. A two-way ANOVA (Commercial Type X Domain Type) on the men's preference data revealed only the predicted main effect for domain type, F (1, 58) = 11.58, $p < .01$. Regardless of condition, men expressed more interest in the Quantitative Domain than the Verbal Domain. Turning to the women's data, a two-way ANOVA (Commercial Type X Domain Type) also revealed a main effect for domain type, F (1, 58) = 10.35, $p < .01$, but this main effect was qualified by a significant two-way interaction between commercial type and domain type, F (1, 58) = 20.08, $p < .001$.

Simple-effect tests on the women's data revealed a tendency for women exposed to the neutral commercials, like men in either condition, to express more interest in the Quantitative Domain than the Verbal Domain, although this tendency was not significant, $F < 2$. In marked contrast, women exposed to the gender-stereotypic commercials expressed significantly more interest in the Verbal Domain than the Quantitative Domain, $F(1, 58) = 29.62$, $p < .001$. Furthermore, simple-effect tests also revealed that women in the neutral-commercial condition expressed significantly more interest in the Quantitative Domain than women in the stereotypic-commercial condition, $F(1, 58) = 6.67$, $p = .01$. This pattern of interest was reversed for the Verbal Domain, where women in the stereotypic-commercial condition expressed marginally more interest than women in the neutral-commercial condition, $F(1, 58) = 3.67$, $p = .057$ (see Figure 3).

Study 2 extended our previous research by confirming that stereotype threat can also affect women's educational and vocational aspirations. Women exposed to gender-stereotypic commercials subsequently indicated less interest in both academic and professional domains in which they risk being negatively stereotyped, and more interest in those domains in which they are immune to stereotype threat. Moreover, unlike Study 1, in Study 2 expressing a reduced interest in one field did not necessitate expressing a compensatory interest in another field. Therefore, Study 2 established that stereotype threat leads women not only to avoid traditionally masculine domains, but also to actively seek domains in which stereotypes do not allege a sex-based inability.

Study 3

Study 3 was designed to test whether stereotype threat could also depress women's desire to assume leadership positions—a role within which females risk being personally reduced to a negative stereotype. Specifically, we investigated whether stereotype threat could influence women's decision to be a leader or follower on an impending leadership task. For this design to be effective, however, it was necessary that the leader and subordinate roles be equally appealing to both genders, which presented us with some unique challenges. As discussed earlier, leadership is viewed as a traditionally masculine domain where women are stereotyped as lacking ability, and attitudes towards female leaders are most negative when the leadership role is particularly masculine in nature (Eagly, Karau, & Makhijani, 1995). Thus, if the impending leadership task was perceived as being too masculine, for women just the prospect of assuming the leader role could provoke apprehension over being negatively stereotyped. So we were faced with the challenge of developing a leadership task that would normally not elicit stereotype threat among women, while remaining an appealing task for men.

The development of our leadership task was guided by the work of Fred Fiedler (1978), who suggested there are two basic types of leaders: 1) task-oriented leaders who focus on the job at hand, and 2) relationship-oriented leaders who are more concerned with the feelings of their workers. Considering the content of those two descriptions, it should come as no surprise that cultural stereotypes allege that women prefer a relationship-oriented style of leadership, whereas men prefer a task-oriented style leadership (Eagly & Johnson, 1990). Eagly and Johnson

(1990) did a meta-analysis on a number of laboratory experiments that actually confirmed there is some validity to these gender-stereotypic expectations. Therefore, we decided to describe the leadership task in such vague terms that it could be construed as being conducive to either a task-oriented, or relationship-oriented, approach to leadership, which should reduce women's apprehension without sacrificing men's interest.

The final challenge was to develop a subordinate role that both genders would normally find as enticing as the leader's role. Considering our participants are all students at a highly selective university, we assumed they would naturally avoid anything labeled "subordinate." So we decided to refer to the followers as the "Problem-Solvers," and described their role in such vague terms as to partially mask the status of the role. Overall, we hoped that after reading the description of the impending leadership task, participants would consider the Leader's role just slightly higher in status, and marginally more masculine, than the Problem-Solvers' role.

The assumption underlying Study 3 is that stereotype threat can lead women to avoid the traditionally masculine domain of leadership in favor of a non-threatening subordinate role. In order to test this hypothesis, we partially replicated Study 2, replacing the survey with a questionnaire that first described the leadership task, and then had participants indicate their role preference for that impending task. Considering that the participants believed they would actually assume a role for the leadership task, this study investigates actual behavioral choices. We expected that exposure to the gender-stereotypic

commercials would lead women to indicate less interest in assuming the Leader role and more interest in assuming the Problem-Solver role.

Method

Participants and Design

Participants were 61 undergraduates (30 men, 31 women) at the University of Waterloo, who participated for credit in an introductory psychology class. Approximately equal numbers of men and women were randomly assigned to the 2 X 2 X 2 mixed-model design, which had two between–participants factors (gender and commercial type) and one within-participants factor (role type). The primary dependent variable was the degree of interest indicated for the Leader and Problem-Solver roles.

Materials

The same set of neutral and gender-stereotypic commercials used in Studies 1 and 2 were also employed in Study 3. After watching their assigned set of commercials, participants read the following description of an alleged impending leadership task:

> We would appreciate your participation in a study being conducted on the effectiveness of various leadership strategies. You can either choose to be a **leader** or a **problem solver**, but there will only be one leader assigned per group. Both the problem solvers and the leader will be given a written description of a series of complex problems to be solved. The leader, however, will also be supplied with the answers to those problems. It's the leader's job to guide the problem solvers to the solutions without explicitly telling them the answers. Previous research has demonstrated that the most effective leaders in these situations have the ability to facilitate cooperative interaction among the problem solvers, which requires excellent

interpersonal skills. Whereas, the most effective problem solvers are good team players and have excellent communication skills.

After reading the above description, the participants were asked to indicate their degree of interest in assuming the leader and problem-solver roles. Participants indicated their interest for each role using a scale ranging from 1 (no interest) to 7 (strong interest).

Pretests

To ensure there were no gender differences in role preference in the absence of our commercial-type manipulation, we pretested these materials on 40 male and female undergraduates at the University of Waterloo. Results confirmed that both genders had a similar degree of interest in assuming the Leader and Problem-Solver roles, Fs < 1. We also ran a subsequent pretest on 146 male and female undergraduates to ensure there were no gender differences in the perceived status or masculinity of each role, which was also confirmed, Fs < 2. This latter pretest allowed us to examine whether the two roles were viewed as being distinct from one another with respect to their masculinity and status. Participants indicated "how traditionally masculine" they considered each role using a scale ranging from 1 (not at all masculine) to 7 (completely masculine), and the status of each role using a scale ranging from 1 (very low status) to 7 (very high status). Results established that the Leader role (M=4.20) was perceived as being more traditionally masculine than the Problem-Solver role (M=3.61), F (1, 145) = 40.06, p < .001. It was also established that the Leader role (M=5.32) was considered higher status than the Problem-Solver role (M=4.66), F (1, 145) = 56.79, p < .001.

Procedure

The procedure for Study 3 was identical to that employed in Studies 1 and 2 up to the point at which the female experimenter (blind to condition) returned to the laboratory after participants had viewed their assigned commercials. Again, the participants, who were run in mixed-gender groups ranging in size from two to five people, were informed by the researcher that 20 minutes had to elapse before their long-term memory for the commercials could be tested. To occupy those 20 minutes, the students were asked to voluntarily participate in an apparent separate study being conducted on the effectiveness of various leadership strategies. All participants volunteered to participate in the leadership study. Once they had read the description of the alleged impending leadership task, and indicated their role preference, the participants were thoroughly debriefed and thanked for their participation.

Results and Discussion

Having established through pretesting that the two roles were equally appealing to both men and women, in the neutral-commercial condition we expected no differences in role preference. In the stereotypic-commercial condition, however, we expected women to express less interest in the Leader role and more interest in the Problem-Solver role. A three-way ANOVA (Gender X Commercial Type X Role Type) on the preference data revealed a significant three-way interaction between gender, commercial type, and role type, F (1, 57) = 4.45, p < .05, with no other effects approaching significance, Fs < 1.50.

Since we expected our commercial-type manipulation not to affect men's role preference, we broke down the above triple interaction by gender and

separately analyzed the data for our male and female participants. As expected, a two-way ANOVA (Commercial Type X Role Type) on the men's data revealed that no effects approached significance, $\underline{F}$s < 1. A two-way ANOVA (Commercial Type X Role Type) on the women's data, however, revealed a significant two-way interaction between commercial type and role type, $\underline{F}$ (1, 57) = 5.07, $\underline{p}$ < .05.

Simple-effect tests on the females' data revealed that women exposed to the neutral commercials, like men in either condition, expressed no clear preference for either role, $\underline{F}$ < 1. In contrast, women exposed to the gender-stereotypic commercials subsequently revealed a strong preference for the Problem-Solver role compared to the Leader role, $\underline{F}$ (1, 57) = 7.26, $\underline{p}$ < .01. In addition, simple-effect tests also indicated that women in the neutral-commercial condition expressed more interest in the Leader role than women in the stereotypic-commercial condition, $\underline{F}$ (1, 57) = 4.70, $\underline{p}$ < .05. The opposite pattern of interest was revealed for the Problem-Solver role, women in the stereotypic-commercial condition expressed more interest in the Problem-Solver role than women in the neutral-commercial condition, $\underline{F}$ (1, 57) = 5.16, $\underline{p}$ < .05 (see Figure 4).

Study 3 confirmed that stereotype threat can undermine women's desire for leadership positions. Specifically, exposure to gender-stereotypic commercials led women to express less interest in assuming a Leader role, and more interest in assuming a Problem-Solver role. Pretests revealed that the Leader role was perceived by both genders as being more traditionally masculine and of higher status than the Problem-Solver role. Consequently, with the female stereotype made salient through exposure to the stereotypic commercials, contemplating the impending leadership task became threatening enough to induce women to avoid

that traditionally masculine domain. That is, stereotype threat led women to avoid a role in which they risk being negatively stereotyped in favor of a non-threatening subordinate role.

Study 4

The primary objective of Study 4 was to investigate whether varying the stereotype relevance of a leadership position could influence women's role preference. In order to examine this issue, we decided to borrow the stereotype-threat-reducing manipulation employed by Spencer, Steele, and Quinn (1999). Spencer and his colleagues discovered they could successfully manipulate the level of stereotype threat experienced during a math test by simply providing the students with bogus information about the relative past performance of men and women on that test. We felt that a similar stereotype-threat manipulation could revitalize women's interest in leadership even after they had viewed the stereotypic commercials. Specifically, if the leadership-inability stereotype is made irrelevant to the position, by telling women the leadership task has revealed no gender differences in the past, stereotype threat should be eliminated from that situation. Therefore, we decided to manipulate the stereotype relevance of the leadership task to determine if women's interest in the leader role could be reestablished once the gender-stereotypic commercials had elicited the female stereotype.

Method

Participants and Design

Participants were 65 undergraduates (32 men, 33 women) at the University of Waterloo, who participated for credit in an introductory psychology class. Approximately equal numbers of men and women were randomly assigned to the 2 X 2 X 2 mixed-model design, which had two between–participants factors (gender and description type) and one within-participants factor (role type). The

primary dependent variable was degree of interest indicated for the Leader and Problem-Solver roles.

Materials

Only the stereotypic set of commercials used in Studies 1, 2, and 3 were employed for Study 4. After viewing the gender-stereotypic commercials, the participants were randomly assigned to read either the same description of the leadership task utilized in Study 3, or a modified version designed to eliminate stereotype threat from the situation. The modified version was identical to the description used in Study 3 with the exception of one additional sentence. "There is a great deal of controversy in psychology surrounding the issue of gender-based differences in leadership and problem-solving ability; however, our research has revealed absolutely no gender differences in either ability on this particular task." It should be noted that this no-gender-difference description does not dispute the validity of the leadership-inability stereotype in general, only its relevance to this specific task. After reading their randomly assigned description of the leadership task, the participants were asked to indicate their degree of interest in assuming the Leader and Problem-Solver roles. Participants indicated their interest for each role using a scale ranging from 1 (no interest) to 7 (strong interest).

Procedure

The participants were run in mixed-gender groups ranging in size from two to five people. With one exception, the procedure for Study 4 was identical to that employed in Studies 1, 2, and 3 up to the point at which the female experimenter returned to the room once the participants had viewed the television commercials. The one change in procedure was that participants in Study 4 were not randomly

assigned to view either gender-stereotypic or neutral commercials; rather, all the participants in Study 4 viewed the same gender-stereotypic set of commercials. After watching the commercials, the participants were informed that 20 minutes had to elapse before their long-term memory for the commercials could be accurately tested. To occupy those 20 minutes, the students were asked to voluntarily participate in an apparent separate study looking at the effectiveness of various leadership strategies. All participants volunteered to participate in the leadership study. The participants were then randomly assigned to read either the description of the leadership task utilized in Study 3 (no-gender-information condition), or the modified description claiming no gender-based differences in task ability (no-gender-difference condition). Both task descriptions had the identical coversheet, which enabled the experimenter to remain blind to the participants' condition. Once they read their assigned description of the task and indicated their role preference, the participants were thoroughly debriefed and thanked for their participation.

Results and Discussion

Since the no-gender-information condition in Study 4 is a replication of the stereotypic-commercial condition in Study 3, we expected to replicate our earlier findings. So if participants were provided no information about the relative past performance of men and women on the leadership task, female participants were expected to avoid the Leader role in favor of the Problem-Solver role. In contrast, women explicitly told that there were no gender differences on the task were expected to reveal no role preference. A three-way ANOVA (Gender X Description Type X Role Type) on the preference data revealed a significant three-

way interaction between gender, description type, and role type, F (1, 61) = 4.56, p < .05, with no other effects approaching significance, Fs < 1.

Once again, since we expected that our description-type manipulation would not affect men's role preference, we reduced this triple interaction by gender, and separately analyzed the data for our male and female participants. As predicted, a two-way ANOVA (Description Type X Role Type) on the men's data indicated no significant trends, Fs < 1. Whereas a two-way ANOVA (Description Type X Role Type) on the women's data revealed a significant two-way interaction between description type and role type, F (1, 61) = 4.45, p < .05.

Simple-effect tests on the females' data confirmed that women in the no-gender-differences condition, like men in either condition, expressed no preference for either role, F < 1. Women in the no-gender-information condition, however, replicated our previous findings by expressing a significant preference for the Problem-Solver role compared to the Leader role, F (1, 61) = 5.84, p < .05. Simple-effect tests also indicated that women in the no-gender-differences condition expressed more interest in the Leader role than women in the no-gender-information condition, F (1, 61) = 4.57, p < .05. The opposite pattern of results was revealed for the Problem Solver role, women in the no-gender-information condition indicated significantly more interest in the Problem-Solver role than did women in the no-gender-differences condition, F (1, 61) = 6.90, p = .01 (see Figure 5).

These findings confirm that manipulating the stereotype relevance of the task can influence women's desire to assume leadership positions. After being exposed to gender-stereotypic commercials, which have been shown to elicit the

female stereotype, stereotype threat was effectively removed from the leadership task by informing participants the task had never revealed gender differences. The no-gender-difference description of the task reduced women's apprehension by making the leadership-inability stereotype irrelevant to that specific task. Consequently, women's interest in leadership was restored while the female stereotype was still salient.

Throughout this paper we have assumed that exposure to the gender-stereotypic commercials elicits the female stereotype, and that the resulting level of stereotype activation among women mediates the insidious effects of those commercials. But without an actual measure of stereotype activation in Studies 1, 2, 3, or 4, this mediational hypothesis was not directly tested. In order to correct that oversight, we designed Study 5 to integrate aspects of our previous studies with an implicit measure of stereotype activation.

Study 5

For Study 5 we wanted to directly test whether level of stereotype activation mediates the effect of the commercials on women's desire to assume leadership positions. To achieve this goal, activation of the female stereotype has to be measured after the participants have been exposed to the commercials, but before they read the description of the leadership task. This design would allow us to verify that exposure to gender-stereotypic commercials activates the female stereotype, and the resulting level of stereotype activation among women mediates the effect of those commercials. Study 5 was also designed to help clarify the relationship between stereotype activation and stereotype threat. As discussed earlier in this paper, for stereotype activation to evoke stereotype threat, the target must be experiencing, or at least contemplating, a situation in which stereotypes alleged a group-based inability. Therefore, the above mediational hypothesis only pertains to those women considering a situation in which they risk being personally reduced to a negative stereotype. As Study 4 established, stereotype threat can be removed from the leadership task by telling participants the task has never revealed gender differences. Consequently, we predicted that varying the description of the leadership task would moderate whether stereotype activation mediated the effect of the commercials on women's role preference.

Method

Participants and Design

Participants were 116 undergraduates (58 men, 58 women) at the University of Waterloo, who participated for credit in an introductory psychology class. Approximately equal numbers of men and women were randomly assigned

to the 2 X 3 X 2 mixed-model design, which had two between–participants factors (gender and testing condition) and one within-participants factor (role type). The primary dependent variables were degree of interest indicated for the Leader and Problem-Solver roles and activation of the female stereotype as measured by a lexical decision task.

Materials

The same sets of neutral and stereotypic commercials utilized in Studies 1, 2, and 3 were also employed for this study. Immediately after watching their assigned commercials, the participants' activation of the female stereotype was measured using a lexical decision task. This task involves identifying as quickly as possible whether letter strings that are flashed on a computer screen are words or non-words. The letter strings used for this lexical decision task were words related to the female stereotype, neutral words (paired in frequency and length to the stereotypic words), and non-words. The premise behind the lexical decision measure is that participants for whom the female stereotype is activated should be quicker to recognize words related to that stereotype than participants for whom that stereotype is not activated.

The 15 stereotypic words employed in this study were generated during pretesting by a group of male and female students enrolled in an undergraduate psychology course at the University of Waterloo. Those 15 stereotypic words are: helpful, intuitive, gentle, gullible, irrational, wasteful, kind, inferior, uncertain, distracted, emotional, indecisive, tense, worried, and weak. It should be noted that this list of words is remarkably similar to the list generated by participants in the Broverman et al. study discussed earlier in this paper (1972). Considering the

Broverman et al. study was conducted prior to the birth of any of the students who helped generate the current list of stereotypic words, the similarity of the two lists demonstrates the stability of gender stereotypes in our culture.

After completing the lexical decision task, participants were assigned to read either the no-gender-difference description of the leadership task, or the version that provided no information about the relative past performance of men and women on the task. Once they had read their assigned description of the leadership task, the participants were asked to indicate their degree of interest in assuming the Leader and Problem-Solver roles. Participants indicated their interest for each role using a scale ranging from 1 (no interest) to 7 (strong interest).

Procedure

Before the participants reported to the laboratory, the female experimenter randomly chose a number between 1 and 3 to determine the testing condition for the upcoming session. Those numbers corresponded to three stacks of questionnaires and videos that were otherwise indistinguishable to the experimenter. This design enabled the experimenter to remain blind to the participants' condition throughout the study. In one condition, participants were exposed to the neutral commercials and given the no-gender-information version of the leadership task, replicating the neutral-commercial condition in Study 3. In the second testing condition, participants were exposed to the gender-stereotypic commercials and again read the no-gender-information version of the leadership task, replicating the no-gender-information condition in Study 4. In the final condition, participants were exposed to the gender-stereotypic commercials and

given the no-gender-difference version of the leadership task, replicating the no-gender-difference condition in Study 4. Other than randomly choosing the testing condition number, however, the procedure for Study 5 was identical to Studies 1, 2, and 3 up to the point at which the female experimenter returned to the laboratory after the participants had viewed their assigned set of commercials.

After watching the commercials, the participants, who were run in mixed-gender groups ranging in size from two to five people, were informed by the researcher that 20 minutes had to elapse before their long-term memory for the commercials could be accurately tested. All participants were asked to participate in two "cognitive busy tasks," purportedly to fill time before the memory task. The first cognitive busy task was actually a lexical decision task designed to measure activation of the female stereotype, which only took 5 minutes to complete. The lexical decision task was individually administered on the five personal computers contained in the laboratory. The second cognitive busy task was the leadership task. After the participants had read their assigned description of the task and indicated their interest in assuming the two roles, they were informed that the experiment was over, thoroughly debriefed, and thanked for their participation.

Results and Discussion

Role Preference

With the exception of the lexical decision task, Study 5 is a replication of conditions found in Studies 3 and 4. Since the act of taking the lexical decision task should not affect the participants' role preference, we expected to replicate our previous findings. Therefore, compared to all other participants, women exposed

to the gender-stereotypic commercials and provided with no information about the relative past performance of men and women on the leadership task, were expected to avoid the Leader role in favor of the Problem-Solver role. Furthermore, male and female participants in the other two testing conditions were expected to reveal no preference for either role. A three-way ANOVA (Gender X Testing Condition X Role Type) on the preference data revealed a significant three-way interaction between gender, testing condition, and role type, F (2, 110) = 4.51, p = .01, with no other effects approaching significance, Fs < 2.

Since we expected our testing-condition manipulation not to affect men's role preference, we broke down this triple interaction by gender, and separately analyzed the data for our male and female participants. As predicted, a two-way ANOVA (Testing Condition X Role Type) on the males' preference data revealed that no effects approached significance, Fs < 1 (see Figure 6). In contrast, a two-way ANOVA (Testing Condition X Role Type) on the females' preference data revealed a significant two-way interaction between testing condition and role type, F (2, 110) = 5.66, p < .01.

Simple-effects tests on the females' data revealed that women in the stereotypic-commercial/no-gender-information condition expressed greater interest in the Problem Solver role than the Leader role, F (1, 110) = 10.66, p < .01, while women in the other two testing conditions revealed no role preference, Fs < 1. Additional simple-effect tests also revealed that women in the stereotypic-commercial/no-gender-information condition expressed less interest in the Leader role than women in the neutral-commercial/no-gender-information condition, F (1, 110) = 7.47, p < .01, or women in the stereotypic-commercial/no-gender-

difference condition, F (1, 110) = 6.24, p = .01. The opposite pattern of results was found for the Problem Solver role, for which women in the stereotypic-commercial/no-gender-information condition expressed more interest than women in the neutral-commercial/no-gender-information condition, F (1, 110) = 4.78, $p < .05$, or women in the stereotypic-commercial/no-gender-difference condition, F (1, 110) = 3.60, p = .057 (see Figure 7). Considered jointly, the above results are a replication of our previous findings in both Studies 3 and 4.

Stereotype Activation

As measured by their recognition times for female stereotypic words on the lexical decision task, it was predicted that participants who viewed the gender-stereotypic commercials would exhibit activation of the female stereotype compared to those participants who viewed the neutral commercials. In order to facilitate this analysis, the two testing conditions in which participants viewed the gender-stereotypic commercials were combined—these two conditions are still identical at the point of the lexical decision task. Consequently, a 2 (Gender) x 2 (Commercial Type) ANCOVA was conducted on the participants' recognition time for stereotypic words, with the covariate being recognition time for matched neutral words. The ANCOVA revealed the predicted main effect for commercial type, F (1, 110) = 9.48, $p < .01$, but this main effect was qualified by a significant two-way interaction between gender and commercial type, F (1, 110) = 3.70, p = .05. Simple-effect tests on the women's data revealed that women exposed to the gender-stereotypic commercials activated the female stereotype compared to those women who viewed the neutral commercials, F (1, 110) = 11.40, $p < .01$. There was also a tendency for the men who viewed the stereotypic commercials to activate

the stereotype compared to men exposed to the neutral commercials, although this tendency was not significant, $F < 1$ (see Figure 8).

Mediation

In order to test whether level of stereotype activation mediates the effect of the commercials on role preference, we conducted a series of regression analyses recommended by Baron and Kenny (1986) and Judd and Kenny (1981). For these analyses, role preference was defined as the participants' degree of interest in assuming the Leader role minus their degree of interest in assuming the Problem-Solver role. We hypothesized that activation level would mediate the effect of the commercials on role preference when women were provided with no information about the relative past performance of men and women; however, if women were told the leadership task had never revealed gender differences, we expected this mediation to be moderated. We will test these two hypotheses in turn. Since our testing-condition manipulation did not affect men's role preference, these regression analyses will be conducted solely on the female participants' data.

There are four steps necessary to test whether the level of stereotype activation among women who read the no-gender-information version of the leadership task mediates the effect of commercial type on role preference. First, we conducted a regression analysis to determine if commercial type actually predicted role preference, which was confirmed ($\beta = -.49$, $T_{(36)} = -3.38$, $p < .01$). Next we examined whether commercial type predicted activation of the female stereotype. As expected, commercial type did have a significant effect on level of stereotype activation ($\beta = -.46$, $T_{(36)} = -3.08$, $p < .01$). A third step examined whether stereotype activation (the potential mediator) predicted role preference when we

controlled for the effect of commercial type. Results confirmed that level of stereotype activation did in fact predict role preference (β= .45, $T_{(35)} = 3.03$, $p < .01$). The final and most crucial step establishes whether stereotype activation actually mediates the effect of commercial type on role preference. The amount of mediation is defined as the amount of reduction in the effect of commercial type on role preference when controlling for stereotype activation. When level of stereotype activation was controlled for in the analysis, the effect of commercial type on role preference dropped from $\beta = -.49$, $T_{(36)} = -3.38$, $p < .01$ to $\beta = -.29$, $T_{(35)} = -1.95$, $p > .05$. The Goodman (1960) equation verified that this degree of mediation is indeed significant, $Z = -2.23$, $p < .05$. Taken together, the above analyses confirmed that level of stereotype activation among women who were given the no-gender-information version of the leadership task did in fact mediate the effect of the commercials on role preference (see Figure 9).

Moderation of Mediation

We also hypothesized that varying the stereotype relevance of the leadership task could moderate whether stereotype activation mediates the effect of the commercials on women's role preference. To test this hypothesis we conducted separate regression analyses for the two groups of women who viewed the identical set of gender-stereotypic commercials, but read the two different descriptions of the leadership task. These regression analyses allowed us to determine whether level of stereotype activation predicted role preference differently for the two groups of women. Since the testing conditions for these women were identical other than their assigned task description, any disparity between the two groups would indicate that our task-description manipulation

affected the relationship between stereotype activation and role preference. As expected, the regression analysis among women given the no-gender-information version of the task revealed that level of stereotype activation ($\underline{M}$=712 ms) strongly predicted role preference, (β= .50, $\underline{T}_{(18)} = 2.40$, $\underline{p} < .05$). Among women who read the no-gender-difference description of the leadership task, however, the relationship between stereotype activation ($\underline{M}$=722 ms) and role preference was completely eliminated, ($\beta = -.05$, $\underline{T}_{(19)} = -0.20$, $\underline{p} > .80$). This latter task description made the leadership-inability stereotype irrelevant to the task, which eliminated stereotype threat from the situation, thus activation of the female stereotype no longer predicted whether women wanted to be a leader or a follower. These findings suggest that our task-description manipulation successfully moderated whether stereotype activation among women mediated the effect of the commercials on role preference.

Study 5 allowed us to directly test whether exposure to the gender-stereotypic commercials elicits the female stereotype, and whether the resulting level of stereotype activation mediates the insidious effects of those commercials. Results confirmed that women who viewed the gender-stereotypic commercials activated the female stereotype compared to women who viewed the neutral commercials. More importantly, it was also established that level of stereotype activation mediates the effect of the commercials on women's role preference. Level of stereotype activation, however, only predicted women's role preference for stereotype-relevant leadership tasks. When told the leadership task had revealed no gender differences in the past, which eliminates stereotype threat from the situation, women revealed the same role preference as men. That is,

although the female stereotype had already being activated, the no-gender-difference description of the leadership task eliminated the women's apprehension and restored their interest in leadership. Therefore, varying the stereotype relevance of the leadership task moderated whether level of stereotype activation mediated the coercive effects of the commercials on women's role preference.

General Discussion

Situations in which women risk fulfilling, or being judged by, a negative gender stereotype can provoke a disruptive apprehension that interferes with their performance and pleasure in those domains. We call this situational predicament "stereotype threat." Women are susceptible to stereotype threat whenever they risk being personally reduced to a negative gender stereotype that provides a plausible explanation for their behavior in a given domain (Crocker et al., 1997; Spencer et al., under review; Steele, 1997). The present research examined the detrimental effects that stereotype threat can have on women's achievement-related choices. We hypothesized that the risk of experiencing stereotype threat would lead women to avoid traditionally masculine domains in an attempt to cope with the self-evaluative threat they can impose.

In a series of five studies, all employing gender-stereotypic commercials to elicit the female stereotype, we demonstrated that exposure to stereotypic media images leads women to withdraw from domains that evoke stereotype threat, and seek domains that are immune to stereotype threat. Specifically, Study 1 revealed that only women exposed to the gender-stereotypic commercials avoided math items in favor of verbal items on a subsequent aptitude test. In Study 2, exposure to the stereotypic commercials led women to indicate less interest in educational/vocational options in which they risk being negatively stereotyped (i.e., quantitative domains), and more interest in fields in which stereotypes do not allege a sex-based inability (i.e., verbal domains). By establishing that only women who viewed the gender-stereotypic commercials avoided leadership positions on an impending task, Study 3 demonstrated the stifling effect that stereotype threat

can have on women's leadership aspirations. In Study 4 we showed that eliminating stereotype threat from the impending task restored women's interest in leadership positions, even though the women had already been exposed to the gender-stereotypic commercials.

The design of Study 5 integrated aspects of Studies 3 and 4 with an implicit measure of stereotype activation. This allowed us to verify that exposure to gender-stereotypic commercials elicits the female stereotype among women, and this level of stereotype activation mediates the effect of the commercials on women's desire to assume leadership positions. Activation of the female stereotype, however, only predicted role preference when women considered the impending leadership task to be stereotype relevant. When the leadership-inability stereotype was made irrelevant to the situation by the no-gender-difference description of the task, women's interest in leadership was restored. Therefore, Study 5 established that varying the stereotype relevance of the leadership task moderated whether activation of the female stereotype mediated the effect of the commercials on women's role preference.

Some may argue that our findings represent nothing more than participants modeling the behavior of the female actresses in the gender-stereotypic commercials. Supporting this contention, Bandura's social learning theory suggests that media models do have the power to influence the viewer's behavior (e.g., Bandura, Ross, & Ross, 1961). Directly modeling the actresses' behavior in the commercials, however, cannot account for the female participants' performance on the aptitude test, or their educational and vocational aspirations. It can be argued that the actresses behaved in a generally unintelligent manner,

but if female viewers were simply modeling unintelligent behavior, they would have underperformed on the entire aptitude test, and shied away from all intellectually demanding majors and careers. As reported earlier, women exposed to the gender-stereotypic commercials only underperformed on the math portion of the aptitude test, and shied away from only quantitative domains. The results from our three leadership studies also present a problem for this modeling argument. If our female participants were simply mimicking the actresses, why would the no-gender-difference description of the leadership task eliminate the persuasive power of those media models?

Another alternative explanation for the present findings stems from research showing that primed stereotypes can evoke stereotype-consistent behavior, unbeknownst to the individual displaying that behavior (e.g., Bargh, Chen, & Burrows, 1996; Dijksterhuis et al., 1998). Dijksterhuis and colleagues showed that individuals primed with a professor stereotype subsequently performed better on a general-knowledge test than individuals primed with a supermodel stereotype. As demonstrated in Study 5, exposure to the gender-stereotypic commercials did indeed prime the female stereotype among women, yet this notion of behavioral assimilation cannot account for all of our findings. For example, even though they had activated the female stereotype, women given the no-gender-difference description of the leadership task expressed as much interest in assuming the leader role as women not primed with the female stereotype. How can the behavioral-assimilation argument explain the stereotype-inconsistent behavior of these women who were primed with the female stereotype?

These alternative explanations that suggest women are simply assimilating to salient gender stereotypes actually represent the antithesis of what our research has demonstrated. Avoiding domains in which one risks being negatively stereotyped, and seeking domains that evoke less threat of being negatively stereotyped, are distinct behaviors from assimilating to, or matching oneself to, an activated gender stereotype. In fact, Steele and Aronson (1995) established that stereotype threat motivates targets to dissociate themselves from activated stereotypes. Their findings revealed that Black participants anticipating a threatening situation, first activated the racial stereotype, and then avoided conforming to any racial-stereotypic traits or preferences (e.g., lazy, aggressive, rap music). That is, Black participants experiencing stereotype threat avoided categorizing themselves in terms of the racial stereotype (Steele & Aronson, 1995). Similarly, women in the present research dissociated themselves from negative gender stereotypes by avoiding domains in which they risk being negatively stereotyped, and seeking domains that are immune to stereotype threat. The risk of experiencing stereotype threat, in our view, creates apprehension about being personally reduced to a negative stereotype. Consequently, we argue that stereotype threat motivates targets to dissociate themselves from those negative stereotypes—not assimilate to them.

This discovery that stereotype threat leads to the avoidance of targeted domains could represent the seeds of psychological disengagement. Members of stigmatized groups may try to cope with stereotype threat by temporarily disengaging their self-esteem from threatening domains. This defensive detachment ensures that feelings of self-worth are independent of any

performance feedback received in those targeted domains (Major et al., 1998). Like stereotype threat, psychological disengagement can be a temporary state that is situationally specific, but it normally occurs in situations where poor performance is either experienced or anticipated (Crocker et al., 1997; Major et al., 1998). For example, Brenda Major and her colleagues demonstrated that White college students' self-esteem fluctuated in accordance with the positive or negative feedback they randomly received on an intelligence test. The self-esteem of Black college students, however, was not affected by this performance feedback, which confirmed that the Black students had at least temporarily disengaged their self-esteem from the stereotype-relevant domain (Major et al., 1998).

As alluded to above, experiencing stereotype threat repeatedly in a given domain may eventually lead to chronic psychological disengagement. That is, temporary psychological disengagement may eventually result in stable disidentification (Crocker et al., 1997; Major et al., 1998; Steele, 1992). Disidentification is an adaptation strategy of eliminating a domain as a long-term basis of self-evaluation. For example, if females repeatedly experience stereotype threat in traditionally masculine domains, in order to protect their feelings of self-worth, they may permanently disassociate themselves from those domains. Disidentification can therefore lead to systematic group differences in aspirations and accomplishments in stereotype-relevant fields. Inevitably, the stigmatized group's lack of achievement in those domains is then erroneously interpreted by others as reflecting some group-based inability, rather than simply a defensive effort to cope with the self-evaluative threat imposed by their society (Crocker & Major, 1989; Crocker et al., 1997).

Unfortunately, some of the individuals who erroneously infer a group-based inability are the targets of the cultural stereotypes themselves. One grave consequence of disidentification is the possibility that the stigmatized groups themselves begin to internalize cultural stereotypes; that is, begin to actually believe the negative accusations contained in those stereotypes. Stereotypes can be internalized at a group level, or even more troubling, internalized at a personal level—in which case the individual believes the stereotype accurately describes her/him. For example, among students with comparable math skills, females tend to underestimate their math ability compared to males (Yee & Eccles, 1988), and assume that they possess less ability to learn mathematics than their male counterparts (Sherman, 1983). Moreover, women are 2 1/2 times as likely to indicate a preference for male leaders than a preference for female leaders; in fact, women indicate a greater masculine bias in this stereotype-relevant domain than men (Gallup, 1996). Since individuals partially base their achievement-related choices on perceptions of ability and potential success in a given domain, this internalization of the female stereotype can have serious long-term repercussions for women in our society (Stangor & Sechrist, 1998).

It is crucial to remember that the women's behavior in the present research was not indicative of something intrinsic to their group. Rather, their response to the gender-stereotypic commercials signified an interaction between their group's social identity and a threatening predicament created by way of cultural stereotypes. Unlike intrinsic factors, predicaments are situational and amenable to change, a fact that should offer some encouragement to women in our society. Such optimism needs to be qualified, however, since this predicament involves a

mass media culture that is saturated with negative stereotypes. Since stereotype threat derives from the broad dissemination of these cultural stereotypes (Steele, 1997), it seemed appropriate to employ actual television commercials to elicit stereotype threat in our research. Television, however, is not the only medium by which negative cultural stereotypes are communicated to women in our society. For example, we could have just as easily elicited stereotype threat in the present research by having a career counselor make a gender-stereotypic comment prior to the women indicating their major and career preferences. What do you think is the cumulative effect of friends, parents, teachers, and bosses who steer women away from traditionally masculine domains because of their stereotypic notions of gender-related ability?

As long as these cultural stereotypes permeate our society, members of stigmatized groups will be susceptible to the insidious effects of stereotype threat. Obviously, it would be a formidable task to eliminate negative stereotypes from our mass media culture. Our research, however, has demonstrated that it may be possible to eliminate the situational cues that evoke stereotype threat. Therefore, the realistic challenge is to create academic and vocational environments that effectively reduce the risk of experiencing stereotype threat. Within these environments, members of stigmatized groups could concentrate on fulfilling their potential, rather than fulfilling a negative stereotype.

References

Aronson, E. (1999). The social animal (8th ed.). New York: Worth Publishers.

Aronson, J., Lustina, M., Good, C., Keough, K., Steele, C., & 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.

Aronson, J., Quinn, D., & Spencer, S. (1998). Stereotype threat and the academic underperformance of minorities and women. In J. K. Swim & C. Stangor (Eds.), Prejudice: The target's perspective (pp. 83-103). San Diego: Academic Press.

Ashmore, R. D., Del Boca, F. K., & Wohlers, A . J. (1986). Gender stereotypes. In R. D. Ashmore & F. K. Del Boca (Eds.), The social psychology of female-male relations(pp. 69-119). New York: Academic Press.

Bandura, A., Ross, D., & Ross, S. (1961). Transmission of aggression through imitation of aggressive models. Journal of Abnormal and Social Psychology, 63, 575-582.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct Effects of trait construct and stereotype activation on action. Journal of Personality and Social Psychology, 71, (2), 230-244.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. Journal of Personality and Social Psychology, 51, 1173-1182.

Bergen, D. J., & Williams, J. E. (1991). Sex stereotypes in the United States revisited: 1972-1988. Sex Roles, 24, (7), 413-423.

Best, D. L., Williams, J. E., Cloud, J. M., Davis, S. W., Robertson, L. S., Edwards, J. R., Giles, H., & Fowles, J. (1977). Development of sex-trait stereotypes among young children in the United States, England, and Ireland. Child Development, 48, 1375-1384.

Bloom, A. (1968). The republic of Plato. New York, NY: Basic Books.

Broverman, I. K., Vogel, S. R., Broverman, D. M., Clarkson, F. E., Rosenkrantz, P. S. (1972). Sex-Role stereotypes: A current appraisal. Journal of Social Issues, 28, (2), 59-78.

Bretl, D. J., & Cantor, J. (1988). The portrayal of men and women in U.S. television commercials: A recent content analysis and trends over 15 years. Sex Roles, 18, (9), 595-609.

Catalyst. (1998). Census of woman corporate officers and top earners. New York: Catalyst.

Crocker, J., Major, B., & Steele, C. (1997). Social stigma. In D. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), Handbook of social psychology (4th ed.) (pp. 504-553). Boston: McGraw Hill.

Crocker, J., & Major, B. (1989). Social stigma and self-esteem: The self-protective properties of stigma. Psychological Review, 96, 608-630.

Croizet, J. C. & Claire, T. (1998). Extending the concept of stereotype threat to social class: The intellectual underperformance of students from low socioeconomic backgrounds. Personality and Social Psychology Bulletin, 24, 588-594.

Culotta, E., & Gibbons, A. (November 13, 1992). Minorities in science. Science, 258, 1176-1232.

Devine, P. (1989). Stereotypes and prejudice: Their automatic and controlled components. Journal of Personality and Social Psychology, 56, 5-18.

Dijksterhuis, A., Spears, R., Postmes, T., Stapel, D., Koomen, W., van Knippenberg, A., & Scheepers, D. (1998). Seeing one thing and doing another: Contrast effects in automatic behavior. Journal of Personality and Social Psychology, 75, 862-871.

Eagly, A. H. (1987). Sex differences in social behavior: A social role interpretation. Hillsdale, NJ: Erlbaum.

Eagly, A. H., & Johnson, B. T. (1990). Gender and leadership style: A meta-analysis. Psychological Bulletin, 108, (2), 233-256.

Eagly, A. H., Karau, S. J., & Makhijani, M. G. (1995). Gender and the effectiveness of leaders: A meta-analysis. Psychology Bulletin, 117, (1), 125-145.

Eccles, J. S. (1994). Understanding women's educational and occupational choices. Psychology of Women Quarterly, 18, 585-609.

Educational Testing Service. (1992). Practicing to take the GRE General Test – No. 9. Princeton: Educational Testing Service.

Fiedler, F. (1978). The contingency model and the dynamics of the leadership process. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 11, pp. 59-112). Orlando, FL: Academic Press.

Fitzgerald, L. F., & Crites, J. O. (1980). Toward a career psychology of women: What do we know? What do we need to know? Journal of counseling Psychology, 27, 44-62.

Fogg, J. (1991). The insider's guide to the colleges, 1991. New York: St. Martin's Press.

Gallup, G., Jr. (1996). The Gallup poll. Wilmington, DE: Scholarly Resources.

Geis, F. L., Brown, V., Jennings, J., & Porter, N. (1984). TV commercials as achievement scripts for women. Sex Roles, 10, (7), 513-525.

Gerbner, G., Gross, L., Morgan, M., & Signorielli, N. (1993). Growing up with television: The cultivation perspective. In J. Bryant & D. Zillman (Eds.), Media effects: Advances in theory and research. Hillsdale, NJ: Erlbaum

Goffman, E. (1976). Gender advertisements. New York: Harper & Row.

Goodman, L. A. (1960). On the exact variance of products. Journal of the American Statistical Association, 55, 708-713.

Hewitt, N. M., & Seymour, E. (1991). Factors contributing to high attrition rates among science and engineering undergraduate majors. A report submitted to the Alfred P. Sloan Foundation.

Hollander, E. P. (1992). The essential interdependence of leadership and followership. Current Direction in Psychology Science, 1, 71-75.

Jacobs, J. E., & Eccles, J. S. (1985). Gender differences in math ability: The impact of media reports on parents. Educational Researcher, 14, 20-25.

Jennings, J., Geis, F., & Brown, V. (1980). The influence of television commercials on women's self-confidence and independent judgement. Journal of Personality and Social Psychology, 38, (2), 203-210.

Judd, C. M., & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluations. Evaluation Review, 5, 602-619.

Kimball, M. M. (1986). Television and sex-role attitudes. In T. M. Williams (Ed.), The impact of television: A natural experiment in three communities (pp. 265-301). Orlando, Fl: Academic Press.

Lavine, H., Sweeney, D., & Wagner, S. H. (1999). Depicting women as sex objects in television advertising: Effects on body dissatisfaction. Personality and Social Psychology Bulletin, 25, (8), 1049-1058.

Lefevre, J., Kulak, A., & Heymans, S. (1992). Factors influencing the selection of university majors varying in mathematical content. Canadian Journal of Behavioral Sciences, 24, 276-289.

Leuptow, L. B., Garovich, L., & Leuptow, M. B. (1995). The persistence of gender stereotypes in the face of changing sex roles: Evidence contrary to the sociocultural model. Ethnology and Sociobiology, 16, 509-530.

Lovdal, L. (1989). Sex role messages in television commercials: An update. Sex Roles, 21, (11), 715-724.

Major, B., Spencer, S., Schmader, T. , Wolfe, C., & Crocker, J. (1998). Coping with negative stereotypes about intellectual performance: The role of psychological disengagement. Personality and Social Psychology Bulletin, 24 ,(1), 34-50.

Morrison, A. M., & Von Glinow, M. A. (1990). Women and minorities in management. American Psychologist, 45, (2), 200-208.

Pollay, R. W. (1986). The distorted mirror: Reflections of the unintended consequences of advertising. Journal of Marketing, 50, 18-36.

Powell, G. N. (1993). Women and men in management (2nd ed.). Newbury Park, CA: Sage.

Ragins, B .R., & Sundstrom, E. (1989). Gender and power in organizations: A longitudinal perspective. Psychology Bulletin, 105, (1), 51-88.

Seymour, E., & Hewitt, N. M. (1997). Talking about leaving: Why undergraduates leave the sciences. Boulder: Westview Press.

Sherman, J. (1983). Factors predicting girls' and boys' enrollment in college preparatory mathematics. Psychology of Women Quarterly, 7, 272-281.

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.

Spencer, S. J., Quinn, D. M., Davies, P. G., & Gerhardstein, B. (under review). Cultural stereotypes and stereotype threat: How TV commercials can activate gender stereotypes and undermine women's math performance. Journal of Personality and Social Psychology.

Stangor, C. & Sechrist, G. B. (1998). Conceptualizing the determinants of academic choice and task performance across social groups. In J. K. Swim & C. Stangor (Eds.) Prejudice: The target's perspective (pp. 105-124). San Diego: Academic Press.

Steele, C. M. (April, 1992). Race and the schooling of Black Americans. The Atlantic Monthly, 68-78.

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.

Yee, D. K., & Eccles, J. S. (1988) Parent perceptions and attributions for children's math achievement. Sex Roles, 19, 317-333.

Endnotes

[1] A three-way ANOVA (Gender X Commercial Type X Question Type) on the performance data controlling for number of attempts (corrected score/number of attempts) revealed a main effect for question type, F (1, 63) = 83.39, $p < .001$, which was qualified by a two-way interaction between gender and question type, F (1, 63) = 9.65, $p < .01$, which in turn was qualified by a marginal three-way interaction between gender, commercial type, and question type, F (1, 63) = 3.70, $p = .06$. The women's data were as follows: math performance in the neutral-commercial condition M=.53, math performance in the stereotypic-commercial condition M=.39, verbal performance in the neutral-commercial condition M=.24, verbal performance in the stereotypic-commercial condition M=.28.

[2] None of the interactions involving the Health factor were significant, Fs < 2. Therefore, only the cell means will be reported here. The means for men in the neutral-commercial condition, men in the stereotypic-commercial condition, women in the neutral-commercial condition, and women in the stereotypic-commercial condition, respectively, were as follows: M=2.81, M=3.11, M=3.98, M=3.27.

Table 1

The 57 majors/careers and the 3 factors on which they load, items under each factor appear in descending order of factor loadings.

Quantitative Domain	Verbal Domain	Health Domain
25 Item Factor (α=.91)	20 Item Factor (α=.92)	12 Item Factor (α=.92)
Financial Analyst	Author of Novels	Biologist
Computer Engineering	Linguistics	Biology
Stock Broker	Journalist	Kinesiology
Economics	Children's Author	Physician
Mechanical Engineering	Artist	Biochemistry
Engineer	Art History	Pharmacist
Business	Creative Writing	Optometrist
Electrical Engineering	English Literature	Health Studies
Chemical Engineering	Communications	Optometry
Accountant	Journalism	Nurse
Office manager	Language Studies	Chemistry
Computer Programmer	Editor	Zoology
Accounting Studies	Librarian	
Sales manager	Geography	
Mathematics	Clothes Designer	
Mathematician	Drama	
Computer Science	Political Science	
Architect		
Statistics		
Architecture		
Urban Planning		
Astronomer		
Physics		

Figure 1. Math and Verbal Attempts as a Function of Gender and Commercial Type

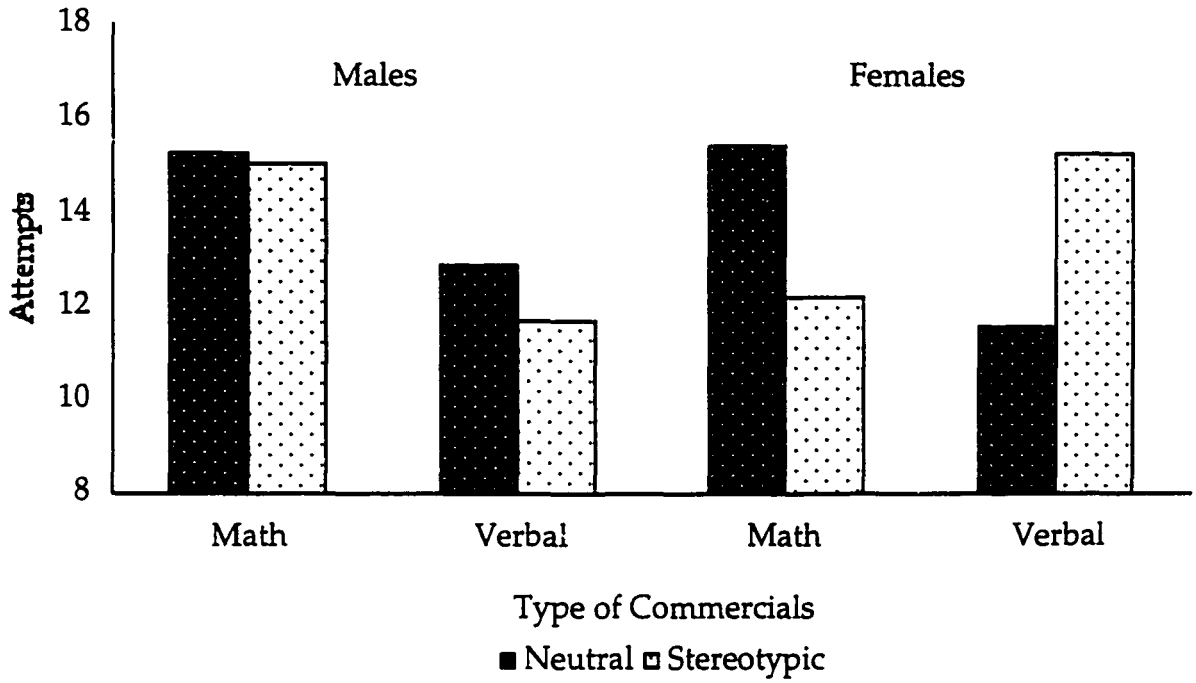


Figure 2. Math and Verbal Performance as a Function of Gender and Commercial Type

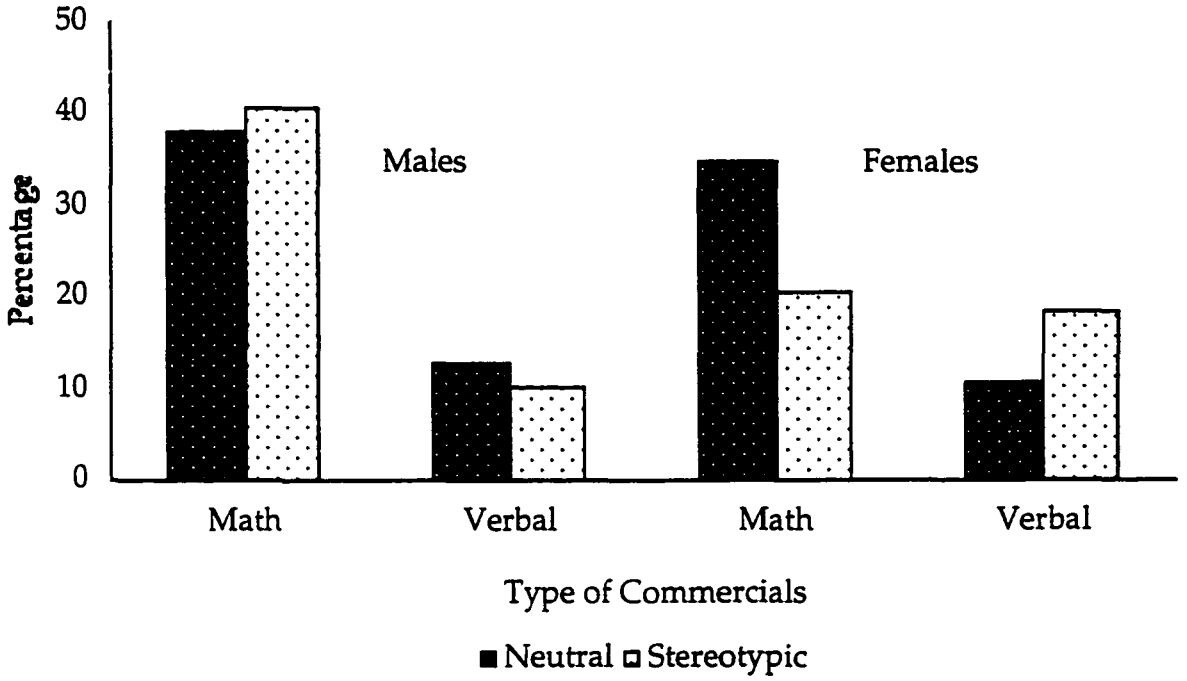


Figure 3. Preference for Majors/Careers in Quantitative/Verbal Domains as a Function of Gender and Commercial Type

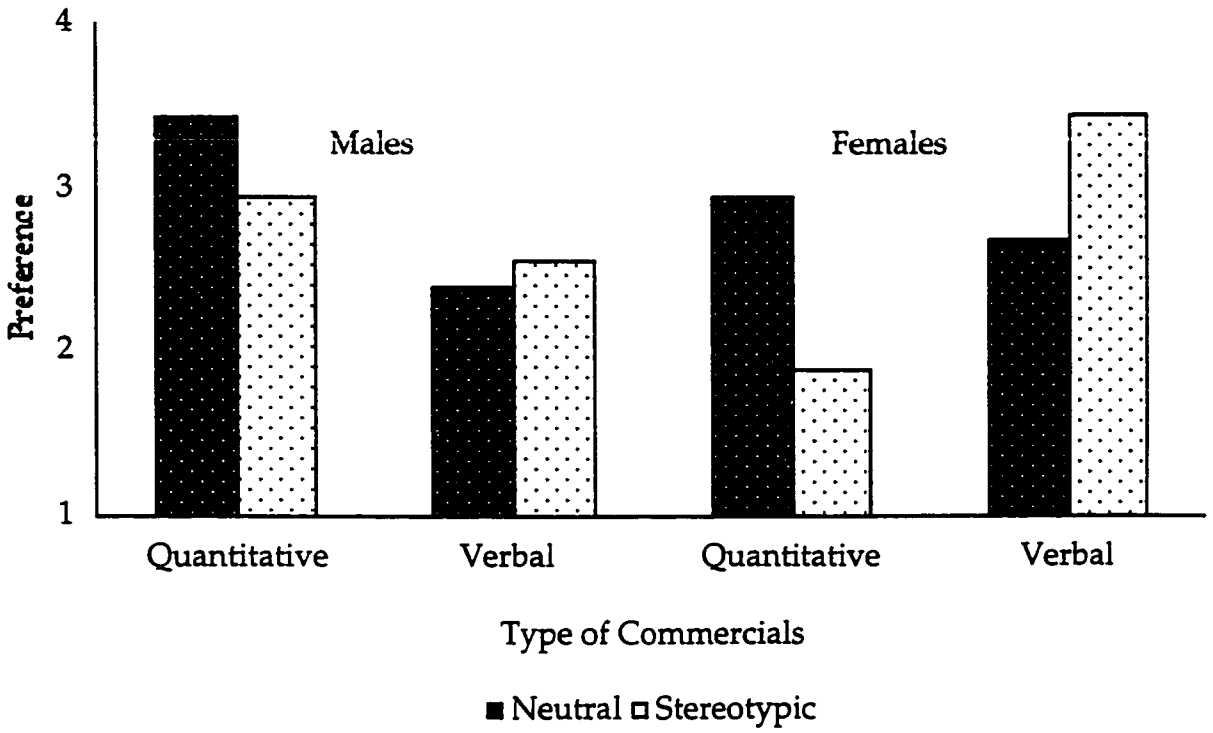


Figure 4. Leader/Problem-Solver Preference as a Function of Gender and Commercial Type

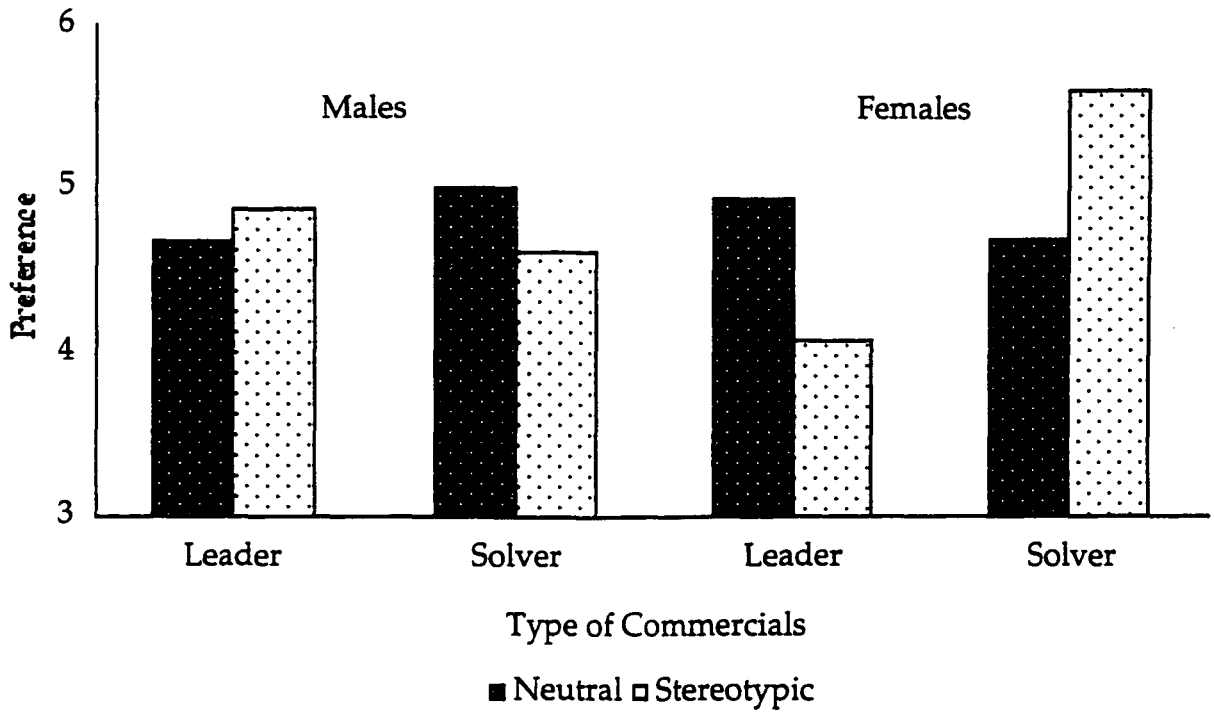


Figure 5. Leader/Problem-Solver Preference as a Function of Gender and Task Description Type

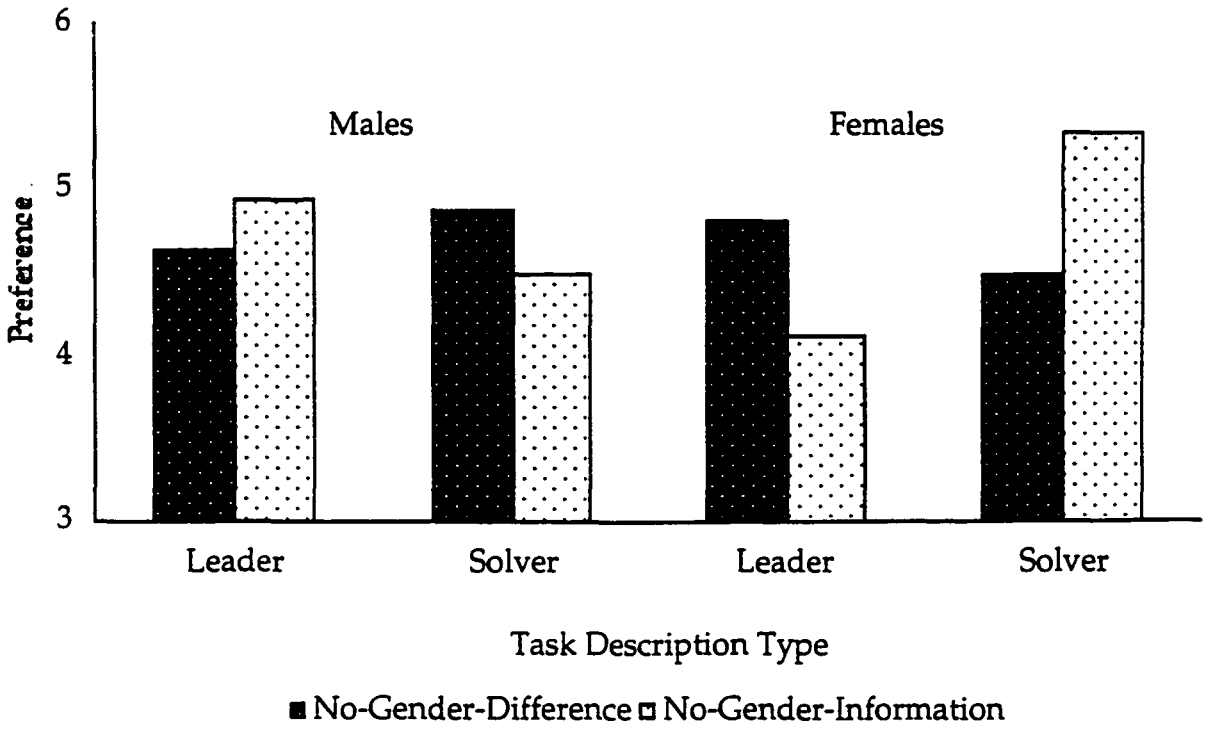


Figure 6. Leader/Problem-Solver Preference among Males as a Function of Commercial Type and Task Description Type

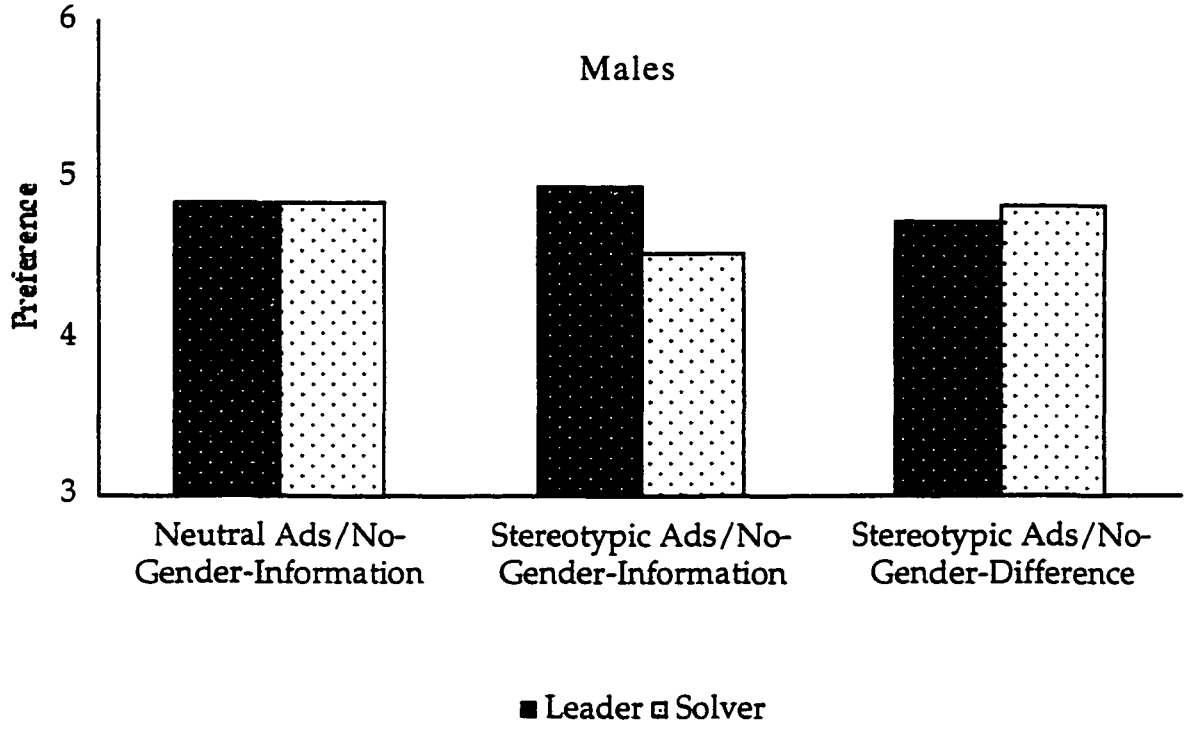


Figure 7. Leader/Problem-Solver Preference among Females as a Function of Commercial Type and Task Description Type

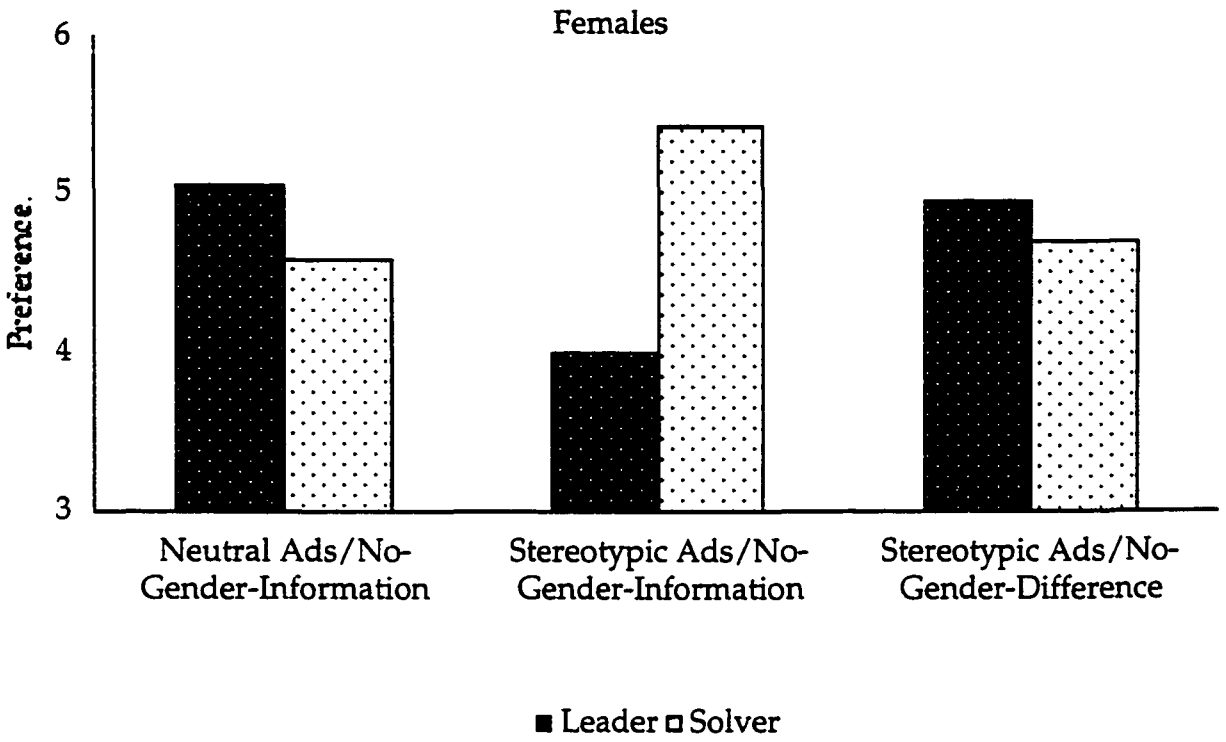


Figure 8. Activation of the Female Stereotype as a Function of Gender and Commercial Type

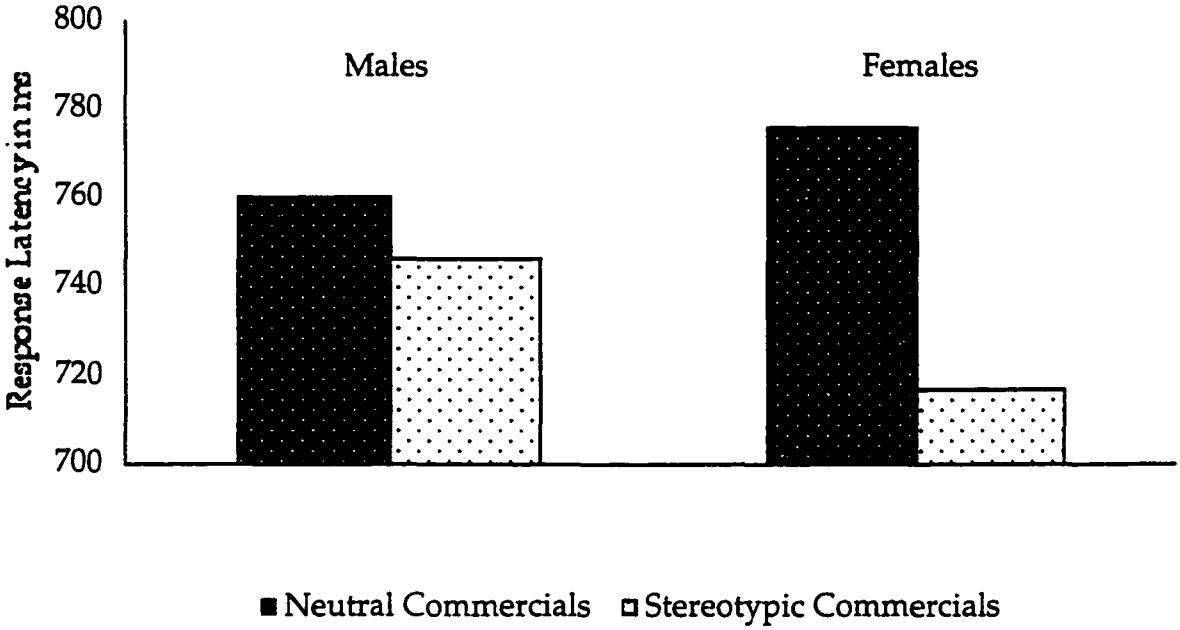


Figure 9. Level of Stereotype Activation among Women Mediates the Effect of Commercial Type on Role Preference

