**Implicit racial and gender bias about handguns: a new Implicit Association Test**

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**ABSTRACT**

This study measured implicit and explicit racial bias about women and handguns and addresses important perceptions and stereotypes about gun competence and victimization that vary based on race and gender. We administered a national survey to 1,000 US adults using a new Race-Women-Handguns implicit association test (RWH-IAT). Survey weighting was used to generate nationally representative estimates on the prevalence of implicit racial bias about women with handguns. The majority of participants (62.5%) associated Black women with handguns and White women with smartphones (weighted-mean IAT=0.252;95%CI=[0.227,0.276]) reflecting anti-Black bias among US adults that is stereotype consistent associating Black women with handguns and White women with smartphones. The proportion who indicated Black and White women were competent with handguns was low (21.6 and 22.4%, respectively), and the proportion of US adults who indicated Black women are more likely to experience intimate partner violence (range:19.4-22.9%) and sexual harassment/assault (range:11.4-20.4%) was low compared to the prevalence of both forms of violence among Black women that may impact the decision to possess a handgun. These findings suggest there is an anti-Black implicit bias about women with handguns (associating Black women with handguns) among US adults and support the need for further research measuring racism in systems and structures that intersect with gun possession.

**Keywords**: implicit racial bias, firearm-related public opinion, safety and risk perceptions

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**INTRODUCTION**

Firearm-related deaths in the US in 2020 were around double among Black women and men (6.6 and 56.0 per 100,000 people, respectively) than in other racial groups including American Indian or Alaska native women and men (3.4;20.2), Asian or Pacific Islander women and men (0.9;5.3), and White women and men (3.5;20.0) (Centers for Disease Control and Prevention, 2021). These large and persistent racial disparities in firearm-related deaths demonstrate the need to confront firearm-related harm for both public health and health equity. Improving the public health approach to firearm-related harm will increasingly require clarity about how the public views the intersection of race, gender, and gun possession. This study measures implicit and explicit racial bias about women and handguns and addresses important perceptions and stereotypes about gun competence and victimization that vary based on race and gender. Implicit bias is automatic and unconscious and seeps into decision-making and behavior unintentionally (Greenwald et al., 1995). In contrast, explicit bias is a conscious bias where a person is fully aware and it influences decision-making and behavior with intent (Amodio & Ratner, 2011; Smith & DeCoster, 2000). The Implicit Association Test (IAT) was developed to measure bias of which people may not be aware or are unwilling to report.

Individuals make gun ownership decisions based on the risks they perceive in society as well as the risks of possessing a handgun. Self-protection is the most common reason people have a gun (Wolfson et al., 2020), but women are more likely than men to say protection is the *only* reason they own a gun, 27% of women and 8% of men (Horowitz, 2017). Black women make this choice in the context of deep-rooted systems of racialized oppression (Browder, 2006; DuMonthier et al., 2017). Important factors may include home intrusion, harassment, racial and/or gender hate crimes, police mistreatment, intimate partner violence, and community violence. The National Neighborhood Crime Study found that Black communities experience a rate of violent crime five times higher than predominantly White communities (Peterson & Krivo, 2010). In the last several years, there has been an increase in homicide rates and interpersonal violence exacerbating long-standing disparities in community violence especially among youth in large cities (Kravitz-Wirtz et al., 2022; Rosenfeld & Lopez, 2020). Like any gun owner, Black women must also confront the trade-offs between this potential for self-protection and the underlying risk of firearm-related harm from owning a lethal weapon.

In addition, racist ideas about criminality and violence have been woven into the fabric of Western societies. Studies persistently document racist perceptions about weapons and safety in the US (Johnson & Chopik, 2019; Nosek et al., 2007; Sadler & Devos, 2020; Somo et al., 2020). Data on two existing Implicit Association Tests (Race-Safety IAT and Race-Weapons IAT) show associations between Black-danger and White-safety on the Race-Safety IAT and Black-weapons and White-harmless objects on the Race-Weapons IAT (Johnson & Chopik, 2019; Nosek et al., 2007; Sadler & Devos, 2020; Somo et al., 2020). Prior studies employ IATs to measure unconscious or implicit racial bias about weapons, but to our knowledge all of these studies have focused on racial bias about men and have used a variety of weapons (e.g., gun, knife, bat). The exclusion of women and the lack of focus on handguns inhibits an application of these IATs to firearm-related death disparities. Bias often leads to discrimination and harm—intended and unintended (Bertrand & Mullainathan, 2004; Block et al., 2021; Bowleg et al., 2020; Hall et al., 2015; Hoekstra & Sloan, 2020; Nunes et al., 2013). Implicit and explicit racial bias may also inhibit public support for policies aimed at reducing racial disparities in firearm-related deaths. For example, a recent experimental study showed that an individuals' support for handgun ownership is affected by both the race and gender of the potential owner (Hayes et al., 2021), suggesting that racial bias may be playing a role in public opinion about involvement with handguns.

This study measures implicit racial bias about Black women with handguns in a nationally representative weighted sample and provides evidence on the association between implicit racial bias about women with handguns along with explicit racial and gender bias measures. We hypothesized that the average IAT score would reflect an anti-Black bias associating Black women with handguns and White women with smartphones because existing research has consistently found anti-Black bias among US adults. Prior research demonstrates that in-group members (e.g., white people and men) are perceived with more competence and out-group members (e.g., Black people and women) are perceived with less competence (Cuddy et al., 2008; Fiske et al., 2002). These assumptions about competence are particularly pronounced in gender bias research (Moss-Racusin et al., 2012; Oh et al., 2019), so we also explored views about Black women’s ability and skill related to gun use. Finally, since gun possession is often about the pursuit of self-protection, we examined perceptions of victimization risk and the perception of a Black women’s need for self-protection.

**METHODS**

*Study Design, Participants, and Setting*

The study team designed a new IAT to measure racial bias in partnership with Project Implicit. The IAT was administered in a cross-sectional survey by the survey research firm YouGov using a proprietary opt-in panel of US adults from April 26 to May 18, 2021. US adult panel members, age 18 or older, were eligible to participate. YouGov invited 4,473 US adults to participate, and the overall response rate was 34.1% based on American Association for Public Opinion Research standards. The survey and IAT included validity checks (e.g., speed checks and requiring the difference between participant reported age and membership profile age to be £ 2years). YouGov evaluated these validity checks and created a sample of n = 1,000 with survey weights to improve the representativeness of the sample (Enamorado & Imai, 2019; Rivers, 2006). Participants did not receive direct compensation from the study team or the University of Washington for participating in this study. Members in the YouGov panel participate in a point-based system and accrue points for completing surveys that they can redeem them for gift cards, donations, or prepaid cash. The data received by the study team was completely de-identified by YouGov, and this study was deemed exempt by the University of Washington Institutional Review Board.

*Race-Women-Handguns Implicit Association Test (RWH-IAT)*

Implicit Association Tests (IATs) measure implicit bias by determining the strength of associations between concepts or groups (e.g., facial stimuli of Black women and White women) and attributes (e.g., handguns and smartphones). This cognitive test is based on a hypothesis that response time is faster when stimuli of a group (e.g., Black women) are closely associated in the subjects’ mind with an attribute/item (e.g., handgun) (Greenwald et al., 2003). Results from a meta-analysis established a test-re-test reliability of from 50 IAT studies and an internal consistency of from 257 IAT studies (Greenwald et al., 2022; Greenwald & Lai, 2020). We developed a novel Race-Women-Handguns Implicit Association Test (RWH-IAT) that is similar to validated IATs (Johnson & Chopik, 2019; Nosek et al., 2007; Sadler & Devos, 2020; Somo et al., 2020). We utilized validated facial stimuli for the groups of women from the Chicago Face Database (CFD) (Ma et al., 2015), publicly available handgun photos from the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) (Bureau of Alcohol, Tobacco, Firearms, 2021), and stock photos of smartphones from Pexels (Pexels, 2021). All stimuli included in the IAT are provided in **Figure A1**. In the administered RWH-IAT, participants were asked to sort and group facial stimuli (Black and White women) with attributes (handguns or smartphones) and their response times were recorded.

*Measures*

*Implicit racial bias score.* We obtained a standard score that measures implicit bias, referred to as the IAT D score, using response times from the administered RWH-IAT. The IAT D score continuously ranges from -2 to 2 and is calculated using a standard IAT algorithm (Greenwald et al., 2003). In this study, positive and larger IAT D scores reflect implicit associations between Black women and handguns, and White women and smartphones (implicit anti-Black bias). IAT D scores greater than -0.15 and less than 0.15 indicate no measurable racial bias (Nosek et al., 2007), 0.15-0.34 slight anti-Black bias, 0.35-0.64 moderate anti-Black bias, and 0.65 strong anti-Black bias consistent with conventional criteria for small, medium, and large effect sizes of Cohen’s d measure (Cohen, 1988; Greenwald et al., 2003). This anti-Black implicit bias is stereotype consistent with racist perceptions about Black people, criminality, and violence (Johnson & Chopik, 2019; Nosek et al., 2007; Sadler & Devos, 2020; Somo et al., 2020). All participants were also asked whether they had ever taken an Implicit Association Test.

*Explicit bias: Feelings*. Separate from the IAT, several questions were used to assess explicit racial and gender bias among respondents. Respondents were asked about four different groups: “How negative or positive are your feelings towards (White women/Black women/White men/Black men)?” on a scale from 0 (strongly negative) to 10 (strongly positive). Responses were recoded to generate a three-category variable for negative (0-4), neutral (5), or positive feelings (6-10) about each group.

*Explicit bias: Handgun competence*. Four additional questions were asked to assess explicit intersectional racial and gender bias about people with handguns. Respondents were asked “In general, how competent with using handguns are (White women/Black women/White men/Black men)?” on a scale from 0 (Not at all competent) to 10 (Very competent). Responses were recoded to generate a three-category variable for not competent (0-4), neutral (5), or competent (6-10) perceptions about each group and handguns.

*Explicit bias: Handgun safety attitudes*. The survey asked two questions to assess explicit racial and gender bias about handgun safety. Respondents were asked “How important is it for handgun safety that the person with the handgun: is a certain race / is a certain gender?” Respondents were provided with Likert-scale response options from 1 (Not at all important) to 5 (Extremely important). Responses were recoded to create a dichotomous variable with values not important (1 only) and important (2-5).

*Explicit bias: Women’s safety*. Six questions were asked to assess explicit racial bias about women’s safety issues. Respondents were asked which group (Black or White women) were more likely to experience the following: intimate or romantic partner violence, gun violence in their community, sexual harassment, stalking, or assault, violence at work, other violent crime, and non-violent crime. They responded on a Likert-scale from 1 to 5 where 1 indicated Black women were more likely, 3 Black and White women equally likely, and 5 White women more likely.

*Socioeconomic and demographic characteristics*. Respondents provided their age, gender identity, race and ethnicity, highest level of education, marital status, employment status, household income, current or prior military service or law enforcement, and whether they were living in a household with a firearm at the time of survey completion.

*Statistical Analysis*

Socioeconomic and demographic characteristics of the study sample were summarized using frequency and percent for categorical variables and weighted mean and standard deviation for age. All missing or not reported information was also described. To assess the amount of anti-Black bias about Black women with handguns in the US, we calculated the weighted mean and standard error of the IAT D score in the overall sample (Heeringa et al., 2010). To measure the association between implicit and explicit racial bias about women with handguns, we calculated weighted proportions of explicit bias measures across three groups, 1) participants with anti-Black bias (IAT D scores associating Black women with handguns and White women with smartphones, stereotype consistent); 2) participants without implicit racial bias; 3) participants with pro-Black bias (IAT D scores associating Black women with smartphones and White women with handguns, stereotype inconsistent). We also calculated weighted proportions for socioeconomic and demographic characteristics across the same groups to determine whether the estimated demographic construction of these groups differed in key characteristics (e.g., gender identity, race/ethnicity, income, firearm ownership, prior military or law enforcement service). Finally, we assessed whether each group, anti-Black bias, no racial bias, pro-Black bias, had larger or smaller weighted proportions of the group who perceive Black women as more likely to experience a number of women’s safety issues (Heeringa et al., 2010).

All weighted measures were calculated using sampling weights constructed using sample matching (Rivers, 2006). Sample matching is a two-stage process where a random sample is drawn from the target population, US adults 18 years, and then for each member of the random sample, a matching YouGov panel member is selected based on demographics from the 2018 American Community Survey using the proximity matching method. This sample matching procedure is used so the study sample reflects a true probability sample and estimates of implicit and explicit racial bias about Black women with handguns in the US are representative of all US adults aged 18 years. All analyses were conducted using the survey prefix command (svy) in STATA 16.1.

**RESULTS**

Most of our study sample, 76.9% had never taken an IAT prior to this study (**TableA1**). On average, respondents in the sample were 47.9 years of age (SD=17.8). There were 474 cis-men (47.4%), 494 cis-women (49.4%), 30 participants (3.0%) who reported another gender identity (e.g., transwoman, non-binary, genderqueer, or multiple genders), and 2 participants who declined to respond. The sample included 3.1% Asian or Asian American participants, 11.5% Black or African American participants, 13.2% Hispanic or Latino participants, 66.8% White participants. There were 54 participants (5.4%) who reported their race as Middle Eastern, Native American, or reported more than one race. At least 30.9% of the sample was living in a household with a firearm when they completed the survey.

*Implicit racial bias about women with handguns in the United States and associated demographics*

The majority of the sample (62.5%) associated Black women with handguns and White women with smartphones, an anti-Black implicit racial bias that was stereotype consistent (**Figure1**, **TableA2**). A very small proportion (12.5%) associated Black women with smartphones and White women with handguns, a pro-Black bias that was stereotype inconsistent. Overall, the weighted mean IAT D score was 0.252 (95%CI=[0.227,0.276]) reflecting a slight anti-Black bias on average among US adults (**Figure1**). The strength of this association between Black women and handguns is precisely estimated, and we reject the null of no association (no racial bias) with a type 1 error rate (false positive) of 5 percent. The estimated weighted proportion of those who were Black and those with less than a high school education were higher in the pro-Black bias group than the no racial bias and anti-Black bias group (**TableA2**). There were minimal differences in the weighted proportions in each group on other demographic factors (e.g., other racial groups, other education levels, living in a home with a firearm, marital status, employment status, income, prior military or law enforcement).

*Explicit racial bias about women with handguns and association with implicit racial bias*

The estimated weighted proportion of US adults expressing positive (52.6%,95%CI=[49.21,56.03]) or neutral (40.0%,95%CI=[36.74,43.44]) explicit feelings towards Black women was high (**Figure2a**). However, far fewer reported that they thought women were competent with handguns, especially Black women (21.6%,95%CI=[18.81,24.68]) compared to Black men (35.4%,95%CI=[32.12,38.72]) and White men (39.8%,95%CI=[36.53,43.22]) (**Figure2b)**. We found minimal differences in the weighted proportions of three explicit bias measures (handgun competency, racial importance for handgun safety, gender importance for handgun safety) between groups with anti-Black implicit bias, no racial bias, or pro-Black bias about women with handguns (**Figure3**). About 19.1% of US adults with anti-Black bias rated Black women as being competent with handguns (95%CI=[15.9,22.7]) compared to 24.5% of US adults who showed pro-Black bias (95%CI=[17.2,33.7]). We found little to no associations between implicit and explicit bias measures.

*Association between implicit bias and perceptions about women’s safety*

The estimated weighted proportion of US adults expressing a belief that Black women were more likely to experience a number of women’s safety issues (intimate partner violence, community gun violence, sexual harassment or assault, violence at work, other violent crime, non-violent crime) is presented in **Table 1**. The estimated weighted proportion of US adults who perceive Black women to be more likely than White women to experience gun violence in their community ranged from 70.8-64.1% (**Table 1**). A much smaller estimated proportion of US adults viewed Black women as more likely than White women to experience other forms of violence and crime. These estimated differences in the proportion of the US population who perceived that Black women were more likely than White women to experience violence or crime were small between those with anti-Black bias, no racial bias, and pro-Black bias. For example, the weighted proportion of US adults who express a belief that Black women are more likely to experience intimate partner violence ranged from 19.4% among those with no racial bias (95%CI=[14.5, 25.4]) to 22.9% among those with Pro-Black bias (95%CI=[16.0, 31.7]). Overall, the perceptions about risks to Black women were low. The weighted proportion of US adults who express Black women are more likely to experience sexual harassment or sexual assault ranged from 11.4% among those with no racial bias (95%CI=[7.5, 17.0]) to 20.4% among those with Pro-Black bias (95%CI=[13.2, 30.3]).

**DISCUSSION**

Our findings establish a small but significant anti-Black implicit bias about women and handguns among US adults, and these findings demonstrate that US adults perceive women to be less competent with handguns, especially relative to Black or White men. These findings of anti-Black bias about women and handguns are consistent with prior evidence of anti-Black bias associating Black men with danger and weapons (Johnson & Chopik, 2019; Nosek et al., 2007; Sadler & Devos, 2020; Somo et al., 2020). Further, US adults inaccurately assessed safety risks facing Black women, especially intimate partner violence and sexual violence. These perceptions consistently show that US adults underestimate the safety risks that may play a role in a Black women’s decision to possess or own a handgun. These findings have important public health implications.

Prior research shows that racial bias leads to discrimination in encounters with police, networking, the labor market, and health care (Bertrand & Mullainathan, 2004; Block et al., 2021; Bowleg et al., 2020; Hall et al., 2015; Hoekstra & Sloan, 2020). Because discrimination leads to substantial health consequences and early mortality (Williams et al., 2009), future work should seek to examine and measure the consequences of implicit racial bias about Black women with handguns. Our findings also show both racial and gender bias about competence with handguns. While there are mixed findings on firearm skill evaluations across genders (Goldschmied, 2016; Mon-Lopez et al., 2020), actual differences may correlate with differences in opportunities (e.g., shooting sports programs, shooting skills training, firearm-related work tasks) on the basis of gender. Coupled with implicit racism, inaccurate explicit bias about handgun competence may intensity judgments about and reactions to Black women with handguns. Future work should examine whether and how implicit racial bias about women with handguns coupled with explicit assumptions about handgun competence contribute to assumptions of criminality and violence, and other individual-level behaviors (e.g., responses and reactions) not studied here. This work could also help further evaluate and examine public support and opinions about handgun safety policies (Hayes et al., 2021).

In addition, future studies should seek to establish the consequences and harm of these perceptions. This is critically important in the context of high rates of violence against women, particularly Black women. Our findings establish that most US adults do not recognize that Black women are also at higher risk than White women of experiencing intimate partner violence including homicide, sexual harassment, and sexual assault. The prevalence of intimate partner violence is highest among Black women though not significantly different than White and Hispanic individuals (Cho, 2012). Black women are much more likely to experience sexual harassment or assault. Over 40% of confirmed sex trafficking survivors in the US are Black (Banks & Kyckelhahn, 2011), and Black women experience sexual harassment at work at three times the rate for White women (Rossie et al., 2018). Our findings show US adults, regardless of implicit racial bias, far underestimate most safety risks that may play a role in a Black women’s decision to possess or own a handgun.

These safety risks likely play a role in the decision to possess, own, or carry a handgun. Women gun owners are more likely than men gun owners to report protection as a primary and/or only reason for firearm ownership (Horowitz, 2017; Wolfson et al., 2020). In addition, some safety planning and community strategies to combat violence against women (e.g., shelters, law enforcement, protection orders) have centered strategies that improve outcomes for White women but do not necessarily lead to the same improvements in outcomes for Black women (Al’Uqdah et al., 2016; Hampton et al., 2008; Tajima, 2021; Wallin et al., 2021). Future work should examine policies, systems, and safety planning that fail to meet the needs of Black women and whether they increase the likelihood that Black women choose to possess, own, or carry a handgun. At the same time, firearm access may be a key risk factor for firearm-related harm (Studdert et al., 2020). Future work should examine how key findings from this study (inaccurate perceptions about safety risks, racist and gendered perceptions about handgun competence, and anti-Black bias about women with handguns) contribute to harmful reactions from others as well as firearm-related harm among Black women.

This study had limitations. The predictive power of the IAT on actual future behavior is low, similar to most psychological measures, and debate about the predictive validity of the IAT is ongoing (Blanton et al., 2009; Greenwald et al., 2009; Meissner et al., 2019). Future work should evaluate whether implicit racial bias about women and handguns is associated with responses or reactions that harm health and well-being (e.g., discrimination). Social desirability bias may have had a meaningful impact on respondents’ answers to many questions. For example, we found little variation when participants were directly asked about their feelings about Black women, Black men, White women, and White men. Yet the same participants provided quite different responses when asked to indicate how competent they presume Black women, Black men, White women, and White men are with handguns. Neutral options were provided for all questions to build trust with respondents when asking about controversial topics like guns and racial bias. The neutral option was selected in most questions by the majority of respondents; 52.8% of responses on average across thirteen survey questions in this analysis with a neutral option. Future research should seek to explore biases about women with handguns in research settings with mutual respect and trust-building to understand how these results may be impacted by social desirability bias. In addition, our sample may be biased due to sample selection if some invited participants were more or less likely to participate in a study asking about implicit and explicit racial bias. IAT procedures use randomization of all included stimuli, so it is not possible to assess whether these findings are influenced by unmeasured confounding based on facial stimuli (e.g., hair, body type, colorism). However, the Chicago Face Database has demonstrated that factors of the included stimuli reliably capture femininity, masculinity, and Afrocentricity that would be required to make relevant psychological judgements about race and gender. Importantly, the thresholds used to define racial bias are arbitrary but were chosen because lack of racial bias is a desirable societal goal. These results may be sensitive to alternate thresholds, especially those that capture central tendency like standard deviations away from the mean. However, this kind of alternate threshold would be centered around the status quo of anti-Black bias in the US.

Further, implicit racial bias about women with handguns was not associated with measures of explicit bias included in our study. This is consistent with findings demonstrating the need to measure implicit bias especially in the context of intimate partner violence where explicit bias is absent but implicit bias is present and also associated with both IPV perpetration (Eckhardt et al., 2012; Sanchez-Prada et al., 2021). In our study, this may have been a function of correspondence between measures. Correspondence between implicit and explicit bias measures is essential for accurately capturing correlation between implicit and explicit bias because correlations increase with increasing correspondence between the two measures (Gawronski, 2019). Since the explicit bias question about competence with handguns corresponds more closely with implicit bias measured using the RWH-IAT, this suggests that the lack of a relationship between explicit racial and gender bias about competence with handguns and the IAT score is more reliable than the lack of the relationship using broad feelings about people in certain groups. However, the Race-Women-Handguns IAT (RWH-IAT) was designed to measure implicit racial bias. A Race-Gender-Handgun IAT that includes facial stimuli from multiple genders may more closely correspond with explicit bias measures about handgun competence and should be explored in future studies to capture intersectional racial/gender bias about handguns. Lastly and importantly, implicit association tests may measure differences in racial bias, but can also reflect a difference in executive control or a combination of both (Gawronski, 2019; Sherman et al., 2008). It is possible that conducting this study in the post-2020 period of heightened attention to systemic racism has enhanced executive control or recognition of implicit racial bias. In addition, implicit bias scores can change substantially over time or with different priming (Gawronski et al., 2017). Future work should consider the stability of implicit racial bias about women with handguns and explore whether the racial bias demonstrated here is associated with changes in behavior.

**CONCLUSION**

This study provides a useful empirical tool, the Race-Women-Handguns IAT, for future work examining the consequences of implicit racial bias about women with handguns. Our findings demonstrate an anti-Black implicit bias about women and handguns among US adults. In addition to anti-Black bias about women with handguns, US adults explicitly perceive women to be less competent with handguns, especially relative to Black or White men, and US adults underestimate risks facing Black women that may play a role in the decision to possess or own a handgun. This study provides additional clarity about implicitly racist public perceptions at the intersection of race, gender, and gun possession.

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