STEREOTYPE THREAT: AN OVERVIEW

EXCERPTS AND ADAPTATIONS
FROM REDUCING STEREOTYPE THREAT.ORG

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Adapted by R. Rhys

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Consequences of stereotype threat can contribute to educational and social inequality of some groups including ethnic minorities in academic environments and women in math. Just a few negative outcomes are:

- limiting domains of study students wish to pursue;
- not valuing an area of study (Aronson, Fried, & Good 2002; Osborne, 1995; Steele, 1997); and
- narrowing students' career options.

The purpose of this article is to provide a summary and overview of published research on stereotype threat. It contains highlights from the reducingstereotypethreat.org web site by Stroessner and Good. You are strongly encouraged to visit this site for a more comprehensive review. By doing so you may increase your understanding of the phenomenon known as stereotype threat and gain strategies to reduce its occurrence and impact (Johns, Schmader, & Martens, 2005).

What is stereotype threat?

Stereotype threat refers to being at risk of confirming, as a self-characteristic, a negative stereotype about one's social group (Steele & Aronson, 1995).

The term, stereotype threat, was first used by Steele and Aronson (1995) who showed in several experiments that Black college freshmen and sophomores performed more poorly on standardized tests than White students when their race was emphasized. When race was not emphasized, however, Black students performed better and equivalently with White students. The results showed that performance in academic contexts can be harmed by the awareness that one's behavior might be viewed through the lens of racial stereotypes.

In general, the conditions that produce stereotype threat are ones in which a highlighted stereotype implicates the self though association with a relevant social category (Marx & Stapel, 2006; Marx, Stapel, & Muller, 2005). When one views oneself in terms of a salient group membership (e.g., "I am a woman. Women are not expected to be good at math." and "This is a difficult math test."), performance can be undermined because of concerns about possibly confirming negative

stereotypes about one's group. Thus, situations that increase the salience of the stereotyped group identity can increase vulnerability to stereotype threat.

Who is impacted?

Everyone is vulnerable to stereotype threat, at least in some circumstances.

Research has shown that stereotype threat can harm the academic performance of *any* individual for whom the situation invokes a stereotype-based expectation of poor performance. Everyone belongs to at least one group that is characterized by some sort of stereotype. Any salient social identity can affect performance on a task that offers the possibility that a stereotype might be confirmed. Stereotype threat effects have been shown with a wide range of social groups and stereotypes including, but not limited to:

- women in math (e.g., Spencer, Steele, & Quinn, 1999; Walsh, Hickey, & Duffy, 1999);
- Whites with regard to appearing racist (Frantz, Cuddy, Burnett, Ray, & Hart, 2004);
- students from low socioeconomic backgrounds compared to students from high socioeconomic backgrounds on intellectual tasks (e.g., Croizet & Claire, 1998; Harrison, Stevens, Monty, & Coakley, 2006);
- men compared with women on social sensitivity (Koenig & Eagly, 2005);
- Whites compared with Asian men in mathematics (e.g., Aronson, Lustina, Good, Keogh, Steele, & Brown, 1999);
- Whites compared with Blacks and Hispanics on tasks assumed to reflect natural sports ability (e.g., Stone, 2002); and
- young girls whose gender has been highlighted before completing a math task (Ambady, Shih, Kim, & Pittinsky, 2001).

There are factors which may play a role in one's "stereotype vulnerability" (Aronson, 2002). These factors include: group membership, domain identification, group identification, internal locus of control/proactive personality, and stereotype knowledge and belief, among others.

What are some of the consequences of stereotype threat?

Decreased performance in academic and non-academic domains, increased use of self-defeating behaviors, disengagement, and altered professional aspirations are just a few potential outcomes.

In situations in which the stereotype is relevant, potential consequences are listed below.

1. Stigmatized groups underachieve on classroom exams, standardized tests, and tasks that have previously been suggested to be "culture free" and relatively "pure" measures of cognitive ability (Steele & Aronson, 1995; Cole, Matheson, & Anisman, 2007; Good, Aronson, & Harder, 2008; Keller, 2007; Neuville & Croizet, 2007; Good, Aronson, & Inzlicht, 2003; Brown & Day, 2006; Klein, Pohl, & Ndagijimana, 2007).

   For instance, stereotype threat has been shown to harm the academic performance of:

- Hispanics (Gonzales, Blanton, & Williams, 2002; Schmader & Johns, 2003);
- students from low socioeconomic backgrounds (Croizet & Claire, 1998);
- females in math (Good, Aronson, & Harder, 2008; Inzlicht & Ben-Zeev, 2000; Spencer, Steele, & Quinn, 1999); and
- White males when faced with the specter of Asian superiority in math (Aronson, Lustina, Good, Keogh, Steele, & Brown, 1999; Stone, Lynch, Sjomerling, & Darley, 1999).

2. Decreased performance on tasks in non-academic domains such as

    - White men in sports (e.g., Stone, Lynch, Sjomerling, & Darley, 1999);
    - women in negotiation (Kray, Galinsky, & Thompson, 2002);
    - gay men in providing childcare (Bosson, Haymovitz, & Pinel, 2004);
    - women in driving (Yeung & von Hippel, 2008); and
    - elderly in memory performance (Levy, 1996).

    A literature review revealed a dearth of research on stereotype threat and people with disabilities. However, it is feasible that people with disabilities are also vulnerable to stereotype threat. Future research is needed.

3. Increased use of self-defeating strategies, such as practicing less for a task and discounting tasks (Stone, 2002).

    Reduced Practicing Time

    - White students highly identified with sports who completed a task described as reflecting "natural athletic ability" practiced the task less than when under no threat and also when compared with individuals not identified with sports (Stone, 2002).
    - Girls who performed poorly on a math test under stereotype threat were more likely to invoke the stress they had been experiencing before taking the test (Keller 2002).
    - Steele and Aronson (1995) showed that African American students under stereotype threat also tended to produce a priori excuses for possible failure (see also Schimel, Arndt, Banko, & Cook, 2004). Brown and Josephs (1999) also showed that providing external excuses beforehand for failure eliminated stereotype threat effects. These results show that individuals under stereotype threat might reduce preparation, exhibit less effort, or invoke factors to create attributional ambiguity for potential failure. To the degree that individuals engage in self-defeating behavior however, actual performance can suffer.

    Task Discounting

    Individuals may question the validity of the task or even the importance of the trait being tested.

- Highly math identified women operating under stereotype threat were more likely to agree with statements such as "this test is not an accurate measurement of my math ability," and "I feel that I am better at math outside of this test" (Lesko & Corpus, 2006).
- Girls who performed poorly on a math test after being told of gender differences were more likely to agree that the test was "tricky" or "unfair" (Keller 2002).
- Belgians with sub-Saharan origins were more likely to assert that an intelligence test commonly used in job selection was inappropriate given their nationality when they had been placed under stereotype threat and performed poorly (Klein, Pohl, & Ndagijimana, 2007).

Although task discounting might help protect the self from the consequences of poor performance, it can also undermine motivation and lead a person to devalue the domain if used to excess.

4. Disengagement and disidentification (Crocker, Major, & Steele, 1998; Major, Spencer, Schmader, Wolfe, & Crocker, 1998). Disengagement occurs when stereotype threat leads individuals to distance themselves from a threatening domain or to suggest that performance in a domain is unrelated to self-worth. For instance,

    - Prior to taking an IQ test, White students were reminded of the stereotype that Asians are intelligent. Subsequently, White students tended to claim that intelligence is relatively unimportant to them (von Hippel, W., von Hippel, C., Conway, Preacher, Schooler, & Radvansky, 2005).

    Limited or context-specific disengagement can be healthy and protective. For example, Major et al. (1998) found that after performing a difficult intelligence test Black participants were less affected by the negative feedback they received after the possibility of racial bias was invoked. Nussbaum and Steele (2007) showed that short-term disengagement allowed Black students under stereotype threat to maintain their motivation on a task. These findings suggest that disengagement can represent an adaptive response that allows individuals to maintain positive self-views or to maintain motivation and persistence.

    However, disengagement can also produce "disidentification" if an individual copes with long-term threat by avoiding the domain or detaching one's identity from a domain (Steele, et al. 2002). For example:

    - The correlation between academic performance and self-esteem was significant for both Black and White students in 8th grade, but African American boys showed a weakening correlation over time so that by 12th grade, academic performance and self-esteem were unrelated (Osborne, 1997).
    - Among students of color, those who most identified with academics (and would be therefore, most susceptible to stereotype threat in academic domains) were most likely later to withdraw from school (Osborne & Walker, 2006).

- High achieving Black students who do *not* disidentify from academics were more likely to face peer-group ostracism compared with high-achieving White students (Fryer, 2006; Zirkel, 2004).

5. Altered professional identities and aspirations

   Recent research has shown that stereotype threat can alter stereotyped students' professional identities by redirecting their aspirations and career paths.

   - Women undergraduates in male dominated disciplines reported higher levels of sex discrimination and stereotype threat. These women were also more likely to report that they were thinking of changing their major compared to women in fields that were not dominated by men (Steele, James, & Barnett, 2002).
   - Women math and science majors who viewed a discussion of math and science topics where males were numerically dominant showed lowered interest in participating in such future discussions (Murphy, Steele, & Gross, 2007).
   - The more that "male characteristics" were emphasized as important in a career field, the less women expressed an interest in entering that field (Gupta & Bhawe, 2007).
   - Emphasizing stereotypical attributes in a classroom environment can affect perceived sense of belonging to that discipline. The more that women perceived that their college calculus classes conveyed negative stereotypes about women's math abilities, the more they reported feeling like unaccepted members of the math community. This threat to their identity as a future mathematician (or scientist) had real consequences for their achievement and career aspirations. When women's sense of belonging was reduced by their perceptions of a stereotypical environment, they earned lower course grades and were less likely to express interest in taking more math classes in the future (Good, Dweck, & Rattan, 2008).

What situations lead to stereotype threat?

Example situations: Stereotyped group status is highlighted, solo status is involved, stereotypes are invoked, and evaluative scrutiny occurs.

Although some individuals are more susceptible to stereotype threat than others, stereotype threat is also more common in some *situations* than others. Research suggests that stereotype threat is more likely to occur in the following contexts.

1. Group identity salience

   When one's stereotyped group status is made relevant or conspicuous by situational features, stereotype threat and performance decrements are more likely. Because stereotype threat arises from negative performance expectations in a specific domain, any group can show evidence of underperformance if the situation brings attention to the threatened identity. In other words, although stereotype threat tends to be experienced by members of some groups more than others, it would be inappropriate to conclude that it is only experienced by members

of traditionally stigmatized or stereotyped groups. A stereotyped social identity can be highlighted in several ways in social situations.

For example, highlighting stereotyped social identities by soliciting identity-relevant information before test taking has been used in several studies and the results consistently show performance decrements for the stereotyped group when identity information is gathered before rather than after test completion (Ambady, Shih, Kim, & Pittinsky, 2001; McGlone & Aronson, 2006; Shih, Pittinsky, & Ambady, 1999; Shih, Pittinsky, & Trahan, 2006; Yopyk & Prentice, 2005). These effects are particularly worrisome since it is standard practice to ask questions about test-takers' group memberships including gender and race before students complete high stakes exams such as the SAT and GRE.

Data provided by Stricker and Ward (2004; see also Danaher & Crandall, 2008) suggest that merely moving the standard demographic inquiry from the beginning to the end of the test would improve performance of women on the AP Calculus Test. By instituting this procedural change, it is estimated that an additional 4700 female students would receive AP Calculus credit annually. There is additional support for these findings from studies such as the following:

- Steele and Aronson (1995) had African American college students indicate their race on a test booklet prior to taking a test. They found that merely asking participants to indicate their race caused Black students' anxiety to increase and their test scores to drop, even though the test had been described as non-diagnostic of ability. A more subtle form of group identity salience occurs when an individual interacts with an outgroup member. Studies suggest that group identity tends to be more salient when an individual interacts with an outgroup member, and in such situations the performance of group members associated with a negative stereotype tends to be harmed.
- Marx and Goff (2005) had Black and White undergraduates complete a challenging verbal test in the presence of a Black or White test administrator. Blacks reported feeling more threat and performed worse when the test administrator was White rather than Black. When the experimenter was Black, Black students performed as well as White students, and White students were unaffected by the administrator's race.
- Stone and McWhinnie (2008) used a similar manipulation by having females perform a golf task in the presence of a male or female experimenter. When the experimenter was male, women tended to make more errors indicating poor focus and concentration.

2. Solo or Numerical Minority Status: Situations where one is (Sekaquaptewa, Waldman, & Thompson, 2007) or even just expects to be (Murphy, Steele, & Gross, 2007) the single representative of a stereotyped group or a numerical minority can create heightened group identity and stereotype threat.

    - Women showed performance decrements on math tests (where there exists a stereotype of female inferiority), but only when they took the test in the presence of

men, and performance decreased in proportion to the number of fellow male test takers (Inzlicht & Ben-Zeev, 2000).

- Beaton, Tougas, Rinfret, Huard, and Delisle (2007) also provided evidence of lowered math performance in conditions involving solo status. They showed that decrements are likely caused by the increased feelings of performance anxiety that arise under solo status. Solo status does not affect intellectual performance generally, however. Women's performance on verbal tests (where there are no strong gender stereotypes) tends not to be affected by the gender composition of the group (Inzlicht & Ben-Zeev, 2000).
- Individuals who were the sole minority in their department experienced a greater degree of stereotype threat, affecting how employees interpreted feedback from colleagues and supervisors (Roberson, Deitch, Brief, & Block, 2003).

3. Stereotype Salience

Identities can become threatened when stereotypes are invoked in the performance environment, either blatantly (e.g., Aronson, Lustina, Good, Keough, Steele, & Brown, 1999; Smith & White, 2002; Spencer, Steele, & Quinn, 1999; Yeung & von Hippel, 2008) or subtly (e.g., Beilock, Rydell, & McConnell, 2007; Brown & Pinel, 2003). Such stereotype endorsement tends to reduce performance in those individuals who are members of the supposedly lower performing groups.

Task performance has also been harmed when women must complete a task in the presence of an instructor who supposedly has sexist attitudes (Adams, Garcia, Purdie-Vaughns, & Steele, 2006). These various means for endorsing stereotypes consistently reduce the quality of performance in individuals who are members of the supposedly lower performing group.

Stereotype endorsement is *not* necessary to produce stereotype threat effects. Studies that have simply exposed individuals to group stereotypes without endorsing them (Ambady, Paik, Steele, Owen-Smith, & Mitchell, 2004; Bergeron, Block, & Echtenkamp, 2006; Levy, 1996) or have directed individuals to think about the ways they are affected by stereotypes of their group (Josephs, Newman, Brown, & Beer, 2003) have also produced performance decrements.

The way a task is described can also affect which stereotypes are highlighted in a given situation (e.g., Brown & Day, 2006; Huguet & Régner, 2007). Studies indicate that the description of the task itself can alter the stereotypes that are invoked in a situation, with activation of threatening stereotypes harming performance.

- When researchers suggested that task performance with regards to golf putting relied on natural sports ability (invoking the stereotypical superiority of Blacks), Whites performed significantly worse than Blacks on the task. When researchers described the task as reflecting athletic intelligence (invoking the stereotypical superiority of Whites), Whites performed better than Blacks (Stone, Lynch, Sjomeling, & Darley, 1999).

- Performance of White participants was worse when researchers suggested that performance on a computer-administered test reflected “racial bias” (highlighting the stereotype that Whites are racist) than when participants were told the test reflected "knowledge of [but not belief in] cultural stereotypes." Ironically producing scores on the test consistent with White racial bias (Frantz, Cuddy, Burnett, Ray, & Hart, 2004).

4. Evaluative scrutiny

Situations in which an individual believes that his or her ability in a stereotypic domain will be evaluated can create a strong sense of group identity and stereotype threat. When a test is described as being able to provide reliable and valid information about one's ability in a stereotyped domain, feelings of anxiety and intrusive thoughts of failure can arise, harming performance (e.g., Frantz, Cuddy, Burnett, Ray, & Hart, 2004; Kray, Thompson, & Galinsky, 2001; Marx, Stapel, & Muller, 2005).

- Varying the presumed diagnosticity of a test in a threatened domain can affect the quality of performance. African American and White American college students took a difficult verbal test resembling the GRE after being told either that the test measured their intellectual abilities, or alternatively, that the test measured psychological processes involved in problem solving. When the tests were supposedly diagnostic of intelligence, White students outscored Black students. However, in the condition in which the test was described as diagnostic of problem solving (for which there exists little or no racial stereotype), the racial gap in performance was eliminated (Steele & Aronson, 1995). Although most people strive to do well on a diagnostic test, stereotyped individuals may become hyper-motivated to perform well in order to disprove the stereotype. This highly motivated state can create an added level of stress, anxiety, and intrusive thoughts that undermine the relaxed concentration that is optimal for performance on complex cognitive tasks (see Beilock, Rydell, & McConnell, 2007; Osborne, 2007; Schmader & Johns, 2003). Tests that are supposedly diagnostic of intelligence are particularly a source of concern, since poor performance can imply limited ability, and therefore can affect life aspirations and goals.

Evaluative scrutiny is also increased when a situation tests the limits of one's abilities. Several studies have shown that stereotype threat effects are more likely on difficult tests and difficult items, particularly for people who are highly-identified with a domain. For example:

- Researchers gave an easy or difficult math test to women and men who had a history of successful performance and who valued performance in math. Performance was equivalent when the test was relatively easy, but men outperformed women when the test was difficult (Spencer, Steele, & Quinn, 1999).
- Experimenters asked men and women to complete an easy or difficult math test under stereotype threat or no stereotype threat conditions. Stereotype threat improved performance of women on the easy set of problems, but harmed performance on the difficult problem set. Men were unaffected by the stereotype threat manipulation. Similar effects have been shown in children (O'Brien & Crandall, 2003; Wicherts, Dolan, & Hessen, 2005).

- Third grade girls performed more poorly on difficult items after their gender had been highlighted, but their performance on easy items was equivalent across conditions (Neuville & Croizet, 2007). These results suggest that stereotype threat will more likely arise when individuals confront difficult tasks involving the stereotype and, once it arises will more likely harm performance on difficult compared with simple tasks.

What are the mechanisms behind stereotype threat?

Anxiety, negative cognitions, lowered performance expectations, physiological arousal, reduced effort, self-control, memory capacity, creativity, flexibility and speed, are just some of the proposed mechanisms involved in stereotype threat.

Given that stereotype threat effects have been shown in many different situations involving a variety of stereotypes, what do we know about how negative stereotypes lead to the demonstrated consequences?

Although stereotype threat effects appear to be robust, the specific mechanisms by which the stereotype threat harms performance is still not entirely clear. This ambiguity likely reflects that fact that stereotype threat probably produces several different consequences, each of which can contribute to decreased performance (Steele, Spencer, & Aronson, 2002). Steele and Aronson (1995), for example, speculated that distraction, narrowed attention, anxiety, self-consciousness, withdrawal of effort, or even over-effort might all play a role.

Research has provided support for the role of some of these factors, at least in some contexts. It is quite likely that these factors work together to undermine performance under stereotype threat. It is also possible that certain consequences are more likely in some contexts (and among some groups) than in others.

1. Anxiety

   Since the notion of stereotype threat was first proposed, it has been speculated that the emotional reactions it produces could directly interfere with performance. For example, Steele (1997; Steele et al., 2002) suggested that stereotype threat effects reflect increased anxiety about confirming a negative stereotype about one's group. Despite the assumed centrality of emotions, the results have often been mixed (e.g., Beilock, Rydell, & McConnell, 2007; Gonzales, Blanton, & Williams, 2002; Harrison, Stevens, Monty, & Coakley, 2006; Keller & Dauenheimer, 2003; Osborne, 2001; Stangor, Carr, & Kiang, 1998; Steele & Aronson, 1995; Cadinu, Maass, Rosabianca, & Kiesner, 2005).

2. Negative cognitions and dejection

   Stereotype threat can heighten stereotype–related thinking, leading to distraction and loss of motivation which, in turn, can negatively affect performance.

   - Cadinu, Maass, Rosabianca, and Kiesner (2005) examined women's math performance when gender differences in math problem solving were either highlighted

or explicitly refuted. To the degree that women under stereotype threat thought about gender math stereotypes, their performance tended to be worse.

- Keller and Dauenheimer (2003) showed that girls' reports of frustration, disappointment, and sadness accounted for poor math performance under stereotype threat. In addition to producing anxiety and motivation loss, these negative cognitions and emotions might also diminish the cognitive resources available that are necessary for maximal performance.
- Krendl, Richeson, Kelley, and Heatherton (2008) examined brain activity during a math exercise in the presence or absence of stereotype threat. Women in a control condition showed activation in brain regions associated with math learning during problem solving. However, women who were reminded of gender stereotypes in math showed heightened activation of the ventral anterior cingulate cortex (vACC) and no evidence of heightened levels of activation in the regions important for successful math performance. The vACC has been implicated in the processing of negative information.

3. Lowered performance expectations

   Related to negative thoughts and emotions are low expectations. If individuals expect to do poorly on a task, they might not be able to perform as well as when confidence is high.

   - Stangor, Carr, and Kiang (1998) showed that activating gender stereotypes undermined performance expectations of women who were asked to estimate their performance on an upcoming task involving spatial perception.
   - Kray, Thompson, and Galinsky (2001) showed that subtle manipulations linking performance to gender stereotypes reduced performance expectations in women prior to a task involving negotiation. Kellow and Jones' (2007) research also illustrated lowered performance expectations among 9th grade African American students under stereotype threat, although performance deficits did not emerge.

4. Physiological arousal

   Stereotype threat has been shown to affect physiological processes in several studies.

   - Croizet, Dépres, Gauzins, Huguet, Leyens, and Méot (2004) showed that undergraduate students under stereotype threat (specifically, psychology majors with a reputation of lower intelligence compared with science majors) performed more poorly on a task described as a "valid measure of general intellectual ability involved in mathematical and logical reasoning" than when the task was described as "not diagnostic of any ability." In addition, this poorer performance was associated with a decrease in heart rate variability (HRV). Moreover, the changes in HRV mediated the relationship between stereotype threat and performance. Thus, the increased mental workload under stereotype threat (and indicated by the decreased HRV) was responsible for the poor performance of those individuals susceptible to stereotype threat.

- Osborne (2006, 2007) showed that students under stereotype threat showed higher skin conductance and blood pressure, while also displaying lowered skin temperature.

If physiological arousal occurs under stereotype threat, not all performance should be negatively affected. Specifically, the effects of arousal have been shown to depend on task difficulty, with arousal improving performance on simple tasks, but decreasing performance on difficult tasks. O'Brien and Crandall (2003) tested whether arousal might account for stereotype threat effects by inducing stereotype threat in students prior to their completing a challenging or easy task. Women under stereotype threat performed better on an easy math test, but worse on a difficult math test compared with women who were not exposed to stereotype threat. These results are consistent with the notion that arousal plays a central role in accounting for stereotype threat effects.

5. Reduced effort

Stereotype threat can lead individuals to reduce their effort, perhaps because of low expectations of performance or perhaps to use self-defeating strategies. (Stone, 2002; see also Schimel, Arndt, Banko, & Cook, 2004) provided evidence that individuals who experienced stereotype threat before performing a task related to golf engaged in less voluntary practice compared with individuals not operating under stereotype threat. Stereotype threat can reduce preparation and effort, and using such self-defeating strategies can offer psychological protection by providing an a priori explanation for failure. Of course, under-preparation can also produce a self-fulfilling prophecy, producing failure under the very conditions where people fear doing poorly.

6. Reduced self-control

Inzlicht, McKay, and Aronson (2006) showed that stereotype threat can diminish people's ability to direct their attention and behavior in purposeful ways. In this study, Blacks who reported anxious expectations of encountering racial prejudice reported lower ability to regulate their academic behavior, and subsequent experiments demonstrated that imposition of stereotype threat reduced their ability to effectively regulate attentional and behavioral resources. Similarly, Smith and White (2002) produced evidence that individuals who were exposed to stereotypes that were then nullified were better able to focus on the task than were individuals operating under stereotype threat. These findings suggest that coping with stereotype threat can reduce the ability to effectively regulate behavior in a variety of related and unrelated domains.

7. Reduced working memory capacity

Recent research suggests that stereotype threat can reduce working memory resources, undermining the ability to meet the information-processing requirements of complex intellectual tasks. Croizet, Després, Gauzins, Huguet, Leyens, and Méot's (2004) study used HRV, an indirect, physiological indicator of mental load, to show that stereotype threat can impose a cognitive burden. More direct evidence regarding the nature of this burden was provided by Schmader and Johns (2003; see also Osborne, 2006) who showed that working memory

capacity (i.e., a short-term memory system involved in the controlling, regulating, and maintaining of information relevant to the immediate task) is affected by stereotype threat. Female students in the study performed a math task after being told either that "women are poorer at math than men" or were given no information about gender differences. Later, women's performance and their working memory capacity (defined as the ability to recall words that had to be held in memory while participants solved math problems) were assessed. Women under stereotype threat showed poorer math performance and reduced working memory capacity compared with the control group. Differences in working memory capacity also mediated the link between stereotype threat and poorer math performance.

Beilock, Rydell, and McConnell (2007) extended this work by showing that stereotype threat appears to undermine phonological components of the working memory system involved in inner speech and thinking. Pressure-related thought and worries can reduce working memory resources, and tasks that require working memory resources (such as novel or poorly practiced skills) are most likely to reveal decrements under stereotype threat. Stereotype threat can increase worries and concerns, and these thoughts can reduce the working memory capacity necessary to effectively meet the information-processing requirements of a task. The effects of reduced working memory can be task, or even component, specific. Stone and McWhinnie (2008) showed, for example, that subtle stereotype threat seemed to affect only task components that rely on concentration and focused attention.

8. Reduced creativity, flexibility, and speed

   Some research (Higgins, 1998) suggests that stereotype threat can produce a *prevention focus*, a regulatory state in which individuals become vigilant to prevent failure. Under such conditions, people tend to use risk-averse means, manifesting in higher performance accuracy and enhanced analytic thinking. People in a state of vigilance, however, tend to exhibit poorer performance on tasks that rely on creativity, openness, flexibility, and speed (Seibt & Förster, 2004). Since most tasks require both analytic thinking and a degree of openness and speed for successful completion, a prevention focus induced by stereotype threat can hinder performance on many tasks.

How can we reduce stereotype threat?

Though using different specific techniques, the studies cited below *all use methods that reduce the salience of identities that are tied to poor performance in a domain by emphasizing*:

- Idiosyncratic valued characteristics
- Characteristics shared with other groups
- Other identities, or complex identities

Stereotype threat effects have been demonstrated in many studies using different tests and tasks. However, research has also shown that performance deficits can be reduced or eliminated by several means.

Examples of Specific Techniques

1. Consider moving standard demographic inquiries about ethnicity and gender to the end of a test.

   Empirical Evidence: Stricker and Ward (2004) as well as, Danaher and Crandall (2008) found that by doing so, women had significantly higher performance on the AP Calculus Test.

2. Encourage individuals to think of themselves *as complex and multi-faceted.*

   Empirical Evidence:

   - *Women encouraged to think of themselves in terms of their valued and unique characteristics were less likely to experience stereotype threat in mathematics (Ambady, Paik, Steele, Owen-Smith, & Mitchell 2004).*
   - *Individuals who were asked to think of characteristics that are shared by ingroup and outgoup members, particularly characteristics in the threatened domain appeared to be less vulnerable to developing stereotype threat in conditions that normally produce it (Rosenthal, Crisp, & Suen, 2007; Rosenthal & Crisp, 2006).*
   - *Women who created complex self-representations or complete descriptions of themselves were less likely to experience stereotype threat in math manipulations compared to counterparts who created simple maps defining only a "fundamental characteristic," or who made no self-representational maps at all. Moreover, women who were highly identified with math performed as well as men if they had asserted complex self-representations (Rosenthal & Crisp, 2006; Gresky, Ten Eyck, Lord, & McIntyre, 2005).*

3. Highlighting social identities that are not linked to underperformance in a domain can attenuate stereotype threat.

   Empirical Evidence: McGlone and Aronson (2006) varied social identity salience by having students complete questionnaires that focused on different social identities. Differences in men's and women's performance on a gender-linked task were greatest when the questionnaires focused on their gender and smaller when they inquired about other social identities.

4. Encourage self affirmation.

   Allowing people to affirm their self worth is a general means for protecting the self from perceived threats and consequences of failure. This can be done by encouraging people to think about characteristics, skills, values, or roles that they value or view as important.

   Empirical Evidence:

   - *White Americans who were given the opportunity to affirm their commitment to*

being nonracist were less likely to respond in a stereotypic fashion to an implicit measure of racial associations that had been described as indicative of racial bias (Schimel, Arndt, Banko, & Cook, 2004; Frantz, Cuddy, Burnett, Ray, & Hart, 2004).

- *Women who engaged in self-affirmation did not demonstrate the performance decrements that typically arise when stereotypes about gender differences in mathematics and spatial ability are invoked (Martens, Johns, Greenberg, & Schimel, 2006*).

- *African American students who were asked to engage in self-affirmation for 15 minutes performed better during the semester than those who did not. The salutatory consequences of self-affirmation appears to arise because self-affirmation alleviates psychological threat imposed by a fear of confirming to stereotypes of poor performance (Cohen, Garcia, Apfel, & Master, 2006)*.

5. Emphasize high standards with assurances about the capability for meeting them.

Constructive feedback appears most effective when it communicates high standards for performance, but also provides assurances that students are capable of meeting those high standards (Cohen, Steele, & Ross, 1999). Such feedback reduces perceived evaluator bias, increases motivation, and preserves domain-identification. High standards and assurances of capability appear to signal that students will not be judged stereotypically and that their abilities and "belonging" are assumed rather than questioned.

6. Provide Role Models.

Exposure to positive role models can improve performance. Thoughts about outgroup members whose performance is superior in a domain can interfere with performance, and providing role models demonstrating proficiency in a domain can reduce stereotype threat effects (Blanton, Crocker, & Miller, 2000).

Empirical Evidence:

- *Women's performance on a math test in a mixed-gender environment was negatively related to their thoughts about specific men who perform well in mathematics (Huguet & Régner, 2007)*.
- *Women tended to perform as well as men on a math test when the test was administered by a woman with high competence in math, but they performed more poorly (and showed lower state self-esteem) when the test was administered by a man. Results indicated that these effects were due to the perceived competence, and not just the gender, of the experimenter (Marx & Roman, 2002, Marx, Stapel, & Muller, 2005)*
- *Providing even a single role model that challenges stereotypic assumptions can eliminate performance decrements under stereotype threat. Evidence indicates that even reading essays about successful women can alleviate*

performance deficits under stereotype threat (McIntyre, Lord, Gresky, Ten Eyck, Frye, & Bond Jr., 2005; McIntyre, Paulson, & Lord, 2003).

7. Offer individuals explanations for why anxiety and distraction are occurring that do not implicate the self or validate the stereotype**.**

Empirical Evidence:

- *Encouraging students to attribute struggles with middle school transitions to an external, temporary cause such as the difficult nature of the transition eliminated typical gender differences in math performance (Good, Aronson, & Inzlicht, 2003).*
- *Providing individuals with an external attribution for anxiety and arousal can disarm stereotype threat. Johns, Schmader, and Martens (2005) taught students about the possible effects of stereotype threat before they took a math test. For example, they told students, "It's important to keep in mind that if you are feeling anxious while taking this test, this anxiety could be the result of these negative stereotypes that are widely known in society and have nothing to do with your actual ability to do well on the test." (p.176) This instruction eliminated stereotype threat effects in women's math performance.*

8. Emphasizing the importance of effort and motivation in performance while de-emphasizing inherent talent or genius reduces stereotype threat.

Beliefs about the nature of ability influence a host of variables including motivation and achievement in the face of challenge or difficulty. Incremental theorists view intelligence as a quality that can be developed and that changes across contexts or over time (Dweck & Leggett, 1988; Dweck & Sorich, 1999; and Mueller & Dweck, 1998).

Empirical Evidence:

- *Black students who were encouraged to view intelligence as malleable, "like a muscle" that can grow with work and effort, were more likely to indicate greater enjoyment and valuing of education, and they also received higher grades that semester (Aronson, Fried, & Good, 2002).*
- *Mentoring that emphasizes expandable intelligence and external attributions for difficulty produced higher reading scores and eliminated gender differences in students' mathematics performance* (*Good, Aronson, & Inzlicht, 2003*).
- *Females who watched an educational video that presented intelligence as "fixed" performed less well on a math test in the stereotype threat condition than in the non-threat condition. However, when they learned new math concepts portrayed from an approach where the malleable nature of intelligence was emphasized, there were no differences between the stereotype threat and the non-threat conditions on the math test (Good, Rattan, & Dweck, 2007).*

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Comment [MSOffice1]: I removed the bold from the titles so all would be the same. cmb

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