Racial Essentialism and Stress: A Deadly Combination for Prospective Police Officers' Encounters with Black Suspects

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Abstract

Previous research based on documented incidents of police uses of lethal force and experimental studies using computer sorting programs have demonstrated that incorrect lethal force decisions tend to occur more frequently with Black relative to White suspects. Using virtual reality, the current study examined the psychophysiology underlying incorrect lethal force decision with Black suspects, and the interactive impact of racial essentialism. Forty-nine White criminal justice majors viewed 360 degree videos of high-pressure suspect interactions in VR, from the perspective of the police officer. A virtual police-issued handgun was used to make and record decisions to shoot; incorrect uses of lethal force were operationalized using signal detection theory. Physiological stress (i.e., variance in pupil dilation) and visual attention were measured with embedded eye tracking in the VR. As predicted, physiological stress led to more incorrect uses of lethal force with Black suspects through fixated visual attention, but only among those who scored high on a racial essentialism survey measure. Findings converge with more recent studies supporting the potent interactive role between cognition (e.g., racial essentialism) and affect (i.e., stress) on lethal force decisions with Black suspects. These studies point to the continued role of psychoeducation and cognitive-behavioral interventions in informing police training interventions aimed at mitigating incorrect uses of lethal force with Black men and women.

Keywords Black/African American · Lethal force · Decision-making · Visual attention · Cognitive-behavioral therapy · Physiological stress

Introduction

Recent media attention to police violence toward unarmed Black men and women is unprecedented; social media has apparently exposed a reality of racially disparate uses of lethal force to a more general public (Brown, 2016). Analyses of documented incidents of police shootings generally do find that Black suspects are disproportionately killed relative to White suspects (Fridell, 2016; Holmes, 2022; Holmes et al., 2019; Klinger et al., 2015; Liska & Yu, 1992). However, analyses based on real life incidents may be challenged by the presence of uncontrolled extraneous variables, for example, findings may be specific to the districts in which the data were collected and data sources may vary in how they report or construe incident reports (Holmes, 2022).

Thus, in conjunction with findings based on documented incidents, experimental studies conducted in tightly controlled laboratories have made important contributions by successfully simulating participants' racial biases in real time decisions to use lethal force. Typically in these studies participants sit in front of a computer and respond to still images of Black and White suspects who appear on the screen holding a gun or a benign object (e.g., Correll et al., 2002). A number of experiments demonstrate that both police officer and citizen subjects tend to be quicker to shoot and are more inaccurate in their lethal force decisions when faced with Black relative to White suspects (e.g., Correll et al., 2002, 2007a, 2007b; Plant & Peruche, 2005; Sim et al., 2013).

Of course, these experimental studies are not without their own challenges. In particular, desktop sorting programs are not likely to induce the type of affective states (i.e., physiological stress) or cognitive processes (i.e., visual attention patterns) experienced by police officers' making lethal force decisions within unpredictable, high-pressure

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environments (Akinola & Mendes, 2012; Luini & Marucci, 2015; Nieuwenhuys & Oudejans, 2010, 2011; Nieuwenhuys et al., 2012). In this study, I employ virtual reality (VR) for simulating high-pressure environments, while monitoring participants' physiological responses and attention patterns through embedded eye tracking. A few previous efforts have been made to examine racial bias in lethal force decisions while inducing participants' stress. However, this body of work is small and inconclusive regarding whether or not stress mitigates or exacerbates police officers' racial bias in shooting decisions (Akinola & Mendes, 2012; Luini & Marucci, 2015).

One possibility is that the extent to which stress impacts racial bias in lethal force decision-making depends on the extent to which participants essentialize race, for example, believing Black people are naturally aggressive and volatile. Research on "attentional control theory" suggests that when under stress, people tend to disproportionately allocate visual attention to stimuli they deem to be threatening (Eysenk et al., 2007; Nieuwenhuys & Oudejans, 2010; Simonovic et al., 2018; Vickers & Lewinski, 2012). It stands to reason that people who essentialize race will thus over-attend (i.e., fixate) on Black suspects leaving less attentional resources for attending to the social context which could provide necessary information for making the correct decision. Identifying the way in which racial essentialism, stress, visual attention, and their interactions relate to lethal force decision-making with Black suspects could greatly aid in the development of police training programs aiming to mitigate improper uses of lethal force.

In the following review, I summarize the bodies of research using documented incidents and the experimental psychological research using desktop applications to examine police use of lethal force. I then review the smaller inconclusive literature examining the impact of stress on racial bias in lethal force decisions. Next, I review the supportive studies that support the notion that racial essentialism may adversely impact lethal force decision-making with Black suspects, and the research on attentional control theory suggesting one mechanism (i.e., visual fixation) by which the interaction between essentialism and stress may lead to improper uses of lethal force with Black suspects.

Racial Bias in Lethal Force Decision-Making

Research Based on Documented Incidents

Published analyses using documented incidents of police shootings generally find that Black suspects are disproportionately killed relative to White suspects (Fridell, 2016; Holmes, 2022; Holmes et al., 2019; Klinger et al., 2015; Liska & Yu, 1992). Further analyses of these data have been

conducted in efforts to understand the cause of these disparities, however, these findings have been inconsistent. For example, Klinger et al. (2015) analyzed incidents of police officer involved shootings in St. Louis from 2003 to 2012 and found that higher levels of community violence within Black communities accounted for higher incidents of police use of lethal force; the researchers suggests that higher levels of police use of lethal force in Black communities may simply be a result of greater objective levels of threat of violence toward officers (Klinger et al., 2015). Other studies, however, have found communities with larger Black populations to experience higher levels of police uses of lethal force even when controlling for measures of "objective threat" such as levels of community violence (Holmes et al., 2019; Liska & Yu, 1992); these findings suggest that higher levels of police use of lethal force in Black communities may result from police officers' *subjective* perceived levels of threat of violence from Black suspects, such as their stereotyped assumptions that Black people will be dangerous.

It is difficult to reconcile these disparate findings from research based on documented incidents of police uses of lethal force. For example, it is possible findings are specific to the districts in which the analyses were conducted. These studies, relying on reports from within police agencies, may also be hampered by coverage or underreporting (Holmes, 2022). Thus, crowdsourced data could be particularly valuable (Holmes, 2022). Since January of 2015 the *Washington Post* has maintained a publicly available record of every lethal police encounter in the U.S. An analysis of these data at the time of this writing reveals that Black men and women comprised 22.9% of these deaths by police, despite being only approximately 13% of the U.S. population. Moreover, among Black citizens killed by police, 8.8% were unarmed; among the White citizens killed by police, 5.9% were unarmed. Moreover, among Black citizens killed by police, 45% were fleeing while killed; among the White citizens killed by police, 35.8% were fleeing while killed.¹ Higher proportions of Black suspects who are unarmed and/or fleeing when killed poses a serious challenge to the objective threat perspective. Nonetheless, crowdsourced data are not without limitations, for example, there are inconsistencies across datasets with regard to how police uses of lethal force are defined, and, these datasets often do not include police officer characteristic variables (e.g., officer race, experience level) that could be helpful for understanding how and why police officers make biased decisions to use lethal force (Holmes, 2022).

¹ The Washington Post data downloaded at the time of this writing and the syntax used to run these analyses can be accessed at: https://osf.io/xnzd3/?view_only=489f01f4eb4b46529de25e4a193cf353

Research Based on Experimental Laboratory Studies

Thus, experimental research conducted within tightly controlled laboratories has the potential to bridge these gaps in our understanding, including contributing to our understanding of how police officer characteristics, attitudes, and behaviors may relate to biased decisions to use lethal force. In experimental laboratory studies, researchers can examine police officer or subject decision-making in real time, manipulating only the suspect race and keeping all other potential sources of variance constant. The vast majority of experimental research within psychology on police use of lethal force has used computerized sorting tasks in which subjects are presented with images of both Black and White suspects who are either armed or unarmed. For example, Correll's paradigm—which is undoubtedly the most widely used in this body of research—includes images of Black and White volunteer undergraduate models, holding either a gun or a harmless object in various poses (Correll et al., 2002). The program randomly selects a background (e.g., train station, park) against which one of the figures appears in a random location. Participants indicate either “shoot” or “don't shoot” by pressing corresponding buttons on a keypad, while a computer script records the number of incorrect decisions. Paradigms such as Correll's lend themselves to a variety of outcome measures.

Lethal force decision variables are computed as the ratios of incorrect to correct decisions to shoot and include *Wrongful Shootings* (WS; i.e., errors in which a participant shoots an unarmed suspect) and *Failure to Shoot* (FS; i.e., errors in which a participant fails to shoot an armed suspect). Studies using these outcomes do tend to find higher WS rates with Black suspects than White suspects (Ma & Correll, 2011; Miller et al., 2012; Plant & Peruche, 2005; Plant et al., 2005). For example, Plant and Peruche (2005) found police officer participants to be more likely to shoot unarmed Black than unarmed White suspects. Only one of these studies found racial disparities in FS rates; Ma and Correll (2011) found participants to fail to shoot White suspects at a higher rate than Black suspects.

Another approach for analyses applies signal detection theory (SDT) in which wrongful shooting and failure to shoot rates are combined to create two alternative outcome variables, *Shooting Sensitivity* (SS) and *Shooting Threshold* (ST). SS reflects the participants' ability to differentiate armed from unarmed suspects and ST reflects the degree to which participants favor a “shoot” rather than a “don't shoot” response. For both SS and ST, two scores are calculated (see [methods](#) section for exact calculation procedures), one in relation to Black suspects and one in relation to White suspects. Using SDT, two studies have found participants to have greater difficulty differentiating armed from unarmed Black suspects compared to White suspects (i.e., SS; Sadler

et al., 2012; Sim et al., 2013); however, most report null findings with regard to racial bias in SS (Correll et al., 2002, 2007a, 2007b; Luini & Marucci, 2015; Plant & Peruche, 2005; Sadler et al., 2012). More consistently, research has found that participants have lower shooting thresholds toward Black suspects compared to White suspects (i.e., ST; Correll et al., 2002, 2007a, 2007b; Plant & Peruche, 2005; Sim et al., 2013). For example, both citizen and police samples had negative ST scores that were significantly different from zero—indicating bias toward a tendency to shoot—when faced with Black suspects, but not when faced with White suspects (Correll et al., 2007b).

Stress and Racial Bias in Lethal Force Decisions

Despite the valuable contributions of these previous studies for furthering our understanding of racial bias in police decisions to use lethal force, one challenge is that completing desktop sorting programs are not likely to induce the type of affective states (i.e., physiological stress) or cognitive processes (i.e., visual attention patterns) experienced by police officers making lethal force decisions within unpredictable, high-pressure environments. A small body of research has examined participants' lethal force decisions while under stress-inducing conditions (Akinola & Mendes, 2012; Luini & Marucci, 2015; Nieuwenhuys & Oudejans, 2010, 2011; Nieuwenhuys et al., 2012). For example, participants completing a sorting task similar to Correll's while under pressure from a “shootback cannon” (which fired small plastic bullets at the subject) were more likely to shoot unarmed suspects, and shot faster and less accurately than participants completing the task without the shootback cannon (Nieuwenhuys et al., 2012).

Studies that specifically examine if induced stress exacerbates racial disparities in lethal force decisions are sparse and inconclusive (Akinola & Mendes, 2012; Luini & Marucci, 2015). In one study, civilian and police officer participants who completed a stress-inducing task before completing a task similar to Correll's paradigm had faster response times shooting Black suspects relative to White suspects (Luini & Marucci, 2015), suggesting higher levels of racial bias under stress conditions. In another study using a similar design, participants who were under stress before completing Correll's shooting task were more likely to shoot Black armed suspects compared to White armed suspects; however, higher levels of stress (as indicated by increased cortisol levels) correlated with *fewer* incorrect decisions to shoot with Black armed (but not White armed) suspects, as well as greater ability to differentiate armed from unarmed Black suspects (Akinola & Mendes, 2012).

It is difficult to reconcile these contradictory findings, particularly given the scarcity of studies. Perhaps there is some unmeasured variance across studies impacting the

outcomes; one possibility is that the extent to which stress impacts lethal force decisions with Black suspects depends on the extent to which participants essentialize race. Racial essentialism is the tendency to group people into distinct racial categories and to ascribe inherent trait characteristics toward members of these groups (Bastian & Haslam, 2006; Tawa, 2017) such as the ascription of threatening traits such as inherent “aggression” or “violence” to Black people (Correll et al., 2006; Eberhardt et al., 2004). There is supportive research to suggest that people who essentialize race may be more likely to experience Black suspects as threatening, adversely impacting lethal force decisions with Black suspects. In a study using the Correll shooting task, participants shot armed Black suspects faster than armed White suspects and this difference was mediated by physiological responses (measured via event related potentials) consistent with perception of threat during trials with Black suspects. Moreover, racial bias in shooting decisions were significantly more pronounced among people who endorsed stereotypes of Black people as aggressive, violent, and dangerous (Correll et al., 2006). In what follows I first consider the direct impact racial essentialism may have on lethal force decisions, and then examine supportive research suggesting a potentially deadly interaction between stress and racial essentialism.

Racial Essentialism and Lethal Force Decisions

Research suggests that racial essentialist beliefs are quite common; for example, among a community sample of 575 adults, Tawa (2018) found over 50% to agree with the notion that races are genetically distinct from one another and over 30% to agree with the notion that racial groups have distinct behavioral tendencies. A growing body of research has demonstrated that racial essentialism is predictive of a variety of adverse intergroup outcomes including: greater discomfort interacting with outgroup members (Tawa, 2017), less willingness to relate with outgroup members (Donovan, 2017; Williams & Eberhardt, 2008) and less actual diversity within their close relationships (Deeb et al., 2011; Pauker et al., 2018; Tawa et al., 2020; Williams & Eberhardt, 2008). I am not aware of research that has directly linked racial essentialism to punitiveness or aggression toward outgroups; however, the related concept of “dehumanization” has (Goff et al., 2008, 2014; Haslam & Loughnan, 2014; Mekawi et al., 2015). Dehumanization could be conceptualized as a more specific form of racial essentialism insofar as people who endorse this belief set do think of other racial groups as naturally distinct, for example, denying Black people human characteristics such as higher order intelligence and likening Black people to animals (i.e., apes; Haslam & Loughnan, 2014). Establishing the influence of the more general construct of racial essentialism on lethal force decisions is

particularly valuable given the prevalence of endorsement of racial essentialism.

There is research to demonstrate that dehumanization of Black people does lead to more punitive and even lethal outcomes in a policing context. For example, Goff et al. (2008) found that participants were more likely to condone a police assault when primed with images of apes compared to big cats, but only when they believed the victim was Black rather than White. Goff et al. (2014) also found that among police officer participants, implicit associations between Black faces and apes were related to overestimations of Black suspects’ ages in a criminal case scenario (a picture and description) and higher levels of perceived culpability for the crime. Consistently, Mekawi et al. (2015) found that fear of people of color predicted a tendency to shoot Black suspects (using a computer task similar to the studies described above), but only among people who associated Black faces with animal/nature words. Mekawi et al.’s (2015) study is particularly notable in that they examined the interactive role of affect (in their case, self-reported fear) and dehumanization in what they aptly refer to as a “lethal combination.” Like Mekawi et al.’s (2015) study, the current study seeks to improve our understanding of police officers’ decision-making processes by examining the role of affect (i.e., stress) in combination with cognitive process (i.e., beliefs about race and visual attention). Below I discuss some supportive research suggesting one mechanism by which stress in combination with racial essentialism may be particularly deadly: a fixated visual attention.

Stress and Essentialism: A Deadly Combination Through Fixated Visual Attention

Attentional control theory (Eysenk et al., 2007), predicts that when people experience stress, attention becomes fixated on emotionally evocative threatening stimuli leaving less attentional resources for contextual cues that may be necessary for correct decision-making (Akinola & Mendes, 2012; Eberhardt et al., 2004; Nieuwenhuys & Oudejans, 2010; Simonovic et al., 2018; Vickers & Lewinski, 2012). Within policing encounters, the extent to which officers visually fixate on Black relative to White suspects may depend on the extent to which they essentialize race. In one study that I am aware of that has specifically examined visual attention to Black and White suspects in a policing context, Correll (2015) found that while completing the Correll shooting task participants spent less time looking at the object in question (i.e., either the gun or the benign object) before making a decisions during counter-stereotypic trials (i.e., trials with unarmed Black suspects and armed White suspects) compared to stereotypic trials (i.e., trials with armed Black suspects and unarmed White suspects). Presumably the race of the suspect provided—often erroneously—the information

deemed necessary to make a decision about whether or not to shoot.

Although not specific to a policing context, other studies have examined racial bias in attention using an attentional cueing task (Donders et al., 2008; Trawalter et al., 2008). For example, Trawalter et al. (2008) provided participants with images of either Black or White faces appearing on the left or right of a computer screen; face image presentations were followed by a momentary blurring mask and then presentation of a target dot which also occurred on the left or right of the screen. Participants in this study made faster correct identifications of the target dot when located on the same side of the screen as Black faces relative to White faces (Trawalter et al., 2008). Participants' inclination to be orienting toward the dot location but only following presentation of a Black face stimulus suggests greater visual attention to Black faces. Donders et al. (2008) using a similar task found that White participants who had higher implicit associations of Black faces with danger (on a separate task) demonstrated greater attention to Black faces on the attentional cueing task. This study, in particular, suggests that the extent to which participants' bias attention toward Black suspects may depend on the extent to which Black suspects are essentialized as a source of threat. Below, I outline the four hypotheses in this study:

Hypotheses

H₁ Stress will be related to greater attention to Black suspects, lower levels of sensitivity, lower shooting thresholds, and more wrongful shootings with Black suspects.²

H₂ Belief in racial essentialism will be related to greater attention to Black suspects, lower levels of sensitivity, lower shooting thresholds, and more wrongful shootings with Black suspects.

H₃ Stress will interact with racial essentialism such that among those higher in racial essentialism, greater stress will be more strongly related to greater attention to Black suspects, lower levels of sensitivity, lower shooting thresholds, and more wrongful shootings with Black suspects compared to those who are lower in racial essentialism.

H₄ Attention to Black suspects will mediate the relationships between stress while interacting with Black suspects and lower levels of sensitivity, lower shooting thresholds

toward Black suspects, and more wrongful shootings with Black suspects.

Method

For this study I filmed a series of scenarios of suspect-police interactions with a 360° video camera. When the 360° videos are viewed through a VR headset, the participant is embedded in a series of highly realistic, high-risk suspect encounter scenarios from the perspective of a police officer. Eye tracking technology integrated within the headset (offered by Tobii pro) allows for compilation of raw data related to pupil dilation and eye-gaze while participants interacted in the suspect encounter scenarios. A program was built in Unity which introduced participant to the study and their task, lead participants through two practice scenarios, and then the 12 scenarios. Prior to beginning each scenario, participants were provided with text in the VR offering a brief stage setting for each scene. Scene descriptions are available in Appendix A, which can be accessed online at: https://osf.io/xnzd3/?view_only=489f01f4eb4b46529de25e4a193cf353. In addition to the program in Unity, two separate programs were developed in Python, one to determine the metric of stress (based on pupil dilation raw data) and one to determine the metric of attention (based on eye tracking coordinates).

Scenarios were scripted and filmed using volunteer theater majors at a nearby university and include scenes such as traffic stops and street altercations. Scenarios were filmed once featuring a White suspect and again featuring a Black suspect. To avoid the obvious order effect problem, which would occur if a participant views one scenario with, for example, the White suspect but then the same scenario with the Black suspect, I constructed two “sets” of 12 unique scenarios. Within each set of 12 unique scenarios, 6 include a Black suspect and 6 include a White suspect.³ Each scenario is 30 s long and unfolds such that a decisive stimulus (a gun or benign object) appears at the 28 s mark.

Participants

Participants were 49 White criminal justice majors recruited from a University in the Northeast with a strong criminal justice program. Participants were majority males (69.4%)

² Outcomes related to failure to shoot rates will be explored across all hypotheses.

³ A series of preliminary between-subjects analyses found that differences in behavior toward Black and White suspects depended significantly on set-assignment limiting the capacity to discern if differences in behavior toward Black and White suspects was due to the suspects' race or set assignment. Thus, the current analyses focused only on predictors of behavior toward Black suspects.

and predominantly U.S. born (98.0%).⁴ Approximately half (49.0%) of the participants had previously used VR. Participants spent an average of 1.73 h ($SD = 1.29$) per week playing first-person shooter games.

Procedures

Participants signed informed consent and were then brought into an isolated room and given a hand controller, which is depicted in the VR as a police-issued handgun and used for recording decisions to shoot. Participants were then fitted with the VR headset. Participants were told that they should use lethal force (shoot) if their own or if someone else's life is in danger. Following Correll et al.'s (2002) procedures, participants were awarded points for correctly shooting a suspect with a gun and for not shooting a suspect holding a benign object, and were deducted points for shooting a suspect holding a benign object and for not shooting a suspect holding a gun. All participant received \$10 for completing the study; participants who scored a total of 30 or higher received an additional \$10 and those who score a total of 60 or higher received an additional \$25. Following completion of the shooter task, participants completed a questionnaire. All procedures were completed in compliance with the approved Institutional Review Board protocol.

Measures

Physiological Stress

When people experience increases in stress or cognitive load they produce greater variability in pupil diameter (Aminihajibashi et al., 2019; Hershman et al., 2018; Krejtz et al., 2018). Thus, consistent with previous studies physiological stress while interacting with Black suspects was determined as the standard deviation of pupil diameter occurring across all scenes with Black suspects (Aminihajibashi et al., 2019; Krejtz et al., 2018). Pupil diameters are sampled at every 8.33 ms. Among the current sample, the average stress score was 0.0004 ($SD = 0.00009$). Scores were multiplied by 1000 to ease interpretation and ranged from 0.25 to 0.72 ($M = 0.39$; $SD = 0.10$).

Attention to Black Suspects

A script was written to define Areas of Interest (AOIs) in the virtual environment [unpublished manuscript available upon

request]. Suspects were determined as an AOI by “drawing” a polygon that tightly fit around the suspect. The eye tracker in the VR samples eye-gaze coordinates at every 8.33 ms. Attention to Black suspects was determined as the percentage of time that participants' gaze fell within the Black suspect AOI over the course of the trial. To compute this variable for each participant, percentages of each 30 s trial that was spent looking at the Black suspect were averaged across all trials. Scores on this variable ranged from 0.24 to 0.57 ($M = 0.40$; $SD = 0.07$).

Lethal Force Decisions with Black Suspects

Wrongful shootings were determined when a participant shot an unarmed Black suspect or when a participant shot an armed Black suspect before the gun was revealed during the final 2 s of the scenario. The wrongful shooting rate (WS) was calculated by dividing the number of wrongful shootings plus 0.5 (in order to eliminate the possibility of a 0 in the numerator) by the number of trials with Black suspects (i.e., 6). Scores ranged from 0.08 to 0.42 ($M = 0.15$; $SD = 0.11$). Failures to shoot were determined when a participant failed to shoot a suspect who was armed. The failure to shoot rate (FS) was calculated by dividing the number of failures to shoot plus 0.5 by number of trials with armed Black suspects (i.e., 3). Scores ranged from 0.17 to 1.17 ($M = 0.58$; $SD = 0.32$).

Shooting sensitivity (SS) and shooting threshold (ST) scores were based on all scenes with Black suspects. SS is calculated as the standardized proportion of correct decisions to shoot (CS) to failures to shoot (FS), minus the standardized proportion of wrongful shootings (WS) to correct restraint (CR) [$SS = \frac{zCS}{zFS} - \frac{zWS}{zCR}$], and ST is calculated as the standardized proportion of correct decisions to shoot (CS) to failures to shoot (FS), plus the standardized proportion of wrongful shootings (WS) to correct restraint (CR), multiplied by -0.05 [$ST = -0.05 \left(\frac{zCS}{zFS} + \frac{zWS}{zCR} \right)$]. For SS, higher scores indicate a stronger ability to differentiate a gun from a benign object. Scores on SS ranged from -3.21 to 1.85 ($M = 0.00$; $SD = 1.52$). For ST, lower scores indicate a tendency to favor shooting responses regardless of whether or not the suspect was armed. Scores on ST ranged from -0.18 to 0.12 ($M = 0.00$; $SD = 0.07$).

Belief in Racial Essentialism

Belief in racial essentialism was measured using the beliefs about race scale (BARS; Tawa, 2017), which assess people's belief in racial groups as genetically distinct. A sample item is: “During an autopsy, the race of a person can be determined by examining bone structure.” This scale is comprised of 16 items that are scored on a 6-point Likert scale with

⁴ A question about participants' age was not included in the demographic survey, which was an oversight.

Table 1 Correlations among study variables

	1	2	3	4	5	6	7	8
1. PD	–	– .05	.02	– .01	.14	– .09	.10	– .02
2. BAR		–	– .22	– .08	.14	– .03	.15	.04
3. ATT			–	– .32*	– .10	.31*	.18	.07
4. WS				–	.15	– .76**	– .65**	– .39**
5. FS					–	– .76**	.65**	– .22
6. SS						–	.00	– .40**
7. ST							–	.13
8. FPS								–

PD pupil dilation (standard deviation). BAR beliefs about race (Tawa, 2017), ATT visual attention to Black suspects, SS shooting sensitivity, ST shooting threshold, WS wrongful shooting rate, FS failure to shoot rate, FPS average hours per week spent playing first-person shooter games

** $p < .01$; * $p < .05$

responses ranging from “strongly disagree” (1) to “strongly agree” (6). Thus the possible range of computed scores is 16 to 96; scores in the current sample ranged from 24 to 76 ($M = 44.73$; $SD = 11.59$). The Cronbach internal reliability estimate with the current sample was 0.79.

Results⁵

Preliminary Analyses

As preliminary analyses I examined how participant demographics and previous use of VR and first-person shooter games related to primary study variables so that they could be controlled in further analyses if needed. Multivariate analyses of variance with the four outcome variables entered as dependent variables (WS, FS, SS, and ST) determined that gender [$F(2, 46) = 0.50$; $p > 0.05$; $\eta_p^2 = 0.02$] and previous use of a VR [$F(2, 46) = 0.20$; $p > 0.05$; $\eta_p^2 = 0.009$] were not significantly related to the outcome variables. Gender was also unrelated to stress [$F(1, 47) = 0.30$; $p > 0.05$; $d = 0.17$] and attention to Black suspects [$F(1, 47) = 1.74$; $p > 0.05$; $d = 0.41$]. Previous use of a VR was also unrelated to stress [$F(1, 47) = 0.20$; $p > 0.05$; $d = 0.13$] and attention to Black suspects [$F(1, 47) = 0.02$; $p > 0.05$; $d = 0.04$]. Average hours spent per week playing first-person shooter games was related to greater SS ($r = 0.40$; $p < 0.01$) and fewer wrongful shootings ($r = -0.39$; $p < 0.01$), and was unrelated to all other study variables (see Table 1). First-person shooter use (FPS) was thus controlled in all future analyses using the SS and WS outcomes.

Hypothesis Testing

Hypotheses 1 and 2 were examined using Pearson’s correlations. Neither racial essentialism nor stress while interacting with Black suspects were related to attention to Black suspects nor any of the study outcome variables (i.e., WS, FS, SS, ST). Hypotheses 1 and 2 were not supported.

In hypotheses 3 I considered the interaction of racial essentialism and stress on attention to Black suspects (ATT) and the outcome variables. For these analyses, racial essentialism was dichotomized into two groups, high racial essentialists (1) and low racial essentialists (0). Hypothesis 3 was examined with 5 separate moderation analyses using the bootstrapping method aided by PROCESS version 3.3, model number 1 (Hayes & Preachers, 2014) with a bias-corrected 95 percent confidence interval with 1000 resamples to determine significance. For each outcome variable (ATT, WS, FS, SS, and ST), stress was entered as the independent variable and racial essentialism (RE) was entered as the moderator. For the SS and WS outcomes only, average hours per week playing first-person shooter games (FPS) was entered as a covariate. RE significantly moderated the relationship between stress and attention to Black suspects ($t = 2.49$; $p < 0.05$); for people low in RE, the relationship between stress and ATT trended in a negative direction ($t = -1.59$; $p = 0.12$), while for people high in RE, the relationship between stress and ATT trended in a positive direction ($t = 1.93$; $p = 0.06$; see Fig. 1). RE did not moderate the relationship between stress and wrongful shooting rate ($t = 1.22$; $p > 0.05$), failure to shoot rate ($t = -0.33$; $p > 0.05$), SS ($t = -0.43$; $p > 0.05$), or ST ($t = -1.37$; $p > 0.05$).

In hypothesis 4 I considered the potential mediating role of attention to Black suspects on the relationship between stress and shooting decisions. Given that the relationship between stress and ATT varied by level of RE, I tested these hypotheses with a series of moderated mediations whereby the mediating role of ATT on the relationship between stress

⁵ All data and syntax for analyses are publicly available at: https://osf.io/xnzd3/?view_only=489f01f4eb4b46529de25e4a193cf353

Fig. 1 The moderation of essentialism on the relationship between stress and attention to black suspects

Table 2 The mediating role of attention on the relationship between stress and wrongful shooting rates at high and low levels of essentialism

	Coeff	SE	LLCI	ULCI
<i>Independent effects</i>				
Stress	-.16	.18	-.53	.21
Attention	.30*	.15	.01	.60
Essentialism	-.10	.27	-.64	.45
Stress × essentialism	.12	.28	-.44	.69
First-person shooter (cov)	-.40**	.13	-.67	-.14
<i>Conditional direct effect</i>				
Low essentialism	-.16	.18	-.53	.21
High essentialism	-.03	.20	-.44	.37
<i>Conditional indirect effects</i>				
Low essentialism	-.09	.07	-.26	.02
High essentialism	.12 ^{tm}	.12	-.002	.34

Model summary [$R = .52$ $F(5, 43) = 3.26$; $p = .01$]

^{tm}[index of moderated mediation = .21 ($SE = .14$); CI(95) .01–.54]

** $p < .01$; * $p < .05$; ^t $p < .10$

and shooting decisions was examined at different levels of RE. A total of 4 moderated-mediation analyses were run, again using the bootstrapping method aided by PROCESS version 3.3, model number 8 (Hayes & Preacher, 2014) using a bias-corrected 95 percent confidence interval with 1000 resamples to determine significance. For each shooting outcome variable (WS, FS, SS, and ST), stress was entered

Table 3 The mediating role of attention on the relationship between stress and failure to shoot rates at high and low levels of essentialism

	Coeff	SE	LLCI	ULCI
<i>Independent effects</i>				
Stress	.22	.21	-.19	.64
Attention	.26	.16	-.07	.58
Essentialism	.27	.30	-.35	.87
Stress × essentialism	-.27	.30	-.90	.36
<i>Conditional direct effect</i>				
Low essentialism	.22	.21	-.19	.64
High essentialism	-.05	.22	-.50	.40
<i>Conditional indirect effects</i>				
Low essentialism	-.08	.06	-.21	.04
High essentialism	.10 ^m	.09	-.02	.33

Model summary [$R = .26$ $F(4, 44) = .82$; $p = .52$]

^m[Index of moderated mediation = .17 ($SE = .13$); CI(95) -.03 to .47]

** $p < .01$; * $p < .05$

Table 4 The Mediating role of attention on the relationship between stress and shooting sensitivity at high and low levels of essentialism

	Coeff	SE	LLCI	ULCI
<i>Independent effects</i>				
Stress	-.06	.18	-.43	.31
Attention	-.38*	.14	-.68	-.09
Essentialism	-.10	.27	-.64	.45
Stress × essentialism	.14	.28	-.42	.71
First-person shooter (cov)	.43**	.13	.16	.69
<i>Conditional direct effect</i>				
Low essentialism	-.06	.18	-.43	.31
High essentialism	.08	.20	-.32	.48
<i>Conditional indirect effects</i>				
Low essentialism	.12	.08	-.02	.27
High essentialism	-.15 ^{tm}	.11	-.41	-.004

Model Summary [$R = .53$ $F(5, 43) = 3.40$; $p = .01$]

^{tm}[index of moderated mediation = -.26 ($SE = .15$); CI(95) -.61 to -.03]

** $p < .01$; * $p < .05$

as the independent variable, ATT as the mediator, and racial essentialism (RE) was entered as the moderator. Indices of moderated mediation (IMM) were examined for each model to determine significance.

ATT did mediate the relationship between stress and WS, but only at high levels of RE [IMM = 0.20; CI95 (0.01–0.54)]; at lower levels of RE the indirect effect of ATT was insignificant in a negative direction [IE = -0.09; CI95 (-0.26 to 0.01); see Table 2], while at higher levels of RE the indirect effect of ATT was marginally significant ($p = 0.05$) in a positive direction [IE = 0.12; CI95 (-0.002

Table 5 The mediating role of attention on the relationship between stress and shooting threshold at high and low levels of essentialism

	Coeff	SE	LLCI	ULCI
<i>Independent effects</i>				
Stress	.33	.20	– .08	.74
Attention	– .01	.16	– .33	.32
Essentialism	.25	.30	– .36	.86
Stress × essentialism	– .39	.31	– 1.02	.23
<i>Conditional direct effect</i>				
Low essentialism	.33	.21	– .08	.74
High essentialism	– .07	.22	– .51	.38
<i>Conditional indirect effects</i>				
Low essentialism	.00	.05	– .08	.12
High essentialism	.00 ^m	.07	– .14	.16

Model Summary [$R = .27$ $F(4, 44) = .90$; $p = .48$]

^m[index of moderated mediation = .00 ($SE = .11$); $CI(95) = .24$ to .23]

** $p < .01$; * $p < .05$

to 0.34)]. ATT, however, did not mediate the relationship between stress and FS at any level of RE (see Table 3). ATT did mediate the relationship between stress and SS, but only at high levels of RE [IMM = – 0.26; CI95 (– 0.61 to – 0.03)]; at lower levels of RE the indirect effect (IE) of ATT was insignificant in a positive direction [IE = 0.11; CI95 (– 0.02 to 0.27)], while at higher levels of RE the indirect effect of ATT was significant in a negative direction [IE = – 0.15; CI95 (– 0.41 to – 0.003); see Table 4]. ATT also did not mediate the relationship between stress and ST at any level of RE (see Table 5).

Discussion

To briefly summarize results, neither stress nor racial essentialism had a direct impact on attention to Black suspects or any of the lethal force shooting outcomes with Black suspects. In combination, however, they did. At high levels of racial essentialism, findings support the hypothesized adverse impact of stress on both wrongful shooting and shooting sensitivity outcomes, and mediation analyses support that the mechanism by which stress adversely impacts shooting decisions is through greater attention to Black suspects. Yet, there was also some evidence to suggest that at low levels of racial essentialism, stress unexpectedly had a *beneficial* impact on shooting decisions. At lower levels of racial essentialism, the indirect effect of attention to Black suspects was insignificant, but notably, the pattern of relationships trended in the reverse direction such that more stress related to *less* attention to Black suspects, which in turn was related to fewer wrongful shootings and greater shooting sensitivity.

Certainly the notion that stress can both impair and improve performance more generally is not at all a new idea (Corbett, 2015; Regeher et al., 2008). Indeed, at a physiological level stress and heightened cognitive activity (i.e., cognitive load) are not distinct and are simultaneously captured in variation in pupil dilation (Aminihajibashi et al., 2019; Krejtz et al., 2018). Perhaps then, in the absence of unwarranted beliefs about Black dangerousness, participants have some freedom to allocate cognitive resources to the detection of social contextual cues within the high-pressure environment that might provide clues to the suspect's actual dangerousness or innocence. Of course some attention to suspects is necessary for correct decision-making, but it appears that participants who were most successful in their decision-making were able to find a minimal threshold for necessary attention to the suspect while leaving additional attentional resources to the context.

The “minimal threshold” point above begs the question: how much attention is enough? Although beyond the scope of the current study, closer examination of the role of attention—either in a non-linear or longitudinal capacity—could be a very fruitful future research direction. A closer look at the “attentional control theory” literature suggests that fixative responses to threatening stimuli frequently occur in the early stages of attention (Bean et al., 2012; Trawalter et al., 2008). For example, using an attentional cueing paradigm, Bean et al. (2012) found that among White participants, higher anxiety (compared to lower anxiety) participants attended to Black faces during early stages and actually tended to avoid looking at the Black faces in later stages. Perhaps then, maladaptive attention patterns are not so much best characterized by the sum total of viewing time of suspects but rather by a recognizable pattern of more rigid attention (i.e., fixation early, avoidance later) rather than more fluid attention across the event duration.

Perhaps the most encouraging aspect of the current study is that while racial essentialism had a pronounced, detrimental consequence on decisions to use lethal force, there is considerable emerging research to suggest—quite simply—that racial essentialist views can be mitigated through education (Donovan, 2017; Donovan et al., 2019; Tawa et al., 2020; Tawa, 2016, 2020). For example, in a recent study, among a community sample of adults, watching just a 10 min video on the social construction of race was effective for reducing the belief in races as biologically and genetically distinct (Tawa, 2020). Whether or not such learning experience actually translate into improvements in intergroup behavior that has been associated with racial essentialism (e.g., less interaction across races; Deeb et al., 2011; Pauker et al., 2018; Tawa et al., 2020; Williams & Eberhardt, 2008) still remains to be borne out in future research.

It is notable here that the participants in the current study were in fact criminal justice majors in college and were not

police officers. It is unclear how much exposure the students in this study had to education about the social construction of race, but the relatively wide variance in racial essentialism scores suggests that it was likely quite varied among the students. Certainly, future research should continue to examine the impact of racial essentialism on lethal force decisions with active police officers and academy recruits. For example, it would be particularly interesting to examine how beliefs about race are shaped within police academy socialization experiences which may discourage individual or critical thinking in favor of depersonalization, “non-civilian” attitudes and behaviors, and deference to the hierarchical structure of the police profession (Conti, 2009). Thus, it could be tremendously valuable for future researchers to examine the extent to which early educational efforts on the social construction of race—perhaps during primary or secondary education—persist (or fail to persist) within a police officers’ training experiences, and the extent to which early education on race may be related to improved community relations and of course fewer instances of improper uses of force with Black suspects later on in the officers’ careers.

It is also notable that participants in the current study were limited to White participants; this decision was a matter of statistical power and is not intended to suggest that non-White police officers are not also capable of racial essentialist views, stereotyping, and incorrect decisions to use lethal force on Black suspects (Mbuba, 2018). Yet, I would argue that the mechanisms through which non-White police officers make biased decisions to use lethal force are likely to be quite different than White police officers, for example, they may include processes of racial conformity (Helms, 1995) and/or internalized racism based on their own experiences of racism (Bailey et al., 2021). Exploration of such processes would warrant a full sample of non-White participants, and would be a fruitful future direction for researchers.

There is a reasonable question regarding the interpretation that people high in racial essentialism would be more likely to perceive Black suspects as threatening, “perception of Black people as threatening” was not directly measured but only inferred from the measure of racial essentialism and physiological stress data. The hypothesized impact of racial essentialism in the literature review was buttressed by the body of supportive research on dehumanization which has more specifically examined people’s perception of Black people as aggressive, dangerous, and threatening. While undoubtedly a more direct assessment of Black people as threatening would be beneficial to the analysis, assessment of this sort is not without challenges; critically, assessments of prejudice and stereotype trait endorsement are plagued with social desirability challenges and consequently has typically been measured through implicit association tests (Goff et al., 2008, 2014; Mekawi et al., 2015). In fact, one of

the compelling aspects of the study of racial essentialism is that it is *not* met with the same social desirability challenge as more direct measures of prejudice or stereotype endorsement (Tawa, 2017). It seems that while people are aware that it is not socially desirable to endorse views of Black people as dangerous and threatening, people feel relatively comfortable stating that racial groups are genetically distinct. This may explain the relative pervasiveness of racial essentialist beliefs described earlier (Tawa, 2018). Thus, I believe there is tremendous benefit to continuing to examine the role of racial essentialism in lethal force decision-making.

Findings in this study are encouraging and converge with more recent findings demonstrating a potent interactive impact of affect (e.g., stress, fear) and cognition (e.g., beliefs about race, dehumanization; e.g., Mekawi et al., 2015). In addition to psychoeducational interventions on beliefs about race and implicit bias, cognitive-behavioral interventions could be particularly effective for disrupting the fixated attentional processes found in the current study. Tobon et al. (2011) review 10 studies that have empirically supported cognitive-behavioral interventions for attentional bias (i.e., the tendency to focus on threatening stimuli) in anxious adults. Common applications included cognitive restructuring to lessen associations of the stimuli as threatening and systematic and gradual exposure to the threatening stimuli. In addition, a key feature of cognitive-behavioral theory is the development of “insight,” including an increasing awareness of the onset of symptoms as a first step toward reduction of symptoms (Grosse-Holtforth et al., 2007). Thus, police officer trainings could help officers become more aware of when their visual attention has become fixated and consciously strive toward more fluid attention. The recommendation of psychological intervention specifically for addressing maladaptive attentional processes converges with recent calls in the literature about the continued application of cognitive-behavioral interventions more broadly for reduction of bias in police lethal force decisions (Papazoglou & Andersen, 2014). In turn, these calls within the literature are supported in recommendations from former President Barack Obama’s 21st Century Policing Task Force report (2015) which emphasized the need for improving police and community relations including social interactional training and implicit bias reduction, and funding has been made available by the Department of Justice to implement such trainings.

The findings in this analysis contribute to filling a gap in the broader research on police use of lethal force; specifically, while previous research using both documented incidents and experimental simulations have primarily focused on the extent to which racial bias exists in police use of lethal force, the focus in the current research is on *how* psychological processes such as cognitive biases and stress inform police decisions to use lethal force. In an effort to position

this research within this broader research, I think it is helpful to address the inherent tension that exists between ecological validity and experimental control (Blascovich et al., 2002); as one introduces greater nuances and variability that are present in real life (ecological validity), one simultaneously compromises laboratory control. If I were to place the previous bodies of research on this continuum, I would suggest that research examining documented incidents of police use of lethal force are the most ecologically valid but suffer the most from experimental control. The most tightly controlled are those studies using computer sorting tasks (e.g., Correll et al., 2002), but their ecological validity is compromised. I believe the current research falls somewhere in the middle of this continuum. Unlike computer sorting tasks, the VR program embeds participants in highly realistic, unpredictable, and high-pressure environments that were successful at inducing heightened affective states.

Yet despite efforts in this study to improve the ecological validity of previous experimental research, participants are nonetheless still making decisions within a laboratory simulation and thus raise questions about the external validity of the findings in this study. We cannot assume that because participants make incorrect decisions to use lethal force in this simulation that they necessarily would have made the same incorrect decision in a real life scenario. One notably relevant difference between virtual and real life police encounters is the relative absence of concern about being shot within virtual environments and, thus, the ways this concern would undoubtedly influence decision-making. Some studies have attempted to simulate concern of being shot (at least to some extent) by actually having machines or actors return fire with fake bullets (e.g., Nieuwenhuys et al., 2012). In this study, similar to the Correll paradigm, this concern was simulated by creating the highest point penalty for failing to shoot an armed suspect which in turn would lower the actual stipend received by the participant. It is unclear how successful these efforts to simulate concern over being shot have been in this experimental literature. For example, even if the point system was effective in the current study for producing variations in stress among participants, it is possible that this stress was an unintended byproduct resulting from, for example, a participants' desire to earn money, or perhaps even concern of the ethics of the study. I am not aware of efforts in previous research to systematically test the differential effects of these simulation efforts; however, I suspect this would be a fruitful direction for future research. Qualitative and subjective feedback from police officers with previous experience in armed encounters could be particularly valuable here.

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Declarations

Conflict of interest The author has no conflicting interests that might be interpreted as influencing the research, and APA ethical standards were followed in the conduct of this study. All data, syntax for analyses, and an appendix can be accessed at https://osf.io/xnzd3/?view_only=489f01f4eb4b46529de25e4a193cf353

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