The Effects of Race-Related Factors on Social Cognition in Black Women

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Abstract

Social cognition, the ability to perceive, interpret, and process information in social interactions, is an important predictor of functional outcomes in individuals with schizophrenia (Green et al., 2015; Halverson et al., 2019). Past studies have found differences across race in social cognition tasks in both clinical and non-clinical populations, highlighting a need to assess contextual and individual race-related factors behind this discrepancy (Nagendra et al., 2018; Pinkham et al., 2008, 2017). The Challenge and Threat model provides a framework to understand how multiple race-related factors interact to impact physiological and psychological response to social cognitive tasks. Specifically, we hypothesized that experimenter race and level of perceived discrimination would impact social cognitive performance, in that participants with higher perceived discrimination and who were tested by White experimenters would have the most inhibited performance. Forty eight Black women were assessed with a battery of social cognitive tasks while continuous physiological data was collected. A multi-level regression was conducted to assess main and interaction effects of experimenter race and perceived discrimination on social cognitive performance, as well as correlations to assess underlying physiological responses to the tasks. However, the results did not support the hypotheses. Future research should assess other race-related factors under the Challenge and Threat model to advance understanding on racial disparities in social cognitive tasks.

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The Effects of Race-Related Factors on Social Cognition in Black Women

Schizophrenia is a severe mental illness that occurs in approximately 3 million individuals in the U.S., and 1% of the world population (Hennekens et al., 2005). Schizophrenia is characterized by a combination of positive symptoms (e.g. delusions), negative symptoms (e.g. avolition), and disorganized behavior (e.g. incoherent speech; American Psychological Association, 2013). Pronounced cognitive deficits are another key feature in many individuals diagnosed with schizophrenia (Green et al., 2015). Schizophrenia is also characterized by impaired functioning, including community-based functioning (i.e. independent living), and social skills (Green, 2019).

Impaired daily functioning is a critical target for treatment in schizophrenia, as it supports recovery beyond just symptom reduction. Consequently, it is vital to explore the underlying factors of such impairment. Past research has focused on the role of neurocognition (i.e., working memory, processing speed, and problem solving) on daily functioning (Green et al., 2015). However, more recent research has examined another domain of cognition, social cognition, defined as the mental processes used to perceive, interpret, and process information in social interactions (Green et al., 2015). Although there is a clear connection between neurocognitive deficits and functional outcomes, research has found that social cognition mediates the relationship between neurocognition and indices of daily functioning (Halverson et al., 2019). In addition, social cognitive performance is related to negative symptoms and disorganization, highlighting its importance in our understanding and treatment of individuals with schizophrenia (Salva et al., 2013).

Social cognition in schizophrenia research can be divided into four sub-domains: emotion processing, theory of mind, social perception, and attributional bias (Pinkham et al., 2014). Emotion processing is the ability to perceive and use emotions in different social contexts, such as identifying the correct emotion from a facial expression, and understanding how to best respond (Green et al., 2008). Theory of mind (ToM) is the ability to decipher an individual's speech and behaviors to understand their intentions and beliefs (Green et al., 2015). For example, ToM is used to detect the true meaning in indirect speech through inference (e.g., picking up on white lies; Pinkham et al., 2016). Social perception refers to the ability to identify social roles, societal rules, and social context (Green et al., 2008). Social perception is evaluated through participants identifying interpersonal characteristics in often ambiguous social situations (Pinkham et al., 2016). Lastly, attributional bias refers to the extent to which an individual ascribes the causes of positive and negative events to internal (due to one-self), external (due to others), or situational factors (due to the situation or context; Green et al., 2008). These four sub-domains are useful in understanding the intricacies that influence daily functioning in individuals with schizophrenia, and creating accurate measurements for each of these domains has been a crucial step in progress towards treatment.

Social cognitive tasks can also be construed in two broad categories: skills-based and bias-oriented tasks. Skills-based tasks measure controlled processing and assessment of external social situations, while bias-oriented tasks utilize automatic processing that requires participants to imagine themself in certain interpersonal scenarios. Furthermore, skills-based tasks assess correct interpretation of a social situation, and thus have right or wrong answers, while

bias-oriented tasks examine patterns in interpretations of social situations, with no right or wrong answers (Buck et al., 2016).

One understudied area of social cognition is racial differences. A small body of research suggests that these differences exist across social cognitive tasks. In the large-scale Social Cognition Psychometric Evaluation (SCOPE) study, results indicated that in both healthy and clinical groups, Black participants had lower scores on emotion processing and ToM tasks compared to White participants (Pinkham et al., 2017). Other research has also found that Black participants obtain lower scores on some social cognitive measures (Pinkham et al., 2008). These findings parallel research on neurocognitive performance in clinical and non-clinical groups, which have generally found that Black individuals have lower scores than their White counterparts on neurocognitive tasks (e.g., Keefe et al., 2006; Nagendra et al., 2018). Notably, these effects have been sustained even after controlling for education level (Nagendra et al., 2018).

A variety of factors have been put forth to explain observed racial differences in cognitive performance in nonclinical individuals. One well-supported theory is the Challenge and Threat model, which posits that when an individual is faced with a motivated performance situation (in this case, a cognitive assessment), they react in one of two ways: with a challenge or a threat response. A challenge response occurs when an individual perceives that their personal resources are greater than the demand of the task, resulting in optimal cognitive performance. Alternatively, the threat response engages when an individual perceives that the demand of a task exceeds their personal resources, resulting in impaired cognitive performance. Examples of

demand evaluations include perceptions of danger, required effort, and uncertainty, and examples of resource evaluations include perceptions of individual knowledge and abilities, as well as external support (Mendes et al., 2002).

The Challenge and Threat model has the potential to unify a variety of findings on race-related factors and cognitive performance. For example, research suggests that experimenter race may impact cognitive performance. Richeson, Trawalter, and Sheltonet (2005) found that Black individuals performed better on a cognitive task when tested by Black versus White experimenters. Similarly, Richeson et al. (2005) revealed that Black individuals had more impaired executive functioning after an interracial interaction. Nagendra et al. (2018) found Black participants performed better on skills-based social cognitive tasks when tested by a same-race experimenter. Thus, a Black experimenter may decrease the perceived demands of a task, while a White experimenter may do the opposite. In other words, experimenter race may impact the extent to which individuals experience a Challenge or a Threat response in a cognitive testing situation.

Another race-related factor that may impact both evaluations of demand and personal resources is perceived discrimination. Perceived discrimination has been found to affect neurocognitive performance, such that individuals with higher reports of perceived discrimination perform more poorly on neurocognitive tasks (Barnes et al., 2012; Thames et al., 2013). Specifically, higher frequency of discrimination can heighten an individual's perception of danger or uncertainty in a cross-race interaction, resulting in higher demand (Thames et al., 2013).

Past research has also found that the interaction between experimenter race and perceived discrimination can lower cognitive performance in Black individuals. One study found that Black participants with high levels of reported perceived discrimination performed worse on neurocognition tasks when tested by a White experimenter compared to a Black experimenter (Thames et al., 2013). Further, Nagendra et al. (2018) examined performance in healthy Black men on tasks that assess for attributional bias to test for perceived hostility and potential mistrust. They found that individuals who reported higher levels of perceived discrimination were more prone to discern negative intentionality in accidental interpersonal scenarios (Nagendra et al., 2018), suggesting that cumulative experiences of perceived discrimination may result in Black individuals experiencing a threat response under such circumstances (e.g. being tested by a White experimenter).

A potential mechanism underlying the threat response is physiological arousal, which shows unique signatures when individuals are experiencing a Challenge vs. a Threat response (Mendes et al., 2002). Specifically, respiratory sinus arrhythmia (RSA) measures the variability in exhalation (slowing of the heart rate) and inhalation (speeding up of heart rate; Muhtadie et al., 2015). RSA is used as an indicator of vagal tone, which moderates heart rate responses to the environment (Friedman 2007). When faced with a threat in the environment, vagal tone is inhibited, resulting in increased heart rate (Quintana et al., 2012). Measurements of vagal tone and vagal reactivity are often used to assess threat responses (Muhtadie et al., 2015). A negative RSA reactivity score indicates greater perceived threat in the environment (Muhtadie et al., 2015).

RSA has been linked in prior studies to both experiences of racism and cognitive performance. For example, Hill et al. (2017) found an inverse relationship between perceived discrimination and baseline RSA, revealing the gradual negative effect discrimination can have on physiological ability to respond to environmental stressors. Further, Quintana et al. (2012) found that participants with higher baseline RSA performed better on a measure of theory of mind. Muhtadie et al. (2015) found that RSA reactivity, or vagal flexibility, was a predictor for performance on a social-emotional perception test, with higher reactivity predicting more accurate performance. Therefore, RSA has been found to link to both race-related factors and social cognitive performance, and should be evaluated as a potential mediator when exploring the relationship between perceived discrimination, racial context, and social cognition. Physiological arousal also serves to provide a more objective measurement of threat response compared to self-reports of anxiety or activation.

The purpose of this honors thesis is to address the gap in extant literature on the effects of race-related factors on social cognition. Thus, using the Challenge and Threat framework, this study examines how individual and contextual race-related factors impact performance, looking at effects of experimenter race and levels of perceived discrimination specifically. This study also analyzes the mediating effects of RSA on social cognitive performance in order to explore the links between psychological and physiological responses as a product of varying demand and resource allocations. This study is a first step in understanding racial differences in social cognition, and may offer insight to future studies aimed at addressing and eliminating racial disparities in schizophrenia diagnosis and treatment.

Aims:

1) Examine the main effects of experimenter race and perceived discrimination, as well as their interaction, on skills-based tasks. It is hypothesized that the participants with lower perceived discrimination scores, tested by Black experimenters, or the interaction of the two, will perform more accurately on skills-based social cognition tasks, due to experiencing a challenge response. In comparison, those tested by White experimenters, with higher perceived discrimination scores, or their interaction, will have lower social cognitive scores due to experiencing a threat response.
2) Examine the main effect of experimenter race, perceived discrimination, and their interaction on bias-oriented tasks. Similar to the hypothesis above, it is hypothesized that participants with lower perceived discrimination scores, tested by Black experimenters, or the interaction of the two, will perform lower on bias-oriented social cognition tasks (indicating lower attributional bias). In contrast, participants with higher perceived discrimination scores, tested by White experimenters, or their interaction, will have higher bias-oriented scores.
3) To explore the role of RSA on race-related factors under the Challenge and Threat model, specifically:
    a) Examine the relationship between baseline RSA and perceived discrimination, with a hypothesis that individuals with higher frequency of perceived discrimination will have lower baseline RSA, due to a reduced physiological capacity to respond to stressors over time.

b) Examine RSA reactivity as a mediator of the relationship between perceived discrimination and social cognition. It is hypothesized that participants with higher perceived discrimination will have lower RSA reactivity during each task, and therefore will perform worse on social cognition tasks.

Methods

Participants

The data for this study is taken from a larger project called "Black American Women and Social Cognition." This study recruited 48 Black women between the ages of 18-30, half undergraduate and half non-undergraduate (i.e. graduate students and community members). The participants were primarily recruited through an online interface called Join the Conquest, as well as flyers around UNC-Chapel Hill and Facebook ads. Participants were excluded if they had a relative with schizophrenia, bipolar disorder, or autism, if they had experienced a severe head injury, or a Beck's Depression Inventory score higher than 13. Due to task requirements, participants were also excluded if they indicated any impairments with reading, visual, or hearing limitations.

Measures

Pre-Experimental Session Questionnaire. The Daily Life Experiences Scale(RaLES-DLE; Harrell 1997) was used to assess racism microstressors by asking 20 prompts about how often an experience occurs as a result of being Black (e.g. "being treated rudely or disrespectfully" or "being left out of conversations or activities") on a scale of 0 ("never") to 5 ("once a week or

more), as well as how much any of these experiences bothered the participant from 0 ("has never happened to me") to 5 ("bothers me extremely"). Two scores are calculated from this questionnaire, a frequency score and a microstress score. Each was calculated by summing the rating of the items and then dividing by the number of items (Harrell, 1997). Only the frequency subscale was used for analyses. Possible scores for the frequency subscale range from 0-5.

Social cognition tasks. There was a total of four tasks completed to measure social cognition. See the Appendix for examples of each task.

ER-40. The Penn Emotion Recognition Task (ER-40; Kohler et al., 2003) was used to assess emotion perception. Participants were asked to recognize which four facial emotions or no emotion was being displaced in 40 photos of faces presented on a computer. The faces in the ER-40 differed by age, race, and gender. The task was assessed by the total score of correct responses. Possible scores range from 0-40.

BLERT. The Bell-Lysaker Emotion Recognition Task (BLERT; Bryson et al., 1997) also assessed emotion perception with six emotion categories or no emotion. The stimuli were 21 ten-second video clips on a computer of the same White male reciting a monologue with different intonation and facial changes. Performance was indexed for the composite number of correct responses. Possible scores range from 0-21.

Eyes Task. The Reading the Mind in the Eyes Task (Eyes Task, Baron-Cohen et al., 2001) was used to measure theory of mind by determining mental states from a different list of four words (i.e. irritated, joking) for each of the 36 photos of eye regions of White faces

presented on a computer. Performance was indexed by the total number correct. Possible scores range from 0-36.

AIHQ. Lastly, the Ambiguous Intentions Hostility Questionnaire (AIHQ) – Abbreviated (Combs et al., 2007) was used to measure hostile attributional biases by assessing reactions to ambiguous negative situations (e.g. "You walk past a bunch of teenagers at a mall and you hear them start to laugh"), intentional negative situations (e.g. "While driving, the person in the car behind you honks their horn and then cuts you off") and accidental negative situations (e.g. "A friend of yours slips on the ice, knocking you to the ground"). Regardless of subscale, each scenario was followed by three questions, that assessed intentionality (e.g. "do you think X happened on purpose?"), anger/hostility, (e.g. "How angry would this make you feel?"), and blame (e.g. "How much would you blame X?"). A blame score was calculated and used for analyses for the accidental and ambiguous subscales by computing the mean across the five questions for each scale. The ambiguous blame score was used because it has been found to have high levels of internal consistency (Combs et al., 2007). The accidental blame score was used as it was found to have significant results in Nagendra et al.'s study (2018). For both indices, scores ranged from 1-5.

Physiological markers. Experimenters attached electrodes using the Lead II electrode configuration to the participant to collect electrocardiographic (ECG) and impedance cardiographic (ICG) signals. Cardiac measures were obtained continuously both for a 5-minute baseline period at the start of the study and throughout the social cognitive tasks. ECG was collected at a sampling rate of 1,000 Hz with the Mindware monitoring system. The data was

scored by visually inspecting the waveform of the R spikes and then averaging the responses into 1-minute segments. RSA was calculated using Mindware software's HRV 2.6 module, and then the scores derived from this program were inspected by trained research assistants. Any misidentified R spikes were manually edited. Respiration rate was found via the dz/dt signal also using the Mindware scoring module, and was analyzed as a covariate in the RSA analyses. However, respiration rate was not found to influence any of the results, so the results do not discuss respiration rate analyses.

Procedure

Participants completed a 30-minute questionnaire, including the measure of perceived discrimination, at least 24 hours before coming into the in-person lab session. In the two-hour experimental session, participants were randomized to either be tested by two White research assistants or two Black research assistants. All research assistants were women to reduce potential gender effects. All research assistants followed a protocol that included a standardized script, dress code, and instruction on speaking in a neutral tone throughout the session.

The participants first were greeted by one of the experimenters at the door, and were asked if they were a part of the social information study. After reading and signing a consent form, participants were outfitted with equipment for measurement of heart rate variability (i.e. ECG). After collection of initial baseline data, the experimenter administered a battery of neurocognitive and social cognitive tasks. The two batteries were randomized so that some participants completed neurocognitive tasks first, and some completed social cognitive tasks first. The tasks in the social cognitive battery were randomized.

Data Analytic Plan

Descriptive statistics, correlations, and regressions were evaluated using SPSS 23.0. Social cognitive performance was evaluated for each of the four tasks independently, as well as a composite score for the skills-based tasks by calculating z-scores for each task (ER-40, Eyes, BLERT) and computing the mean. The bias-oriented task (AIHQ) was assessed with two outcomes, the AIHQ-ambiguous blame score and the AIHQ-accidental blame score. The data analytic strategy used for each hypothesis is described below.

Hypotheses 1 and 2. A multiple linear regression was conducted to assess the main effects of experimenter race, perceived discrimination, and their interaction on social cognitive performance. Experimenter race (dichotomous variable), perceived discrimination (continuous variable), and the interaction term (experimenter race X perceived discrimination) were entered into the model simultaneously. The interaction term was computing by centering each independent variable at the mean and then calculating a combined score. A regression was run to assess three outcome variables separately: composite skills-factor score, the AIHQ-ambiguous blame score, and the AIHQ-accidental blame score.

Hypothesis 3a and 3b. To explore the role of RSA on race-related factors and performance, first a single linear regression was run between perceived discrimination and baseline RSA. Then, a multiple linear regression analysis was conducted to determine if RSA reactivity was a mediator between perceived discrimination and social cognitive performance. To conduct the regression, a mean reactivity score was calculated for each social cognitive task by subtracting RSA mean obtained from the baseline recording from the RSA mean score at the

start of each task. The mean reactivity score was computed across the three skills-based tasks for a composite skills-based reactivity score. The last time segment was chosen for baseline to account for time to acclimate to the testing setting, while the first time segment was chosen for each social cognition task to ensure the initial reaction to the task was encapsulated.

Results

There was no statistically significant difference between participants tested by Black experimenters versus White experimenters in terms of participant age or undergraduate status (Table 1). In four cases, there was missing data for the social cognition tasks, and these participants were excluded from analyses. Table 1 displays the mean scores and standard deviations between groups across social cognition tasks and the perceived discrimination scale.

Hypotheses 1 and 2.

Effect of Experimenter Race, Perceived Discrimination, and their Interaction on Skills-Based Tasks

A multiple linear regression was conducted to predict social cognitive performance based on experimenter race and perceived discrimination. The overall model was not significant, $F(2, 41) = .058$, $p > .05$), $R^2 = .003$. The analysis shows that there was no main effect of perceived discrimination (*Beta* = -.05, $t(43) = -0.33$, *ns*), nor experimenter race (*Beta* = .01, $t(43) = 0.03$, *ns*) on skills-based scores. The interaction term was also not significant, (*Beta* = -.02, $t(43) = -0.13$, *ns*). See Figure 1 for minor, non-significant differences in scores across experimenter race.

Effect of Experimenter Race and Perceived Discrimination on Bias-Oriented Task

A multiple regression analysis was conducted to examine performance on the bias-oriented tasks, namely the AIHQ-ambiguous blame subscale and the AIHQ-accidental blame subscale. The overall model fit for AIHQ-ambiguous blame score was not statistically significant, $F(2, 41) = .854$, $p > .05$, with an R^2 of .04. Perceived discrimination did not significantly predict AIHQ-ambiguous blame score (*Beta* = .09, $t(43) = 0.57$, *ns*), and experimenter race also did not significantly predict AIHQ-ambiguous blame score (*Beta* = -.17, $t(43) = -1.10$, *ns*). The interaction term was also not significant, (*Beta* = .07, $t(43) = 0.42$, *ns*). The overall model fit for the AIHQ-accidental blame score was also not significant, $F(2, 41) = 2.53$, $p > .05$, with an R^2 of .11, with no main effect for perceived discrimination (*Beta* = .18, $t(43) = 1.23$, *ns*) nor experimenter race (*Beta* = -.25, $t(43) = -1.64$, *ns*) on AIHQ-accidental blame score. The interaction term was also not a significant predictor of the AIHQ-accidental blame score, *Beta* = .01, $t(43) = 0.08$, *ns*.

In sum, experimenter race, perceived discrimination, and their interaction were not significant predictors of skills-based or bias-oriented social cognitive task performance.

Hypotheses 3.

Mediation Effects of RSA on Social Cognitive Performance

The third hypothesis explored the effects and interactions of physiological data, specifically whether a) participants with higher frequency of perceived discrimination would have lower baseline RSA, and b) RSA reactivity was a mediator between perceived discrimination and social cognition performance. Refer to Table 2 for descriptive data of the physiological data.

a. A simple linear regression was calcuated to predict baseline RSA based on level of perceived discrimination. No significant regression equation was found, $F(1, 41)= 0.59$, $p > .05$, with an R^2 of .014 (see Figure 2).

b. To assess RSA reactivity as a mediator, first bivariate correlations were conducted between perceived discrimination, RSA reactivity, and each social cognitive task. Then three separate multiple linear regression analyses were conducted with perceived discrimination and RSA reactivity as predictors, and each social cognitive task score (skills-based factor score, AIHQ-ambiguous blame, AIHQ-accidental blame) as outcomes.

Skills-based factor score. First the skills-based factor score was assessed, and there was no significant relationship between RSA reactivity during the skills-based tasks and perceived discrimination, $r(45) = .025$, $p = .87$. A relationship trended towards significance between the skills-based factor score and RSA reactivity during the skills-based tasks, $r(45) = -.292$, $p = .06$. However, the mediation analysis was not significant, $R^2=.056$, $F(2, 40) = 1.179$, $p > .05$.

AIHQ-ambiguous blame score. There was no significant relationship between RSA reactivity and AIHQ-ambiguous blame, $r(45) = -.237$, $p = .14$, or perceived discrimination and AIHQ-ambiguous blame, $r(45) = .110$, $p = .48$. The mediation analysis was also not significant, $R^2=.052$, $F(2, 38) = 0.982$, $p > .05$.

AIHQ-accidental blame score. There was no significant relationship between perceived discrimination and AIHQ-accidental blame, $r(45) = .224$, $p = .14$. There was a significant relationship between RSA reactivity during the AIHQ task and

AIHQ-accidental blame, $r(45) = -.31$, $p = .05$. However, the mediation analyses did not find RSA reactivity to be a significant mediator between perceived discrimination and AIHQ-accidental blame score, $R^2=.116$, $F(2, 38) = 2.351$, $p > .05$.

Discussion

This study aimed to examine the extent to which race-related factors, framed within the Challenge and Threat Model, explained variations in social cognitive performance in healthy Black women. Across the analyses, there were no main effects nor interactive effects of experimenter race or perceived discrimination on social cognition performance across both skills-based and bias-oriented tasks. This study also examined physiological indicators, specifically baseline RSA and RSA reactivity as indices for threat responses. There was no significant relationship between level of perceived discrimination and baseline RSA, and RSA reactivity was not a signifcant mediator in the relationship between perceived discrimination and any measure of social cognitive performance. Thus, the Challenge and Threat model was not supported by the findings. This discussion will review potential reasons for the null findings, and suggest future directions for research focused on understanding racial variation in social cognitive performance.

There are several potential reasons the Challenge and Threat model may not have been supported in the current study. First, the measures may not have captured factors most relevant to the social cognitive performance of Black individuals. The seminal Challenge and Threat paper (Mendes et al., 2002) includes an array of examples for what constitutes a demand (e.g., perceptions of danger, required effort, and uncertainty) or a resource (e.g., perceptions of

individual knowledge and abilities and external support). In our study, we examined only a few factors that prior research indicated may be salient in understanding cognitive performance - experimenter race and level of perceived discrimination (Nagendra et al., 2018; Richeson et al., 2005; Thames et al., 2013). Thus, our measures may not encapsulate the many variables that could have impacted the demand and resource evaluations that in turn lead to experience of challenge or threat in Black women.

Another shortcoming in the measures could be in the social cognitive tasks. A challenge or threat response is activated only when there is task engagement during a motivated performance situation (Seery 2011). If participants did not feel motivated during the social cognitive tasks, or did not perceive the tasks as an important evaluation, then the Challenge and Threat model could not be applied. In previous studies where experimenter race and/or perceived discrimination was found to impact tasks performance, neurocognitive tasks were used for assessment (Richeson et al., 2005; Thames et al., 2013). Social cognitive measures may not have had the same salience or meaning to participants. Thus, neurocognition may be a more relevant measure to activate the challenge or threat response in future studies.

Third, the sample used in the current study may have impacted the results. Specifically, the present study's sample comprised more than half undergraduate students, and the study was conducted at a Predominantly White Institute (PWI). Students may have experienced a challenge response over a threat response as they felt prepared for testing in this setting. Furthermore, Black students are accustomed to interactions with fellow White students at a PWI, and thus may have expected a White experimenter and therefore did not register a threat response. These additional contextual factors thus may have been at play while participants underwent this study

protocol, thus simply assessing perceived discrimination and experimenter race may not have provided a nuanced application of Challenge vs. Threat in the current study. Moreover, the sample was relatively small as the study is still collecting data; thus, the analyses may have been underpowered.

A fourth potential explanation for the null findings was the possible priming of race-related cues. Advertisements for the study specifically asked for Black women, and the screening battery, administered before subjects came in for their session, also asked many race-related questions (i.e. the perceived discrimination scale). Thus, participants may have had a heightened awareness of their racial identity when entering the lab setting, which could have activated stereotype threat and thus depleted cognitive performance (Nagendra et al., 2018). Alternatively, participants might have guessed the purpose of the study was related to race, and may have been less prone to responding to race-related cues in the session as a result.

This study was the first to assess the possible mechanisms behind racial differences in social cognition performance, and future research is vital in taking steps to understand why racial disparities exist in schizophrenia diagnosis and treatment. One possible next step for future research is to look at other race-related factors that may influence social cognition. For example, Neblett and Roberts (2013) found that the negative physiological and psychological effects of discrimination can be buffered by salience of racial identity. A follow-up study that examines the moderating effects of racial identity between perceived discrimination and social cognitive tasks would allow for a deeper understanding of the intricacies of race-related individual differences. Similarly, past research has explored various other resource factors such as resiliency and social support, which have demonstrated mediating effects between perceived stress and mental health

symptoms, particularly depression (Catabay et al., 2019). Another study found that Black students who attend PWIs and held higher ratings of race-related stress also reported higher racial agency, or empowerment to engage in race-related social change, leading to higher feelings of interconnectedness with other Black students on campus (Bentley-Edwards & Chapman-Hilliard, 2015). Therefore, future studies should look at other race-related individual differences, such as resilience and racial agency, and how these individual factors interact with other contextual factors, such as the lab setting.

Another future study should examine neurocognitive tasks as an outcome instead of social cognitive tasks. Thames et al.'s (2013) study found important interacting effects of perceived discrimination and experimenter race on neurocognitive performance, and exploring physiological response as a mediator to this impaired performance would potentially support for the Challenge and Threat model. Common neurocognitive batteries test for aspects of memory, language, and reaction time, which are most likely closer to testing in school than the social cognitive battery is. Thus, the schema for testing may be more readily activated, which is more congruent with tasks proposed in the Challenge and Threat model.

Lastly, an important future study should replicate these methods with individuals with schizophrenia, to explore if race-related factors have an impact on Black individuals with schizophrenia. Perceived discrimination is a common experience for Black Americans, with a lifetime prevalence rate of 61% in experiences of day-to-day racial discrimination (Sellers and Shelton, 2003), so it is likely that Black individuals with schizophrenia would have similar variance to the non-clinical Black population. This future research should also explore if perceived discrimination affects other symptomology alongside social cognition. This research

area has the potential to expand culturally competent treatment methods and provide a more comprehensive understanding of the intersection of race and schizophrenia, and how both of these combined factors may result in impaired functioning.

The purpose of this study was to evaluate how experimenter race and perceived discrimination impacted social cognitive performance through the Challenge and Threat model, while utilizing physiological measures, namely RSA, to understand psychological and physiological outcomes to a threat response. However, there were no significant findings across the hypotheses. Important limitations were discussed, and other race-related individual and contextual factors, such as racial identity and resiliency, were identified for future research. Regardless of the null findings, this study identifies racial disparities as a key gap in schizophrenia research, and outlines important next steps toward understanding and combating these disparities.

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Tables

Table 1. Means and standard deviations for social cognitive measures, frequency of perceived discrimination, and physiological markers.

Measure	Black Experimenter, M (SD)	White Experimenter M (SD)
Demographics (Total N)	21	30
Age	22.00 (2.20)	21.26 (2.73)
Undergraduate (%)	61.9%	63.3%
Skills-based tasks	0.05 (.45)	-0.04 (.80)
ER40	33.95 (2.68)	34.96 (2.63)
BLERT	17.70 (1.90)	17.70 (2.05)
Eyes	26.32 (2.47)	26.30 (3.13)
AIHQ-ambiguous blame	3.12 (0.62)	2.91 (0.62)
AIHQ-Accidental blame	2.69 (0.88)	2.25 (0.69)
Daily Life Experiences Frequency Subscale	1.86 (1.08)	1.59 (0.99)

Table 2. The descriptive statistics for heart rate, respiration rate, and respiratory sinus arrhythmia between same-race and cross-race groups.

Physiological marker	Black Experimenter, M (SD)	White Experimenter, M (SD)
Baseline RSA	6.48 (1.20)	6.23 (1.26)
Baseline HR	82.43 (10.33)	79.75 (12.42)
Baseline Respiration Rate	16.15 (3.11)	18.13 (2.75)
RSA Reactivity		
ER-40	0.22 (0.79)	0.19 (1.01)
Eyes	-0.22 (0.97)	0.08 (1.05)
BLERT	0.13 (1.11)	0.16 (0.89)
AIHQ	0.69 (3.21)	0.24 (0.96)
HR Reactivity		
ER-40	0.52 (3.57)	0.06 (5.15)
Eyes	-0.36 (4.54)	-0.59 (5.62)
BLERT	0.04 (5.45)	-1.14 (6.82)
AIHQ	-0.93 (4.97)	-0.19 (5.01)
Respiration Rate Reactivity		
ER-40	1.18 (3.97)	-1.18 (3.71)
Eyes	1.73 (2.39)	-1.17 (3.97)
BLERT	-0.72 (4.12)	-0.41 (4.72)
AIHQ	0.69 (3.21)	-0.33 (3.91)

Figures

Figure 1. Difference in composite skills-based tasks across same-race and cross-race groups.

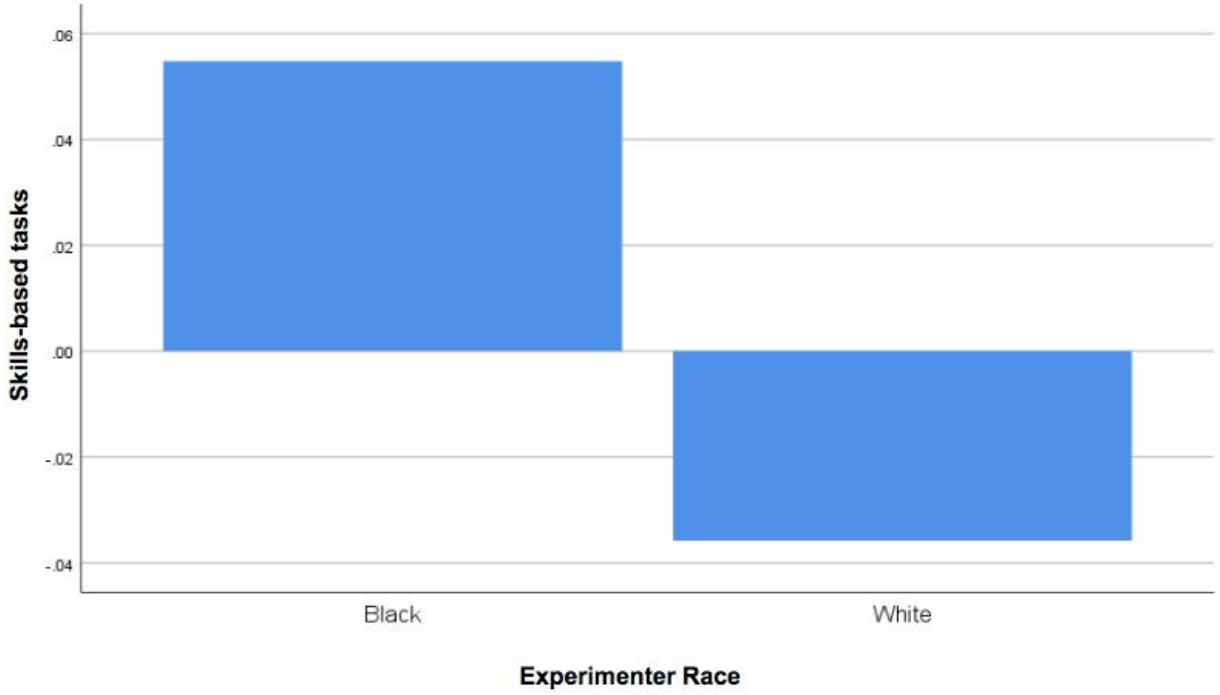
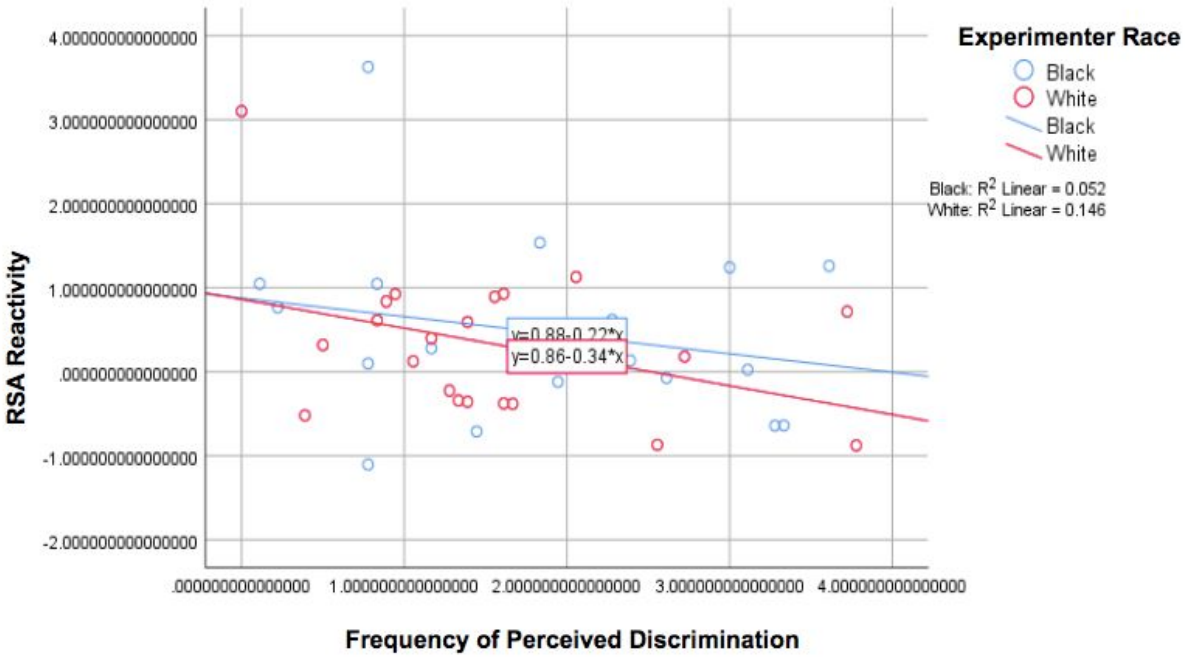


Figure 2. The relationship between frequency of experiences of perceived discrimination and RSA reactivity during the bias-oriented AIHQ task, split by experimenter race.

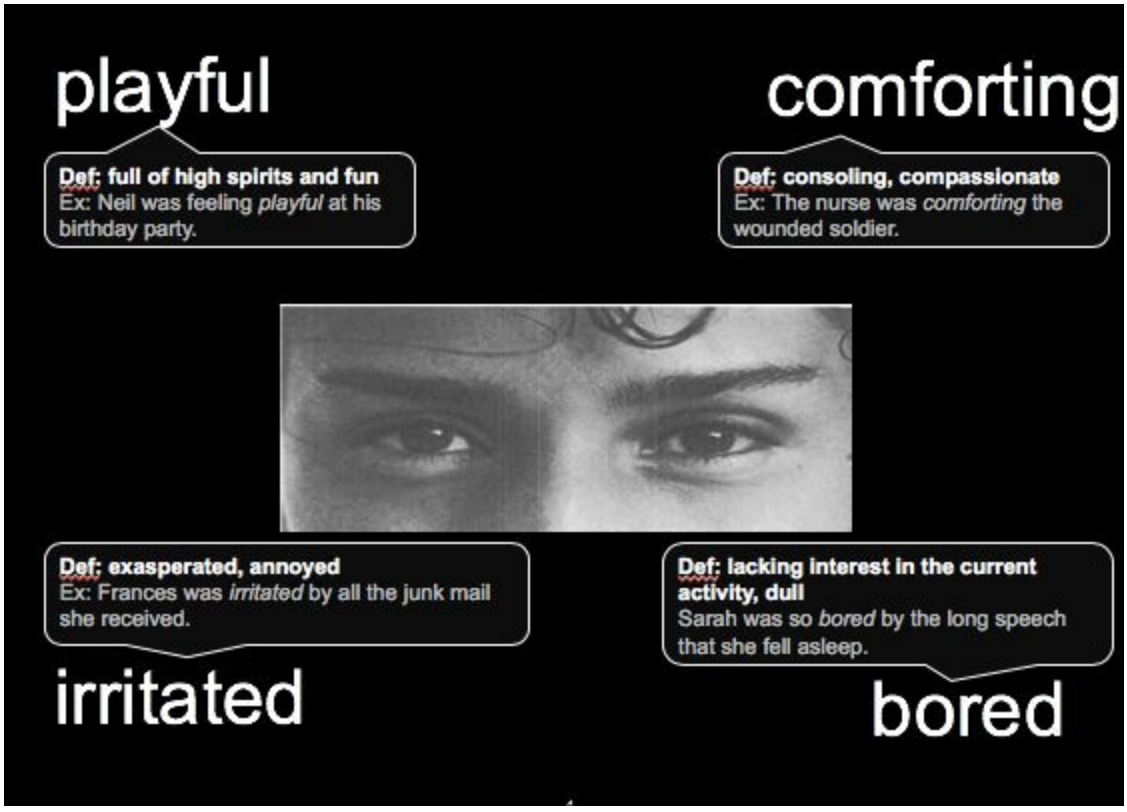


Appendix

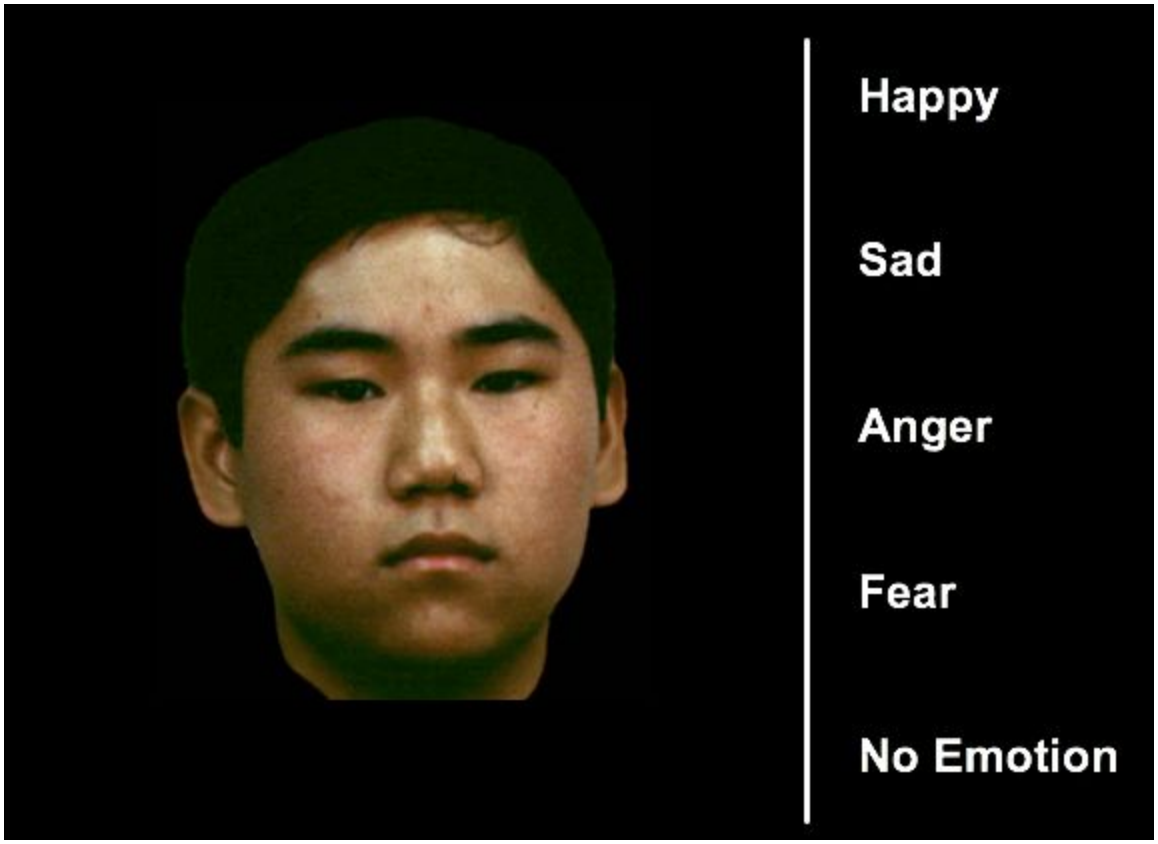
Example of Daily Life Experiences Questionnaire

	How often did it happen to you because of race?						How much did it bother you?					
	Never (1)	Once (2)	About once a month (3)	A few times a month (4)	Once a week or more (5)	Prefer not to answer	Never happened to me (1)	Didn't bother me at all (2)	Bothered me a little (3)	Bothered me somewhat (4)	Bothered me extremely (5)	Prefer not to answer
a. Being ignored, overlooked or not given service (in a restaurant, store, etc.)	○	○	○	○	○	○	○	○	○	○	○	○
b. Being treated rudely or disrespectfully	○	○	○	○	○	○	○	○	○	○	○	○
c. Being accused of something or treated suspiciously	○	○	○	○	○	○	○	○	○	○	○	○
d. Others reacting to you as if they were afraid or intimidated	○	○	○	○	○	○	○	○	○	○	○	○
e. Being observed or followed while in public places	○	○	○	○	○	○	○	○	○	○	○	○
f. Being treated as if you were "stupid", being "talked down to"	○	○	○	○	○	○	○	○	○	○	○	○
g. Your ideas or opinions being minimized, ignored, or devalued	○	○	○	○	○	○	○	○	○	○	○	○
h. Overhearing or being told an offensive joke or comment	○	○	○	○	○	○	○	○	○	○	○	○
i. Being insulted, called a name, or harassed	○	○	○	○	○	○	○	○	○	○	○	○
j. Others expecting your work to be inferior	○	○	○	○	○	○	○	○	○	○	○	○

Example of the EYES Task.



Example of the ER-40 Task.



Examples of BLERT Task.