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The Cognitive Effects of Experiencing and Observing Subtle Racial Discrimination

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Most research on the cognitive effects of subtle racial discrimination among racial and ethnic minorities focuses on direct experiences of it wherein stigmatized individuals are the targets of discriminatory treatment. However, it is not necessary for people to be the direct target of discriminatory behavior to experience the negative consequences associated with it. Although exposure to discriminatory behavior is increasingly common given the accessibility of smartphones and social media, we know relatively little about how this exposure affects people's executive functioning. Here, we provide a systematic, comparative review of the extant literature on the effects of (a) personally experiencing versus (b) observing instances of subtle racial discrimination toward others on three core executive functions: inhibition, shifting, and updating. We highlight where more work is needed to understand the cognitive consequences of observing discrimination and we provide initial evidence that observing subtle discrimination impairs updating—a previously unexplored relationship. Finally, we discuss the implications of executive function impairment due to observing and experiencing subtle discrimination for long-term outcomes, such as academic achievement, employment, and mental health.

“As an attorney, I often show up to court in a suit and briefcase and the court personnel will assume I am the client and they will ask, “Is your attorney coming?” And I usually

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reply, "I hope not," and then explain that I am the attorney. The assumption is because I am a black man that I am the defendant."

—Daniel Tann, *Everyday Racism in America: Real Stories of Racial Bias*. MSNBC, 2018

Whether it is being passed over for a job, followed in a store, or assumed to be "the help," acts of subtle racial bias are a common feature of life in America for racial and ethnic minorities. For members of these groups, subtle bias is often experienced during interactions with Whites who exhibit negative nonverbal behavior while explicitly endorsing positive attitudes toward minorities when surveyed (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, Jackson, Dunton, & Williams, 1995). Unlike acts of blatant bias (e.g., "We don't serve Hispanics here," physical violence, or the use of racial slurs), acts of subtle bias are characterized by more attributionally ambiguous behaviors (Dovidio, 2001), like choosing not to sit next to someone on a bus, providing poor service in a restaurant or questioning people about their belongingness in a public space. The ambiguous behaviors that characterize acts of subtle bias raise perplexing and often unanswerable questions about the perpetrator's intentions for the racial/ethnic minorities with whom they interact, such as "Am I being treated this way because of my race/ethnicity?" and "Is this person racist?" Furthermore, research documents that members of stigmatized groups are vigilant to cues of bias (Murphy, Steele, & Gross, 2007) and being able to identify acts of discrimination is adaptive for minorities' self-esteem, as such an attribution allows minorities to attribute negative treatment to the perpetrator's prejudice rather than something about themselves (Crocker & Major, 1989). When racial and ethnic minorities encounter subtle, ambiguously negative behavior—like feeling they are being followed by a store employee or being questioned about whether they belong in their own neighborhood or home—they must decide whether they should attribute others' behaviors to racial bias or some other (nonracial) factor. This disambiguation process is effortful and is theorized to consume cognitive resources (van den Bos & Lind, 2002).

Most research with stigmatized individuals on the effects of subtle racial discrimination focuses on direct experiences of it wherein stigmatized individuals are the direct targets of discriminatory treatment. However, it is not necessary for people to be the direct target of discriminatory behavior to experience the negative consequences associated with it. Indeed, we are all exposed to instances of subtle racial/ethnic bias through television shows, news, social media, and word of mouth. Because social networks tend to be relatively segregated (Massey, Charles, Lundy, & Fisher, 2003), racial/ethnic minorities often witness or are otherwise exposed to stories or videos about subtly discriminatory incidents toward people of color. Although these observations of subtle discrimination are becoming increasingly common, we know relatively little about how this exposure affects people's cognitive functioning.

In this article, we provide a systematic review of the extant literature on the cognitive consequences of (a) personally experiencing versus (b) being exposed to instances of subtle racial discrimination toward others. We begin by reviewing the three core executive functions—inhibition, shifting, and updating—discussed by executive function researchers (Miyake et al., 2000). We then describe how these different cognitive functions are affected by experiencing (or observing) subtle racial discrimination and, to motivate future research directions in this area, highlight where gaps in knowledge exist. Finally, we present the findings of an initial, exploratory experiment that examines how observing subtle discrimination affects the executive function of updating among Black and Latinx individuals, addressing one of the gaps in the extant literature.

Executive Functions

Executive functions are a set of cognitive processes that are necessary for selecting and monitoring behaviors that facilitate goal attainment. These processes are required for effortful cognitive tasks such as focusing, resisting temptation, planning, decision-making, and problem-solving (Diamond, 2013).

In their seminal paper, Miyake et al. (2000) put forth a framework that identifies three core executive functions: inhibition, shifting, and updating. We adopt this framework to contextualize the cognitive consequences of experiencing and observing subtle racial discrimination. Within this framework, *inhibition* refers to one's ability to suppress an automatic or prepotent response in favor of another desired response. This process has been assessed with cognitive tasks such as the Stroop task (Stroop, 1935), the antisaccade task (Hallett, 1978), and the go/no go task (e.g., Kiefer, Marzinzik, Weisbrod, Scherg, & Spitzer, 1998). In tests like the Stroop task, inhibition is measured by asking participants to quickly report the color of the text in which a color word is written. On critical trials, the text of a color word (e.g., yellow) is presented but it is written in a font color that is inconsistent with its meaning (e.g., the word "yellow" written in blue). Thus, participants must inhibit their automatic impulse to read the word (e.g., yellow) in order to quickly provide the correct response (i.e., reporting the color of the text—answering "blue" rather than "yellow"). In control trials, the target word is not related to colors (e.g., the word "table" written in red text), thus inhibition remains relatively unengaged when correctly responding to control trials. When people's abilities to inhibit their prepotent responses are limited, they are slower to correctly identify the color of the words in critical trials compared to control trials. Thus, impaired inhibition is indicated by the difference between response time of critical trials and that of control trials.

Impairment of the inhibitory executive function has been associated with a variety of negative outcomes across the lifespan. For example, decreased inhibition has been correlated with poorer math and reading comprehension skills in

children (e.g., St. Clair-Thompson & Gathercole, 2006), procrastination and alcohol abuse in college-aged adults (e.g., Paz, Rosselli, & Conniff, 2018; Rebetz, Rochat, Barsics, & Van der Linden, 2016), and aggression in adults (e.g., Hoaken, Shaughnessy, & Pihl, 2003).

The next executive function, *shifting* (also referred to in some literature as *task-switching*), captures the ease with which an individual can effectively transition between multiple tasks. Shifting is typically assessed using cognitive tasks that require the participant to switch between different rules or approaches to problem solving, such as the number–letter task (Rogers & Monsell, 1995) and the plus-minus task (Jersild, 1927). For example, in the number–letter task, participants are presented with a number–letter pair (e.g., 6U) in one of four quadrants on a computer screen. Participants are told that if the number–letter pair appears in either of the two quadrants at the top of the screen, they should respond by indicating whether the number was odd or even. If the number–letter pair appears in either of the two quadrants at the bottom of the screen, they should respond by indicating whether the letter is a vowel or a consonant. First participants complete two blocks of control trials. In these trials, the number–letter pairs appear in the top two quadrants (block 1) or the bottom two quadrants (block 2). Thus, participants are only implementing one rule in each block. Next, participants complete the critical blocks assessing their shifting abilities. In these blocks, the number–letter pairs are presented in a clockwise rotation of the four quadrants. Thus, in these blocks, trials where the pair appears in the upper-left and lower-right quadrants require participants to “shift” or “switch” between the two rules.

The ability to shift one’s focus, adapt to novel contexts, and implement new strategies could be related to success in a variety of contexts. Mental flexibility has been associated with increased creativity (Adcock & Martin, 1971), greater resilience (Haglund, Nestadt, Cooper, Southwick, & Charney, 2007; Masten, 2007; Qouta, El-Sarraj, & Punamäki, 2001), better decision making (Brand, Fujiwara et al., 2005; Brand, Kalbe et al., 2005), and increased conscientiousness (Fleming, Heintzelman, & Bartholow, 2016). Additionally, researchers have demonstrated that the shifting component of executive function is associated with academic achievement (Mayes, Calhoun, Bixler, & Zimmerman, 2009; Yeniad, Malda, Mesman, van IJzendoorn, & Pieper, 2013).

Finally, the third core executive function identified by Miyake et al. (2000) is the updating and monitoring of working memory representations—termed *updating*. The updating executive function refers to one’s ability to continuously monitor and mentally manipulate information while also disregarding or discarding irrelevant information. Updating is assessed with cognitive tasks such as the operation span task (Miyake et al., 2000; Turner & Engle, 1989), the keep-track task (Yntema, 1963), and the letter memory task (Morris & Jones, 1990). For example, in the operation span task, participants are presented with several sets of equation-word pairs. In this task, participants are asked to evaluate a simple

mathematical equation (e.g., $(5 \times 2) - 6 = 4$) and indicate whether the equation is true or false. Then they are presented with a word (e.g., “snow”). After several equation-word pairs, they are asked to recall all of the words from that set. Thus, participants must maintain and “update” the list of words in their working memory.

Across various literatures, impaired updating has been related to decreased math ability (e.g., Andersson, 2008), reading comprehension (e.g., Carretti, Cornoldi, De Beni, & Romanò, 2005; St. Clair-Thompson & Gathercole, 2006), and emotion regulation (Schmeichel, Volokhov, & Demaree, 2008), among other skills. Thus, as with inhibition and shifting, the updating executive function has been associated with skills that affect important academic and social-related outcomes.

Taken together, these three core executive functions—the ability (or inability) to suppress, effectively update, and monitor representations in working memory—may be related to individuals’ educational, employment, and health outcomes. Thus, examining the cognitive costs of experiencing and observing subtle discrimination is imperative, particularly given that executive functioning may predict individuals’ socioemotional and interpersonal well-being (i.e., emotion regulation, resilience, and aggression), as well as their opportunities in a variety of contexts.

Cognitive Consequences of Experiencing Subtle Discrimination

The above research demonstrates that the executive functions of inhibition, shifting, and updating may have implications for performance and well-being. Thus, it is important to understand the antecedents of these functions. Next, we review the literature examining how minorities’ experiences with discrimination impact these executive functions.

Inhibition. Several studies have shown that directly experiencing subtle racial discrimination can undermine the executive function of inhibition (Bair & Steele, 2010; Barnes et al., 2012; Holoien & Shelton, 2012; Murphy, Richeson, Shelton, Rheinschmidt, & Bergsieker, 2013). Researchers have hypothesized that because subtle discrimination is—by its nature—relatively ambiguous, deciding whether subtle acts are (or are not) instances of discrimination can consume cognitive resources (e.g., Holoien & Shelton, 2012; Murphy et al., 2013) and interfere with other effortful cognitive processes, such as inhibition.

In one of the first studies to examine this relationship, Holoien and Shelton (2012) assessed the cognitive functioning of Black and Asian participants following their interaction with a White partner primed with either a colorblind or multicultural diversity ideology. The colorblind prime was meant to activate subtle bias within the White partner and emphasized commonalities between ethnic groups (e.g., “we are all the same”); whereas the multicultural prime acknowledged and valued ethnic differences (e.g., “validate the identity of each group”) and

was construed as a “no bias” condition. After a videotaped discussion with their White partner, Black and Asian participants completed the Stroop color-naming task. Ethnic minority judges also coded the videotaped interactions to determine the level of prejudice White participants displayed during the interaction. Results revealed that White interaction partners primed with colorblindness displayed more subtly biased behavior (e.g., averted eyes, closed body posture) toward their minority partner than did Whites primed with multiculturalism. Furthermore, minorities who interacted with the subtly biased White partners performed worse on the Stroop task—indicating disrupted inhibition—compared to minorities who interacted with White partners primed with multiculturalism. Mediation analyses revealed that the colorblindness (vs. multicultural) prime predicted Whites’ displays of subtly prejudiced behaviors, which in turn depressed minorities’ cognitive functioning. These findings suggest that interacting with subtly prejudiced individuals (here, Whites primed with colorblind ideology) interferes with the executive function of inhibition among racial and ethnic minorities.

In other research drawing on attributional ambiguity theory (Crocker, & Major, 1989; Major & Crocker, 1993), Murphy et al. (2013, Study 1) directly manipulated the behavior of a White interaction partner to investigate whether experiencing subtle bias would impair minorities’ cognitive functioning. In the study, Black participants interacted with a White confederate who was trained to express subtle bias or no bias during the interaction. Previous research has shown that subtly biased Whites often explicitly endorse positive attitudes toward minorities—that is, they will say positive things to minorities during an interaction, but they will also exhibit negative nonverbal behaviors during the interaction, such as little eye contact and greater physical distance (Dovidio et al., 1997; Fazio, Jackson, Dunton, & Williams, 1995). Thus, Black participants in the subtle bias condition interacted with a White partner who expressed this conflicting, relatively ambiguous verbal and nonverbal behavior, while Black participants in the no bias condition interacted with a White partner who expressed positive verbal and nonverbal behavior and then completed the Stroop color-naming task. Confirming predictions, Black participants performed worse on the Stroop task when their White partner displayed subtle bias, compared to no bias, during the interaction.

Taken together, these findings suggest that experiencing subtle discrimination while interacting with Whites can undermine the executive function of inhibition among racial and ethnic minorities. Furthermore, these studies are instructive because they demonstrate that while subtle bias can be manipulated in different ways, it is often communicated through ambiguous and subtly prejudiced behavior that saps individuals of the resources needed to suppress prepotent responses.

Shifting. Research has demonstrated that experiencing subtle racial discrimination increases anxiety and arousal (Banks, Kohn-Wood, & Spencer, 2006; Soto, Dawson-Andoh, & BeLue, 2011). This increased arousal leads individuals’

attentional and cognitive systems to become attuned to stress-related cues (Eastbrook, 1959, Murphy et al., 2007). When they encounter subtle discrimination, minorities become vigilant for environmental and situational factors that can signal racism—a psychological phenomenon termed “racism-related cognitive vigilance” (Clark, Benkert, & Flack, 2006). Highlighting this phenomenon, an ethnographic study by Feagin (1991) documented Black Americans’ experiences with racial discrimination. Several participants described experiences such as “being constantly aware” and “be[ing] prepared for insults and discrimination . . . even if nothing happens that day.” These accounts suggest that people scan and evaluate their environments for evidence of bias to help them avoid experiences of discrimination. This increased vigilance represents an additional cognitive burden that likely directs attention away from other tasks. Thus, it is reasonable to predict that experiencing subtle racial discrimination could impair minorities’ abilities to shift their attention between tasks and quickly implement new strategies.

Although researchers have not yet examined this idea directly in the context of race, there is evidence to suggest that experiencing subtle bias undermines the executive function of shifting in the context of gender. In two studies, Carr and Steele (2009) asked female participants to complete different shifting tasks—the water-jar task (Luchins, 1942) and the Wisconsin Card Sorting Test (Grant & Berg, 1948)—that assessed women’s abilities to switch between math-relevant mental strategies. Across studies, subtle bias was communicated with the suggestion that women perform differently on such mathematical tasks—creating attributional ambiguity among participants about whether the researchers held lower expectations for women’s performance and might stereotype them as low in mathematical ability. In Study 1, participants were asked to imagine that three jars (Jars A, B, and C) could hold different amounts of water and their goal was to use the jars to measure out a given quantity of water. Participants were instructed to use addition and subtraction to generate the simplest method for containing a specified amount of water without using any jar more than three times. For example, “If Jar A holds 9 quarts, Jar B holds 42 quarts, and Jar C holds 6 quarts, how would you measure out 21 quarts of water?” To solve the problem, participants should generate the method “ $B - A - 2C$,” indicating that they would fill Jar B, then subtract Jar A, and then subtract Jar C twice. Following instructions, participants completed six “set establishing” trials for which “ $B - A - 2C$ ” was the only solution. Next, they completed five critical trials where the established solution was a valid answer to the problems, but a simpler solution also existed. The last three critical trials were problems where the simple solution was very obvious. Thus, participants were required to mentally “shift” away from the established solution and to find a new simpler solution to the problems in the critical trials. Impaired shifting was indicated if the participant used the previously established solution on at least one of the three obvious trials.

In the second study, shifting was assessed by the Wisconsin Card Sorting Test (Grant & Berg, 1948). In this task, participants are presented with a target card that has a picture on it (e.g., three blue squares), as well as four additional cards that vary the shapes, colors, and number of objects pictured (e.g., one red circle, two yellow stars). Participants must match the target card with one of the four other cards, but they are not told which characteristic (i.e., shape, number, or color) to use when sorting the cards. The goal is to figure out the correct “sorting rule” based on feedback about whether their answers are correct or incorrect. In Carr and Steele (2009) Study 2, the sorting rule changed after participants chose the correct card on ten trials, requiring them to mentally “shift” away from the old sorting rule and figure out the new sorting rule. Impaired shifting was indicated by the participant’s shifting score (calculated by dividing the number of errors made after the sorting rule had changed by the number of sorting rule changes received), such that a higher shifting score was evidence of less shifting.

In both studies, women in the experimental condition were told that the task measured mathematical ability and were asked to indicate their gender prior to beginning the task, suggesting that gender was relevant to task performance and that men and women might perform differently on the task (i.e., subtle gender bias). In the no bias condition, participants were told that the task would provide insight into how people solve puzzles and were not asked to indicate their gender before beginning the task (i.e., no gender bias). Results revealed that women in the subtle gender bias condition were more likely to exhibit impaired shifting on the water-jar task and the Wisconsin Card Sorting Test than those in the no gender bias condition. These findings suggest that experiencing subtle bias can impair the shifting executive function among women. Whether similar processes affect shifting among racial and ethnic minorities who experience such bias is a question that is ripe for future investigation.

Updating. Several studies have shown that experiencing subtle discrimination impacts individuals’ ability to update and monitor their working memory representations. As previously discussed, experiencing subtle racial discrimination has been associated with increased stress and anxiety (Banks, Kohn-Wood, & Spencer, 2006; Soto et al., 2011). Numerous studies have also demonstrated that increased stress and anxiety can impair people’s ability to update their working memory (e.g., Derakshan & Eysenck, 1998; Klein & Boals, 2001). Thus, experiencing subtle racial discrimination is theorized to undermine performance on updating tasks. For example, in one study investigating how a particular instantiation of subtle bias might affect working memory, Latinx women were asked to complete an operation span task under conditions where different attributions of subtle discrimination were possible (Schmader & Johns, 2003). In one condition, women were told that the task was highly predictive of intelligence and that the researchers were interested in how people from different ethnic groups perform—making it

salient that the researchers could have lower expectations for Latinx women and might intellectually stereotype them. Participants were also asked to indicate their ethnicity on the test materials before they began—again, suggesting that their ethnicity was relevant to performance on the operation span task. In other words, this condition was designed to make racial stereotypes about intelligence salient and to suggest to the Latino participants that they were expected to perform worse than Whites. Because racial bias was a possible attribution for the instructions in this condition, but negative racial attitudes were not explicitly communicated (e.g., through language such as: “Hispanics are intellectually inferior to Whites and therefore, we expect them to perform worse”), this situation can be thought of as an instance of subtle bias. In the control condition, participants were only told that the task measured working memory. Results revealed that Latinx women who experienced subtle racial discrimination performed significantly worse on the operation span task compared to those who did not experience discrimination. That is, experiencing subtle discrimination interfered with the updating executive function among Latinx women.

Summary

Taken together, several correlational, experimental, and ethnographic studies provide evidence that experiencing racial discrimination can undermine the three core executive functions of inhibition, shifting, and updating. The cognitive impairments that stem from experiencing subtle racial discrimination may have significant implications for performance in educational and employment settings, as well as in other settings that require people’s full cognitive resources to perform well and succeed. Achievement gaps between White and minority students are seen on many outcomes that rely on executive functions, such as math and reading comprehension (U.S. Department of Education, 2017). Furthermore, racial inequalities persist into adulthood. Indeed, Black and Latinx adults are more likely to be unemployed than White adults (Bureau of Labor Statistics, 2018). If experiencing subtle discrimination in learning environments (through interactions with teachers and peers) or in workplaces (through interactions with supervisors and coworkers) disrupts people’s executive functions, these situationally induced cognitive impairments might explain these gaps. Future work should investigate the role of impaired executive functioning due to people’s experiences of subtle racial discrimination throughout the lifespan.

Cognitive Consequences of Observing Racial Discrimination

While individuals have always been exposed to information about discriminatory treatment toward others, the widespread accessibility of smartphones and the ever-increasing popularity of social media have made it considerably easier

to transmit these discriminatory interactions and experiences. Though subtly biased acts can be more difficult to identify and rarely inspire protests like some highly publicized incidents of blatant bias (such as instances of police brutality and racial slurs; e.g., Botelho, 2012; Williams, 2018, Murray, Burke, Marcius, & Parascandola, 2014), these acts of subtle racial bias are increasingly broadcast via television, news, and social media (e.g., Associated Press, 2018; Baragona, 2018). For example, a White manager at a Philadelphia Starbucks recently called the police on two Black men waiting for a friend. The manager thought the men were suspicious because they wanted to use the store's restroom, but hadn't yet ordered anything (Stevens, 2018). Soon after, the incident was widely recounted across numerous social media sites and instigated a highly publicized, company-wide training to help employees avoid these kinds of subtly biased acts. Though the two men felt that their treatment was likely due to racial bias, the manager never explicitly indicated race was a factor in the decision to call the police. This attributional ambiguity is a key component of subtle discrimination—indeed, attributional ambiguity is what makes subtle discrimination “subtle”—and it is why subtle discrimination may confer negative cognitive effects to targets.

In another example, police officers questioned Lolade Siyonbola, a Black graduate student at Yale University, when they were summoned by a White student who saw her sleeping in their dorm's common area. Again, the situation was attributionally ambiguous. Although the White student denied being prejudiced and did not make explicit reference to the student's race, Siyonbola felt that the incident was likely racially motivated (Wootson, 2018). After she posted videos documenting her exchanges with the other student and the responding officers to her Facebook page, Siyonbola's story made national headlines and within a week of the incident, the videos received over one million views.

Because social networks tend to be relatively segregated (Massey et al., 2003), racial/ethnic minorities often witness or are otherwise exposed to stories or videos about subtly discriminatory incidents toward other people of color. However, despite people's increased exposure to narratives, news articles, and even videos of other's encounters with subtle discrimination, relatively little attention has been devoted to understanding how these observations affect people.

Researchers have long theorized that *observed discrimination* may play an important role in understanding the effects of racism (Essed, 1991; Harrell, 2000). In a text examining the experiences of racism among Black people, Essed (1991) states, “Individual Blacks also experience racism through the experiences of others because of the very nature of racism. It is not directed against any one person, but against every Black” (p. 161). Similarly, Harrell (2000) notes that, in addition to direct experiences, racism is experienced “vicariously through observation and report” (p. 45). Based on this idea, Harrell (1994) developed a measure of perceived racial discrimination that includes an observed discrimination subscale. Although this measure has been validated and administered in many studies, very

few researchers have explored correlates of the *observed discrimination* subscale independently.

Furthermore, Essed (1991) and Harrell (2000) suggest that both experienced and observed discrimination (sometimes termed vicarious racism or vicarious discrimination) significantly contribute to racism's effects on racial and ethnic minorities. For example, Harrell (2000) theorized that stress related to observed and experienced racism can negatively influence minorities' physical, psychological, social, functional, and spiritual well-being. Finally, suggesting that both observed and experienced racism can impact minorities' cognitive functioning, in particular, Harrell notes that minorities expend a great deal of cognitive energy by processing, replaying, and reanalyzing discriminatory experiences.

Although there has not been much empirical work conducted in the area of observed discrimination, studies that examine the consequences of observing subtle discrimination suggest that it can have similar impacts on minorities' cognitive functioning as being the direct target of it. To date, research examining how observing subtle discrimination affects executive functioning has focused on inhibition. To our knowledge, no studies have examined how observing subtle discrimination affects shifting and updating. We have begun to address this gap in the literature by conducting an initial exploratory study of how observing subtle discrimination affects the executive function of updating. In what follows, we review the research that examines the effects of observing subtle discrimination on inhibition and then we present one study examining effects on updating.

Inhibition. To examine how observing discrimination affects inhibition, Salvatore and Shelton (2007) asked Black and White college students to complete a hiring task that involved evaluating the resumes of candidates who ostensibly applied for a consulting position in a company. Next, participants received information about the company's hiring manager (a racial outgroup member) and his decisions regarding which candidates should be hired. The hiring manager's decisions were manipulated to be indicative of either subtle, blatant, or no racial discrimination against a member of the participants' in-group. Then, to assess how exposure to this biased act affected participants' executive functioning, participants completed the Stroop task (i.e., a measure of inhibition). The researchers found that Black participants performed worse on the Stroop task after exposure to the subtly discriminatory decision (compared to both the blatant and no discrimination conditions) against another Black person.

In another study examining the effects of observing subtle discrimination on inhibition (Murphy et al., 2013, Study 2), Latinx college students were asked to watch a video of an interracial interaction. During the video-taped interaction, the White partner displayed subtle (or no) racial discrimination toward their Black partner consisting of negative nonverbal behavior such as averting one's eyes and exhibiting a closed body posture. After watching this interracial interaction,

participants completed the Stroop task as a measure of inhibition. Consistent with Salvatore and Shelton's (2007) findings, participants demonstrated impaired inhibition after witnessing this subtly biased interaction.

Taken together, these findings suggest that, similar to *experiencing* subtle discrimination, *observing* subtle discrimination can also undermine inhibition. While there is relatively little research on the cognitive consequences of observing subtle discrimination, the extant research focuses on the inhibition component of executive function.

Shifting and updating: missing literatures. To our knowledge, no studies have examined the influence of observed subtle discrimination on shifting or updating processes. However, it is reasonable to predict that, in addition to inhibition, observing subtle racial discrimination impacts these executive functions as well. Because race and ethnicity are central components of self-identity for many minorities, racial and ethnic minorities are likely to perceive a relatively high degree of overlap in their self-concept with other members of their group (e.g., Mackie, Devos, & Smith, 2000; Tajfel & Turner, 1986). Because of this overlap, observing racial discrimination toward others is likely to increase the perceiver's racism-related vigilance and anxiety—both of which are documented correlates of shifting and updating impairments. That is, minorities who observe subtle discrimination toward a member of their group might experience anxiety related to these events and are likely to be vigilant to environmental cues that suggest they could experience similar treatment to that which is observed. Similar to impairments in the shifting and updating executive functions seen in those who experience subtle bias directly, those who observe subtle bias may also experience decrements in shifting and updating. In the next section, we begin to address this gap in the literature by investigating whether observing subtle bias impairs performance on an updating task related to working memory.

Effects of Observing Subtle Discrimination on Minorities' Updating Processes: An Initial Investigation

The current study examines how exposure to subtle racial bias toward a Black job applicant affects updating among Black and Latinx individuals. We hypothesized that observing an instance of subtle discrimination against a racial minority individual would consume cognitive resources by requiring participants to disentangle the attributional ambiguity that characterizes subtle bias, and thus would undermine participants' working memory. This work is the first to examine whether observing subtle discrimination impairs the executive function of updating.

Participants were invited to the lab for a study about hiring decisions. First, they were asked to complete a hiring task, adapted from Salvatore and Shelton

(2007), where they were exposed to subtle discrimination, blatant discrimination, or no racial discrimination. Next, they completed an ostensibly unrelated second study that included an abstract symbolic logic task (Kaminski, Sloutsky, & Heckler, 2008), which required participants to maintain, manipulate, and apply mathematical principles to solve problems—skills that have been associated with updating (Miyake et al., 2000). Consistent with attributional ambiguity theory (Crocker & Major, 1989), we predicted that minorities who observed subtle discrimination in the hiring task would perform worse on the updating task compared to those who observed no discrimination. As the subtle versus no bias comparison was the primary comparison of interest, we did not have specific predictions about the extent to which observing blatant bias would affect updating. While the present study employed the observed discrimination paradigm of Salvatore and Shelton, we were not sure whether our study would mirror their findings because we examined the effects of observed discrimination on a different cognitive process (updating) than what Salvatore and Shelton examined (inhibition).

Method

Participants and Design

One hundred ninety-one self-reported Black and Hispanic undergraduates (113 females, 78 males; $M_{\text{age}} = 19.24$; $SD = 1.57$) participated in this experiment for partial fulfillment of a course requirement or \$10. Participants were randomly assigned to one of three bias conditions: observing subtle discrimination, observing blatant discrimination, or no discrimination. A sensitivity power analysis indicated that this sample size provided 80% power to detect a minimum effect size, Cohen's $f = .23$.

Materials

All study materials and measures are provided in the online supplement.

Job description. The discrimination manipulation was adapted from previous research (Salvatore & Shelton, 2007). Participants were provided with a one-page document that outlined a full-time Human Resources Consultant position. The primary responsibilities of the position included designing, implementing, and evaluating compensation programs for the company. The job description included a list of responsibilities and qualifications, as well as information about the salary and benefits.

Applicant resumes. Participants received the resumes of four applicants who had ostensibly applied and interviewed for the position. The resumes of

Applicants 1 and 2 were filler resumes such that Applicant 1 was a White man with a mediocre educational background, work history, and extracurricular activities and Applicant 2 was a White woman with an impressive educational background, work history, and extracurricular activities. Applicants 3 and 4 were the applications that constituted the subtle or no racial bias manipulation. Applicant 3, a White man, was the “unqualified” candidate as he had graduated from a small, regional university, had little relevant work experience and unimpressive extra-curricular activities. His resume was designed to convey that he was unqualified for the position. Applicant 4 was the “most qualified” candidate for the position. His resume indicated that he had graduated from Yale, had relevant work experience, and impressive extracurricular activities. Applicant 4’s resume also implied that he was Black (e.g., Black Student Union, NAACP member).

Hiring manager information sheet. Participants received a one-page information sheet that listed the hiring manager’s name, gender (male), race (White), and number of years with the company.

Hiring manager’s recommendations. The hiring manager’s recommendation and a short rationale for his decision about each candidate communicated subtle discrimination, blatant discrimination, or no discrimination. The hiring manager chose to hire two of the four candidates. In both conditions, the hiring manager chose to hire the more qualified filler candidate (Applicant 2) and did not hire the less qualified filler candidate (Applicant 1). In the *no discrimination condition*, the hiring manager chose to hire the most qualified (Black) candidate (Applicant 4) and his notes were race-neutral. In the *subtle discrimination condition*, the hiring manager chose to hire the unqualified (White) candidate (Applicant 3) over the more qualified Black candidate (Applicant 4), and again his notes were race-neutral (i.e., no mention of race)—leaving it attributionally ambiguous as to why the more qualified Black candidate was not favored. In the *blatant discrimination condition*, the hiring manager again chose to hire the unqualified (White) candidate (Applicant 3) over the more qualified Black candidate, but in this condition, his notes explicitly stated that race was a factor in his decision—leaving no doubt that racial discrimination was at play. The online supplement includes all study materials.

Procedure

Participants were told that they would complete two separate and unrelated studies that had been bundled together due to time. In the “first study” participants were asked to learn about and evaluate a company’s hiring practices. They read a letter from a manager at an ostensible company asking for help with deciding whether hiring decisions were best made by a group of hiring managers or by a single hiring manager working alone. Participants were told that they would

be randomly assigned (via a drawing) to evaluate either a group hiring decision or a solo decision. In reality, participants took part in a rigged drawing and all participants were assigned to evaluate a solo hiring decision.

Next, participants received a binder that contained the job description, the resumes of the four ostensible applicants who had applied for a position at the company, and an evaluation packet. While reviewing the materials, participants were instructed to use the evaluation packet to evaluate each candidate's qualifications and fit for the job. Participants completed this part of the task at their own pace and were asked to alert the experimenter once they were finished. After evaluating the candidates, participants received biographical information about the company's hiring manager, his evaluations of each candidate, and his decision regarding who should be hired for the position. The discrimination manipulations were embedded in these decisions as described above. Thus, participants learned the hiring manager had exhibited subtle discrimination, blatant discrimination, or no discrimination against the more qualified Black applicant. After participants read these materials, participants were told that the researchers were interested in how well people remembered information about others and, therefore, they would be tested over the materials they just read. Then participants completed a "memory check" packet that contained questions about their perceptions of the hiring manager and his hiring decisions. This task served as our manipulation check. After completing the memory check packet, participants were told that they had finished the "first study" and would begin the "second study."

Participants then completed the cognitive task that assessed updating (Kaminski et al., 2008). For this, we administered a task (described below) that employed a dual-task paradigm shown to assess working memory (e.g., Logie, Gilhooly, & Wynn, 1994; Oberauer & Göthe, 2006)—a key component of the updating executive function (Miyake et al., 2000). After completing the second study, participants answered demographic questions. Then they were debriefed and thanked for their participation.

Measures

Manipulation check. To assess whether participants perceived that the hiring manager's decision was more biased when they observed subtle and blatant discrimination compared to no discrimination, participants responded to three items (e.g., "How biased was the hiring manager's decision?") on a scale of 1 (*Not at all*) to 7 (*Very*). Higher values indicate greater perceived discrimination ($\alpha = .88$).

Updating task. To assess the executive function of updating, participants completed a computerized working memory task in which they learned the rules for combining three geometric symbols to produce an outcome symbol.

Participants were told that the researchers were interested in how people learn different tasks. The instructions described the task as deciphering an ancient hieroglyphic language (see also Boucher, Rydell, Van Loo, & Rydell, 2012). Participants were presented with six rules for combining the symbols and were asked to study the rules until they had learned them well, committing them to working memory. After studying the rules, participants completed the 24 test problems. The test problems involved using the memorized rules to combine various sequences of shapes—updating the resulting shapes as they went along—with the goal of arriving at a single outcome shape. For example, four of the rules indicated that (1) combining two diamonds (♦♦) creates a circle (○); (2) combining two circles (○○) creates a diamond (♦); (3) combining a circle and a diamond (○♦) creates a flag (+); and (4) combining any shape with the flag (e.g., ○+) results in the first shape in the pair (○). A test problem using these rules would involve combining several sequences of these shapes to arrive at a final outcome shape (♦♦♦○○♦♦○○=♦). Thus, to solve the problems, participants needed to hold the rules in their working memory, manipulate the rules to figure out the correct shape, and update their representation of the outcome as they added the next shape. The problems varied in the number of shapes participants needed to combine. They worked through the 24 problems at their own pace and were asked to do their best to answer each question correctly. The online supplement includes all of the updating task materials.

Results

Manipulation Check

An ANOVA was conducted to assess whether participants perceived different levels of bias in the hiring manager's decision by condition. Results revealed a significant effect of condition, $F(2,173) = 86.51$, $p < .001$, $\eta_p^2 = .50$. Simple effects tests showed that those who observed blatant discrimination ($M = 5.44$, $SD = 1.14$) perceived the hiring manager's decision as more biased than those who observed both subtle discrimination ($M = 4.09$, $SD = 1.41$) and no discrimination ($M = 2.30$, $SD = 1.34$), both $ps < .001$. Additionally, those who observed subtle discrimination perceived the hiring manager's decision as more biased than those who observed no discrimination, $p < .001$.

Updating Task

The working memory task was scored by computing the total number of problems answered correctly out of 24 problems ($M = 12.62$, $SD = 4.36$). An omnibus ANOVA was conducted to assess whether condition (subtle vs. blatant vs. no discrimination) affected participants' working memory scores. Results revealed no omnibus effect, $F(2,188) = 2.13$, $p < .122$, $\eta_p^2 = .02$. However, the

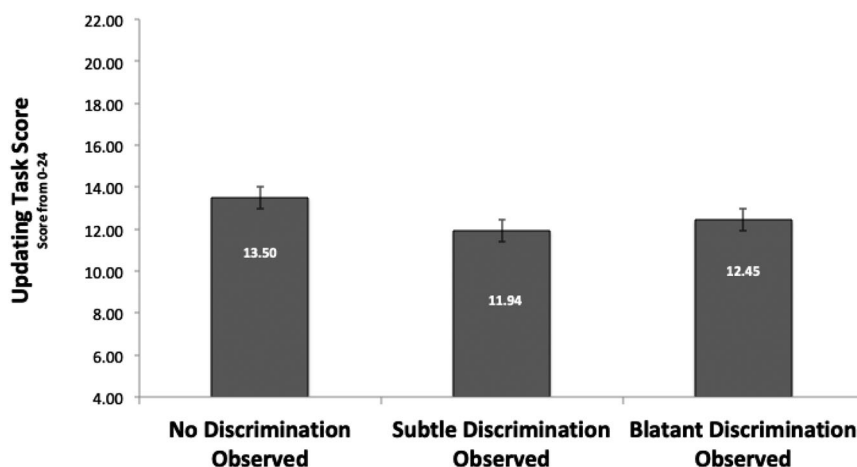


Fig. 1. Mean updating task scores as function of observed discrimination condition. Error bars represent standard errors.

a priori planned contrast between the subtle discrimination and no discrimination conditions revealed that participants who observed subtle discrimination ($M = 11.94$, $SD = 4.09$) performed more poorly on the updating task than participants who observed no discrimination ($M = 13.50$, $SD = 4.11$), $F(1, 188) = 4.12$, $p = .04$, $\eta_p^2 = .02$. Exploratory contrasts revealed that those who observed blatant discrimination ($M = 12.45$, $SD = 4.76$) did not differ from those who observed subtle discrimination, $F(1, 188) = .455$, $p = .50$, $\eta_p^2 = .002$, or those who observed no discrimination, $F(1, 188) = 1.84$, $p = .18$, $\eta_p^2 = .01$. (See Figure 1.)

Discussion

Consistent with our key prediction, results revealed that racial and ethnic minorities who observed subtle (vs. no) discrimination showed impairments to the executive function of updating as assessed by the working memory task. Specifically, participants who observed a hiring manager pass over a more qualified Black applicant for a less qualified White applicant (i.e., subtle discrimination condition) performed worse on a task that required them to manipulate and revise information in working memory relative to participants who observed no racial discrimination in the hiring decision. Though we had no specific predictions regarding the blatant discrimination condition, results showed that participants' working memory scores did not differ, on average, from those who observed subtle discrimination or those who observed no discrimination condition. Though this latter result deviates from related previous findings for the executive function of

inhibition (Salvatore & Shelton, 2007), it tentatively raises the possibility that observing blatant discrimination may be somewhat more detrimental to inhibition processes than other executive cognitive functions (e.g., updating). This possibility, however, should be treated with caution, and studies that directly investigate different executive functions in the same study will be needed to investigate this question fully. Nonetheless, the importance of investigating the cognitive effects of observing subtle and blatant discrimination cannot be overstated. Advances in technology have made it easier than ever to witness or be made aware of incidences of discrimination in a very short amount of time. While researchers have begun to explore the cognitive effects of *experiencing subtle discrimination* on the three core executive functions of inhibition, shifting, and updating and *observing subtle discrimination* on inhibition, the current study extends this literature by examining for the first time how observing subtle discrimination negatively impacts the executive function of updating—highlighting the broad impact that observing subtle bias may have on individuals' cognitive processing.

The current updating findings are consistent with updating findings from previously discussed work on the effects of directly experiencing subtle discrimination (Schmader & Johns, 2003). Taken together with previous work, these findings have important implications for academic and employment settings, where the ability to maintain, manipulate, and update information in working memory is crucial for performance and success.

Although this study makes an important contribution to the racial discrimination literature, there are some limitations that should be considered. First, while this study provides initial evidence that observing subtle discrimination impairs updating, it is still a single study that employed only one measure assessing this executive function. To increase confidence that observing subtle discrimination impairs updating, additional updating tasks should be employed (e.g., span tasks, keep-track task, letter memory task); using different tasks will increase the generalizability of these findings. Additionally, future work should examine whether observing subtle discrimination affects updating among other stigmatized groups as well (e.g., women, religious minorities, sexual minorities).

Future work should also directly compare the effects of experiencing and observing discrimination on cognitive functioning. Although observing racial discrimination may, indeed, impair the cognitive functioning of racial and ethnic minorities, differences in the nature of observational and experiential situations may result in different effects. For instance, the concerns of individuals who directly experience discrimination are often about the physical safety and wellbeing of the self—as the self is directly implicated in the interaction. However, the concerns of people who observe others discriminate are less likely to be about the self (e.g., how will this person treat *me*) because the perpetrator may not always be physically present; especially if the situation is communicated through video, social media, news, etc. Instead, those who observe discrimination may be

more concerned about how outgroup members treat *members of my group*. While there is a greater need/demand to mobilize a personal and immediate response in experienced situations than in observed situations, observed situations may lay bare larger patterns of discrimination and thus motivate collective action to reduce discrimination. Thus, while experiencing discrimination may have greater effects on the cognitive functioning of individuals; observing discrimination may have greater effects on the group's ability to identify and resist discrimination.

Observing discrimination may also have different implications for the race-related vigilance of racial and ethnic minorities. Exposure to multiple instances of discrimination against one's group has been shown to increase individuals' perceptions of the pervasiveness of prejudice (Carter & Murphy, 2017). Thus, individuals who experience racial discrimination directly may become more vigilant to cues of discriminatory treatment toward the *self*, whereas those who observe discrimination may also become more vigilant to cues that suggest that *members of their group* (and/or members of other stigmatized groups) may be discriminated against. These attentional biases may impact other downstream consequences, such as people's physiological responses and willingness to advocate on behalf of victims.

Finally, to better understand who is likely to be affected by observing racial discrimination, future work could investigate how individual differences may moderate the effects of observing racial discrimination against others. While researchers have not yet examined this question with respect to executive functioning, studies suggest that factors related to racial identity, such as group identification, can shape how racial minorities are otherwise affected by and respond to information about incidents of discrimination (Mason et al., 2017; Roberts et al., 2017). For example, Roberts et al. (2017) examined Black students' reactions to race-related fatal shootings of unarmed Black people. The researchers found that participants' racial centrality—the extent to which students' race is a central part of their personal identity—predicted psychological distress. Consistent with this research, we predict that factors related to racial identity and group identification may moderate the cognitive effects of observing racial discrimination. Future work should examine the role of these and other potential moderators. These directions will increase our understanding of how people who experience and observe subtle discrimination cope with these stressful situations.

General Discussion

This article provides the first comparative review of the cognitive costs of experiencing and observing subtle discrimination. In particular, we provide theory and empirical evidence to explain how and why both *experiencing* and *observing* subtle racial discrimination may impair the three major components of executive functioning—inhibition, shifting, and updating. To date, there is less empirical

research examining the cognitive costs of observing subtle racial discrimination—that is, observing behavior toward another racial/ethnic minority group member that is attributionally ambiguous and difficult to decisively attribute to racism. However, we propose that as acts of subtle bias become increasingly visible via television, news, and social media, racial/ethnic minority perceivers may experience impairments across each core executive function. To this end, we provide initial evidence that observing subtle racial discrimination can negatively affect a previously unexplored component of executive functioning among racial and ethnic minorities—updating. In so doing, we call for more nuanced thinking about what it means to be the “target” of prejudice and discrimination, as people’s vicarious experiences of discrimination can exact adverse consequences (cf. Harrell, 2000). These questions are increasingly relevant and have implications for people’s outcomes across a number of important indices and contexts (i.e., cognition, physiology, well-being; schools, workplaces) as others’ experiences of subtle racial discrimination become more prominently featured in mainstream news and social media.

In particular, the current work has important policy implications for how companies and governments address claims of subtle discrimination. Most organizations have policies to address and remediate claims of blatant discrimination. However, research has demonstrated that Whites (who often hold positions of power within companies and governments) tend to not recognize or include subtle discrimination in their definitions of discrimination (Sommers & Norton, 2006). Thus, it is likely that these claims are often downplayed or dismissed outright. Evidence demonstrating that both experiencing *and* observing subtle discrimination have negative consequences can encourage policymakers and organizations to (a) find ways to help individuals (particularly Whites and men) and institutions recognize and label subtle discrimination as discrimination, (b) create avenues for reporting instances of subtle discrimination, and (c) develop policies to reduce, address, and help targets cope with the consequences that stem from experiencing and observing subtle discrimination. Importantly, implementing reporting systems are not sufficient—the data gathered from such systems should be regularly analyzed to identify and address inequalities in the experiences of people from stigmatized (e.g., racial and ethnic minorities, women, gay individuals, etc.) and nonstigmatized (e.g., Whites, men, heterosexual individuals, etc.) backgrounds. For example, many organizations have anonymous online bias reporting systems that allow individuals to submit formal complaints when they have experienced or witnessed racial discrimination. However, these systems often define discrimination as blatant, overt mistreatment based on race. Indeed, the examples of racial discrimination provided by the U.S. Equal Employment Opportunity Commission (EEOC) include only blatant forms of discrimination, such as “racial slurs, offensive or derogatory remarks about a person’s race or color, or the display of racially offensive symbols” (“Race/Color Discrimination,” n.d.). Given the burgeoning

evidence that experiencing and observing subtle bias has negative cognitive and noncognitive outcomes, it may be appropriate to broaden the operational definitions of discrimination to include subtle bias.

Beyond Cognitive Consequences

Although this article focuses on cognitive consequences of observing and experiencing subtle discrimination, the discussion could be broadened to examine additional noncognitive effects of experiencing and observing discrimination. Given past research, we predict that blatant bias may not have the same cognitive costs as subtle bias because blatant bias is not ambiguous and can be easily attributed to racism (e.g., Murphy et al., 2013; Salvatore & Shelton, 2007). The ability to clearly label behavior as discrimination, and have others recognize it as such, removes the need to effortfully disambiguate the situation and is thus theorized to be less detrimental to people's executive functions (cf. van den Bos & Lind, 2002). Nonetheless a large body of research has demonstrated that experiencing, and to a lesser extent, observing racial discrimination both have consequences for racial and ethnic minorities across a variety of important life domains (e.g., Carter & Forsyth, 2010; Geronimus, Hicken, Keene, & Bound, 2006; Taylor & Walton, 2011).

In addition to affecting basic executive functions, research has shown that experiencing subtle instances of racial bias can undermine more complex cognitive processes, such as academic learning in an educational context. For example, Taylor and Walton (2011) asked Black and White participants to study and learn rare words in one session and to recall them later under conditions of subtle or no racial bias. In the study, some participants were given instructions that suggested that the experimenter expected that African Americans might not perform well on the task—leaving it ambiguous as to whether the experimenter was intellectually stereotyping participants (i.e., subtle racial bias condition). The others received instructions that suggested no racial bias. Following the manipulation, participants studied a list of rare words and their definitions and returned to the laboratory 1–2 weeks later to complete the recall task. Results revealed that Black students who heard the subtly biased instructions suggesting that their group might not perform well learned and recalled fewer words than those exposed to the unbiased instructions. White students showed no differences as a function of the bias instructions. Taken together with previous work (e.g., Steele & Aronson, 1995), these findings suggest that experiencing and observing subtle discrimination may contribute to academic achievement gaps between Whites and racial/ethnic minorities. Thus, these findings have important implications for academic and employment settings, where the ability to acquire, remember, and apply knowledge is necessary for success and advancement.

In addition, perceived racial discrimination has been shown to have negative affective consequences. Research has found that these experiences can engender negative emotions such as sadness, fear, nervousness, and hopelessness (Broudy et al., 2007; Carter & Forsyth, 2010; Jones, Lee, Gaskin, & Neblett Jr., 2014). Cross-sectional and longitudinal studies have also revealed that racial and ethnic minorities who report higher levels of discrimination are more likely to be diagnosed with depression and anxiety (Finch, Kolody, & Vega, 2000; Gee, Spencer, Chen, Yip & Takeuchi, 2007; Kessler, Michelson, & Williams, 1999; Landrine & Klonoff, 1996; Schneider, Hitlan, & Radhakrishnan, 2000).

Very little research has explored the affective consequences of observing racial discrimination. However, clinical psychologists acknowledge that people can suffer from vicarious experiences of trauma (American Psychiatric Association, 2000). That is, both directly experiencing stressful and traumatic events and being exposed to the traumatic experiences of others can have similar effects on people's emotions and mental health. Thus, it is reasonable to predict that experienced and observed racial discrimination might trigger similar feelings and emotions (e.g., sadness, anger, nervousness, lack of control), as well as more severe mental health challenges (e.g., anxiety, depression).

Likewise, racial discrimination negatively impacts physiological health outcomes. Indeed, leading public health researchers have put forward what is called the "weathering hypothesis," which argues that socially structured, repeated stress process activation by experiences of discrimination can accumulate and increase mental and physical health vulnerability across the lifespan for people who belong to stigmatized social identity groups (Geronimus, 2013; Geronimus et al., 2006; Geronimus & Thompson, 2006; Graham, Brown-Jeffy, Aronson, & Stephens, 2011). The weathering perspective prioritizes research on the lived experience of vulnerable populations, and how aspects of their experiences are translated, through physiological stress process activation, into health vulnerability and early morbidity.

Consistent with the weathering hypothesis, a growing body of literature shows a strong relationship between experiencing racial discrimination and poor physical well-being. Psychosocial stressors, such as perceived discrimination, activate the body's stress response systems. The components of this system that are affected include heart rate and blood pressure, as well as the release of cortisol—a stress hormone (Everly Jr. & Lating, 2013). Although this stress response system developed to protect the body from imminent danger, chronic activation can negatively affect both physical and mental health (Chrousos, 2009).

Cross-sectional and longitudinal studies have revealed that racial and ethnic minorities who report higher levels of discrimination are more likely to be diagnosed with cardiovascular diseases (e.g., Clark, 2003; Hicken, Lee, Morenoff, House & Williams, 2014), and substance abuse issues (e.g., Borrell et al., 2007; Gibbons, Gerrard, Cleveland, Wills, & Brody, 2004). These findings provide

compelling evidence that racial discrimination has important implications for public health. Furthermore, research has demonstrated that the impaired executive function of inhibition is related to diagnoses of substance abuse disorders (e.g., Nigg et al., 2006). Future work should examine whether impaired executive functions play a mediating role in the relationship between not only experiencing, but also observing, racial discrimination and other noncognitive outcomes.

Being a Target of Racial Discrimination

By distinguishing the effects of experiencing and observing discrimination, we complicate the traditional “target” perspective of prejudice and discrimination. Here, we take a novel approach to what it means to be the “target” of stereotyping and discrimination. People are “targets” of discrimination when they both personally experience acts of discrimination and when they observe it happening to others. Yet to date, theories of discrimination that adopt the “target’s perspective” do not often distinguish between these two experiences. In this comparative review, we discuss—using evidence from the literature—how the cognitive processes and consequences of experienced and observed discrimination may converge (while also theorizing about how it might, at times, diverge) for racial and ethnic minorities.

This work is that it has the potential to improve the way organizations respond to racial discrimination. When discriminatory incidents occur, efforts to remedy the situation typically focus on the individuals directly involved. That is, organizations may punish the perpetrator, implement programs to stop others from engaging in the offending behavior, and/or apologize to or compensate the target. However, responses to these incidents rarely address how they affect others who witness them. Institutional responses to other types of traumatizing events often acknowledge that their consequences can be far-reaching. For instance, when a student is assaulted or commits suicide, support services are often available for those who hear about the event or may otherwise be indirectly affected. Recognizing that racial incidents can also have indirect effects necessitates similar interventions and policy changes to help people cope with vicarious experiences of racial discrimination.

Conclusion

The research reviewed here demonstrates that *experiencing* subtle discrimination affects inhibition, shifting and updating executive functions. Additionally, the literature suggests that *observing* subtle discrimination impairs inhibition. These findings have potential implications for short-term outcomes, such as test performance, as well as longer-term outcomes like academic achievement, employment, and mental and physical health.

This review also highlights gaps in the literature regarding the cognitive effects of experiencing and observing subtle racial discrimination. Indeed, the literature is particularly sparse with regard to the effects of observed discrimination on the executive functions of shifting and updating. We have begun to address this gap with an initial study providing preliminary evidence that observing subtle discrimination impairs updating; however, future research should further address these gaps. By investigating the effects of both experiencing and observing subtle bias we will develop a deeper understanding of the processes by which subtle bias contributes to inequalities in academic achievement as well as other socially relevant domains such as employment, and public health.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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