

SCIENCE EDUCATION, PERCEIVED OBJECTIVITY,
AND THEIR RELATIONSHIP WITH RACIAL BIAS

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SCIENCE EDUCATION, PERCEIVED OBJECTIVITY, AND RACIAL BIAS

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ABSTRACT

Previous literature has proposed that physicians may have greater confidence in their own objectivity because of the emphasis on empiricism during their training in the natural sciences, and that this sense of personal objectivity promotes biased thought, thereby contributing to health disparities between advantaged and disadvantaged groups. Psychologists know little about the construct of perceived objectivity, however. The current project addresses this gap in research by investigating the relationships between education in the natural sciences, perception of personal objectivity, and racial bias. Additionally, it examines a definition of objectivity as cognitive rigidity. College students recruited using Amazon's mTurk ($n = 128$) and snowball sampling ($n = 14$; pooled $N = 142$) provided data about their perceived objectivity, openness to new experiences and information, personal need for structure, racial bias, educational background. They also evaluated a hypothetical patient's compliance after random assignment in a 2 (objectivity: prime vs control) x 2 (patient race: White vs Black) between-subjects factorial design. Perceived objectivity was positively related to both personal need for structure and openness. There were no effects of the objectivity prime or patient race on evaluations of patient compliance. The results suggest that perceived objectivity may not

be related to education in the natural sciences or racial bias, in conflict with the proposed theory.

Catherine Cottrell
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Introduction

“I’ve learned to minimize the pain, forgo the consent, blame the behaviors, and dismiss the concerns of my patients of color. I’ve witnessed missed opportunities for healing and the loss of patient trust. And I believe that if we refuse to deeply examine and challenge how racism and implicit bias affect our clinical practice, we will continue to contribute to health inequalities in a way that will remain unaddressed in our curriculum and unchallenged by future generations of physicians.”

- Katherine C. Brooks, Medical Student, 2015

Physicians provide a crucial service toward developing and maintaining a healthy society. Patients rely on them every day to make decisions that affect their well-being, and for those decisions to be well-informed and unbiased. This expectation has historically created immense pressure for physicians and other healthcare professionals to remain somewhat distant from their patients so they are not influenced by personal investment. Intuitively, that appears to be beneficial. It seems like the ideal to have the people making potentially life-altering decisions about another person’s health be as removed from the situation as possible in order to look at “just the facts.” The question arises, however, whether that is actually the best method to practice medicine when patients are consistently disenfranchised from quality medical care by overly-clinical decision making that excludes them from their own pursuit of healing.

The culture of medical practice has begun to answer this question by shifting toward a more patient-centered care delivery model. In response to a history of disconnection between physician and patient, this movement among healthcare providers challenges the concept of the patient as merely a body, and instead aims to provide care that considers the complexity of the patient as a human. Patient-centered care aims to create collaborative partnerships between provider and patient, so that both parties are

treated with respect. The emphasis is on the provider understanding those in their care not only from a clinical perspective, but also from an emotional, mental, spiritual, social, and financial perspective (NEJM Catalyst, 2017).

The evidence for the positive impact of patient-centered care is growing. Framing patients as stakeholders in their own health has been associated with higher reported satisfaction with treatment and improved adherence to treatment (Beach et al., 2005; Haskard-Zolnierek & DiMatteo, 2009). Interestingly, this trend persists even among cancer patients who reported that they preferred not to be a part of medical decision making (Kehl et al., 2015). This result highlights the importance of making an effort to involve patients regardless of their stated preference for involvement because ultimately, patients are glad to have contributed to the process.

The progress of the patient-centered care movement is of great importance to acknowledge in order to properly establish the tone of this project. Although it is broadly framed as an investigation into a negative trend of behavior among physicians, it is not one made without also granting appropriate credit where it is due. Physicians, nurses, administrators, and other professionals in the healthcare industry are consistently making strides toward improving the quality of care for those that rely on them for help in their pursuit of wellness. The goal of this project is not to critique or attack physicians, but rather to bring attention to the reality that they are human and as such are just as susceptible to cognitive biases as any other sample of the population. As demonstrated by the opening quote from Brooks (2015), a then-medical student reflecting upon her education, the broader field of medicine is aware of its role in perpetuating health disparities. It is therefore the intention of this project to be a call for frank, non-

judgmental discussion of what physicians may bring to the table when interacting with patients of color, as well as a starting point for developing evidence-based strategies to support and guide them as they make an effort to self-adjust as a field.

Thus, despite this beneficial paradigm shift in medical practice, we must acknowledge that there's more work to be done to improve the quality of care for all patients and achieve health equity. One topic that has gained major traction in contemporary academic literature is implicit bias. Implicit bias refers to the automatic associations that are developed over a lifetime that allow for quick, unconscious decision-making (Chapman et al., 2013). These biases are distinct from explicit biases in that they are understood to develop and persist without our awareness and are not always in-line with the attitudes and behaviors that we exhibit when navigating our day-to-day lives. In the context of this discussion of race and racial prejudice, the term "implicit bias" is specifically used to refer to the automatic activation of unconscious associations between racial cues, such as skin color or group affiliation, and corresponding cultural stereotypes.

Contextualizing Implicit Bias Within Medical Practice

The notion of implicit bias was originally proposed by Patricia Devine (1989) in an influential article that brought attention to the current state of stigma and prejudice research. Devine pointed out that the existing body of literature only addressed conscious (i.e., explicit) attitudes, which left the background processes that influence behavior completely unaccounted for. In asserting the need to investigate how unconscious (i.e., implicit) biases might relate to observable discriminatory behaviors, Devine sparked a new line of research that is still, nearly 30 years later, regularly producing new insights into the psychological processes that influence prejudice.

Many of these insights have highlighted the relationship between implicit bias and health disparities. For the purposes of this paper, the term “physician bias” will be used as shorthand to refer to implicit bias among physicians. Although the focus of this project is racial health disparities, physician bias has also been associated with disparities as a function of patient obesity (Huizinga, Bleich, Beach, Clark, & Cooper, 2010), sexual orientation (Khan, Plummer, Hussain, & Minichiello, 2008), socioeconomic status (SES; van Ryn & Burke, 2000), and gender (Borkhoff, Hawker, Kreder, Glazier, Mahomed, & Wright, 2008). This fuller scope of the consequences of implicit bias beyond race is worth noting within this discussion because of the implication that where racial biases intersect with these other biases, there may be magnified or compounded effects.

While those other trends of health disparities are worthy of investigation and are developing a body of literature in their own right, the relationship between physician bias and racial health disparities is perhaps the most-often researched. As a result, there is no shortage of evidence that supports the notion that physician bias contributes to racial disparities in healthcare. Patients of color consistently fare worse than their white counterparts as a function of their physicians’ biases. In a broad survey of the literature surrounding physician bias, Chapman, Kaatz, and Carnes (2013) describe a general framework for organizing research surrounding the link between disparate treatment and physician bias. They propose two forms of this research: one that contrasts physicians’ decisions between patients who are otherwise comparable except for specific demographics, and another that correlates a measure of implicit bias with physicians’ decisions. The former assumes that physician bias explains variation between otherwise identical patients, while the latter provides explicit evidence of connections between

physician bias and health outcomes. This division of the literature will be applied in this review to structure the evidence of physician racial bias.

Patient race and physician decision-making. The first form of physician bias research uses an indirect method to parse out the patterns of discrepant healthcare received by patients of color compared to their White counterparts. The logic in support of this method is the same as any other experimental or quasi-experimental method; when all other variables are controlled, it follows that the variation in the outcome is due to the variation in the independent variable. Therefore, when a physician makes distinct diagnoses and treatment recommendations between their otherwise similar patients who only differ with regards to their race, the implication is that the physician has a bias to treat patients differently as a function of their race. This approach to research provides excellent foundational evidence for the existence of racial health disparities.

This approach to research has demonstrated that patients of color experience worse quality of care across medical specializations. In a survey of New York state physicians, for example, van Ryn and Burke (2000) found that physicians perceived their Black coronary artery disease patients as less intelligent and less compliant with treatment compared to White patients. They also found that SES interacted significantly with race such that patients who were Black and in the lowest third of the SES distribution were perceived as less pleasant and rational than their White counterparts. Later analysis of the same sample by van Ryn, Burgess, Malat, and Griffin (2006) demonstrated that those physicians also believed their Black patients would abuse drugs and overreport discomfort, and were less likely than their White counterparts to participate in rehabilitation post-surgery.

Similar patterns of bias have been observed beyond cardiology, in infectious disease medicine. Bogart, Catz, Kelly, and Benotsch (2001) demonstrated that physicians from a nationally representative sample rated Black patients presented in a vignette scenario as less likely to adhere to an HIV-management therapy than White patients. The researchers were able to demonstrate that this implicit belief directly related to physicians' reduced willingness to prescribe that therapy to their Black patients. Calabrese, Earnshaw, Underhill, Hansen, and Dovidio (2014) found that medical students perceived Black men who have sex with men (MSM) as more likely to engage in unprotected sex than White MSM if they were prescribed pre-exposure prophylaxis (PrEP), a preventative prescription for people at risk of HIV acquisition. They were, to add insult to injury, also less willing to prescribe PrEP to those Black patients as a result, making a moral judgment to curb their expected sexual behaviors under the auspices of protecting their health.

The implication of these studies taken together is that Black patients are assumed by default to be non-compliant with treatment. This belief about Black patients as a group translates into practice and bars individual patients from being prescribed the most appropriate treatment, for fear of allocating resources only to waste them. That trend disadvantages Black patients who are trying to protect themselves from infection or manage an existing infection. That trend, in turn, contributes to the disparate rate of infection in that population, where 44% of HIV diagnoses in the U.S. are among non-Latino Black people despite that they comprise only 12% of the national population (CDC, 2017).

Directly measuring physician bias and health disparities. The second form of physician bias research measures implicit bias in order to test its direct association with physician decision making. The vast majority of this literature relies on the Implicit Association Test (IAT; Greenwald, McGhee, & Schwarz, 1998) as the standard measure of implicit bias. The IAT measures participants' response latency when presented with matched pairs of words. One of the words is generally a social group, such as a racial group, and the other word is an attribute, categorized as either positive or negative traits. The logic is that after a brief training period, the response latency will be less when participants need to match the social group with the valence of trait they already associate with that group, under the assumption that it is more accessible and automatic. So, for example, someone who has anti-Black implicit bias will more quickly categorize Black people with negative traits than with positive ones, and may also inversely categorize White people with positive traits than with negative ones more quickly.

Green et al. (2007) established early evidence of both the distinction of implicit and explicit bias among physicians, as well as the predictive validity of implicit bias on clinical decision-making. They found that physicians did not show any explicit preference for White vs Black patients, but had moderate implicit preference for White Americans and demonstrated implicit stereotypes of Black patients as less cooperative. These implicit biases were shown to predict likelihood of treating White patients vs. Black patients, such that greater pro-White bias increased the likelihood of both treating White patients and not treating Black patients.

Similar to some of the research described in the previous section, Cooper et al. (2012) found that implicit bias was associated with Black patients' perceptions of the

quality of care they received. When treated by physicians who had greater anti-Black implicit bias, Black patients reported that they were more verbally dominant (i.e., condescending). Physicians who implicitly associated Blackness with non-compliance demonstrated longer visits, slower speech, and decentralized the patient from inclusion in their treatment plan. This study further supports the trends in subjective experience of care that were outlined previously.

Unique Factors to Physician Bias

The preceding discussion of the very real consequences of physician bias on patient health highlight the practical importance of understanding the development of this bias and the mechanisms by which it operates. Though social psychologists are constantly working to develop new evidence-based interventions to prevent and reduce bias in general, only a few have focused on how physician bias might be distinct.

Chapman, Katz, and Carnes (2013) provide a compelling case for considering the qualities of medical education and practice that might influence physicians to a greater extent than the general population. Namely, they propose that many physicians are under exceptional cognitive load because of the uncertain and time-sensitive nature of their profession. Cognitive load has been shown to promote increased use of automatic processes, such as implicit bias, to make quick decisions that require low cognitive investment (Tversky & Kahneman, 1974; Wigboldus, Sherman, Franzese, & van Knippenberg, 2004). Additionally, medical training relies upon population data to identify risk factors, which might relate to deindividuation and greater stereotyping once the student enters practice. Finally, they suggest that the focus of medical education on the natural sciences may promote medical students' (and subsequently doctors') belief in

their personal objectivity, given that the guiding tenet of scientific research and practice is empiricism and remaining unbiased, and this perceived objectivity has been associated with biased decision-making (Uhlmann & Cohen, 2007).

It is this last proposal, that medical education promotes a sense of personal objectivity which then promotes bias, that leaves the most questions unanswered. In trying to consolidate these physician risk factors into a more cohesive understanding of implicit racial bias, previous research has already established reasonable support for the role of cognitive load on physicians' tendency to rely on implicit racial biases to make decisions in a clinical context (e.g., Burgess et al., 2014). The one study that has been done to connect personal objectivity to biased decision-making, however, was done to investigate gender bias and used an organizational hiring scenario as its contextual framework. In a set of three studies, Uhlmann and Cohen (2007) experimentally primed their participants' awareness of their own objectivity to compare against a non-primed control group, then randomly assigned them to evaluate a job candidate who was either male or female, but otherwise equal, with regard to certain hiring criteria and perceptions of the strengths of the applicant's credentials. They found that participants who endorsed stereotypic beliefs about gender roles were emboldened to rate female candidates worse when primed to feel more objective. In other words, priming objectivity on its own did not have an effect on hiring decisions, but it did moderate the relationship between stereotypic beliefs and biased decision-making. It may have been the case that participants felt encouraged by what Uhlmann and Cohen refer to as a "I think it, therefore it is true" mindset when they were led to see themselves as objective, and as a

result felt more confident in acting upon beliefs they may otherwise have managed during a conscious decision-making process.

While certainly generalizable to an extent, the results of Uhlmann and Cohen's work don't translate directly to the argument to which they are being applied. As a result, it's nebulous at best to confidently state that medical education has anything to do with promoting an objective mindset, and to say further that an objective mindset will promote racial bias, and to go even one step further and say that racial bias primed or developed by objectivity will affect clinical decision-making.

Therefore, it is the role of the current study to investigate each component of that statement and test empirically whether all, or any, of these connections proposed by Chapman and colleagues (2013) actually exist. The theory is interesting, appeals intuitively, and makes logical sense, but demands greater empirical support before it can be included as a meaningful contribution to our understanding of bias processes.

To that end, this study will use the work of Uhlmann and Cohen (2007) as a conceptual foundation to build upon and expand to better fit the medical context. It's certainly possible that perceived objectivity is a factor that is relevant to physician bias, but it must first be defined and measured in a more rigorous way before ruling one way or the other. The following sections will parse out exactly what is meant by using the word "objectivity," propose a possible mechanism by which it might operate, and contextualize it within physician bias research.

The Construct of Objectivity

The word "objective" sounds impressive, and in colloquial use is generally associated with positive valence as a desirable trait, especially when it comes to decision-

making. In law, for example, people expect judges to be objective. Executives in corporate settings are meant to be objective leaders who act in accordance with the goals of their organizations, not for their personal gain. And, as mentioned previously, the traditional biomedical care delivery model emphasizes an objective physician. In each of these examples, describing the person actor as “objective” implies that their perspective is unbiased, and is informed by reason over personal or emotional investment.

From a psychological perspective, it seems questionable that a truly objective person could exist. Cognitive biases are a pervasive trait of human decision making processes. Whether objectivity is real, or possible to achieve by humans, is a grand question that pushes the scope of this project, so it will be left for philosophers and future researchers to discuss in depth. Instead, I propose that for the purposes of this study, personal objectivity refers to one’s belief that their perspective (i.e., their attitudes and beliefs) is not only correct in a general sense, but is informed by some ultimate Truth that is an unbiased source that can not be challenged. This definition is useful because it emphasizes that it is one’s belief (i.e., their perception) of their objectivity, not an absolute quality of objectivity, that is under investigation.

Now with an agreed upon understanding of objectivity established, it’s worth navigating this discussion toward possible psychological explanations for how it might operate. The most intuitively accessible is the notion of the “bias blind spot” (BBS). Originally proposed by Pronin, Lin, and Ross (2002), BBS refers to the phenomenon whereby people tend to see others’ thoughts, behaviors, and attitudes as biased in some way or another, but see themselves as unbiased, even in the face of evidence that they

have demonstrated bias. The “blind spot” is therefore that people are able to see bias in others, but not in themselves.

The original research by Pronin et al. (2002) had participants rate themselves and a target group in terms of how susceptible they were to a list of common cognitive biases. The target group varied by which iteration of the survey they participated in, but included average Americans, average peer at Stanford, and average fellow traveler at San Francisco International Airport. In all three cases, participants rated themselves as significantly less susceptible to the given cognitive bias than the target group. In the second of three parts to that study, participants were asked to rate themselves on a series of positive traits, then were made explicitly aware that they had likely fallen into a common psychological trend called the “better-than-average effect,” a bias whereby people generally rate themselves as better than average when they believe the rating reflects a positive trait. Even in light of the information of the likelihood of their bias, only about a quarter of participants admitted that their initial ratings were biased. The third study connected the former two by investigating whether individual raters in pairs who are shown to demonstrate some cognitive bias would recognize its impact on their partner’s assessment differently than its impact on their own. After completing a test of supposed social intelligence in pairs, each partner was randomly assigned to receive either positive or negative feedback on their performance. Then they were asked to provide feedback on validity of the test, followed by a discussion with their partner about the same topic. Participants who were given positive feedback endorsed the validity of the test more than their negative feedback counterparts, even though researchers provided information about self-protective bias and how it influences our perceptions of the

feedback we receive. Most importantly though, participants rated the influence of self-protective bias as greater in their partners' evaluations of the test than in their own, regardless of whether they or their partner had received the positive or negative feedback. These studies' most significant finding is that knowledge of a cognitive bias and recognition of its effect on the behavior of others does not reduce one's own susceptibility to that bias.

Perceived objectivity as a construct is likely functionally very similar to the BBS. The nuance may lie in the assumption that the latter operates by apparent subconscious denial of the reality that in being human, one is susceptible to bias, whereas the former is along the lines of the state of conscious awareness of one's immunity to bias, even though that immunity is an illusion (Armor, 1999). It is for this reason that I stress that it is one's perception of their own objectivity that might be related to bias, rather than some latent or absolute quality of objectivity.

Perceived Objectivity and Cognitive Rigidity

Uhlmann and Cohen (2007) describe perceived objectivity as the "I think it, therefore it is true" mindset, describing what can be thought of as a closed circular justification of the veracity of one's knowledge: what one knows to be true is true because it is known. A novel explanation for the underlying mechanism of perceived objectivity is that it is related to individual differences in a more global construct of cognitive rigidity. By cognitive rigidity, I refer to a mindset characterized by inflexibility and stasis; in other words, a cognitively rigid person is someone who rarely changes their beliefs or patterns of thought, and may even resist such attempts at change. The logic of this explanation is essentially that someone who considers themselves objective already

believes they are correct about most or all things. As a result, they have little to no motivation to challenge their own beliefs or accept evidence that contradicts them. If they already have the “Truth,” written with a capital “T” to denote its grander and more absolute status than “truth,” they have nothing to gain from challenging it, and so become stuck in a much more rigid pattern of thoughts and behaviors that is resistant to change.

Using the definition outlined above as guidance, I propose that personal need for structure (PNS) and the openness factor of the Big Five personality traits (John & Srivastava, 1999) are each representative of cognitive rigidity. These constructs were chosen because they have previously been associated with racial bias with inverse relationship directionality, and so offer an opportunity to attempt to triangulate perceived objectivity in a somewhat robust nest of relationships between cognitive rigidity and bias.

Neuberg and Newsom (1993) originally proposed PNS as a formal construct. PNS describes the individual differences in preference for simple structure. In other words, PNS describes one’s tendency to process information through simpler frameworks than may be representative of its actual complexity. For example, rather than understanding how culture varies by region and nationality in Latin America, an individual with greater PNS may reduce all Latinx cultures to a single set of practices that may draw from one or several of the myriad that actually exist. PNS might relate to one’s perception of their objectivity because simpler constructs are also easier to understand, and it follows that one might conflate the extent to which one believes they understand the world with the accuracy of their understanding, even though it collapses a nuanced understanding that might be more accurate.

Since its proposal, PNS has since been connected to stereotyping behavior using this same theoretical understanding; the more an individual tends to simplify information in order to process it, the more they tend to form erroneous group stereotypes. These individual differences have been observed even when asking participants to evaluate socially neutral groups, merely referred to as Group A and Group B (Schaller, Boyd, Yohannes, & O'Brien, 1995). Greater PNS predicted worse evaluations of intelligence, ability, and general impression of Group A compared to Group B when presented with complex information about each group's ability to unscramble five- and seven-letter anagrams that actually favored Group A's overall competence. The effect of PNS has also been observed in a more ecologically valid example, in which participants merely responded to the PNS scale and a scale that measured their attitudes towards gays and lesbians (Smith & Gordon, 1998). As expected, PNS was positively related to more harmful stereotypes about gays and lesbians.

Most recently, PNS has been positively associated with harmful stereotyping of Muslims (Newheiser & Dovidio, 2012). Additionally, this relationship was partially mediated by entitativity (i.e., the extent to which participants viewed Muslims as a cohesive group that acts as a greater entity rather than as individuals). This effect suggests that it may not be strictly one's general information-categorization technique (PNS) that affects their stereotyping, but a combination of that thought pattern with the way that they specifically categorize information about a given group (entitativity).

Openness is a similarly intuitively understood construct. Under the Big Five framework of personality (John & Srivastava, 1999), there are five dimensions of personality—openness, conscientiousness, extraversion, agreeableness, and emotional

stability—that broadly describe one’s core personality traits and serve as the foundation of any other features of one’s personality. Openness describes the breadth, depth, originality, and complexity of an individual’s mental and experiential life (John & Srivastava, 1999). Someone who is more open would more readily accept that someone else’s perspective is valid, think more about abstract concepts, and seek out novel experiences. Openness may relate negatively to perceived objectivity because greater open-mindedness could be reflected by an acceptance of uncertainty and a willingness to consider that one does not have all the answers. Openness is useful in this line of research because it, along with agreeableness, has been shown to reliably predict both general prejudice and sexism specifically (Ekehammar & Akrami, 2007). Although there is no known relationship between cognitive rigidity and perceived objectivity, cognitive rigidity is worth investigating in this context because of the established relationship between various measures of cognitive rigidity and stereotyping and biased thought.

The Current Study

Physician bias is a social problem that we cannot afford to ignore. The impact of biased medical practice is evident for patients of color daily. As was demonstrated by the recent high-profile example of Serena Williams, an international tennis star whose difficult delivery of her daughter was exacerbated when the medical staff attending to her evidently ignored her complaints of pain and requests for attention, even wealth and celebrity cannot protect against the pervasiveness of bias in medicine (Lockhart, 2018). As someone invested in the continuing development of a society where everyone has equitable access to equally high-quality care, I propose that we must systematically

investigate the ways that these patterns emerge so we can design and implement evidence-based interventions to curb them. This belief motivates the following project.

Where much of the research on physician bias has addressed its development using social psychological theories of bias development in general, very little of it has investigated the factors that may uniquely or especially affect physicians. Chapman et al. (2013) conducted a review of existing social psychological and medical academic literature regarding physician bias and summarized various factors that may theoretically affect physicians to a greater extent than the general population. One of these theories is that physicians may have confidence in their objectivity as a result of their training in the natural sciences, and as a result demonstrate bias in their practice. The underlying assumption is that the sense of objectivity gained from instruction in the natural sciences, which are understood to emphasize empiricism and objectivity, generalizes into personal beliefs and attitudes, such that an individual believes that their conceptualization of a social group is formed by the objective truth, without influence of personal biases.

Very little empirical attention has been given to this theory, however, although it does tie into broader psychological literature about the bias blind spot (BBS). As described above, this construct encompasses the phenomenon of generally being able to identify and understand the consequences of bias in others' thoughts and behaviors, but having greater difficulty in doing the same to the self (Pronin et al., 2002). Existing research around the bias blind spot supports the idea that people view themselves as objective compared to others. The implication of viewing oneself as less susceptible to bias than others is that we view ourselves as unbiased (i.e., objective). This body of research provides sufficient evidence that people tend to see bias in others, but not the

self, but has not yet established an understanding of the consequences of this pattern in a physician bias context.

Although BBS is a reasonable explanation for the mechanism by which perceptions of objectivity operate, it may also be understood to reflect general cognitive rigidity. To that end, investigating the relationships between perceived objectivity and two representative constructs of cognitive rigidity (i.e., PNS and openness to new experiences and information) may provide some insight into the mechanisms by which perceived objectivity operates. This connection to a broader understanding of the cognitive rigidity factor is relevant especially as these two constructs have previously each been associated with prejudice (Ekehammar & Akrami, 2007; Schaller et al., 1995). This line of thought leads to the set of basic hypotheses this project seeks to test:

H₁: Personal need for structure is positively related to perception of one's objectivity.

H₂: Openness to new experiences and information is negatively related to perception of one's objectivity.

In an applied context, Uhlmann and Cohen (2007) found that participants who endorsed harmful gender stereotypes were more prone to negatively evaluating otherwise equal female applicants than their male counterparts when primed to feel objective compared to the control condition. Priming for objectivity moderated the effect of existing stereotypes on a behavioral measure of prejudice. That study, however, constitutes the only empirical evidence for the theory of the role of perceived objectivity in physician bias proposed by Chapman et al. (2013). Given that there is so little existing literature about the specific construct of interest, the applied portion of this thesis is

framed through the lens of exploratory research questions rather than directional hypotheses. The first of these is whether a novel priming paradigm can replicate a similar pattern of results as those from Uhlmann and Cohen:

RQ₁: Can a novel prime replicate the moderating effect of objectivity on the relationship between racial bias and racial prejudice?

As it is the case that believing oneself to be objective may contribute to biased decision-making, it is imperative to identify potential risk factors for developing an objective mindset. Chapman et al. (2013) proposed that science education might contribute to racial bias by way of increasing one's perception of their objectivity. This line of thought motivates the next set of research question for this thesis, which outline the steps for testing for mediation:

RQ_{2a}: Does science education relate to racial bias?

RQ_{2b}: Does perceived objectivity relate to racial bias?

RQ_{2c}: Does perceived objectivity mediate the relationship between science education and racial bias?

In order to answer these questions, this study uses survey methodology with a 2 (objectivity prime vs control) x 2 (White patient vs Black patient) experimental factorial design to collect data about participants' perceived objectivity, openness to new experiences/information, PNS, implicit bias, decision-making in a race-dependent scenario, educational background, and demographic information. This method will allow for an exploration of each of the outlined hypotheses and research questions.

Method

Participants

Participants were recruited through two techniques. The majority of the sample came from Amazon's Mechanical Turk (mTurk) service (n = 128). The remainder of the sample came from snowball sampling (n = 14) through online groups for pre-medicine students in order to bolster that group in the sample for adequate representation in analysis. One participant was told that the study specifically sought pre-medicine students and was asked to spread the same recruiting statement that was used on mTurk, which framed the study as one about factors that impact memory in clinical settings, to their peers so that the majority would still be blind to the intent of the study. All participants were compensated with \$5 either directly through mTurk or by either a direct payment or an Amazon gift card at their discretion if they had been recruited via snowball sampling.

In order to participate, individuals had to be between 18 and 25 years old and currently enrolled in an undergraduate program at a university based in the United States. The demographic with the greatest proportion in the sample was white men (32%), followed by white women and Asian men (each 20%). Most participants were early in their educational careers (73% in their first or second year of college), and the natural sciences were the most represented majors in this sample (40%).

Materials

Armor objectivity scale. This scale developed by Armor (1999) is designed to measure one's perception of their own objectivity. The scale is composed of 12 items that ask participants to indicate on a spectrum of 1 (Not at all) to 7 (Extremely) the extent to which they are true of them. Some items were phrased positively (e.g., "I am an objective

person.”) and others were phrased negatively (e.g., “I have difficulty seeing my personal shortcomings.”) in order to account for participants’ response bias. Negatively phrased items were reverse scored then averaged with the remaining items to provide a single value where a higher score indicates perception of greater personal objectivity. Internal reliability of the 12-item scale was satisfactory, $\alpha = .81$. The full scale can be viewed in Appendix A.

Big Five Inventory. The Big Five Inventory (BFI) is a standardized measure of five core personality factors: openness to experience, conscientiousness, extraversion, agreeableness, and emotional stability. There are several versions of the BFI in circulation among contemporary personality psychology literature, with long- and short-form versions available across a variety of languages and with varying levels of attention to factor-level vs facet-level analysis. Although only openness is of particular interest, this study used the full BFI-44, a moderate length questionnaire with 44 items that measure the five factors in the traditional Big Five model. The version used in this study originally comes from John, Donahue, and Kentle (1991) and can be found most easily in John, Naumann, and Soto (2008).

Participants are presented with a series of traits that complete the prompt “I am someone who...” and asked to indicate on a scale of 1 (Disagree strongly) to 5 (Agree strongly) the extent to which they believe each trait is true of them (e.g., “is original, comes up with new ideas” measures openness; “does a thorough job” measures conscientiousness; “is talkative” measures extraversion; “is helpful and unselfish with others” measures agreeableness; “is depressed, blue” measures emotional stability). Each factor’s scale includes both straight-forward items and reversed ones. The mean of these

reverse-scored and straight-forward items represents an individual's dispositional level of each factor, where higher scores are indicative of greater presentation of a given trait. Internal reliability was satisfactory for all five factors, all $\alpha \geq .79$. The full scale can be found in Appendix B, with bolded items indicating those that measure openness.

Personal Need for Structure. The Personal Need for Structure (PNS) scale was originally designed by Thompson, Naccarato, and Parker (1989, 1992; cited in Schaller et al., 1995), and has been thoroughly validated by Neuberg and Newsom (1993) as a measure of dispositional desire for simple structure. In other words, this scale measures the extent to which an individual generally prefers to organize information into homogeneous, well-defined, and distinct categories versus ones that have uncertain boundaries and are more heterogeneous.

The PNS scale includes 12 statements (e.g., "I don't like situations that are uncertain") that participants respond to on a scale of 1 (Strongly disagree) to 6 (Strongly agree) in order to indicate the extent to which they agree with that statement. Internal reliability from this sample ($\alpha = .85$) was greater than what was observed by Neuberg and Newsom across six samples, which had a median Cronbach's $\alpha = .77$. The full scale can be found in Appendix C.

Adapted patient case description. A description of an ostensibly real patient was adapted from work by Bogart et al. (2001). This case description was chosen because it was used in research that aligns with its purpose here: to vary qualities of a patient, including race, in order to measure the way they are perceived to be compliant, among other dependent variables. The original case description was meant for a sample of physicians and provides context about a person who has recently been informed that they

are HIV-positive, some mention of the symptoms of their infection, and technical information that would inform diagnosis and treatment recommendation. The original case description can be found in Appendix D.

The version used in this study standardizes one condition for each of the other factors investigated in the original study in order to only vary race between conditions. The decision for which condition to choose over the other in the case of gender, infection severity, and infection risk factor was based on the interaction effects found in the original study in order to generate a case description that was most likely to demonstrate differences between patient race conditions at the chosen level of the other factors. Additionally, medical jargon was removed and rephrased in more plain English in order to be accessible to the non-expert sample that would be reading it. The patient was also given a generic and race-neutral name, Mr. Thompson, so that the description would seem less clinical and more approachable to a lay audience. The participants were also shown a grey scale picture of a white or Black man per their assigned race condition as an additional manipulation of race (images in Appendix E). The adapted version is available in full below, where bracketed text indicates the different conditions:

Mr. Thompson is a 31 year-old [White/Black] man recently found to be HIV-infected. He has several physical complaints, including unexplained fever, chronic diarrhea, and severe weight loss. His past medical history is unremarkable. He has never had surgery or a serious medical illness and has never been hospitalized. His physical exam was unremarkable. His CD4+ count was somewhat low and his viral load was somewhat high; these two standard indicators of infection severity suggest a moderately severe HIV infection. Mr. Thompson's doctor has started him on a highly active antiretroviral therapy (HAART), which is a typical course of action to control an HIV infection in a patient like him.

Adapted Morisky Medication Adherence Scale. The Morisky Medication Adherence Scale was originally developed by Morisky, Green, and Levine (1986) as a self-report measure for physicians to use to acquire information about their patients' adherence to a medication treatment plan. The four yes-or-no questions (e.g., "Do you ever forget to take your medicine?") are meant to be asked of patients by their physicians as a simple way to reliably measure medication adherence. It has been demonstrated to predict the desired positive health outcomes associated with medication adherence (Tan, Patel, & Chang, 2014).

The original four items were slightly rephrased in order to change the target from the self to the patient that is the focus of the case description. Additionally, new response scales were generated that offer a range of responses from 1 to 5 with anchors appropriate for each item. So, for example, the item that originally read as "Do you ever forget to take your medicine?" was instead "How often do you think Mr. Thompson will forget to take his medicine?" with possible answers from 1 (Never) to 5 (Often). One item is reversed to prevent response bias. The reverse scored item was combined and averaged with the other three items in order to represent the extent to which participants believed the patient in the case description would adhere to his treatment plan, where higher scores indicate prediction of lower adherence. Morisky and colleagues reported a Cronbach's alpha of .61, indicating what would generally be considered less than ideal internal reliability, but this adapted version demonstrated greater internal reliability ($\alpha = .83$). The original items and their adapted forms used in this study are available in Appendix F.

Symbolic Racism 2000. The Symbolic Racism 2000 scale was developed by Henry and Sears (2002) as an update to the existing modern racism scale because of the

ways that society has changed and with them, the way that symbolic racism manifests. This scale is meant to provide a contemporary measure of the symbolic racism that is assumed to be more common in modernity than the “old-fashioned” racism of history. Symbolic racism manifests in ways that are subtle and come out in terms of attitudes (e.g., believing that Black people just need to work harder to achieve equality) more than the behavior that is thought of traditionally racist (e.g., slavery, lynching, or other violent acts that target Black victims intentionally). The scale is meant to be used for U.S.-specific analysis of general attitudes about race, racial discrimination, and race relations. In the context of this research this measure is being used as an approximate proxy measure of implicit racial bias. Although the IAT is the standard measure for implicit attitudes, it was not used in this study because it was not compatible with the service that hosts the survey, SurveyMonkey. In partial defense of this choice, it should be noted that research by Blanton, Jaccard, Gonzales, and Christie (2006) found that implicit associations of Blacks with negative valence using the IAT was significantly related to symbolic racism, where implicit associations of Whites with either positive or negative valence and Blacks with positive valence were not. This result suggests that the Symbolic Racism 2000 scale may partially capture anti-Black implicit racial bias, which is its purpose in this study.

The scale includes eight items with variable response scales, such that some ask participants to agree or disagree with the veracity of a statement (e.g., “Over the past few years, blacks have gotten less than they deserve”), while others ask direct questions with their own anchors (e.g., “How much discrimination against blacks do you feel there is in the United States today, limiting their chances to get ahead?” to which participants could

respond on a scale from “None at all” to “A lot”). Four of the items are reverse-scored to account for response bias. Because of the varying ranges of the scales used between items, each item is first standardized on a 0-1 scale then those scores are averaged. A higher score indicates greater anti-black prejudice. Due to the transformation of each item of the scale before calculating the composite, the standardized α will be used and reported instead of the raw. Internal reliability was satisfactory, standardized $\alpha = .87$. The full scale is available in Appendix G.

Procedure

After arriving at the survey landing page through either snowball recruitment or MTurk, participants were prompted to read the informed consent form and indicate whether they consent to participate or not. If they consented, they were directed to complete each of the scales outlined in the materials above. Participants first completed the objectivity scale, followed by the BFI and the PNS scale presented in a random order by participant, such that half saw the BFI first and the others saw the PNS first. The objectivity scale was presented first in order to give it distance from the priming condition that follows the personality scales, and the randomization of the other two scales is meant to control for order effects between participants.

The following two steps served to randomly assign each participant to one of four possible cells in a 2 (objectivity prime vs control) x 2 (White patient vs Black patient) factorial manipulation. Participants were first randomly assigned to an objectivity condition. Roughly half of the participants were just asked to briefly describe a recent example of when they had made a decision, and the remainder were primed to feel greater objectivity by briefly describing a recent example of when they had made an

objectively correct decision. Participants in the objectivity prime condition were told that an objectively correct decision is one “that another rational person would come to if in the same situation.” SurveyMonkey then also randomly assigned roughly half of participants to read the case description of a White patient, while the other half were assigned to read an otherwise identical case vignette about a Black patient. The instructions framed the case as a patient from an infectious diseases clinic. This description was accompanied by grey-scaled images of faces of men that correspond to the description given as an additional manipulation of the patient’s race.

All participants completed the remaining steps in the same order. The adapted Morisky Adherence Scale followed the case description, which in turn was followed by the Symbolic Racism 2000 Scale. Then participants answered a series of questions ostensibly to measure their memory of the case they read earlier (see Appendix H for full instructions and all items). One of these items also serves as a manipulation check to determine if participants were actually aware of the race of the patient in the case description. Participants then read a brief description of the “psychological perspective” on the trend that people generally view themselves as objective (see Appendix I for full text), and responded to the question “To what extent do you believe that you show this tendency?” on a scale from 1 (Not at all) to 5 (Extremely). This question is also a manipulation check to ensure that participants in the prime condition did perceive themselves as more objective than those who were in the control condition. Participants finally responded to demographic questions, first about their education history and then about their race and gender (see Appendix J for full items).

Upon completion of demographics, participants were debriefed about the purpose of the study (see Appendix K for full text). This debriefing statement also served to reduce the effect of the objectivity prime to baseline so that participants did not leave the study in a state that may have been associated with greater bias. Figure 1 gives a general summary of the procedure.

Results

The results of this study will be presented in two parts: the basic definition of objectivity, and its applied role in the context of racial bias. Summary data for all variables of interest can be found in Table 1. All results of inferential tests will be evaluated for statistical significance using an alpha-level of .05, but provided in context of 95% confidence intervals (95% CI) in order to estimate population effect size as well as traditional significance. The confidence level of 95% used in this evaluation of results was chosen to match the .05 alpha used for traditional significance testing.

Defining Perceived Objectivity: Cognitive Rigidity

In order to define perceived objectivity as a type of cognitive rigidity, its relationships with PNS and the openness factor of the BFI were evaluated using Pearson correlations.

Hypothesis 1 predicted a positive relationship between PNS and perceived objectivity. The results supported this hypothesis, $r(111) = .24, p = .01, 95\% \text{ CI } [.06, .41]$, which describes a weak positive relationship between PNS and perceived objectivity. The greater an individual's personal need for simple structures, the more they believe themselves to be objective. By squaring each the lower and upper bounds of the

confidence interval, we can be 95% confident that PNS accounts for between .4% to 16.7% of the variance in perceived objectivity, providing further evidence that this effect is somewhat weak. Figure 2 displays this relationship with 95% CI bands.

Hypothesis 2 predicted a negative relationship between openness and perceived objectivity. The results did not support this hypothesis, $r(111) = .35, p = .0002, 95\% \text{ CI } [.17, .50]$, which describes a positive relationship between openness and perceived objectivity that is medium strength. This result indicates that, in contrast to the hypothesized direction of the relationship, greater openness predicts greater belief in one's objectivity. We can be 95% confident that openness accounts for between 3% to 25% of the variance in perceived objectivity, which provides evidence for a potentially moderately strong effect in the population. Figure 3 displays this relationship with 95% CI bands.

Applications of Perceived Objectivity: Replicating with a Novel Prime

The first research question about perceived objectivity had to do with whether a novel prime could induce belief in one's objectivity. First, responses to the objectivity prime were evaluated for inclusion based on coherence. The prime had asked for participants to provide a brief description of a "recent [objectively correct] decision they made" under the assumption that by engaging with that experience, the participant would be more aware of their supposed objectivity and unbiased decision-making. Therefore, participants who did not provide legitimate responses (e.g., holding down the number "2" until the required amount of time had passed) were excluded. The decision to remove an observation was not taken lightly, but some responses that were coherent grammatically were not coherent responses to the prompt (e.g., describing the importance of deciding

what to eat for breakfast is not a decision that the participant made), but rather a response to keywords from the prompt, and were excluded. After these exclusions, the final cleaned subsample of legitimate responses ($n = 96$) was used for further analysis involving the objectivity prime.

The next step was to determine if there was an effect of the objectivity prime. To do so, an independent samples t-test was used to compare the control ($n = 42$, $M = 2.93$, $SD = 1.05$) and prime ($n = 54$, $M = 3.07$, $SD = .91$) conditions on a manipulation check. The test revealed no significant difference, $t(94) = .73$, $p = .47$, 95% CI [-.25, .54]. The 95% CI indicates that the difference between the control and prime conditions could have favored either group (i.e., we can be 95% confident that either group could have been greater than the other in the population, or could have just as likely been 0), which supports the significance testing conclusion. This result indicates that this prime was not effective in producing a heightened sense of personal objectivity. Figure 4 displays the group means with error bars representing the 95% CI for each group.

It follows that this prime paradigm also did not produce a significant difference in racial bias on the Symbolic Racism 2000 scale. An independent samples t-test comparing the control condition ($M = .55$, $SD = .17$) to the prime ($M = .55$, $SD = .19$) revealed no significant difference between conditions, $t(91) = .07$, $p = .95$, 95% CI [-.07, .08]. The 95% CI includes 0, which supports the significance test interpretation. Figure 5 displays the group means with error bars representing the 95% CI for each group.

Further, this prime manipulation did not interact with the race of the patient in the case description to cause a difference in evaluation of the patient's compliance. A manipulation check of participants' awareness of the race of the patient they had read

about was included after the symbolic racism scale as one of several items that asked about details of the case. All participants who responded to this item ($n = 106$) gave the correct response for their race condition. A 2 x 2 two-way analysis of variance (ANOVA) revealed no significant effect of objectivity prime [$F(1, 90) = .147, p = .70$], patient race [$F(1, 90) = .273, p = .60$], or their interaction [$F(1, 90) = .925, p = .34$] in evaluation of the patient's compliance. Figure 6 displays the group means with error bars representing the 95% CI for each group.

Applications of Perceived Objectivity: Science Education and Bias

The second research question about perceived objectivity had to do with whether it might mediate the relationship between science education and racial bias. In order to test for mediation, this analysis used the approach outlined by Baron and Kenny (1986). In this mediation-testing framework, three linear models are fit systematically in order to evaluate the evidence for the direct relationship between the primary predictor, X, and the criterion or outcome variable, Y, the relationship between X and the mediator, M, and the ability of the full model that uses X and M to predict Y. In this context, science education as represented by total number of science courses is the primary predictor (X), perceived objectivity is the mediator (M), and racial bias as represented by symbolic racism score is the criterion/outcome variable (Y). By using this approach, one can determine:

- 1) if there is a relationship to mediate, using the model:

$$Y_i = \alpha + (\beta_X * X_i)$$

- 2) if the mediator is related to the primary predictor, using the model:

$$M_i = \alpha + (\beta_X * X_i)$$

- 3) whether the mediator is effectively strong enough to replace the primary predictor, using the model:

$$Y_i = \alpha + (\beta_X * x_i) + (\beta_M * M_i)$$

Following this approach, the first step is to fit the linear model that predicts racial bias from science education. Science education was measured as the count of classes taken in the natural sciences. This model has the general equation:

$$Y_i = \alpha + (\beta_{education} * X_i)$$

with Y_i racial bias of an individual i , α model intercept, β effect of education, and X_i number of natural science classes taken by individual i .

The model revealed no significant effect of education on predicting racial bias. The number of classes in the natural sciences that an individual does not predict their racial bias. The details of the fit model are summarized in Table 2. This relationship, or lack thereof, is plotted in Figure 7, with 95% CI of the best-fit line.

In the mediation analysis framework outlined by Baron and Kenny, a non-significant direct relationship between the primary predictor and the outcome of interest provides sufficient evidence that there is no relationship to mediate and to stop further mediation analysis. However, although mediation analysis may no longer be appropriate, this research is largely exploratory, and it may still be of interest to examine the relationship between science education and perceived objectivity. If the motivation was to eventually test for mediation, it would make sense to examine this relationship by fitting another linear model, such that the change in β_X and subsequent R^2 between that model and the final model could be evaluated for mediation. As the first model revealed

no significant relationship to mediate, however, and for the sake of simplicity of interpretation, examining the relationship between science education and perceived objectivity can be done using a Pearson correlation. The results of that test provide no evidence of a significant relationship between science education and perceived objectivity, $r(100) = .006, p = .95, 95\% \text{ CI } [-.19, .20]$. The number of classes taken in the natural sciences did not relate to a person's perception of their own objectivity. This non-relationship is plotted in Figure 8 with 95% CI of the best-fit line.

Finally, the relationship between perceived objectivity and bias can still be examined for the sake of evaluating whether a more nuanced, continuous conceptualization of perceived objectivity can predict racial bias where the objectivity prime manipulation could not cause it. Using a Pearson correlation, no significant relationship between perceived objectivity and bias was found, $r(100) = -.16, p = .16, 95\% \text{ CI } [-.34, .04]$. An individual's perception of their own objectivity did not relate to their score on the symbolic racism scale. This non-relationship is plotted in Figure 9 with 95% CI of the best-fit line.

Discussion

As with the results summarized previously, the discussion of them will be divided into a basic section and an applied section. After expanding on the results in context, the implications of this research will be discussed, followed by a final concluding summary of the project.

Perceived Objectivity as Cognitive Rigidity

The first portion of this study aimed to develop evidence for conceptualizing one's perception of their own objectivity as an example of cognitive rigidity. The relationships between perceived objectivity and each indicator of cognitive rigidity (PNS and openness) were significant, but did not demonstrate the predicted directionality in both cases. PNS was positively related with perception of one's own objectivity, as predicted. People who tend to categorize information into simpler structures tend to believe they are objective. However, in a counterintuitive result, openness was also positively related to perceived objectivity. In other words, both greater personal need for simple structure and greater openness to new ideas predict perception of higher personal objectivity, although the two predictors are still negatively related.

This pattern of results could be due to a variety of reasons. The most obvious is that it may not be reasonable to group perceived objectivity into a cognitive rigidity framework. Perception of objectivity may not be completely explained by one's tendency toward rigid thoughts and beliefs. This explanation finds some evidence in the positive relationship with openness. It may be that one's awareness of their own objectivity comes along with being open to new ideas. People who are more open may be generally more inquisitive, and therefore more introspective and aware of their own biases. As a result, they might report greater belief in their ability to control their own biases and believe themselves to be more objective.

It may also be the case that measuring perceived objectivity directly using the scale from Armor (1999) may not have been appropriate. Using a bias blind spot paradigm to measure perceived objectivity, i.e., by providing a comparison target group

whose objectivity is also measured by the participant and comparing the difference between self and target evaluations, may have been a more fruitful method of measuring how one perceives their own objectivity. If one believes themselves more objective than some target group using this measurement, it might be more likely that a negative relationship would emerge between perceived objectivity and openness, the justification being that someone who is more open to new ideas would likely view other groups and their viewpoints as similarly biased or unbiased as their own. Future research could adopt the BBS paradigm to measure perceived objectivity and recollect data about openness and PNS to retest the cognitive rigidity framework examined in this study. Such research might find evidence of the expected relationships between perceived objectivity and both PNS and openness.

Replicating Previous Research

The second line of inquiry in this project was to evaluate the utility of a new priming mechanism to induce an increase in perceived objectivity. In the original work by Uhlmann and Cohen (2007), four items from Armor's (1999) scale were used as an objectivity prime. As that full scale was going to be used elsewhere in the procedure in order to directly measure one's perception of their own objectivity, this study employed a novel prime in the form of asking participants to respond to a prompt to describe a "recent [objectively correct] decision" they had made. This prime was meant to encourage participants to engage with the notion that they are objective by having them remember a time that by their own definition, they had been objective.

To test the utility of this prime, a manipulation check was included in the procedure after the random assignment to both objectivity and patient race conditions.

The first step to evaluate this prime is to compare group scores between the control and prime objectivity conditions to assess its effect. By this measure, there was no effect of the prime. The next step was to assess whether this prime could cause a difference in racial bias on the symbolic racism scale between control and prime conditions as the original prime had done with gender bias. Again, there was no effect of the prime. These results taken together suggest that this prime may not have been effective (i.e., did not induce any difference between control and prime conditions in their perception of their objectivity).

Although there was no significant difference between the prime or control conditions using this priming mechanism, in a broader sense this line of inquiry is still meaningful and carries symbolic weight in the current shifts in psychological research. With increasing evidence of an inability to replicate results that we as psychologists have taken for granted (Pashler & Harris, 2012; Open Science Collaboration, 2015), it is crucial for a rigorous practice of scientific research to challenge methods that do not seem reasonable or likely to produce the results that were reported. Indeed, researchers are able to gauge with reasonable accuracy whether an effect will replicate or not (Dreber et al., 2015), which lends some credence to trusting one's judgment when evaluating the credibility of research.

In that vein, the ability of four items from a scale, even one as face-valid as the objectivity scale, to prime one's belief in their objectivity seemed suspect, which partially motivated the shift away from it in this conceptual replication. Testing a novel method to attempt to replicate the results of previous research still contributes to scientific knowledge by introducing the possibility that perhaps the effect is not generalizable to

the extent that might be assumed if it can only be found in one prime paradigm and not another. Alternatively, it presents the possibility that this prime merely does not function as an effective prime. Either of these explanations is possible, and prompt questions for future research regarding the efficacy of the original objectivity prime and the generalizability of its effect.

Science Education, Perceived Objectivity, and Racial Bias

The final formal research question for this project set out to evaluate the model proposed by Chapman and colleagues (2013) in which one's perception of their own objectivity mediates the relationship between science education and racial bias. This model was not supported by the data from this sample. None of the three variables was significantly related to any other. In other words, science education, perceived objectivity, and racial bias were not related in this sample.

Several possible explanations exist for this pattern of results. It is possible that measuring science education by number of courses taken was too noisy to detect any meaningful variation in racial bias or perceived objectivity, as that number collapses anywhere from zero class hours to tens or even hundreds to a summary count. Additionally, it merits reiterating that the majority of participants in this sample were still very early in their undergraduate career. The proposed effect of science education on perceived objectivity and subsequently on racial bias was originally nested in a medical school context, which would be years of instruction beyond what is represented by this sample. It may very well be that this effect requires more education in the natural sciences to emerge at all, if it does exist. Further research that collected data from a medical school sample would correct for that limitation in this sample.

Future research could also build off the concepts presented in this project in new ways rather than merely accounting for its limitations. Perceived objectivity, and to go a step further, the notion of an objective person independent of self-perception, is still a largely undefined construct. Psychologists may be interested in asking more questions about what might lead someone to ignore their own biases rather than understand and address them, as well as how to intervene so that the focus is not primarily on identifying harmful biases, but rather on how to reduce them.

Physician bias is also still a pressing real-world issue that begs for attention from all sides. Chapman et al. (2013) proposed various other features of medical education and the profession that follows, like deindividuation, a decline in empathy, and high cognitive load, that are all problems for which social psychology may be able to suggest solutions in collaboration with the field of medicine. Additionally, medical doctors are not the only players in the healthcare arena that interact directly with patients, and therefore are not the only population whose biases might be useful to understand. Nurses, technicians, and administrators all engage in patient care to various extents, and may each bring new and different characteristics that are distinct to their profession from physicians.

Conclusion

This thesis investigated both basic and applied topics related to the construct of perceived objectivity in the context of medical education and physician bias. One hypothesis was supported, that PNS positively predicts perceived objectivity, but otherwise results contradict or at least complicate the very small amount of research and theory that exists in this domain. Although it appears that perceived objectivity may not be a meaningful factor in developing our understanding of physician bias, it remains the

case that physician bias is an issue for the medical community to address. With the disparities that are seen at a group level between patients of color and their white counterparts, there is work to be done to close the gaps until such a point that all people, everywhere, have the same, high chance of receiving the same, high-quality healthcare.

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Tables and Figures

Table 1. Summary statistics of all variables

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Objectivity	119	5.19	.79
PNS*	126	3.91	.86
Openness	125	3.66	.60
Bias	111	.56	.17
Science classes	109	4.92	4.96

*PNS: Personal Need for Structure

Table 2. Modeling bias on science education

Coefficient	β (<i>SE</i>)	<i>t</i>	<i>p</i>
Intercept	.56		
Science classes	-.001 (.003)	-.38	.70

* $R^2 = .001$, $F(1, 103) = .15$, $p = .70$

Figure 1. Summary of method

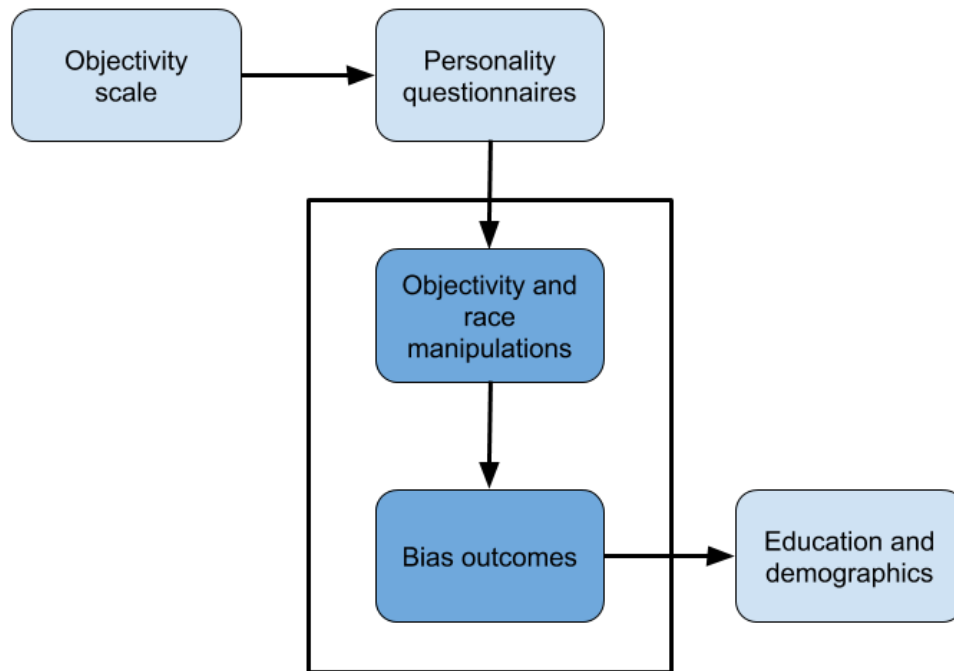


Figure 2. Pearson correlation of PNS and objectivity, with 95% CI bands

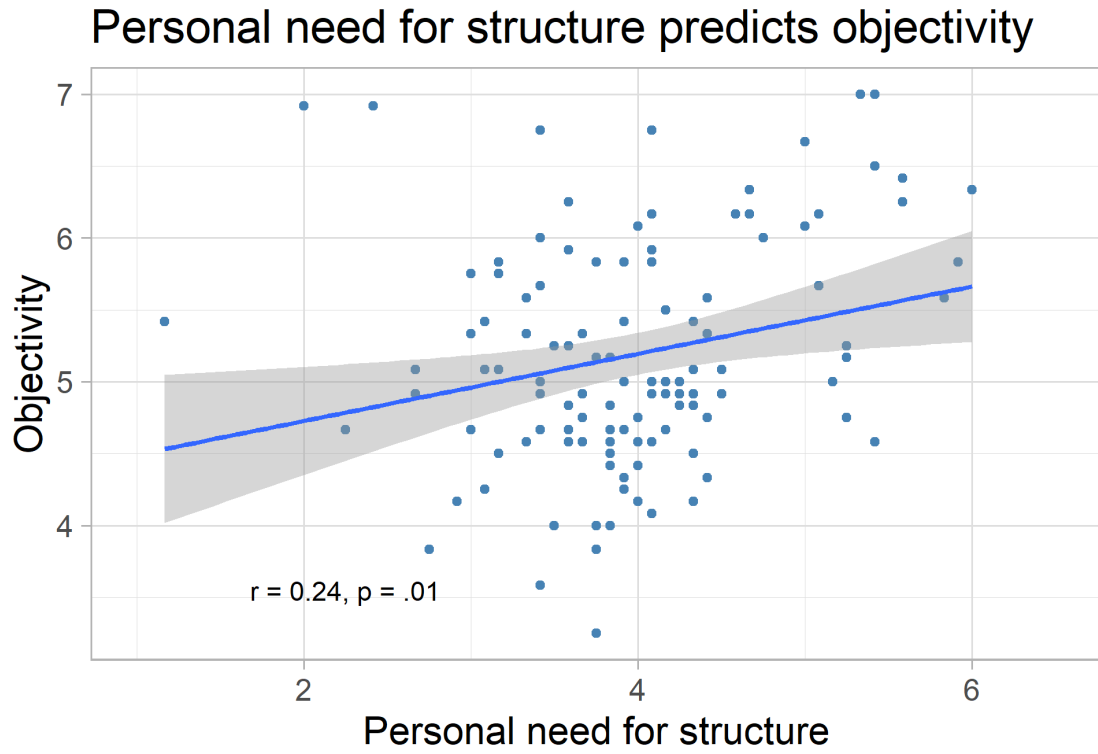


Figure 3. Pearson correlation of openness and objectivity, with 95% CI bands

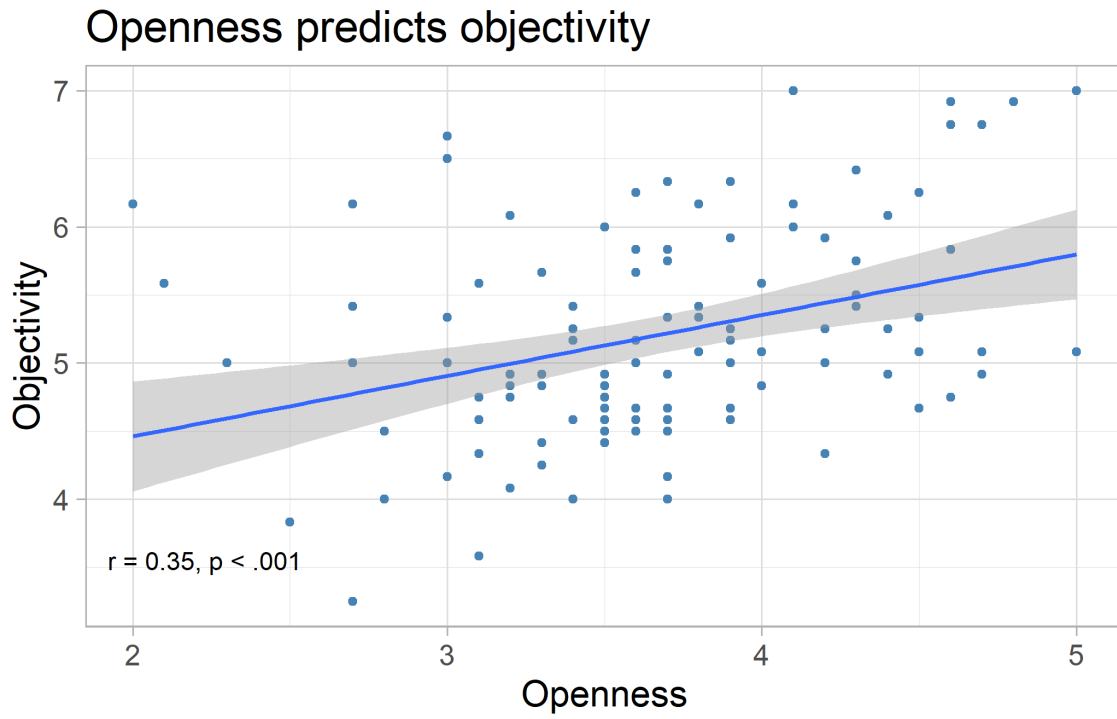


Figure 4. Manipulation check by objectivity prime condition

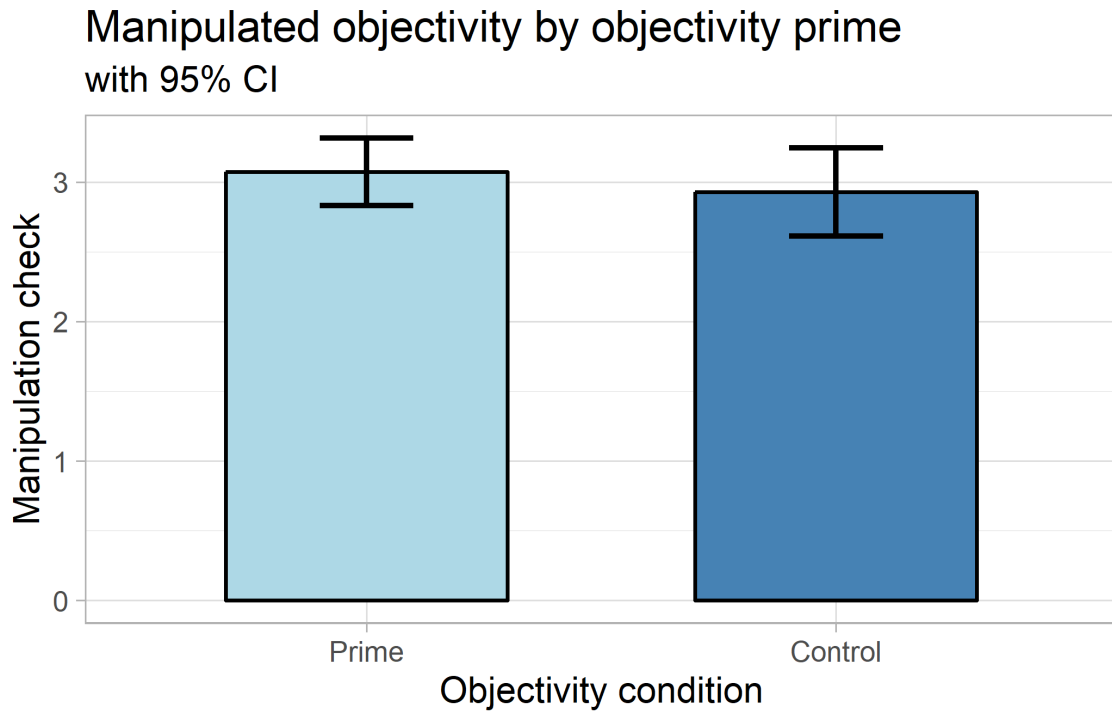


Figure 5. Racial bias by objectivity prime condition

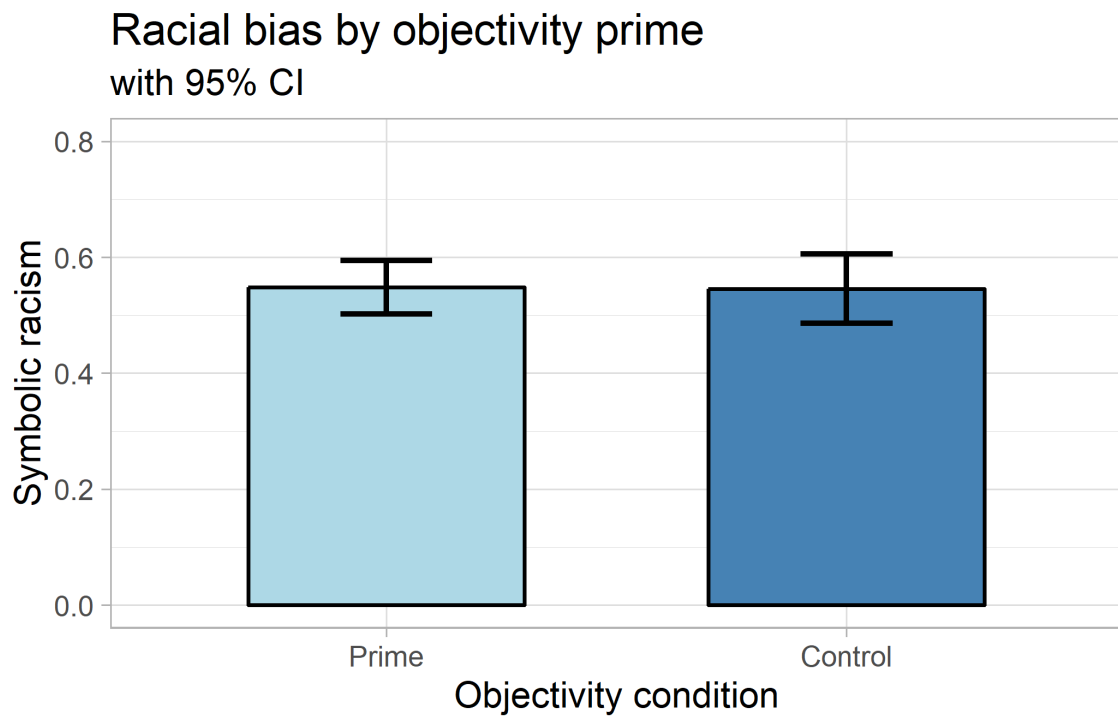


Figure 6. Two-way ANOVA of compliance by objectivity and patient race

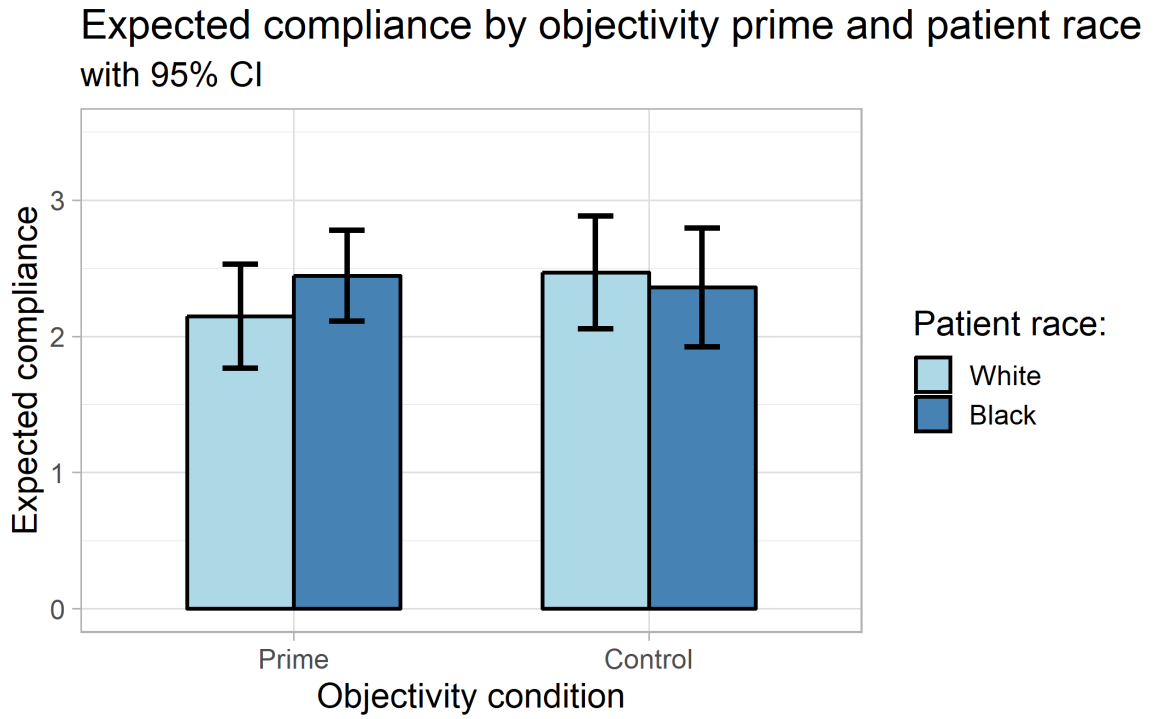


Figure 7. Pearson correlation of science education and bias, with 95% CI bands

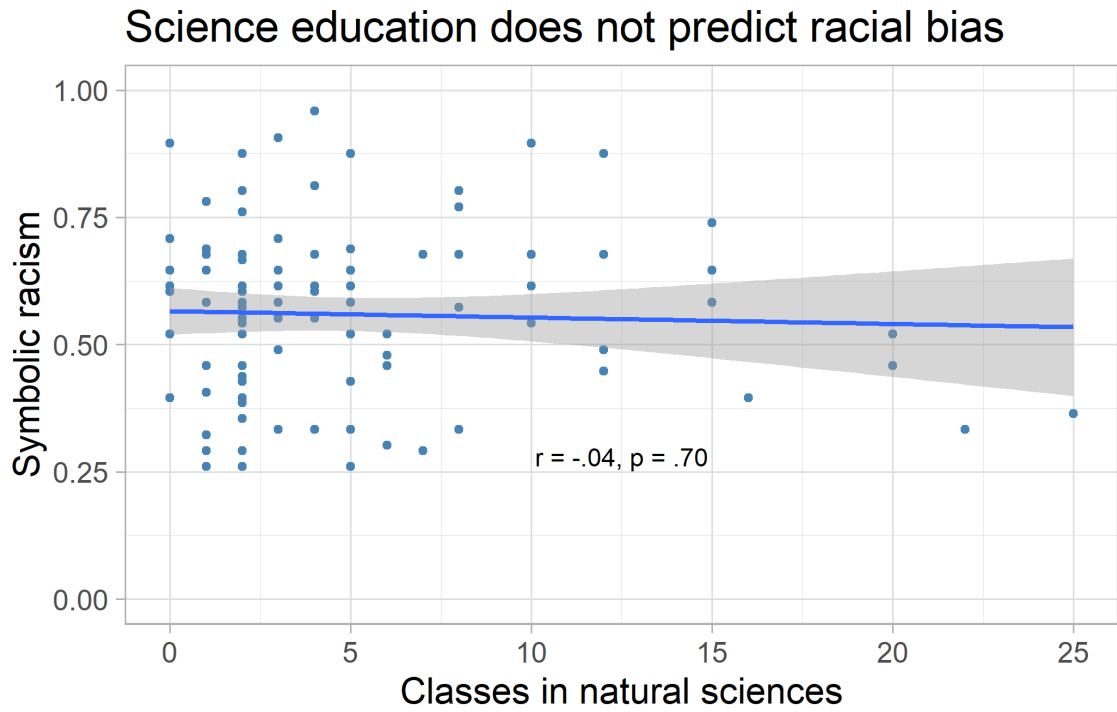


Figure 8. Pearson correlation of science education and objectivity, with 95% CI bands

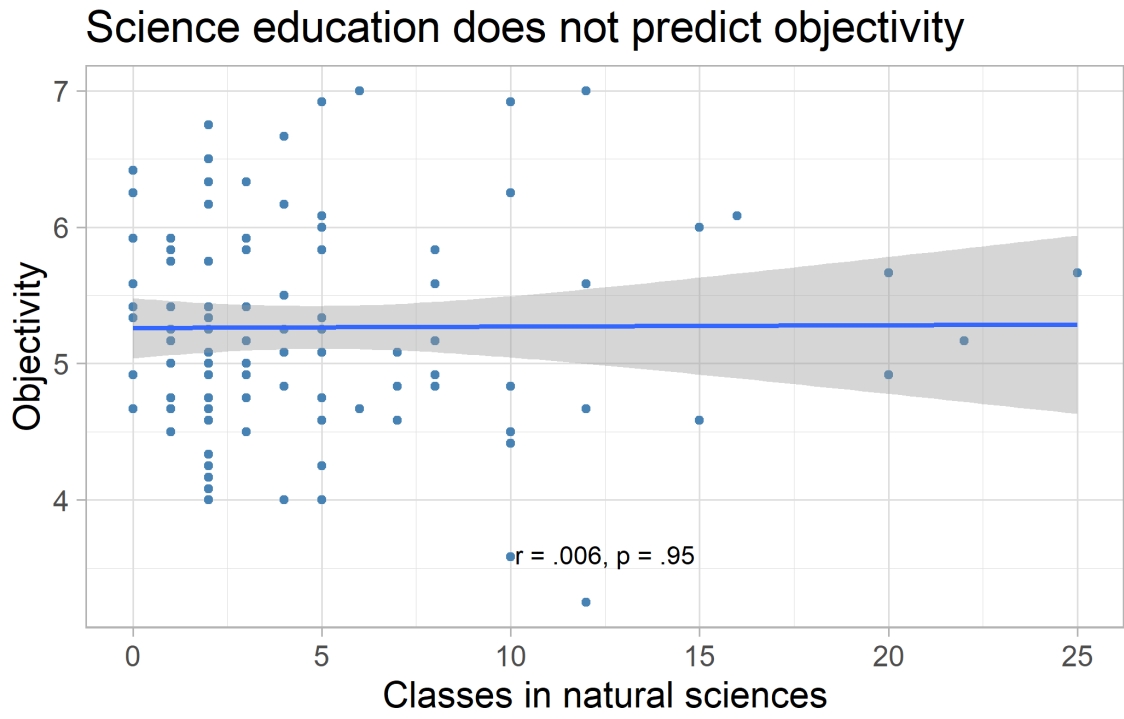
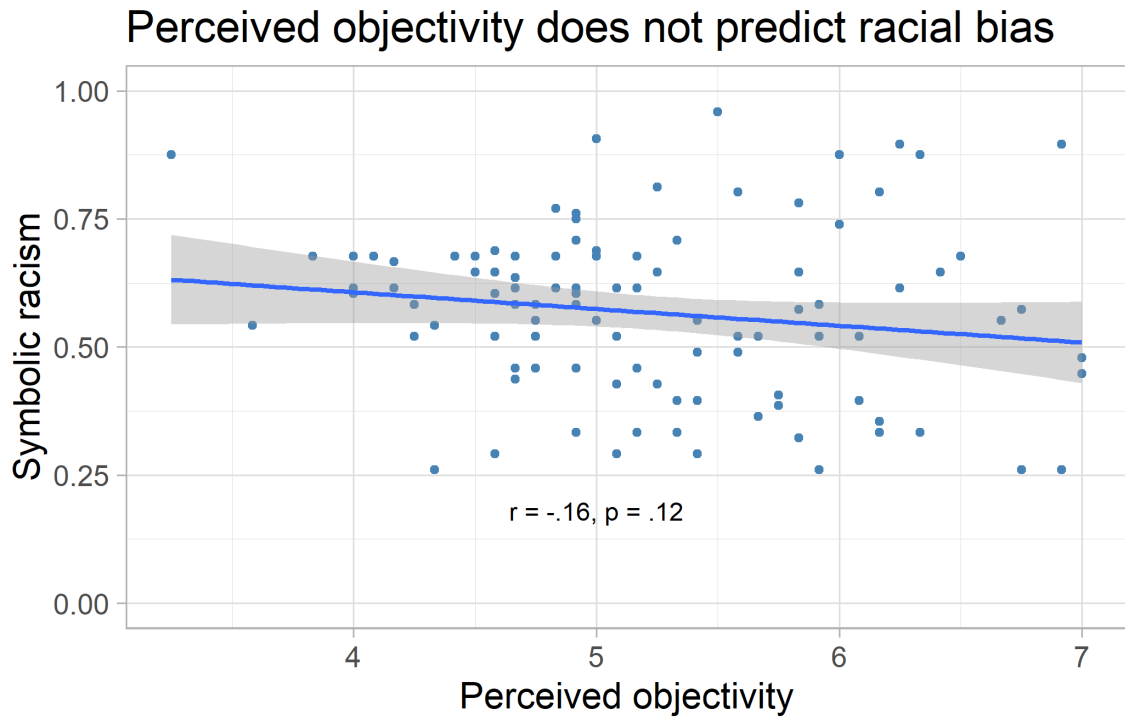


Figure 9. Pearson correlation of objectivity and bias, with 95% CI bands



Appendices

Appendix A: Objectivity Scale

Read each of the following statements and indicate the extent to which you believe it applies to you. No answer is more or less “correct” than any other. We are interested in your input as it applies to you, not in comparison to anyone else.

1	2	3	4	5	6	7
Not at all			Somewhat			Extremely

1. I have a realistic view of my skills and abilities.
2. I am even-handed when evaluating my personal qualities.
3. I have an inflated opinion of myself.
4. I am a good judge of my personal characteristics.
5. I know what is wrong with myself.
6. I find it hard to evaluate myself objectively.
7. I have insight into my own behavior.
8. I am self-aware.
9. I engage in self-deception.
10. I have difficulty seeing my personal shortcomings.
11. I am good at evaluating my strengths and weaknesses.
12. I am an objective person.

Appendix B: Big Five Inventory

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1	2	3	4	5
Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

I am someone who...

1. _____ Is talkative
2. _____ Tends to find fault with others
3. _____ Does a thorough job
4. _____ Is depressed, blue
- 5. _____ Is original, comes up with new ideas**
6. _____ Is reserved
7. _____ Is helpful and unselfish with others
8. _____ Can be somewhat careless
9. _____ Is relaxed, handles stress well.
- 10. _____ Is curious about many different things**
11. _____ Is full of energy

12. _____ Starts quarrels with others
13. _____ Is a reliable worker
14. _____ Can be tense
15. _____ **Is ingenious, a deep thinker**
16. _____ Generates a lot of enthusiasm
17. _____ Has a forgiving nature
18. _____ Tends to be disorganized
19. _____ Worries a lot
20. _____ **Has an active imagination**
21. _____ Tends to be quiet
22. _____ Is generally trusting
23. _____ Tends to be lazy
24. _____ Is emotionally stable, not easily upset
25. _____ **Is inventive**
26. _____ Has an assertive personality
27. _____ Can be cold and aloof
28. _____ Perseveres until the task is finished
29. _____ Can be moody
30. _____ **Values artistic, aesthetic experiences**
31. _____ Is sometimes shy, inhibited

32. _____ Is considerate and kind to almost everyone
33. _____ Does things efficiently
34. _____ Remains calm in tense situations
- 35. _____ Prefers work that is routine**
36. _____ Is outgoing, sociable
37. _____ Is sometimes rude to others
38. _____ Makes plans and follows through with them
39. _____ Gets nervous easily
- 40. _____ Likes to reflect, play with ideas**
- 41. _____ Has few artistic interests**
42. _____ Likes to cooperate with others
43. _____ Is easily distracted
- 44. _____ Is sophisticated in art, music, or literature**

Appendix C: Personal Need for Structure Scale

Read each of the following statements and decide how much you agree with each according to your attitudes, beliefs, and experiences. It is important to realize that there is no “right” or “wrong” answers to these questions. People are different, and we are interested in how you feel.

1	2	3	4	5	6
Strongly disagree	Moderately disagree	Slightly disagree	Slightly agree	Moderately agree	Strongly agree

1. I'm not bothered by things that interrupt my daily routine.
2. It upsets me to go into a situation without knowing what I can expect from it.
3. I enjoy having a clear and structured mode of life.
4. I like a place for everything and everything in its place.
5. I like being spontaneous.
6. I find that a well ordered life with regular hours makes my life tedious.
7. I don't like situations that are uncertain.
8. I hate to change my plans at the last minute.
9. I hate to be with people that are unpredictable.
10. I find that a consistent routine enables me to enjoy life more.
11. I enjoy the exhilaration of being put in unpredictable situations.
12. I become uncomfortable when the rules in a situation are not clear.

Appendix D: Patient vignette

Bracketed text indicates the different conditions.

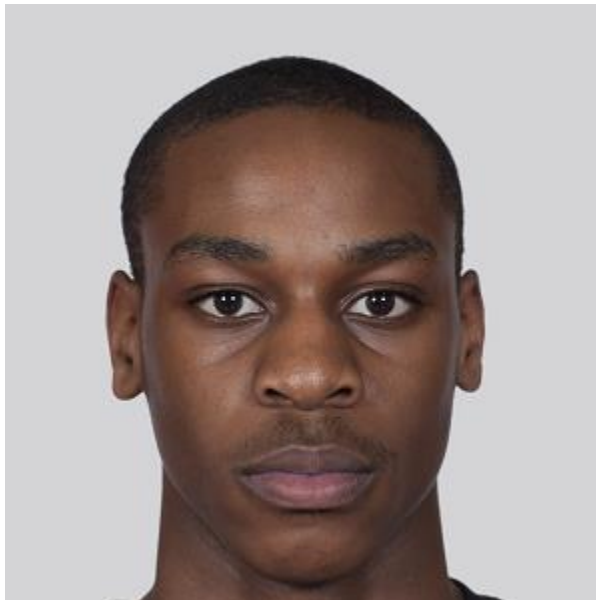
Mr. Thompson is a 31 year-old [White/Black] man recently found to be HIV-infected. He has several physical complaints, including unexplained fever, chronic diarrhea, and severe weight loss. His past medical history is unremarkable. He has never had surgery or a serious medical illness and has never been hospitalized. His physical exam was unremarkable. His CD4+ count was somewhat low and his viral load was somewhat high; these two standard indicators of infection severity suggest a moderately severe HIV infection. Mr. Thompson's doctor has started him on a highly active antiretroviral therapy (HAART), which is a typical course of action to control an HIV infection in a patient like him.

Appendix E: Patient image

White patient condition:



Black patient condition:



Appendix F: Morisky Adherence Scale (adapted)

Please answer a few questions about how you think Mr. Thompson will behave now that he has begun treatment. We know you are not a doctor, and these questions are not meant to be a clinical assessment of Mr. Thompson's case. Rather, we would like to know how the general person perceives a patient like Mr. Thompson. There are no "right" or "wrong" answers, merely your honest prediction of Mr. Thompson's behavior.

1. How often do you think Mr. Thompson will forget to take his medicine?

1 (Never) || 2 || 3 (Sometimes) || 4 || 5 (Often)

2. How careful do you think Mr. Thompson is about taking his medicine?

1 (Not careful) || 2 || 3 (Somewhat careful) || 4 || 5 (Very careful)

3. How likely do you think it is that Mr. Thompson will stop taking his medicine if he starts to feel better?

1 (Not very likely) || 2 || 3 (Somewhat likely) || 4 || 5 (Very likely)

4. How likely do you think it is that Mr. Thompson will stop taking his medicine if he feels worse when he takes it?

1 (Not very likely) || 2 || 3 (Somewhat likely) || 4 || 5 (Very likely)

Appendix G: Symbolic Racism 2000 Scale

Please respond to the following items using the scales provided. Note that the scale is not the same for each item; please keep this in mind as you give your responses. As with the other questionnaires you have taken in this study, there is no right or wrong answer to any of these items. We are merely interested in your perspective.

1. It's really a matter of some people not trying hard enough; if blacks would only try harder they could be just as well off as whites.

1 (Strongly disagree) || 2 (Somewhat disagree) || 3 (Somewhat agree) || 4 (Strongly agree)

2. Irish, Italian, Jewish, and many other minorities overcame prejudice and worked their way up. Blacks should do the same.

1 (Strongly disagree) || 2 (Somewhat disagree) || 3 (Somewhat agree) || 4 (Strongly agree)

3. Some say that black leaders have been trying to push too fast. Others feel that they haven't pushed fast enough. What do you think?

1 (Trying to push too fast) || 2 (Moving at about the right speed) || 3 (Going too slowly)

4. How much of the racial tension that exists in the United States today do you think blacks are responsible for creating?

1 (Not much at all) || 2 (Some) || 3 (Most) || 4 (All of it)

5. How much discrimination against blacks do you feel there is in the United States today, limiting their chances to get ahead?

1 (None at all) || 2 (Just a little) || 3 (Some) || 4 (A lot)

6. Generations of slavery and discrimination have created conditions that make it difficult for blacks to work their way out of the lower class.

1 (Strongly disagree) || 2 (Somewhat disagree) || 3 (Somewhat agree) || 4 (Strongly agree)

7. Over the past few years, blacks have gotten less than they deserve.

1 (Strongly disagree) || 2 (Somewhat disagree) || 3 (Somewhat agree) || 4 (Strongly agree)

8. Over the past few years, blacks have gotten more economically than they deserve.

1 (Strongly disagree) || 2 (Somewhat disagree) || 3 (Somewhat agree) || 4 (Strongly agree)

Appendix H: Memory check

Now we would like to know what you remember from the case description of Mr.

Thompson. Please answer the following questions to the best of your ability.

1. What was Mr. Thompson's sexuality?
 - a. Gay
 - b. Straight
 - c. Bisexual
 - d. This information was not provided**
2. What was Mr. Thompson's race?
 - a. Black**
 - b. White**
 - c. Asian
 - d. This information was not provided
3. What was Mr. Thompson's age?
 - a. 21
 - b. 31**
 - c. 41
 - d. This information was not provided
4. How severe was Mr. Thompson's HIV infection?
 - a. Not severe
 - b. Moderately severe**
 - c. Very severe
 - d. This information was not provided

Appendix I: Psychological perspective on objectivity

Psychologists have claimed that people tend to view themselves as objective. In other words, people often consider their attitudes and beliefs to be based on their unbiased consideration of unquestionably true information. This leads many people to develop an, “I think it, therefore it is true,” mindset, which has both benefits and drawbacks.

To what extent do you believe that you show this tendency?

1 (Not at all) || 2 || 3 (Somewhat) || 4 || 5 (Extremely)

Appendix J: Demographics

Please answer the following questions about your education history.

1. What is your intended or declared major?
2. If you have already declared your major, how long has it been your official major?
3. How many classes have you completed in...
 - a. the natural sciences (e.g., biology, chemistry, physics, etc.)
 - b. the social sciences (e.g., psychology, sociology, anthropology, etc.)
 - c. the humanities (e.g., literature, foreign languages, religious studies, etc.)
 - d. other disciplines or interdisciplinary subjects

Please answer the following questions about your personal demographics.

1. Which of the following best describes your race?
 - a. White
 - b. Black/African American
 - c. American Indian/Alaska Native
 - d. Asian
 - e. Pacific Islander
 - f. Mixed race
 - g. Other (please specify)
2. Which of the following best describes your gender?
 - a. Female
 - b. Male
 - c. Non-binary
 - d. Other (please specify)

Appendix K: Debriefing statement

As you read earlier, psychologists have claimed that people tend to view themselves as objective. In other words, people often consider their attitudes and beliefs to be based on their unbiased consideration of unquestionably true information. What's important to note, however, is that we are not always as correct as we may believe. Even when we believe we are objectively correct, sometimes we still make misjudgements in the process of arriving at that decision. This isn't to say that we're always wrong either, just that sometimes we overestimate our correctness. It's a normal thing that we all do and is not something to be overly concerned about, but rather something to be aware of.

Additionally, it is possible that over the course of your participation you may have suspected that it was not our intention to only measure memory in relation to individual differences as you were led to believe by recruitment materials and the informed consent form.

The focus of this study is actually the relationships between individual differences and perceptions of patients. Details of the case description that you read were different between groups of participants, and we were interested in how those details affected how you perceived Mr. Thompson.