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Stereotype Performance Boosts: The Impact of Self-Relevance and the Manner of Stereotype Activation

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The activation of positive stereotypes has been shown to produce academic performance boosts. Evidence regarding the role of self-relevance in producing such effects has been mixed. The authors propose that the subtlety of stereotype activation plays a key role in creating performance boosts among targets and nontargets of stereotypes. Study 1 found that subtle stereotype activation boosted performance in targets, but blatant activation did not. Study 2 was conducted on both targets and nontargets using different methods of stereotype activation. Again, targets showed performance boosts when stereotypes were subtly activated but not when they were blatantly activated. Nontargets, however, showed boosts in performance only when stereotypes were blatantly activated. The role of self-relevance in mediating sensitivity to stimuli is discussed.

Stereotypes, the categories people use to organize their social world, have recently been found to exert powerful effects on cognition and behavior (Banaji & Greenwald, 1994; Bargh, Chen, & Burrows, 1996; Brewer, 1996; Devine, 1989). The heightened salience of social stereotypes has been shown to have striking effects on outcomes such as behavior (e.g. Bargh et al., 1996; Steele & Aronson, 1995), perceptions of others (e.g., Devine, 1989), and perceptions of the self (e.g., Levy, 1996; Pittinsky, Shih, & Ambady, 1999). In each of these studies, across a variety of domains, nonconsciously priming stereotypes has been found to cause individuals to think and act in stereotype-consistent ways.

Stereotypes can be particularly harmful when they predict inferior academic performance. In one of the most well-known and startling examples of stereotype priming effects, Steele and Aronson (1995, Experiment 4) found that the mere presence of an item asking African American college students to indicate their race prior to the presentation of a standardized test was enough to decrease their score by almost half. The race item presumably activated negative stereotypes about race, which then activated self-confirming mental representations for poor academic performance. With these representations guiding their behavior, participants who had indicated their race unwittingly confirmed stereotypes that African Americans are intellectually inferior. Similar results have emerged regarding other stereotyped groups, including Latino students (Aronson, Quinn, & Spencer, 1998), Caucasian students of low socioeconomic background (Croizet & Claire, 1998), and women, who are stereotyped to have inferior math abilities (Spencer, Steele, & Quinn, 1999).

Recently, however, researchers have found that stereotype activation can not only hurt performance; it can also *boost* performance. In other words, stereotype activation can serve to both enhance and deflate test performance, depending on the valence of the stereotype. For instance, Levy (1996) showed that activation of negative terms associated with the elderly (e.g., senile, dementia) produced deficits in the memory abilities of elderly participants. Meanwhile, the activation of positive terms associated with the elderly (e.g., wise, experienced) produced an enhancement of the elderly participants' memory abilities. In both cases, participants' performance after being exposed to a subtle priming manipulation fell in line with group-based expectations of the elderly. Shih, Pittinsky, and Ambady (1999) also demonstrated that activated stereotypes can have beneficial or destructive effects. Shih et al. (1999) found that Asian American women performed better on a mathematics test when their Asian identity was cued, but worse when their gender identity was cued, compared with a control group. This evidence suggests that individuals are not only "threat-

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ened" by stereotypes, they are more generally "susceptible" to stereotypes. In this article, we examine the conditions under which the activation of positive stereotypes can boost the performance of individuals who are and who are not the targets of the stereotype.

The Assumption of Self-Relevance in Stereotype Susceptibility Studies

In the aforementioned studies, members of the particular stereotyped gender or ethnic or social group were found to exhibit dramatic behavioral shifts corresponding to the activation of group-based expectations. Indeed, many have assumed that stereotypes must be *self-relevant* (applicable to one of the individual's many identities) to exert such effects as performance boosts. For instance, Levy's (1996) findings support the assumption of self-relevance, in that positive stereotypes of the elderly improved the memory of elderly participants but had no such effects on young participants. Stereotype primes of the elderly were thought not to be self-relevant to the young participants, and the absence of stereotype priming effects suggested that stereotypes must indeed be self-relevant to enhance memory performance.

The assumption of self-relevance however, has recently been challenged by findings reported by Bargh and Dijksterhuis and their colleagues (Bargh et al., 1996; Chen & Bargh, 1997; Dijksterhuis, Bargh, & Miedema, 2000; Dijksterhuis & van Knippenberg, 1998). Dijksterhuis and van Knippenberg (1998), for instance, asked college students to think about traits typically associated with either professors or soccer hooligans. Of interest, those in the professor condition performed better on an ostensibly unrelated task composed of items taken from the game "Trivial Pursuit," whereas those asked to think about traits of soccer hooligans performed worse. Thus, the students performed in a stereotype-consistent fashion after being exposed to self-irrelevant concepts. By demonstrating stereotype priming effects among individuals who do not ascribe to the relevant social groups, these studies have suggested that stereotypes need not be self-relevant to elicit improvements in intellectual performance as well as other domains.

Thus, the evidence regarding the role of self-relevance in the production of stereotype performance boosts is mixed. Although some studies suggest that stereotypes must be self-relevant to boost performance (e.g. Levy, 1996), other studies suggest that self-relevance is not an essential condition (e.g. Bargh et al., 1996; Dijksterhuis et al., 2000; Dijksterhuis & van Knippenberg, 1998).

The Differential Effects of Subtle and Blatant Stereotype Activation on Targets and Nontargets

The present set of studies was designed to investigate the source of this conflicting pattern of results. Perhaps this conflict may be addressed by examining the processes through which stereotypes affect targets and nontargets. Wheeler and Petty (2001) proposed that stereotypes impact targets and nontargets through two different processes: a "hot" process affecting targets in which the self is implicated, and a "cold" process affecting nontargets in which the self is not implicated. Building on Wheeler and Petty's proposals, we propose and test a model regarding the conditions under which self-relevance is a necessary factor for generating positive stereotype performance boosts. First, we describe the cognitive processes hypothesized to underlie stereotype susceptibility in general. Then, we discuss the role played by self-relevance in mediating these cognitive pathways.

Most generally, we propose that stereotype activation influences performance through a process consistent with the "perception-behavior expressway" model of social perception (Dijksterhuis & Bargh, 2001). This model posits that perceptual and behavioral representations for a single action form overlapping connections, such that the perception of a behavior automatically sets up action tendencies to produce the same behavior. Support for this hypothesis has come from studies investigating behavioral outcomes such as mimicry behavior (Bargh & Chartrand, 1999). For instance, Fadiga, Fogassi, Pavesi, and Rizzolatti (1995) demonstrated that watching an experimenter grasp an object leads to muscular responses that are similar to those used when participants are asked to grasp the object themselves, suggesting that perceptual and behavioral processes are tightly and inextricably linked.

Important for our understanding of stereotype priming effects, it appears that the perception of a specific behavior such as object grasping is not necessary in the production of corresponding behavioral tendencies within the perceiver. After being exposed to more general trait concepts, individuals will automatically infer and perform trait-consistent behavioral tendencies. For instance, participants in a study conducted by Bargh et al. (1996) found that participants were more likely to interrupt a conversation if they had been primed with the trait *rude*, than those participants primed with *polite*. Similarly, Carver, Gannellen, Froming, and Chambers (1983) found that priming individuals with the concept *hostility* led them to act in a more hostile manner.

Because stereotypes are well-defined collections of trait concepts, it is believed that stereotype priming likewise elicits corresponding behavioral tendencies, regardless of group membership. For instance, priming the concept *Asian* likely activates the stereotypic trait "talented at math," which then sets up the behavioral tendencies related to high math performance. According to the perception-behavior perspective, mere exposure to stereotypic constructs elicits stereotype-consistent behaviors, regardless of the group membership of the perceiver.

In the context of positive stereotypes and test performance, we would expect boosts in performance, regardless of group membership. The process, thus far, referred to by Wheeler and Petty (2001) as a "cold" process, is an automatic one in that activated trait concepts produce corresponding behavioral tendencies without contribution of anxiety-based or self-relevant factors. Among targets, however, additional factors, "hot" processes, may come into play. When the activated stereotypes are self-relevant, activation is believed to introduce additional motivational concerns such as self-esteem or impression management that may also affect behavior.

Because different factors come into play for targets and nontargets when stereotypes are activated, we propose that the activation of stereotypes should lead to different behavioral consequences under different conditions for these two groups of individuals. Specifically, when positive stereotypes are considered, we propose that contextual factors, particularly the manner of stereotype activation, play an important role in the production or nonproduction of stereotype performance boosts among targets and nontargets. The hypothesized relationship between the method of stereotype

activation and self-relevance of the stereotype is discussed in greater detail below.

Sensitivity as a Mediator of Stereotype Susceptibility Effects

Subtly Activated Constructs

Stereotypes can be introduced into a social situation with differing degrees of subtlety, providing individuals with differing levels of awareness about the association between stereotype priming and their behavior (Higgins, 1996; Moskowitz & Roman, 1992). When stereotypes are primed subtly, individuals are not aware of the link between stereotype priming and their behavior. At the subtlest level, stereotypes can be activated subliminally, below the perceiver's threshold of conscious awareness (Banaji & Hardin, 1996; Bargh & Chartrand, 1999; Bargh & Pietromonaco, 1982). For instance, the subliminal presentation of stereotype-related constructs is often accomplished through the visual presentation of stimulus words at rapid exposure times, so that the participant is able to detect a brief flash on a computer monitor but cannot consciously read the words (Bargh & Pietromonaco, 1982). The lack of any conscious awareness on the part of individuals exposed to this paradigm would suggest that motivational or goal-driven processes play little role in this process, rendering everyone equally susceptible to the effects of unconscious priming mechanisms. We argue that although motivational processes are unlikely to play a role, individuals are still likely to exhibit differing levels of sensitivity to subtly presented stimuli, and this sensitivity moderates the strength of the behavioral response. Specifically, we argue that targets of stereotypes, for whom the priming stimuli are self-relevant, are more sensitive to such stimuli and show a lower threshold of activation for such stimuli than do nontargets.

Self-relevant information has long been thought to receive "privileged access" to ongoing mental processing (Cherry, 1953; Wegner & Bargh, 1998). Even when busy attending to other goals and purposes, social perceivers immediately and unintentionally attend to such self-relevant information, as in the well known "cocktail party effect" (Cherry, 1953). Social perceivers are also more sensitive to words related to their central self-concepts. Thus, using a dichotic listening task, Bargh (1982) found that participants for whom the concept of independence was an important part of their self-concept automatically detected and processed independence-related words, suggesting that self-relevance functions as a "cognitive filter" in the processing of incoming stimuli. In an earlier study, Postman, Bruner, and McGinnies (1948) reported that people have lower attentional thresholds to words related to their deeply held values; they saw and later remembered these words at briefer presentation times as compared with words not personally important. We argue that a similar process is at work when individuals are presented with stimuli related to a self-relevant or self-irrelevant social category. When stereotypic constructs are presented at very brief exposures, targets of the stereotype, because of their increased sensitivity to such self-relevant stimuli, should be more likely to process those constructs. By contrast, nontargets should have a higher threshold for such constructs because these stimuli are self-irrelevant. Non-self-relevant stimuli are likely to be processed less vigilantly.

On the basis of this theory, we predict that targets should show stronger behavioral reactions and lower sensitivity thresholds to the subliminal introduction of stereotypes as compared with nontargets. This is exactly the pattern of results previously documented in Levy's (1996) study. Nontarget participants in Levy's study, which presented stereotypic constructs subliminally, showed no effects of stereotype activation. In contrast, targets showed remarkable shifts in memory ability following the subliminal presentation of stereotypic constructs.

Blatantly Presented Constructs

Stereotypes can also be activated in a more blatant manner, as when individuals are made aware of the association between the stereotype prime and a subsequent dependent measure (Bargh, 1994). Individuals can be explicitly told about the applicability or relevance of particular stereotypes in a given context (e.g., Aronson et al., 1998; Spencer et al., 1999). For instance, Spencer et al. (1999) told participants explicitly that the math test they were taking was gender neutral. Not surprisingly, such blatant priming manipulations produce quite different responses as compared with subtle manipulations (Higgins, 1996; Lombardi, Higgins, & Bargh, 1987; Martin, 1986; Moskowitz & Roman, 1992). We propose that more blatant stereotype activation procedures produce a different pattern of stereotype susceptibility effects in targets and nontargets.

Specifically, we propose that the blatant activation of positive stereotypes will not produce performance boosts among targets. For targets, the blatant activation of positive stereotypes may launch in action motivational processes such as impression management concerns. Stereotypes communicate to individuals the traits that society expects them to possess as a function of their group membership (Jones, 1990). Although high expectations for *individual* performance often lead to enhanced performance (e.g., Rosenthal & Jacobson, 1968), high *group-based* expectations often lead to depressed performance (e.g. Brown & Josephs, 1999). Thus, these conscious processes may undo any beneficial effects accrued from an implicitly activated positive stereotype.

In contrast, the detrimental effect of blatantly activating group-based expectations among nontargets should be nil. The stereotype is not self-relevant, and motivational concerns of confirming the primed stereotype are negligible. Because the nontargets do not belong to the stereotyped group, it makes little sense to fear confirming stereotypes associated with that group. Blatant activation of stereotypes, therefore, should not produce a "choking" effect in nontargets. Rather, blatant activation should produce stereotype assimilation effects. By making the prime more salient (i.e., by making participants aware of its presence) and strengthening the salience of the prime, the stereotype should become more cognitively accessible, surpassing the nontargets' detection threshold. A series of studies, in fact, has demonstrated that stereotype assimilative behavior is manifested in nontargets following more blatant presentations of stereotypes (e.g., Bargh et al., 1996; Dijksterhuis et al., 1998; Dijksterhuis & van Knippenberg, 1998; Wheeler, Jarvis, & Petty, 2001). For example, in a study conducted by Bargh et al. (1996, Experiment 2), young college students who were blatantly primed with stereotypes of the elderly subsequently walked more slowly down a hallway, consistent with stereotypes of the elderly. Likewise, Wheeler et al. (2001) used a blatant

priming technique (having participants write about a day in the life of a certain individual) and showed that non-African Americans primed with the concept of African Americans performed worse on a math test, consistent with negative stereotypes about the academic abilities of African American students. On the basis of our conceptualization of the threatening nature of group-based expectations, as well as the results of previous studies, we propose that the blatant activation of positive stereotypes should boost the performance of nontargets, but not the performance of targets.

In sum, we propose that the activation of positive stereotypes influences performance through the initial activation of related trait concepts, as proposed by Dijksterhuis and Bargh (2001). However, we propose that this activation process will be affected by two factors: (a) how the stereotypes are activated (i.e., subtly or blatantly), and (b) whether the stereotypes are self-relevant. Thus, the model to be tested predicts that targets and nontargets will respond differently to both subtle and blatant presentation of positive stereotypes. Subtle activation of positive stereotypes should boost the performance of targets but not nontargets whereas blatant activation of positive stereotypes should boost the performance of nontargets but not targets.

Study 1: Subtle and Blatant Activation of Self-Relevant Stereotypes

The goal of Study 1 was to investigate our proposition that among targets of stereotypes, the subtle priming of positive stereotypes would boost performance whereas the blatant priming of positive stereotypes would not. Specifically, Study 1 examined whether the performance on a mathematics test of Asian Americans would differ when the stereotype "Asians are talented at math" is subtly or blatantly activated. To investigate this question, we asked Asian American students to complete a mathematics test under one of three conditions: (a) *subtle* stereotype activation, which made their ethnic identity salient; (b) *blatant* stereotype activation, which provided direct exposure to the relevant stereotypes; or (c) a *no-prime* condition in which neither the identity nor the stereotype was made salient.

Method

Participants and design. Seventy-three Asian American students who were enrolled in the Harvard Summer School participated in the study in exchange for monetary compensation. Participants were randomly assigned to one of the three experimental conditions.[1]

Stereotype activation manipulation. In the *subtle* activation condition, the Asian aspect of participants' self identities was subtly activated. As part of an ostensibly unrelated task, participants in this condition were asked to complete the "student life survey" used in Shih et al.'s (1999) study. This questionnaire was designed to make ethnicity salient without explicitly priming stereotypes associated with Asian Americans. Participants were asked to indicate (a) whether their parents or grandparents spoke any languages other than English, (b) what languages they knew, (c) what languages they spoke at home, (d) what opportunities they had to speak other languages on campus, (e) what percentage of these opportunities were found in their residence halls, (f) whether they were involved with any student organizations, and (g) how many generations of their family had lived in America. As the Asian identity is linked to the stereotype of superior mathematical abilities (Steen, 1987), this manipulation subtly and indirectly activated the stereotype "Asians are good at math" without making it explicitly clear that participants' math performance was being evaluated in relation to their status as Asian individuals.

In the *blatant* stereotype activation condition, participants completed a stereotype evaluation questionnaire that was designed to bring stereotypes about Asian Americans into conscious awareness. This questionnaire explicitly asked participants to evaluate the commonality and validity of several stereotypes associated with Asian Americans. Rated stereotypes included the following: (a) Asian Americans are respectful, (b) Asian Americans are quiet, (c) Asian Americans have poor verbal skills, (d) Asian Americans are stingy, and (e) Asian Americans are modest. Further, just prior to taking the mathematics test, participants were told that the study was examining the stereotype "Asian Americans are good at mathematics." Thus, participants in this condition were made explicitly aware of publicly-held expectations for superior performance.

Finally, in the no-stereotype activation *no-prime* condition, participants completed an entertainment survey asking them to indicate items such as (a) how frequently they went to the movies, (b) how frequently they ate out, and (c) how frequently they bought CDs.

Procedure. Participants were run individually by an Asian male experimenter blind to the experimental condition. Each participant first completed one of the three stereotype activation questionnaires, after which each participant was given 20 min to complete a challenging quantitative test (see Shih et al., 1999). After the test, participants were asked to complete a final questionnaire, reporting on a scale from 1 (*not at all*) to 9 (*very much*), of how much they enjoyed the experiment, how talented they thought they were at mathematics, how well they thought they did on the test, and their math Scholastic Assessment Test (SAT) score. After they completed the questionnaire, they were subsequently paid, debriefed, and dismissed.

Results and Discussion

Number of questions answered correctly. Consistent with previous research (Steele & Aronson, 1995), our analyses controlled for differences in participant's math performance on the SAT. As shown in Figure 1, an analysis of covariance (ANCOVA) on the number of questions correctly answered revealed significant differences among the conditions, $F(2, 66) = 4.05$, $p = .02$. Participants exposed to subtle stereotype activation showed a large boost in performance ($M = 7.11$) compared with those in the no-prime condition ($M = 5.95$) and those in the blatant stereotype activation condition ($M = 5.89$). Further analyses revealed that participants for whom stereotypes were subtly activated answered more questions correctly on the mathematics test than participants in the blatant activation and no-prime conditions, $t(66) = 2.64$, $p = .01$, $r = .32$. Participants in the blatant condition did not differ significantly in their performance from participants in the no-prime condition.

Accuracy. Similarly, analyses of test accuracy (number of questions correctly answered divided by the number of questions attempted) revealed that there were significant differences among the conditions, $F(2, 66) = 5.18$, $p < .01$. Participants in the subtle stereotype activation condition were the most accurate ($M = 0.68$), followed by participants in the no identity condition ($M = 0.58$) and participants in the blatant stereotype activation condition ($M = 0.53$). Further analyses revealed that participants were significantly higher in accuracy in the subtle condition than in the

[1] Three participants were dropped from final analyses because they had either received too much time on the test or had not taken the experiment seriously.

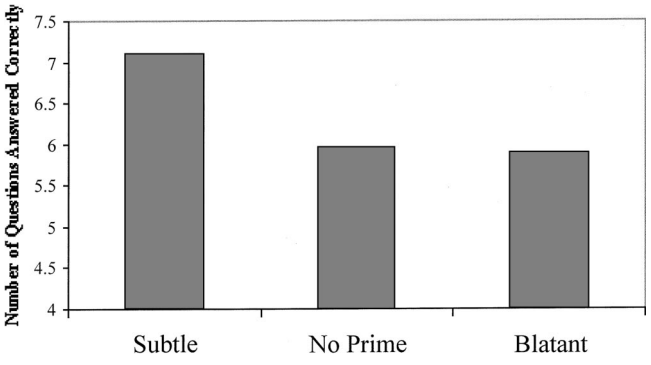

Figure 1. Study 1: Asian American's math test performance following stereotype activation.

blatant and no-prime conditions, $t(66) = 2.71$, $p < .01$, $r = .31$. Once again, participants in the blatant condition did not differ significantly in their performance from participants in the no-prime condition.

Number of questions attempted. We found no significant differences for the third dependent measure, the number of questions attempted.

Additional measures. On analyzing responses to the additional measures, we found significant differences in participants' ratings of their mathematical talent. Participants in the blatant stereotype activation condition reported being more talented at math ($M = 5.83$) than participants in the subtle stereotype activation ($M = 4.31$) or control conditions ($M = 5.23$). Tukey's honestly significant difference revealed the ratings of math talent in the subtle condition were significantly lower than both the ratings in the blatant condition as well as the ratings in the no-prime condition at the .05 level. The comparison between the ratings in the blatant and the no-prime condition were not significantly different. Analysis of the other self-report ratings on the final questionnaire revealed no differences among the conditions in participants' ratings of how much they enjoyed the experiment, or how well they thought they did on the test.

In sum, targets of stereotypes evidenced significant performance boosts following the subtle activation of their Asian ethnicity and performance decrements following the blatant activation of Asian-related stereotypes. These results provide support for the notion that positive stereotypes only boost the test performance of stereotyped individuals when they are subtly activated. It appears that even though the relevant stereotype in this case (i.e., Asians are good at math) was a positive one, blatantly reminding participants of this stereotype produced diminished performance. It is believed that such a condition produced the threat of having to live up to positive group-based expectations, which has previously been shown to threaten intellectual performance (Cheryan & Bodenhausen, 2000).

Study 2: The Impact of Subtle and Blatant Positive Stereotype Primes on Targets' and Nontargets' Math Performance

Study 2 was conducted with two goals in mind: (a) to replicate the findings in Study 1 for the effects of blatant and subtle stereotype presentation and (b) to test our predictions for these effects on nontargets. In this study, both Asians and non-Asians were exposed to words relating to Asian stereotypes at both subliminal and supraliminal presentation speeds. This design permitted a test of the sensitivity hypothesis, which posits that nontargets have higher activation thresholds for constructs that are not self-relevant. Nontargets were predicted to show performance boosts in response to supraliminal exposure to positive stereotype primes, but little or no response to the subliminal exposure of stereotypic constructs. By contrast, we predicted that targets would show performance boosts in response to the subliminal exposure of a positive stereotype, but no boosts following the supraliminal exposure of stereotypic constructs.

Method

Participants. Sixty non-Asian students and 30 Asian students participated in this experiment in exchange for monetary compensation. Eleven participants (8 non-Asians, 3 Asians) were dropped because they indicated that they had lived in the United States for fewer than 7 years and that English was not their first language.[2]

Design and manipulation. In this study, we used a 2 (ethnicity: Asian or non-Asian) × 2 (priming type: subliminal or supraliminal) × 2 (priming content: Asian prime or no prime) factorial design.

The independent variables were manipulated through a "computer vigilance task." This task was based on that used by Bargh and Pietromonaco (1982). In the subliminal prime conditions, participants were exposed to stimulus words that appeared on the screen for 80 ms (Bargh & Pietromonaco, 1982). At this exposure time, they were able to detect a flash but could not consciously read the words. In the supraliminal prime condition, participants were exposed to stimulus words that appeared on the screen for 1,000 ms. At this duration, participants were able to read and consciously register the stimulus words.

Two sets of words were used as stimuli. In the Asian prime condition, 12 words stereotypical of Asians were presented (*TOKYO, HONG KONG, WONTON, SHANGHAI, KIMONO, ASIA, TAIWAN, WOK, CHINATOWN, CHANG, CHOPSTICKS,* and *WONG*). In the no-prime control condition, 12 high-frequency neutral words matched for length (Carroll, Davies, & Richman, 1971) were used (*WATER, SOMETHING, LITTLE, TOGETHER, NUMBER, PEOPLE, WHAT, EVERYTHING, EVERY, DIFFERENT,* and *ALWAYS*). In the Asian prime condition, 80% of the stimulus words were stereotypical of Asians whereas in the no-prime condition, none of the stimulus words were stereotypical of Asians (Bargh & Pietromonaco, 1982).

The computer task was conducted on an IBM compatible desktop computer using the SuperLab Pro (Cedrus Corporation, 1997) program for stimulus presentation. The stimulus words were presented on a white background in capital letters in black Times font. The words were presented in three blocks of 20 trials for a total of 60 trials. The order in which the words were presented on each trial was randomized for each participant within each block. Participants in the subliminal activation condition were told that they were participating in a "vigilance task" and were asked to keep their eyes on a fixation point at the center of the computer screen at the beginning of each trial. They were told that they would see a flash appear on one side of the computer monitor and that they were to respond

[2] It is important that the participants were raised in the United States. Cross-cultural studies documented that the Asian identity is associated with different stereotypes in different countries. Therefore, making the identity salient would have a different effect on non-American individuals (Shih et al., 1999). Furthermore, because the priming task was a word reading task, it was important that English be the participants' first language.

as quickly as possible by pressing one of the keys indicating on which side the flash appeared. In actuality, these flashes were stimulus words presented too quickly to be visually detected (80 ms). Participants in the supraliminal activation condition were told that they would see words on the screen and asked to indicate which side of the screen the words appeared.

Procedure. Participants were run by one of two Caucasian female experimenters blind to the participants' experimental condition. Participants were led into a small room in which a computer and table were set up. Participants were then randomly assigned to one of the four versions of the computer vigilance task. After participants completed the computer vigilance task, they were asked to complete a word fragment completion task (Gilbert & Hixon, 1991), a measure of the activation of the Asian concept. After participants had finished completing the stem completion task,[3] they were given 20 min to complete the math test. Participants then completed a final set of questions. They were asked to indicate on a 9-point scale—rated from 1 (*not at all*) to 9 *(very much*)—(a) how much they enjoyed participating in the study, (b) their confidence in their answers, and (c) their score on the quantitative section of the SAT. Finally, they were paid, thanked, and debriefed.

Results and Discussion

Manipulation check. Responses to the word stem task were used as a check of the priming manipulation. As expected, we found a large main effect for priming condition, $F(1, 39) = 24.34$, $p < .01$. Participants in the Asian prime condition generated, on average, 3.11 Asian-related words in the stem completion, whereas participants in the no-prime condition generated, on average, only 1.55 Asian-related words in the stem completion. There was also a marginal Prime × Ethnicity effect, $F(1, 39) = 3.92$, $p = .055$.

Number of questions answered correctly. As shown in Table 1, the results supported the hypotheses. Once again, our main dependent measure was the number of questions participants correctly answered. A 2 (ethnicity) × 2 (priming content) × 2 (priming type) factorial ANCOVA (covarying SAT scores) revealed a significant three-way interaction between ethnicity, priming content, and priming type, $F(1, 68) = 7.94$, $p < .01$. Thus, to clarify the nature of the three-way interaction, we divided the three interactions into two two-way-interaction analyses.

One should recall that we predicted that Asian participants would show higher performance when subliminally primed with positive stereotypes compared with neutral words. Furthermore, we predicted that when these same primes were supraliminally introduced, Asian participants would show decreased performance when exposed to Asian primes compared with no prime. Nontargets, however, should show the opposite pattern of results. Thus, the comparisons between Asian prime and no prime using the same type of activation (subliminal or supraliminal) for both targets and nontargets would be the most relevant to the question that we were investigating.

We ran separate analyses for Asians and non-Asians. Among Asians, there was a significant two-way interaction between priming type and priming content, $F(1, 68) = 11.84$, $p < .01$. We followed up this analysis with more focused tests. Simple effects tests revealed that Asian participants performed significantly better when they were subliminally exposed to Asian primes ($M = 9.12$) than no primes ($M = 5.14$), $t(68) = 3.79$, $p < .01$, $r = .42$. In contrast, they performed significantly worse on the math test when they were supraliminally exposed to Asian primes ($M = 7.83$) than to no prime ($M = 10.33$), $t(68) = 2.13$, $p = .02$, $r = .25$. These results strongly support our hypothesis.

A parallel analysis for non-Asians also revealed a significant two-way interaction between priming type and priming content, $F(1, 68) = 4.02$, $p = .048$. Simple effects tests revealed that for non-Asian participants, the difference between the Asian prime ($M = 7.23$) and no-prime ($M = 5.75$) conditions using supraliminal priming was significant, $t(68) = 1.82$, $p = .03$, $r = .22$, but the difference between the Asian prime condition ($M = 6.25$) and the no-prime condition ($M = 6.98$) was not significant for subliminal priming.[4]

Accuracy. As shown in Table 2, we found similar patterns of results when examining accuracy, calculated as the number of questions correctly answered divided by the number of questions attempted. A 2 (ethnicity) × 2 (priming content) × 2 (priming type) factorial ANCOVA (covarying out math SAT) revealed a significant three-way interaction between ethnicity, priming content, and priming type, $F(1, 68) = 6.94$, $p = .01$.

To further examine this three-way interaction, we examined Asians and non-Asians separately. Among Asians, we found a significant two-way interaction between priming type and priming content for Asians, $F(1, 68) = 6.33$, $p = .01$. Simple effects tests revealed that Asian participants performed significantly better when they were subliminally exposed to Asian primes ($M = 0.78$) than to no identity primes ($M = 0.54$), $t(68) = 2.70$, $p < .01$, $r = .31$. The decline in performance when supraliminally exposed to Asian primes ($M = 0.75$) compared with no primes ($M = 0.89$) approached significance, $t(68) = 1.50$, $p = .07$, $r = .18$. Among non-Asians, we did not find a significant two-way interaction. Simple effects tests revealed, however, that for non-Asian partic-

Table 1
Mean Number of Questions Answered Correctly by Condition in Study 2

	Supraliminal		Subliminal	
Participant	Prime	No prime	Prime	No prime
Asian	7.83 (1.83)	10.33 (2.25)	9.12 (2.35)	5.14 (1.32)
Non-Asian	7.23 (2.56)	5.75 (2.34)	6.98 (2.61)	6.25 (2.12)

Note. Standard deviations are reported in parentheses.

[3] Not all participants completed the stem completion task. The questionnaire was added into the procedure partway through the project. An analysis of results using only the data after the stem completion was inserted revealed that the pattern of results did not change.

[4] We ran separate analyses for subliminal and supraliminal priming. There was a significant two-way interaction in the subliminal, $F(1, 68) = 13.82$, $p < .01$, and supraliminal, $F(1, 68) = 6.12$, $p = .016$, conditions. Asian participants subliminally exposed to Asian words performed better than non-Asian participants subliminally exposed to Asian words, $t(68) = 2.28$, $p < .01$, $r = .27$, and neutral words, $t(68) = 3.16$, $p < .01$, $r = .36$. Asian participants supraliminally primed with neutral words also did significantly better than non-Asians supraliminally primed with Asian and neutral words, $t(68) = 3.10$, $p < .01$, $r = .35$; $t(68) = 4.50$, $p < .01$, $r = .48$, respectively. We did not find significant two-way interactions for Ethnicity of Participant × Priming Type for either Asian primes or neutral primes.

Table 2
Mean Accuracy Scores of Participants by Condition in Study 2

	Supraliminal		Subliminal	
Participant	Prime	No prime	Prime	No prime
Asian	0.75 (0.19)	0.89 (0.14)	0.78 (0.17)	0.54 (0.10)
Non-Asian	0.67 (0.21)	0.55 (0.23)	0.59 (0.21)	0.60 (0.17)

Note. Standard deviations are reported in parentheses.

ipants in the supraliminal condition, the difference between the Asian prime ($M = 0.67$) and no-prime conditions was significant ($M = 0.55$), $t(68) = 1.98$, $p = .03$, $r = .23$, but in the subliminal condition, the difference between the Asian prime and no-prime conditions was not significant ($M = 0.59$ and $M = 0.60$, respectively). These results support our hypotheses.[5]

Number of questions attempted. Finally, we analyzed the number of questions attempted. An ANCOVA covarying out math SAT scores revealed a significant three-way interaction between ethnicity, priming content, and priming type, $F(1, 68) = 7.94$, $p < .01$. To understand this three-way interaction more fully, we ran separate two-way analyses.

Separate analyses of Asian and non-Asian participants revealed that the two-way interaction between priming content and priming type was not significant. Separate analyses by priming type revealed a significant two-way interaction between participant ethnicity and priming content for the subliminal condition, $F(1, 68) = 11.9$, $p < .01$, but not for the supraliminal condition ($F < 1$). Finally, separate analyses by priming content revealed a significant two-way interaction between priming type and participant ethnicity for neutral words, $F(1, 68) = 8.25$, $p < .01$, but not for Asian words, $F < 1$.

Closer examination of the results reveal that when the words were presented subliminally, Asian participants attempted more questions (prime $M = 11.50$, no prime $M = 9.00$) whereas non-Asian participants showed no difference (prime $M = 11.64$, no prime $M = 10.23$). It appears that the effects for the number of questions attempted were driven mainly by the Asian participants subliminally primed with neutral words. They attempted significantly fewer questions than participants in all of the other conditions except for non-Asians subliminally primed for neutral words.

The results of this study suggest that the beneficial effects of positive stereotypes on performance are not limited only to the individuals for whom the stereotypes are self-relevant. Being primed with Asian words boosted the performance of both Asian Americans and non-Asians, depending on the manner of stereotype activation. Non-Asians showed a performance boost when they were supraliminally exposed to Asian-related words, and no boost when they were subliminally exposed to Asian-related words. This pattern of results provides support for the sensitivity hypothesis, which is that targets are more sensitive to self-relevant information. It appears from our results that nontargets or non-Asians were insensitive to the subliminally presented Asian constructs. By contrast, targets or Asian Americans showed a boost when they were subliminally exposed to Asian-related words. Furthermore, Asian Americans showed performance deficits when they were supraliminally exposed to Asian-related words. These results suggest that targets need not be made aware of the actual content of the stereotype (i.e., "Asians are talented at math") to be threatened. An awareness of reading Asian-related words was sufficient to impede the math performance of Asian American participants.

Results in terms of targets of stereotypes are consistent with those reported in Study 1, which used a different manner of subtle stereotype activation. The consistency of these results suggests that there are indeed two possible pathways to stereotype susceptibility, as posited by Wheeler and Petty (2001). The first, of course, is the perception-behavior link (Dijksterhuis and Bargh, 2001). On perceiving a series of stimuli relating to Asia, individuals—regardless of their membership in the category *Asians*—may automatically infer related trait concepts. These traits may include *shy*, *polite*, *poor in verbal skills*, and, important for the present work, *superior in math skills*. The activation of these trait concepts is speculated to automatically produce consistent behavioral tendencies. Among Asians, for whom the stimuli are self-relevant, an additional pathway involves the temporary salience of the ethnic identity. Because the stereotype primes are self-relevant to Asians, they can have motivational significance. This may cause a "choking effect," which hampers performance. Thus, when Asians are primed blatantly, they perform more poorly as a result of this second pathway. When they are primed more subtly, however, they perform as a result of the perception behavior link. The motivational pathway is less of a concern for nontargets because the stereotype is not self-relevant and has little motivational significance. The findings of the two studies clearly indicate that priming a stereotype in different ways can elicit different performance outcomes.

General Discussion

We found in these studies that the group membership of the individuals being primed (whether they are members or nonmembers of the relevant social group) and the manner in which stereotypes are activated (subtly or blatantly) interacted in determining whether recent priming will produce a change in the academic test performance of individuals. These results therefore highlight the influence of both contextual and personal factors in determining how increased accessibility from recent priming influences subsequent behavioral–cognitive responses, contributing to our knowledge of the processes underlying stereotype susceptibility.

Furthermore, these results provide evidence suggesting that the activation of stereotypes affects targets and nontargets through two difference processes. Results of the studies suggest that the perception-behavior link operates for both targets and nontargets when considering the impact of exposure to positive stereotypes.

[5] We performed separate analyses for subliminal and supraliminal priming. The two-way interaction was significant in the subliminal condition, $F(1, 68) = 4.00$, $p = .05$, but only approaching significance in the supraliminal condition, $F(1, 68) = 3.66$, $p = .06$. Asian participants subliminally exposed to Asian words also did significantly better on accuracy than non-Asian participants subliminally exposed to Asian words, $t(68) = 2.30$, $p = .01$, $r = .27$, and non-Asian participants subliminally exposed to neutral words, $t(68) = 2.21$, $p = .01$, $r = .26$.We also found a significant two-way interaction in the no-prime condition, $F(1, 68) = 8.33$, $p < .01$. Asian participants performed higher when supraliminally than subliminally primed with neutral words, $t(68) = 3.74$, $p < .01$, $r = .41$. They also performed higher than non-Asian participants subliminally and supraliminally primed with neutral words, $t(68) = 3.73$, $p < .01$, $r = .41$; $t(68) = 4.03$, $p < .01$, $r = .43$, respectively.

We found that both targets and nontargets showed boosts in performance when they were exposed to positive stereotypes. However, these two groups of individuals showed these boosts under different conditions, suggesting that stereotypes impact their performance targets and nontargets through different processes. Specifically, stereotype targets evidenced assimilation effects in response to subtly presented stimuli and contrast effects in response to blatantly presented stimuli. Asian Americans performed significantly better on a test of quantitative ability following the subtle activation of Asian-related constructs, an assimilation effect in light of stereotypes regarding the superior mathematical ability of Asians. Asian Americans performed significantly worse, however, following the blatant activation of the same constructs, a contrast effect.

These results fall in line with the pattern of assimilation and contrast effects previously documented in the realm of impression formation. When primed subtly, social perceivers tend to use the prime construct to interpret the characteristics of an ambiguously presented target person, producing an assimilation effect. However, when primed blatantly, individuals tend to avoid using the prime construct in interpreting the characteristics of an ambiguous target person, producing a contrast effect (Lombardi et al., 1987; Martin, 1986; Moskowitz & Roman, 1992; Newman & Uleman, 1990). In examining the results of these studies, it seems that the key factor in determining whether an assimilation or contrast effect will be found is participants' awareness of the priming event. For instance, Moskowitz and Roman (1992) found that their priming paradigm produced an assimilation effect on subsequent judgments of ambiguous behavioral descriptions only when the priming involved the spontaneous formation of inferences, a process of which participants were unaware. However, when the priming paradigm involved conscious impression formation, it produced a contrast effect on subsequent judgments.

It is interesting to note that the Asian participants not only failed to show a boost but actually showed a decline in performance when they were blatantly exposed to Asian primes compared with no primes. It may be that blatant exposure to positive stereotypes produces among targets, but not among nontargets, the sense of "choking under pressure" that leads to diminished performance abilities. It seems that targets of positive stereotypes, made aware of the association between the stereotype prime and the task at hand, should show diminished performance. Although previous work has shown that being negatively stereotyped is threatening (Crocker, Major, & Steele, 1998), there is good reason to believe that the explicit awareness of being positively stereotyped can be just as threatening. Cheryan and Bodenhausen (2000) found decreased performance when they used an explicit identity prime.

Research on the "model minority" stereotype regarding Asians has supported this prediction, in that explicitly conveyed group-based positive expectations lead to greater test anxiety, depressed mood, and psychological distress (Chng, Ding, & Perez, 1998; Crystal, Chen, Fuligni, & Stevenson, 1994). More generally, the pressure to live up to the high expectations of an external audience can produce the phenomenon of "choking under pressure" (Baumeister, Hamilton & Tice, 1985; Baumeister & Steinhilber, 1984; Schlenker, Phillips, Boniecki, & Schlenker, 1995a, 1995b). Insofar as positive stereotypes communicate group-based expectations, explicit awareness of those stereotypes may introduce the same psychological factors that undermine performance, such as test anxiety, as negative stereotypes. Brown and Josephs (1999) found that framing a math test as one that diagnoses exceptional math ability as opposed to diagnosing weak math ability caused men to underperform on the math test. They argued that this occurs because unrealistic standards activated by stereotypes are likely to cause stereotyped individuals to choke. Consistent with this logic, Cheryan and Bodenhausen (2000) found that blatant activation of a group membership associated with positive stereotypes resulted in diminished performance, as compared with blatant activation of an idiosyncratic identity. Specifically, Asian American females whose ethnicity was explicitly activated, performed worse on a mathematics test than Asian American females whose personal identity was explicitly activated, suggesting that the blatant activation of positive stereotypes is detrimental to performance ability.

In examining these results in terms of the test performance of non-Asians, a different pattern emerges. As predicted, unlike Asian American participants, non-Asians showed no boost in math test performance when exposed subliminally to Asian-related words. In fact, there was no difference in test scores among these participants following exposure to Asian-related words as compared with neutral control words. Our explanation for this lack of effect, which is consistent with that reported by Levy (1996), focuses on the notion of increased sensitivity to self-relevant stimuli. Self-relevant stimuli have greater access to unconscious, automatic processing, an effect consistently demonstrated in previous work using several different paradigms, including a dichotic listening task (Bargh, 1982) and a modified Stroop task (Geller & Shaver, 1976). This is explained by the principle of greater cognitive skill arising from greater experience within a given domain (e.g., Newell & Rosenbloom, 1981). Because people consistently see themselves as the central focus of experienced events (e.g., Greenwald, 1980), they most frequently process self-relevant information, leading to increased ease and speed of perception. For Asian American participants, subliminally presented stimuli likely activated related trait and behavioral constructs because they were first processed, having reached the lower sensitivity threshold. For non-Asians, however, the self-irrelevant Asian stimuli likely failed to reach this threshold and thus failed to activate consistent trait and action tendencies.

Contrary to Asian American participants, non-Asians responded with behavioral consistency when blatantly primed with Asian concepts. We speculate that the automatic perception-behavior pathway model can account for this effect. The direct perception of Asian related concepts likely spontaneously activated related trait concepts and action tendencies in non-Asian participants, leading to the execution of stereotype-consistent behavior (Dijksterhuis & Bargh, 2001). This finding replicates those reported in several different domains of performance. For instance, in a study conducted by Dijksterhuis and van Knippenberg (1998), college students blatantly primed with the stereotype of professors or the concept *intelligent* demonstrated enhanced performance on a scale measuring general knowledge. In contrast, college students primed with the concept of soccer hooligans or the trait *stupid* demonstrated reduced performance on the same measure. Similar stereotype-consistent behavioral effects were found among college students primed with stereotypes of the elderly (Bargh et al., 1996, Experiment 2; Dijksterhuis et al., 2000) and non-African Americans primed with stereotypes of African Americans (Wheeler et al., 2001). Thus, for individuals who are not members of the

relevant stereotyped group, it appears that the mere perception of stereotypic constructs is sufficient for the production of dramatic shifts in mental and motor abilities. The present studies contribute to our understanding of this process by demonstrating, for the first time, that the perception of such constructs among nontargets must reach a higher threshold of sensitivity.

Of interest, the priming procedures used in the studies mentioned above and in the studies reported in this article did not invoke social comparison processes. Participants in this study simply read Asian stereotypical words. It may be that assimilation effects for nontargets hold only when the stereotypes are introduced in such a way that social comparison processes are not invoked. It is possible that when direct social comparison processes are invoked, nontargets may also show contrast effects. Aronson et al. (1999) found that White participants showed lowered math performance when they were invoked to make a comparison with Asians, a group to which they cannot claim membership, who were stereotyped to excel in math. In such a situation, nontargets may also be susceptible to "hot" processes because when social comparison processes are invoked, the self would be implicated for nontargets. This possibility would be another interesting avenue to pursue in future studies.

Conclusions

Taken together, these two studies reconcile a vexing contradiction in the literature on stereotype susceptibility. Our results indicate that all individuals are susceptible to the activation of stereotypes, even those that are not relevant, through the automatic links between perception and behavior. For targets an additional pathway involves the temporary salience of an identity related to high or low performance expectations. However, our results demonstrate that the manner of stereotype activation plays a key role in mediating the response of both targets and nontargets. In this way, these results offer a more complete understanding of the cognitive processes underlying the influence of stereotypes on stigmatized and nonstigmatized group members.

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