The Impact of Gun Prevalence and Background Race on Racial Bias in the First Person Shooter Paradigm

by

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Abstract

Laboratory research on the first person shooter task (FPST), requiring participants to make a quick decision whether to shoot at a person who may be carrying a gun, consistently demonstrates a strong bias to shoot at Blacks more than at Whites. In order to enhance external validity, we manipulated the race of the bystander and the probability of the gun. 112 undergraduates were used in the FPST, in which the impact of four variables on Reaction Time and Error Rate were explored: Target Race (Black, White), Gun Prevalence (25%, 50% and 75%), Background Race (Black, White, half Black and half White), Object (Gun, No Gun). Results replicated a classically shown anti-Black bias. Bias was moderated, however, by both the prevalence of the gun and the race of the bystander. When there was no gun present, anti-Black bias was highest when the race of the bystander was all White. When there was a gun present, anti-Black bias was highest when there were any Black bystanders. Independent of background race, as the prevalence of the gun decreased, racial bias generally increased, as indicated by faster hits and fewer misses for Black targets. False alarms, on the other hand, generally decreased with decreased gun prevalence. In general, males made correct decisions faster than females, and the racial bias, limited to the decision to shoot someone holding a gun, hits, was greater for males than for females. These findings show that anti-Black bias in the decision to shoot must be explored under more externally valid circumstances.

The Impact of Gun Prevalence and Background Race on Racial Bias in the First Person Shooter Paradigm

In exploring how race affects social perception and interaction, Correll, Wittenbrink and Judd (2002) first introduced the first person shooter task (FPST), in which participants are shown a series of images that consist of a man holding an object. The man is either Black or White, and the object is either a gun or an innocuous object. If the object is a gun, the participants are instructed to respond by pressing a key labeled "Shoot." If the object is not a gun, the participants are instructed to respond by pressing a key labeled "Don't Shoot." Much of the empirical literature indicates that when the targets are unarmed, participants are more likely to mistakenly shoot Blacks than Whites, and when the targets are actually armed, participants shoot at Black targets faster than at White targets. These results are intriguing and suggest that humans have cognitive schemas that represent Blacks as more threatening than Whites; this may make real-life interactions, especially with police, more hazardous for Blacks than for Whites. In focusing on the theoretical importance of racial bias, however, FPST research has neglected a related empirical literature on visual search that demonstrates how the relative prevalence of a target affects the probability of detecting that target. Also related to external validity, is the presence of bystanders at a potential crime scene. We explore whether the race of those in the background, not just the race of the target, may influence performance on the FPST. Previous research has not addressed gun prevalence or background race in any systematic way. Since gender has been shown to affect performance on the FPST, namely males exhibit a higher anti-Black bias in reaction time for both hits and correct rejections (Correll *et al*., 2007), we, examine gender in our task.

Influences of Bias

Work using the FPST was derived from earlier research which used identification tasks, where individuals were primed with either a Black or White face and then were told to identify either an image of a gun or an image of a tool (Payne, 2001). It was found that participants identified guns faster when they were primed with a Black face and identified tools faster when primed with a White face. The stereotype that exists which portrays Black individuals as criminals is what makes the stereotype congruent condition (a gun after a Black face prime rather than a White face prime) easier, thus eliciting a faster response. Furthermore, because the task is to respond as quickly as possible, stereotypes are propelled simply because controlled responses require more time than automatic responses.

Ito and Urland (2003) examined the manner in which individuals attend to and encode information about social categories. They showed participants images of individuals who were either Black or White and either Male or Female. They were then instructed to recall the race and gender of the individual in the image, all the while tracking event related potentials. Findings show that participants had a selective attention towards images of Blacks rather than Whites and Males rather than Females. They further explained that sensitivity to racial information was seen as early as 122 ms.

Research using the FPST has found that participants correctly decide to shoot faster at armed Black targets (Correct Hit) than at armed White targets and also correctly decide not to shoot faster at unarmed White targets (Correct Rejection) than unarmed Black Targets. Furthermore, error rate analysis show that participants mistakenly shoot (false alarm) unarmed Black targets more than White targets and mistakenly don't shoot (miss) armed White targets more than Black targets (Correll, *et al*., 2002; 2007; Kahn & Davies, 2011; Plant & Peruche, 2005). These findings have been applied to more than just anti-Black bias. Sadler, Correll, Park

& Judd (2012) included Black, White, Asian and Latino targets in the FPST and found that bias in the decision to shoot is somewhat hierarchical in accordance with racial stereotypes. They found that college student and police officers showed higher bias in the decision to shoot Black targets than Latino, White and Asian targets. Furthermore, Latino targets were the second most discriminated against, followed by Whites. Asian targets showed the lowest amount of bias in the decision to shoot. Researchers have begun to examine potential origins of this bias as well as the circumstances under which it can be propelled or repressed. The measure of shooter bias is not a measure of overt or explicit prejudice. In fact, Correll, *et al*. (2002) found that bias in the shooter task and scores on an explicit prejudice test were unrelated.

In order to test whether race is always the discriminating factor that elicits a bias to shoot, Miller, Zielaskowski, & Plant (2012) conducted a study to see if bias was also a function of in-group/outgroup membership. They had participants take a personality test and subsequently, assigned their personality to a color. They then engaged them in the FPST but instead of varying targets by race, they were all White. Targets were placed over backdrops of solid colors that either did or did not correspond to the participants assigned personality color. They found that individuals with strong beliefs about interpersonal threat, or who are highly concerned with protecting themselves from danger, were more likely to mistakenly shoot outgroup members than in-group members. It is hypothesized that this outgroup bias appears because throughout evolutionary history, outgroups posed the most threat, which is why individuals concerned with danger over perceive threat in outgroup members (Maner *et al*., 2005).

Mange, Sharvit, Margas, & Sénémeaud, (2015) also examined the role in-group and outgroup membership plays in the decision to shoot. They engaged participants in the FPST. Targets within the task were visually racially ambiguous. However, participants were primed to

perceive them to be in-group member, nonthreatening outgroup members or threatening outgroup members. The researchers found that although outgroup membership was enough to increase the need for careful consideration in responding, only outgroups stereotypically associated with threat elicited aggressive responses consistent with a classic shooter bias.

In order to examine the extent to which stereotypicality of the stimuli impacts the bias to shoot, Correll, Park, Judd & Wittenbrink (2007) exposed participants to stories of Black individuals with guns. They found that exposure to this type of stereotype congruent information exacerbated anti-Black bias in the decision to shoot. They also found that, when they increase the proportion of Blacks with guns in the video game itself, anti-Black bias in the decision to shoot increased.

In an attempt to examine whether or not this bias can be attenuated, Sim, Correll & Sadler (2013) had participants read newspaper articles depicting either Black criminals or White criminals before engaging in the FPST. Results showed that when participants read about Black criminals (stereotype congruent) they showed a pronounced racial bias effect in the task. When they read about White criminals (stereotype incongruent) the bias was eliminated. They furthered this study by including the use of law enforcement personnel. They found that when the FPST itself depicts a disproportionate amount of Black targets with guns, the shooter bias towards those targets is exacerbated. However, when race is unrelated to the presence of a gun, training in the task may eliminate bias.

It has been found that both the difference of stereotypes between groups, such as the connections between criminality and Black individuals, as well as the differences within those groups impacts bias in the FPST. Maddox (2004) explains that within a given racial group, the individual's level of racial stereotypicality will increase the stereotyping directed at them. Kahn

& Davies (2011) replicated basic shooter bias findings but also examined the extent to which bias to shoot was impacted by the stereotypicality of the target. They found that highly stereotypical Black targets (darker skin, broader noses and fuller lips) elicited more of a bias to shoot than low stereotypical Black targets. These results were found using both White and Black participants. It seems that racial stereotypicality can increase the accessibility of the stereotype linking Blacks and danger, for both in group and out group members.

In order to parse apart factors that influence the bias to shoot even more, Moore- Berg, Karpinski & Plant (2017) replicated basic shooter bias findings but manipulated the socioeconomic status (SES) of the target by altering the clothing they were wearing (high-SES suspects were wearing suits, low-SES suspects wore blank t-shirts). It was found that in the high SES condition, participants showed a bias to shoot Black targets more than White targets. However, the decision to shoot did not vary as a function of race in the low SES conditions. Targets in the low SES condition were treated similar to Black targets in the high SES condition. In a similar vein, Correll, Wittenbrink, Park, Judd & Goyle (2011) placed targets over either safe or dangerous backgrounds. They found that when the environment was safe, participants showed a bias to shoot Black targets. However, when the environment was dangerous participants did not vary their decisions to shoot as a function of race. These findings were not because participants were showing restraint for Black targets in a dangerous context; rather, they were simply treating White targets with more hostility in safe contexts.

In recent years there have been many strides taken to examine and understand when and under which circumstances biases in the decision to shoot can be attenuated or exacerbated. Answers are seemingly more complex than original findings that often depicted either a Black or White male with either a gun or harmless object over a blank computer screen. Though there

have been many studies attempting to more fully understand this bias, none as of yet have utilized findings within the visual search literature that demonstrate how the relative prevalence of a target (gun in the FPST) impacts the probability of detecting that target.

Target Prevalence Effect

Historically, in the FPST research, a gun has been present exactly 50% of the time. If the FPST is conceptualized as a cognitive visual search task, then systematically manipulating the relative prevalence of the gun may yield correspondingly different effects on performance in the FPST that have been reported with such manipulations in visual search research, and, further, the effects of varying gun prevalence may be moderated by race.

Recent literature on visual search has demonstrated the importance of the accurate detection of illegal items during airport screenings or tumors in mammograms. Typically, a visual search task consists of many trials where the participant must respond "target present" or "target absent." In many of these tasks a target is present on all or 50% of trials. Often in real scenarios, however, we find ourselves faced with visual searches where a target is scarcely present. For example, the rarity of an illegal item within luggage screening is often, and hopefully, far less than 50%. Wolfe, Horowitz & Kenner (2005) utilized a luggage screening task where participants were to find illegal items within a series of scanned bags. Targets were present on either 1%, 10% or 50% of trials. They reported that miss errors or responding "target absent" when there is a target present, increased significantly as target prevalence decreased. They also reported that as target prevalence decreased the false alarm error rate also decreased. A shift in target prevalence from 50% to 10% has been shown to increase miss errors by up to five times (Ishibashi, Kita & Wolfe, 2012; Peltier & Becker, 2016). This is attributed to a shift in quitting threshold, such that less information is inspected before responding and a shift in

decision criterion, such that responses are biased towards responding "target absent." However, Godwin, *et al*. (2015) incorporated 3 different types of targets within a visual search task at varying prevalence. Although targets varied in prevalence, there was at least one target present on 50% of trials. They also found that decreasing target prevalence increased miss errors. Since there was at least one target present on 50% of trials this cannot solely be attributed to a shift in quitting threshold. Maddox (2002) explained that when targets become less frequent observers shift their decision criterion to a more conservative position, where they are more willing and faster to respond "target absent" than "target present." With this shift in criterion for low-prevalence targets, there are more errors in target-present trials (misses) than in target-absent trials (false alarms). Likewise, increasing target prevalence above 50% should decrease misses and increase false alarms. The target prevalence effect found in luggage and medical screening tasks was examined through a lens where miss errors were more important and posed more threat than false alarm errors. FPST research, however, has typically stressed data on racially-biased false alarms, i.e. the tendency to shoot unarmed Blacks.

Findings within the FPST literature are often explained and analyzed using *signal detection theory*. Signal detection theory explains how observers detect a signal over noise. An observer who is confronted with two types of stimuli holds a distribution of values for each (Macmillan, 2002). For example, if given a categorization task where one must choose whether a piece of paper is either black or white, there would be a range of shades that one would categorize as white and a range of shades one would categorize as black. There is often a point where these distributions of categories overlap and that is typically where errors in categorization lie. The more noise there is in a visual search the more the signal and noise distributions overlap. Optimal performance requires the observer to place a decision criterion somewhere between

these two distributions. The observer must decide at which shade they will stop calling the paper white and start calling it black. Therefore, errors in categorization will arise when the stimuli surpass the decision criterion threshold but are not in the target group. This type of error is a false alarm, or responding target present when the target is actually absent. When stimuli don't surpass the decision criterion threshold but belongs to the target group this is called a miss, or responding target absent when the target is actually present. Maddox (2002) defined the optimal classifier as one who attempts to maximize rewards and minimize losses. Therefore, an optimal decision criterion is defined as the ratio of the probability of a target absent event to the probability of a target present event multiplied by the payoff matrix, or costs and benefits associated with correct and incorrect responses.

In the FPST task, the innocuous object is the noise, and the gun is the signal. *False Alarms* arise when observers are shown a man without a gun but the stimulus falls beyond their decision criterion, resulting in shooting a harmless man. *Misses* arise when observers are shown a man with a gun and fail to shoot. Likewise, a *Correct Rejection* is when observers are shown a man without a gun and they respond by choosing the "Don't Shoot" key, and a *Hit* is when they are shown a man with a gun and respond by choosing the "Shoot" key. Research has shown that the discriminability, or the distance between the signal and the noise distribution, between signal and noise distributions are not significantly different for Black and White targets. Therefore, observers are simply shifting their decision criterion to a more conservative level for Blacks, shooting those who are less threatening (Correll, *et al*., 2002; 2007).

Although the shooter task is a visual search task and is explained through signal detection theory, it measures something much more contextual and schematic than more basic signal detection tasks and luggage screening tasks. When taking part in a luggage screening task, an

observer is looking for illegal objects. These objects may bear a sense of personal and inherent threat. However, the FPST introduces a task where not only is the object threatening but there exists a cognitive schema associating Blacks and those threatening objects. This task provokes an instance of immediate threat. The field of evolutionary psychology has studied how humans attend to threatening stimuli. Trawalter, Todd, Baird & Richeson (2008) used a dot-probe task and found that, similar to other threatening stimuli, participants showed a selective attention towards Black faces rather than White. Senholzi, Depue, Correll, Banich & Ito (2015) replicated shooter bias findings but more crucially utilized an fMRI to analyze areas in the brain associated with detection of emotionally relevant information while making a decision on threat based and racial stimuli. Results showed that the decision to shoot Black targets was associated with a greater cooperation between the amygdala and parietal and visual cortices than for White targets. The sensitivity of the amygdala to implicit stereotyping was also higher for Black targets than White. Together results indicate that there are different neural and cognitive mechanisms that influence observers to treat Black targets as more threatening than White targets.

Purpose of the Current Study

This study was developed in order to examine the effects of target race and background race on the FPST in a more externally valid way by systematically manipulating the probability that a gun is present. Findings within FPST literature are intriguing and beg for further exploration to delineate the conditions under which this bias may be attenuated or exacerbated. Researchers must take into account the proportion of target absent to target present trials, as a ratio of 1:1 is not representative of what observers would realistically encounter. Consistent with Maddox (2002), it is hypothesized that as prevalence of the gun decreases, general performance will shift. Specifically, the false alarm error rate will decrease and the miss error rate will

increase, at low target prevalence. It is also hypothesized that the impact of target proportion on the two types of errors will depend on, or interact with, the race of the target. Since Black individuals are perceived as more threatening, in the low-gun prevalence situation, participants will adopt a decision threshold that will increase miss errors and decrease false alarm errors, but more so for White targets than Black targets.

The impact of gun prevalence on reaction time may also depend on target race. Compared to high prevalence targets, a lower gun prevalence of 25% may lead to faster correct rejections ("don't shoot" decisions), but more so for White targets than for Black targets who do not have guns. Lower gun prevalence may also slow reaction times for correct hits ("Shoot"), more so for Whites than for Blacks holding guns. On the other hand, raising the gun prevalence, from 50% to 75%, should increase false alarms and decrease misses, and may intensify the racial bias effect of shooting unarmed Blacks. The expectation that target proportion and race will yield interactions, for both error data and for reaction time data, is grounded in evidence that Blacks are more likely associated with threat (e.g. Trawalter, Todd, Baird & Richeson, 2008; Senholzi, Depue, Correll, Banich & Ito, 2015) and that when there is a low prevalence of a gun, participants, who are likely to be less attentive, will be more likely to allow biases to determine their miss responses, i.e., more Whites with guns will be missed. Similarly, when there is a high gun prevalence, participants will be more likely to allow biases to determine their false alarm responses, i.e., more Blacks without guns will be shot.

As in previous FPST studies, the Race of the Target will be varied in a 50-50 ratio of Black to White. The relative Proportion of the Gun will be varied among three different groups of subjects, with a Low 25%, Medium 50% and High 75% chance of a gun being present. Race of the Background individuals will also be manipulated in the proposed study as it has been

found that reaction time is fastest when there are all Black individuals in the background and slowest when there is a mix of Black and White individuals (Vázquez, D'Addario & Holler, 2017).

The current study predicts the following:

H1: We will find a replication of the classic target race x object interaction, such that when there is a gun present Black targets will be shot faster and with fewer Miss errors than White targets. When there is no gun present Rejections will take longer for Black targets than White targets, and participants will commit more False Alarms and will mistakenly shoot Black targets more than White targets.

H2: As Gun Prevalence decreases, reaction time for Rejections will also decrease but disproportionately, or less, for Black targets than for White Targets.

H3: As Gun Prevalence decreases, reaction time for Hits will increase but disproportionally, or less, for Black targets than for White targets.

H4: As Gun Prevalence decreases, the Miss error rate will decrease but disproportionately, or less, for Black targets than for White targets.

H5: As Gun Prevalence increases, the False Alarm error rate will increase but disproportionately, or more, for Black targets than for White targets.

H6: We predict an interaction of the two race factors, such that the effects of Target Race will depend on the Race of the bystanders in the Background.

H7: Males will show a greater anti-Black bias than Females for Hits and Rejections, but not for False Alarms or Misses.

Method

Participants

Participants were 112 undergraduate psychology students from the State University of New York at New Paltz (53 males and 59 females). Of the 53 males, 34 self-identified as White, 11 as Hispanic, 3 as Black, 2 as Multicultural, 2 as other and 1 as Asian. Of the 59 females, 31 self-identified as White, 14 as Hispanic, 6 as Black, 4 as Multicultural, 3 as Asian and 1 as other. Ages ranged from 18-30 years old. Since we expected the Gun Prevalence factor to have a significant impact on Error Rate and Reaction Time, we employed no specific criteria for eliminating participants. Participants were eliminated for excessive talking while the experiment was taking place and overt drowsiness. This resulted in a total exclusion of 2 participants. As compensation, participants opted for either 4 psychology subject pool credits or five dollars in cash. Participants also had the option to enter to win a $25 iTunes gift card. All participants had normal or corrected to normal vision and a full range of motion. Consent forms were signed preceding the experiment and debriefing was given upon completion. Participants were recruited using the following ad:

> "Spotting and Responding to Danger
>
> Want to play an easy video game?
>
> If you are a SUNY New Paltz male undergraduate, 18 to 30 years old, with normal or corrected vision and you have normal range of motion in both of your hands and arms so you can hit keys on a keyboard, you are eligible to participate in a study. You will be

shown situations on a computer screen that may or may not be dangerous, and you will be asked to decide what to do by hitting a key. The study will take less than 45 minutes. Compensation for your time? You can get 4 Subject Pool credits, or get extra credit for a Psychology course, or you can get paid $5 (five dollars). High-scoring participants on the video game will also be entered into a raffle to win one of four $25 *I-Tunes* cards (in addition to your choice of the other compensations).

Please contact Dangerstudy@gmail.com with your full name, Hawkmail address and phone number to sign up soon.

If you have questions, please contact Prof. C. Vázquez at vázquezc@newpaltz.edu."

Materials

Participants engaged in the first person shooter video game task (Correll, Park, Judd and Wittenbrink, 2002). We constructed this task using Cedrus Super Lab 5. Facial images of 12 different forward-facing individuals with short hair (6 Black and 6 White) were selected and superimposed on one standard image of a forward-facing body, in order to create target persons. These targets, who were armed or unarmed and either Black or White, appeared over a background scene of a park with all White or all Black or Half White and Half Black individuals in the background (see Figure 1). Images appeared on a Dell p2317H 23-inch computer monitor. Participants were asked to identify whether the object in the targets' hand was a gun or an innocuous object. If it was a gun they were to assume that the target was dangerous, and they were to press the "Shoot" button. If the object was not a gun they were to press the "Don't Shoot" button. Response buttons were on a detached numerical key pad, which was blocked to

allow only two keys to be visible; keys had clear labels indicating “Shoot” and “Don’t Shoot” on a separate vertical sign posted immediately above the key pad.

Design

A 2X2X3X2X3 design for Target Person Race (Black, White), Object (Gun, No Gun), Race of Background individuals (all Black, all White, 50-50%), Participant Gender (Male, Female) and Gun Prevalence (25%, 50%, 75%), was used, with the first three factors as within-subjects. Participant Gender and Gun Prevalence were the only between-subjects factors. The dependent measures were Reaction Time (msecs) and Error Rate (%). Subsequent analysis treated Reaction Time as two separate dependent measures: Correct Rejections and Correct Hits. Likewise, Error Rate was then disaggregated into Hits and False Alarms.

Procedure

Participants were randomly assigned to one of the following Gun Prevalence conditions: Low 25%; Medium 50%; or High 75%. They then engaged in the first person shooter video game. Using their dominant hand, they were asked to place their index finger and middle finger on buttons labeled “Shoot” and “Don’t shoot.” Response keys were counterbalanced across participants. They then saw a 500 millisecond attention cue of a “+,” in order to focus on the screen. Following the cue, a pictorial background of a park with background individuals appeared, for an interval that varied randomly between 900-1500 milliseconds, and then a target randomly appeared in one of three places on the background screen. Targets appeared on either the left side of the screen with the gun facing inwards, on the right side of the screen with the gun also facing inwards or in the center of the screen with the gun facing to the left side of the image. They had 700 milliseconds to respond before the trial was ended. After each trial a

feedback screen appeared with either “Correct,” “Incorrect,” or “Too Slow” for 1200 milliseconds, before a subsequent attention cue appeared. The entire experiment lasted approximately 30-45 minutes. The following is the instructional script:

Decision Pay Off:

You get 10 points if there is a gun and you shoot.

You get 5 points if there is no gun and you don’t shoot.

You lose 20 points if there is no gun but you shoot.

You lose 40 points if there is a gun but you don’t shoot.

Please sit as comfortably as you can so that you can see the computer screen clearly. Would you like the screen moved up or down? Please use your dominant hand—the hand you write with. Please rest your index finger on the number 4, and place your middle finger on the number 6. Please note the labels of “Shoot” and “Don’t shoot.” You will briefly see a plus sign “+” in the middle of the screen. Please direct your attention to that part of the screen. After the “+” disappears, you will see a scene pop up on the screen. Very soon you will see one man appear on the screen. That man may be holding a gun, or he may be holding a harmless object. If you see a gun, please hit the “Shoot” key as quickly as possible. If that man is holding a harmless object, please hit the “Don’t shoot” key as quickly as possible. Please respond as quickly as possible. If you take too long to respond, you will get a message reminding you to respond more quickly. Do not get upset if you make a mistake. Remember to look for the “+” to appear and then respond to the next man. If you want to stop the study at any point, please say so out loud. Otherwise, it is very important that you not speak or move your head or body during this game. We

will have a few practice trials first. Do you have any questions before we begin? Do you feel comfortable playing this videogame?

The payoff matrix was utilized in coherence with Correll *et al*. (2002) in order to simulate the weight of a real-life scenario where the best decision is shooting someone with a gun, thus protecting the self. The worst decision arises when there was a gun and you fail to shoot, resulting in potential harm to the self.

The study started with 12 practice trials. There were then 576 test trials, in total, spread over 12 cells of the 2X2X3 repeated measures factors of Target Person Race, Object and Background Race. For the between-subjects factor of Prevalence of Gun, the Medium Gun Prevalence condition (50%) included 288 trials in which a man was holding a gun and 288 trials in which there was no gun (trials in which a man is holding a harmless object, e.g. a phone or a wallet). The Low Gun Prevalence (25%) condition had 144 trials in which a man was holding a gun and 432 in which there was no gun. The High Gun Prevalence (75%) condition had 432 trials in which a man was holding a gun, and 144 trials in which there was no gun. Target Person Race and Object was varied from trial to trial randomly. Variations in Background Race were block randomized and counterbalanced across participants.

Results

Hypotheses

Hypothesis 1 predicted we will find a replication of the classic Target Race x Object interaction, such that when there is a gun present Black targets will be shot faster and with fewer Miss errors than White targets. When there is no gun present it will take longer to reject Black targets than White targets and participants will mistakenly shoot Black targets more than White targets. This hypothesis was supported

Hypothesis 2 predicted as Gun Prevalence decreases, Reaction Time for Rejections will also decrease but disproportionately for Black targets than for White Targets. This was partially supported in that as Gun Prevalence decreased to 25%, Reaction Time for Rejections also decreased disproportionately for Black than for White, but only when the Background Race was all White.

Hypothesis 3 predicted as Gun Prevalence decreases, Reaction Time for Hits will increase but disproportionally for Black targets than for White targets. This hypothesis was supported.

Hypothesis 4 predicted as Gun Prevalence decreases, Miss Error Rate will decrease but disproportionately for Black targets than for White targets. This hypothesis was supported.

Hypothesis 5 predicted as Gun Prevalence increases, False Alarm Error Rate will increase but disproportionately for Black targets than for White targets. This hypothesis was supported.

Hypothesis 6 predicted an interaction of the two Race factors, such that the effects of Target Race will depend on the Race of the bystanders in the Background. This hypothesis was supported.

Hypothesis 7 predicted Males will show a greater anti-Black bias than Females for Hits and Rejections, not for False Alarms or Misses. This hypothesis was partially supported in that Males showed a higher anti-Black bias than Females but only for Hits.

Data were reported at two different levels of analysis: at a broad level, in which data for different, but conceptually-related decisions are lumped together, and also at a finer level, in which the 4 specific types of decisions are examined individually. In one large *ANOVA*, referred to as *overall Reaction Time*, data for hits and data for rejections were collapsed. Thus, one large *ANOVA* was used to analyze Reaction Time data for all correct decisions, without distinguishing

between the two types of correct decisions (i.e., shooting when a gun is present and not shooting when a harmless object is present). Similarly, in one large *ANOVA*, referred to as *overall Error Rates*, data for false alarms and misses were lumped together. Thus, one large *ANOVA* was used to analyze all Error Rates, without distinguishing between the two types of errors (i.e., shooting when there is no gun and not shooting when there is a gun). On the other hand, for the fine-grained analyses, data for the 4 types of decisions were each analyzed separately, with individual *ANOVA*s for Hits, Rejections, False Alarms and Misses. There is an exhaustive inventory of figures for all significant results, though not all of them are included in the discussion.

In order to analyze results in terms of Reaction Time, all trials in which a participant had either timed out or made an error were excluded. In order to analyze results in terms of Error Rate, all trials in which a participant had either timed out or made a correct decision were excluded. Data were then averaged and subjected to two separate 2x2x3x2x3 split plot analyses of variance (*ANOVA*) for Target Person Race (Black, White), Object (Gun, No Gun), Background Race (Black, White, Half Black and White), Participant Gender (Male, Female) and Gun Prevalence (25%, 50%, 75%) with repeated measures across the first three factors.

Target Race and Object

This yielded a significant overall main effect within the Reaction Time analysis, for Object $F(1, 106) = 136.94$, $p < .001$, $d = .82$ (see Table 4). Guns ($M = 539.32$, $SD = 29.45$) were shot at faster than harmless objects ($M = 564.90$, $SD = 33.47$) (see Figure. 2). These analyses also yielded significant overall Target Race X Object interaction for Error Rate, $F(1, 106) = 74.25$, $p < .001$ (see Table 3), and also for Reaction Time, $F(1, 106) = 105.54$, $p < .001$ (see Table 4). Black targets with guns (M = 534.59, SD = 30.06) were correctly shot at faster than White targets with guns ($M = 544.06$, $SD = 30.10$), $t(1,111) = -8.15$, $p < .001$, $d = .31$. Participants

correctly decided not to shoot at targets holding harmless objects faster if they were White (M = 559.60, SD = 34.59) than if they were Black (M = 570.20, SD = 33.06), $t(1, 111) = 11.30$, $p < .001$, $d = .31$ (see Figure 3). Furthermore, participants mistakenly decided not to shoot targets holding guns more often if they were White (M = 13.23, SD = 12.00) than if they were Black (M = 9.49, SD = 9.91), $t(1, 111) = -7.99$, $p < .001$, $d = .34$. Targets holding harmless objects were mistakenly shot at more often if they were Black (M = 12.58, SD = 12.67) than if they were White (M = 10.27, SD = 10.16), $t(1, 111) = 4.15$, $p < .001$, $d = .20$ (see Figure 4).

The overall Reaction Time analysis revealed a significant main effect for the Object variable, $F(1, 111) = 136.94$, $p < .001$ (see Table 4). Participants correctly decided to shoot at targets holding guns faster than they decided not to shoot at targets holding harmless objects. The Gun Prevalence factor interacted with the Object variable, $F(2,110) = 153.24$, $p < .001$ (see Table 4). Bonferroni *post hoc* test revealed that participant's Reaction Time to correctly identify guns increased from 75% prevalence (M = 515.53, SD = 27.07) to 25% prevalence (M = 554.42, SD = 24.07), $p < .001$, $d = 1.52$. Participants' Reaction Time to correctly identify a harmless object decreased from 75% prevalence (M = 591.08, SD = 20.78) to 25% prevalence (M = 533.55, SD = 25.89), $p < .001$, $d = 2.45$ (see Figure 5).

The overall Error Rate analysis also yielded a significant Gun Prevalence x Object interaction, $F(2,106) = 83.72$, $p < .001$ (see Table 3). Bonferroni *post hoc* test revealed that participants' Miss Errors increased, with decreased Gun Prevalence, from 75% prevalence (M = 3.95, SD = 2.29) to 25% prevalence (M = 16.99, SD = 13.55), $p < .001$, $d = 1.34$. Participants' False Alarm Errors decreased, with decreased Gun Prevalence, from 75% prevalence (M = 21.00, SD = 12.43) to 25% Prevalence (M = 3.48, SD = 3.71), $p < .001$, $d = 1.91$ (see Figure 6).

The Impact of Gun Prevalence on Shooter Bias

There was a significant main effect for Gun Prevalence on Reaction Time overall, $F(2, 106) = 6.16$, $p = .003$ (see Table 4). Participants made correct decisions faster at 25% Gun Prevalence ($M = 543.98$, $SD = 20.31$) than at 50% Gun Prevalence ($M = 560.14$, $SD = 19.41$), $p = .001$, $d = .81$, and at 75% Gun Prevalence ($M = 553.30$, $SD = 21.22$), $p = .039$, $d = .45$ (see Figure 15).

There was a significant main effect for Gun Prevalence for Rejections $F(2, 106) = 67.17$, $p < .001$ (see Table 12). Participants decided not to shoot at targets without guns faster at 25% Gun Prevalence ($M = 533.55$, $SD = 25.89$) than at 50% Gun Prevalence ($M = 573.05$, $SD = 21.45$), $p < .001$, $d = 1.7$, and 75% Gun Prevalence ($M = 591.08$, $SD = 20.78$), $p < .001$, $d = 2.45$ (see Figure 16). Participants also decided not to shoot at targets without guns faster at 50% Gun Prevalence than at 75% Gun Prevalence, $p = .001$, $d = .85$.

There was a significant main effect for Gun Prevalence for Hits $F(2, 106) = 28.56$, $p < .001$ (see Table 11). Participants shot at targets with guns slower at 25% Gun Prevalence ($M = 554.41$, $SD = 24.07$) than at 75% Gun Prevalence ($M = 515.53$, $SD = 27.07$), $p < .001$, $d = 1.5$ and from 50% Gun Prevalence ($M = 547.23$, $SD = 21.03$), $p < .001$, $d = .32$ (see Figure 17). There was also a significant Target Race x Gun Prevalence interaction for Hits, $F(2, 106) = 9.16$, $p < .001$ (see Table 11). A traditional anti-Black bias was found in terms of Hits. However, the magnitude of this bias depended on the prevalence of the gun ($F(2,109) = 8.53$, $p < .001$) such that anti-Black bias intensified as Gun Prevalence decreased from 50% prevalence ($M = -6.67$, $SD = 9.23$) to 25% prevalence ($M = -15.48$, $SD = 14.74$), $p = .004$, $d = .72$ (see Figure 18). Bias in Correct Rejections did not vary by Gun Prevalence.

There was a significant main effect for Gun Prevalence for Misses $F(2, 106) = 19.09$, $p < .001$ (see Table 10). Participants had a higher Misses Error Rate at 25% Gun Prevalence ($M =$

16.99, *SD* = 13.55) than at 75% Gun Prevalence (*M* = 3.95, *SD* = 2.29), *p* < .001, *d* = .1.34 and 50% Gun Prevalence (*M* = 12.76, *SD* = 7.76), *p* < .001, *d* = .38 (see Figure 19). There was a significant Target Race x Gun Prevalence interaction for Misses, *F*(2, 106) = 5.96, *p* = .004 (see Table 10). A traditional anti-Black bias was found in terms of Misses. However, the magnitude of bias depended on the Prevalence of the gun (*F*(2, 109) = 6.21, *p* = .003), such that anti-Black bias in Misses increased as Gun Prevalence decreased from 75% Prevalence (*M* = -1.49, *SD* = 1.96) to 25% Prevalence (*M* = -4.90, *SD* = 6.46), *p* = .006, d = .71 (see Figure 20).

There was a significant main effect for Gun Prevalence for False Alarms *F*(2, 106) = 42.53, *p* < .001 (see Table 9). Participants had a lower False Alarm Error Rate at 25% Gun Prevalence (*M* = 3.48, *SD* = 3.71) than at 50% Gun Prevalence (*M* = 10.39, *SD* = 6.89), *p* < .001, *d* = 1.25 and 75% Gun Prevalence (*M* = 20.10, *SD* = 12.43), *p* < .001, *d* = 1.81 (See Figure 21). False Alarm Error Rate was also lower at 50% Gun Prevalence than at 75% Gun Prevalence, *p* < .001, *d* = .97 There was also a significant Target Race x Gun Prevalence interaction for False Alarms, *F*(2, 106) = 8.99, *p* < .001 (see Table 9). A traditional anti-Black bias was found in terms of False Alarms. However, the magnitude of bias depended on the Prevalence of the gun (*F*(2, 109) = 9.23, *p* < .001), such that anti-Black bias in False Alarms decreased as Gun Prevalence decreased from 75% Prevalence (*M* = 5.37, *SD* = 7.88) to 25% Prevalence (*M* = .08, *SD* = 2.44), *p* < .001, *d* = .91 (see Figure 22).

The Impact of Background Race on Shooter Bias

In order to examine the impact of Target Race, Background Race and Gun Prevalence on Reaction Time, data were subjected to two separate *ANOVA*s for Hits and Correct Rejections. There was a significant Target Race x Background Race interaction for Hits, *F*(2, 106) = 15.79, *p* < .001 (see Table 11). A traditional anti-Black bias in terms of Hits was found across all levels

of Background Race. However, anti-Black bias in Hits was intensified when the Background Race was all Black (M = -9.19, SD = 20.91) compared to when it was all White (M = -2.96, SD = 15.54), $t(1, 111) = -2.73$, $p = .007$, $d = .34$). Anti-Black bias was also intensified from all White to Half and Half (M = -16.26, SD = 15.54), $t(1, 111) = 5.45$, $p < .001$, $d = .86$) (see Figure 7).

There was a significant main effect for Background Race for Rejections $F(2, 106) = 5.48$, $p = .005$ (see Table 12). Participants correctly decided not to shoot at targets holding harmless objects faster if the Background Race was all Black (M = 562.89, SD = 34.50) than if it were all White (M = 566.71, SD = 37.54), $p = .004$, $d = .11$, or Half and Half (M = 566.95, SD = 31.65), $p = .005$, $d = .12$ (see Figure 8).

There was also significant Target Race x Background Race interaction for rejections, $F(2, 106) = 42.24$, $p < .001$ (see Table 12). The magnitude of anti-Black bias in terms of rejections also depended on the Background Race, such that anti-Black bias intensified when the Background Race was all White (M = 23.82, SD = 20.37) compared to all Black (M = -.917, SD = 17.89), $t(1, 111) = -9.31$, $p < .001$, $d = 1.29$ (see Figure 9).

In order to examine the impact of Target Race, Background Race and Gun Prevalence on Error Rate, data were subjected to two separate *ANOVA*s , one for Misses and one for False Alarms. There was a significant Target Race x Background Race interaction for Misses, $F(2, 106) = 8.06$, $p < .001$ (see Table 10). There was a traditional anti-Black bias in terms of Misses. However, the magnitude of bias depended on the Background Race. Anti-Black bias in Misses increased when the Background Race was all Black (M = -3.70, SD = 8.80) compared to all White (M = 1.35, SD = 7.64), $t(1, 111) = -2.20$, $p = .030$. $d = .61$ (see Figure 10).

There was a also significant Target Race x Background Race interaction for False Alarms, $F(2, 106) = 43.30$, $p < .001$ (see Table 9). There was the traditional anti-Black bias in

terms of False Alarms. However, the magnitude of bias depended on the Background Race. Anti-Black bias in False Alarms increased when the Background Race was all White (M = 6.36, SD = 9.83) compared to all Black (M = -4.57, SD = 1.11), $t(1, 111) = -6.70$, $p < .001$, $d = 1.56$ (see Figure 11).

The Interactive Effect of Background Race and Gun Prevalence on Shooter Bias

The initial *ANOVA* also yielded a significant Target Race X Object X Background Race X Gun Prevalence interaction for Reaction Time, $F(4, 106) = 3.26$, $p = .013$ (see Table 4). This interaction was decomposed using difference scores. Difference scores were created by subtracting the difference in Reaction Time between Black targets and White targets. This was done separately for Correct Hits and Correct Rejections. A set of One-Way *ANOVAs* showed that the effect of Gun Prevalence significantly impacted the difference in Reaction Time between Black and White targets for Correct Hits, when the Background Race is all Black ($F(2, 109) = 6.61$, $p = .002$), and when the Background Race is Half and Half ($F(2, 109) = 4.12$, $p = .019$) but not when the Background Race is all White. Bonferroni *post hoc* tests revealed that when the Background Race was all Black, Reaction Time differences between Black and White targets for Correct Hits significantly increased when Gun Prevalence was restricted from 50% Prevalence (M = -6.23, SD = 17.10) to 25% Prevalence (M = -18.13, SD = 25.29), $p = .03$, $d = .55$. When the Background Race was Half and Half, the race difference increased when Gun Prevalence was reduced from 75% Prevalence (M = -10.89, SD = 12.20) to 25% Prevalence (M = -23.07, SD = 26.29), $p = .02$, $d = .59$ (see Figure 23).

Another set of one-way *ANOVA* also showed that Gun Prevalence significantly impacted the difference in Reaction Time between Black and White targets for correct Rejections, when the Background Race is all White ($F(2, 109) = 18.15$, $p < .001$), and Half and Half ($F(2, 109) =$

5.27, $p = .007$), but not when the Background Race is all Black. Bonferroni *post hoc* tests revealed that when the Background Race was all White, Reaction Time differences between Black and White Targets for correct Rejections, significantly increased when Gun Prevalence was restricted from 75% Prevalence ($M = 10.17$, $SD = 21.93$) to 25% Prevalence ($M = 34.32$, $SD = 15.55$), $p < .001$, $d = 1.27$. When the Background Race was Half and Half the race difference decreased when Gun Prevalence was restricted from 75% Prevalence ($M = 18.36$, $SD = 27.60$) to 50% Prevalence ($M = 5.33$, $SD = 15.98$), $p = .038$, $d = .58$, but not when prevalence was restricted from 50% Prevalence to 25% Prevalence (see Figure 24).

The overall *ANOVA* also yielded a significant Target Race X Object X Background Race X Gun Prevalence interaction for Error Rate, $F(4, 106) = 31.10$, $p < .001$ (see Table 3). This interaction was decomposed by analyzing the Error Rate difference between Black targets and White targets separately for Misses and False Alarms. A one-way *ANOVA* showed that Gun Prevalence significantly impacted the difference in Miss Error Rate between Black and White targets, when the Background Race is all Black ($F(2, 109) = 9.18$, $p < .001$), when the Background Race is all White ($F(2, 109) = 9.86$, $p < .001$) and when the Background Race is Half and Half ($F(2, 109) = 3.20$, $p = .045$). Bonferroni *post hoc* tests revealed that when the Background Race was all Black, Error Rate differences in Misses, between Black and White targets, significantly increased when Gun Prevalence was restricted from 50% Prevalence ($M = -2.86$, $SD = 6.32$) to 25% Prevalence ($M = -7.89$, $SD = 12.00$), p = .028, $d = .52$. When the Background Race was all White, Error Rate differences in Misses, between Black and White targets, significantly decreased when Gun Prevalence was restricted from 50% Prevalence ($M = -5.29$, $SD = 5.82$) to 25% Prevalence ($M = 1.99$, $SD = 9.97$), $p < .001$, $d = .89$. This reduction did not result in anti-White bias in the 25% Gun Prevalence condition. When the Background Race

was Half and Half Error Rate differences in Misses between Black and White targets significantly increased from 75% Prevalence (M = -3.25, SD = 3.35) to 25% Prevalence (M = -8.80, SD = 13.77), p = .039, d = .55 (see Figure 25).

A set of one-way *ANOVAs* also showed that the effects of Gun Prevalence significantly impacted the difference in False Alarm Error Rate between Black and White targets, when the Background Race was all Black (F(2, 109) = 30.11, p < .001), when the Background Race was all White (F(2, 109) = 6.87, p = .002) and when the Background Race was Half and Half (F(2, 109) = 62.24, p < .001). Bonferroni *post hoc* tests revealed that when the Background Race was all Black, Error Rate differences in False Alarms, between Black and White targets, significantly decreased when Gun Prevalence was restricted from 75% Prevalence (M = -14.43, SD = 13.73) to 25% Prevalence (M = -.38, SD = 4.61), p < .001. d = 1.37. When the Background Race was all White, Error Rate differences in False Alarms, between Black and White targets, significantly decreased when Gun Prevalence was restricted from 75% Prevalence (M = 10.42, SD = 13.75) to 25% Prevalence (M = 2.51, SD = 3.40), p = .001, d = .79. When the Background Race was Half and Half, Error Rate differences in False Alarms, between Black and White targets, significantly decreased from 75% Prevalence (M = 20.12, SD = 15.11) to 25% Prevalence (M = -1.99, SD = 4.66), p < .001, d = 1.98. Although Target Race differences in False Alarm rates decreased systematically from 75% Prevalence to 25% Prevalence, they did not significantly change from 50% Prevalence to 25% Prevalence, regardless of the Background Race (see Figure 26).

In order to examine if bias in False Alarms exists at lower Gun Prevalence, Target Race was compared at every level of Background Race, within the 25% Gun Prevalence condition. In the 25% Gun Prevalence condition, Black targets (M = 4.39, SD = 4.16) were mistakenly shot more than White targets (M = 1.87, SD = 3.05), if the Background Race was all White, (t(1 , 39)

= 4.68, $p < .001$, $d = .69$). White targets ($M = 5.00$, $SD = 4.82$) were mistakenly shot more than Black targets ($M = 3.12$, $SD = 4.31$) if the Background Race was Half and Half, ($t(1, 39) = 2.55$ $p = .015$, $d = .41$). There existed no bias in False Alarms at 25% Gun Prevalence when the Background Race was all Black.

The Impact of Gender on Shooter Bias

There was a significant main effect for Gender for Reaction Time of correct Rejections, $F(1, 106) = 8.67$, $p = .004$, $d = .36$ (see Table 12). Males ($M = 558.63$, $SD = 32.55$) correctly decided not to shoot at targets holding harmless objects faster than Females ($M = 570.54$, $SD = 33.55$, see Figure 12). There was also a significant main effect for Gender for Hits, $F(1, 106) = 7.49$, $p = .007$, $d = .44$ (see Table 11). Males ($M = 532.56$, $SD = 28.76$) correctly shot at targets with guns faster than Females ($M = 545.40$, SD 28.96, see Figure 13).

There was a significant Target Race x Participant Gender interaction for Hits, $F(1, 106) = 4.99$, $p = .028$ (see Table 11). This interaction was decomposed by analyzing Reaction Time differences between Black and White targets for Males and Females. The Reaction Time difference in Hits between Black Targets and White targets was significantly larger for Males ($M = -12.07$, $SD = 12.81$) than Females ($M = -7.13$, $SD = 11.40$), $p = .033$, $d = .41$(see Figure 14).

Discussion

Most of our predictions were supported. Racial bias in the FPST is influenced by a variety of factors, not just Target Race. In the current study Gun Prevalence, Background Race and participant Gender also influenced racial bias in the decision to shoot.

The dependent measures of Reaction Time and Error Rate were separated into four different analyses, one for each type of decision: correct Hits, correct Rejections, Misses and

False Alarms. Separating analyses into each type of decision makes interpreting and understanding complex interactions much more informative and theoretically meaningful.

Target Race and Object

Hypothesis 1 was supported. We found that overall participants showed anti-Black bias, such that if a target had a gun they were mistakenly missed more if they were White than if they were Black and they were shot at faster if they were Black than if they were White. If the target did not have a gun, participants decided not to shoot at them faster if they were White than if they were Black and mistakenly shot them more often if they were Black than if they were White. These findings are consistent with previous visual search and signal detection literature that has examined racial bias using the FPST (Correll, *et al*., 2002; 2007; Sadler, *et al*., 2012; Kahn & Davies, 2011; Plant & Peruche, 2005).

Gun Prevalence and Target Race

We engaged participants in the FPST while systematically manipulating the prevalence of the gun to be either 25%, 50% or 75%. The Gun Prevalence factor impacted every possible type of decision (Correct Rejections, Correct Hits, Misses and False Alarms). As Gun Prevalence decreased Miss Error Rate increased and Reaction Time for Rejections decreased. As Gun Prevalence decreased False Alarm Error Rate decreased and Reaction Time for Hits increased. These findings are consistent with visual search and signal detection literature that examines the impact of the frequency of the target item, in the ability to detect said item (Ishibashi, Kita & Wolfe, 2012; Maddox, 2002; Peltier & Becker, 2016).

The Gun Prevalence factor impacted Error Rate in the predicted manner. If there were a gun present, participants took longer to shoot and had higher Miss Error Rates in the 25%

Prevalence condition than the 75% Prevalence condition. If there was not a gun present, participants decided not to shoot faster and had a lower False Alarm Error Rate in the 25% Prevalence condition than in the 75% Prevalence condition. This finding is consistent with visual search and signal detection literature which explains, using multiple visual search tasks, that when a target becomes less frequent one is more willing to respond "target absent" than "target present" (Maddox, 2002). Wolfe, Horowitz & Kenner (2005) utilized findings like this in order to address the difficulties of correctly identifying illegal items in luggage screening. Unlike the aforementioned research, the current study was the first of its kind to address the impact of the target prevalence effect on racial bias in the FPST. Gun Prevalence interacted solely with Target Race, when analyzing for Misses, False Alarms, and Hits but not for Correct Rejections. Hypothesis 4 was supported such that anti-Black bias in Misses increased as Gun Prevalence decreased. Hypothesis 3 was also supported. Anti-Black bias in hits increased as Gun Prevalence decreased. These data support the finding that Blacks are associated with threat more than Whites (Trawalter, Todd, Baird & Richeson, 2008; Senholzi, Depue, Correll, Banich & Ito, 2015) such that when Gun Prevalence is low, participants are more likely to be more permissive to White Targets than Black Targets.

Hypothesis 5 predicted that False Alarm Error Rate would decrease with Gun Prevalence and that it would do so differently for Blacks than for Whites. This was supported. False Alarms did in fact decrease with lower Gun Prevalence. However, anti-Black bias in False Alarms also decreased as Gun Prevalence decreased. Anti-Black bias at 25% Gun Prevalence only existed when the Background Race was all White. This decrease in anti-Black bias in False Alarms at lower Gun Prevalence may be attributed to the high accuracy of participants when responding to gun absent trials, since there were rarely guns present.

Anti-Black Bias in False Alarms was significantly reduced at lower Gun Prevalence. That is, lowering the prevalence of the gun significantly reduced the amount of False Alarms, thus creating a floor effect where participants were highly accurate, and Error was more confined. It is important to note that the reduction in False Alarm bias only took place when reducing prevalence from 75% to 25% and there were no significant changes in bias from 50% to 25%. This finding supports Cesario, Johnson & Terrill (2018) who found that if statistics of fatal shootings are benchmarked on crime rate data, rather than population proportions, there is no disparity in the decision to shoot Blacks rather than Whites. They found that Blacks were 3.3 times more likely than Whites to be mistakenly shot, given population proportions. However, they also found that Whites were 1.8 – 2 times more likely to be shot than Blacks given crime rate statistics.

Another way to interpret this finding is that anti-Black bias in False Alarms increases as Gun Prevalence also increases. When there is a high prevalence of guns, Blacks are mistakenly shot more than Whites, compared to when there is a low prevalence of guns. It could be the case that when guns are extremely prevalent individuals are faster and more willing to respond "Shoot" rather than "Don't Shoot" (Maddox, 2002). Since participants are responding so quickly to guns at high prevalence, they are more likely to inspect less information before making a decision, thus letting associations influence them more so than at low prevalence. At high prevalence participants are more readily using the association between Blacks and danger in their decision to shoot, thus eliciting a higher shooter bias in False Alarms.

Background Race and Target Race

Hypothesis 6 was supported such that Background Race had an impact on shooter bias. Anti-Black bias was highest for False Alarms and Correct Rejections when the Background Race

was all White. Counterintuitively, anti-Black bias was lowest for Misses and Hits when the Background Race was also all White. This is partially consistent with Vázquez, D'Addario and Holler (2017). They found a reverse bias effect where Whites were correctly shot at faster than Blacks. This reversal was only prevalent when the Background Race was all White. In the current study we found a diminished anti-Black bias in Hits when the Background Race was all White. However, the diminished bias in the current study did not result in the same reverse racism effect. A possible explanation for these findings is that when there are no guns present, a match between White Target Race and White Background Race elicits a larger White advantage (faster Correct Rejections and fewer False Alarms). When there is a gun present this increases the participants' association between Blacks and danger and the disadvantage of being Black (faster Hits and fewer Misses) is larger when there is both a Black Target Race and Black individuals in the Background Race. The task is fundamentally different when there is a gun present, compared to when there is no gun. When there is no gun, anti-Black bias is highest when there is an all White Background Race. When there is a gun anti-Black bias is highest when there are Black individuals in the Background Race. One could describe this as either a White Target Race and White Background Race advantage when the task is inherently less dangerous (No Gun) and a Black Target Race and Black Background Race disadvantage when the task is inherently more dangerous (Gun).

There are few empirical studies that attempt to examine the impact environmental factors have on anti-Black bias in the FPST. Correll, *et al*. (2011) systematically manipulated the environmental context to be either threatening or unthreatening. They found that anti-Black bias was only apparent in safe environments and disappeared in dangerous environments. In dangerous environments reduction of bias took the form of increasing the tendency to shoot

White targets. This finding influenced our decision in the selection of a background scene of a park, rather than an image of a dangerous setting. Cox, Devine, Plant, & Schwartz (2014) found that previous knowledge of neighborhood race and crime rate had no bearing over the anti-Black bias. The current research is the first to examine the impact Background Race has on the bias to shoot, without introducing confounds such as crime rate and the degree to which the environment is perceived as dangerous.

Gun Prevalence, Target Race and Background Race

Gun Prevalence also interacted with Target Race and Background Race when analyzing for all four dependent variables (Correct Rejections, Correct Hits, Misses and False Alarms) (see Figures 23-26). Results show a trend towards the increase of anti-Black bias when the prevalence of the gun is low compared to the other two conditions. Anti-Black Bias in Correct Hits increased at lower Prevalence when the Background Race was Black or Half and Half. Although Target Race and Gun Prevalence did not interact to impact Reaction Time for Rejections there was a Target Race, Background Race and Gun Prevalence interaction for Rejections. This partially supports hypothesis 2. Anti-Black Bias in Correct Rejections increased at lower Prevalence when the Background Race was all White. Anti-Black Bias in misses increased at lower Prevalence when the Background Race was Black or Half and Half. Lowering Gun Prevalence intensified bias in regard to the effects of Target Race and Background Race, such that when the task is inherently less dangerous (No Gun), this results in an increase of anti-Black bias when the Background Race is White. When the task is inherently more dangerous (Gun) this results in an increase of anti-Black bias when any Blacks are introduced into the Background Race. These findings show that individuals undergo different

cognitive processes for the decisions to either shoot or not shoot. Factors may influence biases differently, depending on the type of decision being made.

These findings would suggest that the widely used and accepted prevalence ratio of 50% gun and 50% harmless object is flawed in its capability to aid our understanding of how and under which circumstances racial bias occurs. Not only did lowering the prevalence of the gun increase Misses, decrease False Alarms, increase Reaction Time for Hits and decrease Reaction Time for Rejection, but it did so disproportionately for Black targets than for White targets. The direction in which this bias was altered also depended on the race of the bystander. In some cases, lowering the prevalence of a gun to a more externally valid proportion increased anti-Black bias in the decision to shoot.

Gender and Target Race

There was a main effect for Gender on Reaction Time latencies for both Rejections and Hits. Overall, Male participates made correct decisions more quickly than Female. They were faster at correctly identifying guns as well as correctly identifying when there was no gun present. This finding is consistent with Ghisletta, *et al*. (2018) who utilized a simple reaction time task and found that young Males make decisions significantly faster than young Females. It was also found that within older adults, the trend reverses and Females make decisions significantly faster than Males. Since the participants of the currently study were all 18-30 years of age, we could expect a different, or less pronounced trend with an older sample.

Hypothesis 7 was partially supported. Gender did impact shooter bias in terms of Reaction Time of Correct Hits but not for Correct Rejections. Black targets were correctly shot at faster than White targets. However, this anti-Black bias was significantly larger for Males than for Females. This finding supports Archer (2004), who found that Males are significantly

more likely than Females to engage in direct aggression and that that aggression peaks between 20 and 30 years of age. This is also consistent with Correll *et al*. (2007) whose findings indicate that males have a larger anti-Black bias in Reaction Time than Females.

Conclusion

There exist two anomalies within the current findings. We found a reduction of anti-Black bias in Misses as Gun Prevalence decreased, when the Background Race was all White. This reduction of bias did not result in a reverse racism effect. However, it is intriguing to contemplate reasons as to why, when the race of the individuals in the background is all White, would anti-Black bias in misses decrease at lower prevalence? Furthermore, at 25% Gun Prevalence there existed a tendency to mistakenly shoot White targets more than Black targets when the Background Race was Half and Half. In fact, the only consistent trend of anti-Black bias in the False Alarm Error Rate that existed throughout all levels of Gun Prevalence, occurred when the race of the bystander was all White. It seems that Black targets are at the highest and most consistent, risk of being mistakenly shot when they are around all White bystanders. This could be because when Black targets are around White bystanders, cognitive schemas associating Blacks with danger are activated.

Most research examining racial bias in the FPST has utilized a very basic experimental procedure, that in some ways lack external validity. This is among one of the first studies to present individuals in the background (bystanders) while engaging participant in the FPST. We have systematically manipulated the race of the bystander to be either White, Black or half and half. To our knowledge this study is the first of its kind to stray away from the utilization of a gun prevalence ratio of 1:1. We have found that manipulating the race of the bystander as well as the prevalence of the gun may, in some cases, exacerbate racial bias. Future research should

include variables such as Gun Prevalence and Background Race and further explore factors that improve external validity.

Limitations

This study did not examine the impact that having no bystanders has on racial bias in the FPST. Although we found that the race of the bystander is important in influencing racial bias, without a condition that has no bystanders it is difficult to draw conclusions as to how results pertaining to this specific variable compare to a larger literature that uses no bystanders in experimental procedure. Future research should examine the sole impact of having bystanders versus no bystanders on racial bias in the FPST.

Future research should track event-related potentials (ERP) while systematically manipulating Gun Prevalence and Background Race in the FPST. Doing so would aid our understanding of different cognitive, neural and biological mechanisms potentially responsible for bias under these more externally valid conditions. Correll, Urland & Ito (2006) found that Black targets in the FPST elicited a higher threat response (P200) in participants than White targets. They also found that Black targets elicited less conflict about the decision to shoot (N200) than White targets. There is the potential that the trends found in the aforementioned study may be exacerbated under the more externally valid methodology of the current study.

Another limitation of the current study is the use of an undergraduate sample. It has been found that undergraduates, community members and police officers all vary in the extent to which they show bias in the decision to shoot (Correll, *et al*., 2007). Furthermore, the current study used still pictures rather than videos to present stimuli. Ideally, future research would use a more interactive and immersive task, potentially free of computer simulation. The current study also utilized response keys instead of a simulated gun. The use of response keys poses many

potential problems. This technique lacks external validity in the sense that one may feel less magnitude attached with the decision to shoot when pressing a key, compared to when holding an actual gun. Another issue is that the decision to not shoot is a passive one and should not be made with an active response, such as pressing a key.

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Figure 1. Top: White target person holding a gun with half Black and half White bystanders.

Bottom: Black target person holding a cell phone with all Black bystanders.

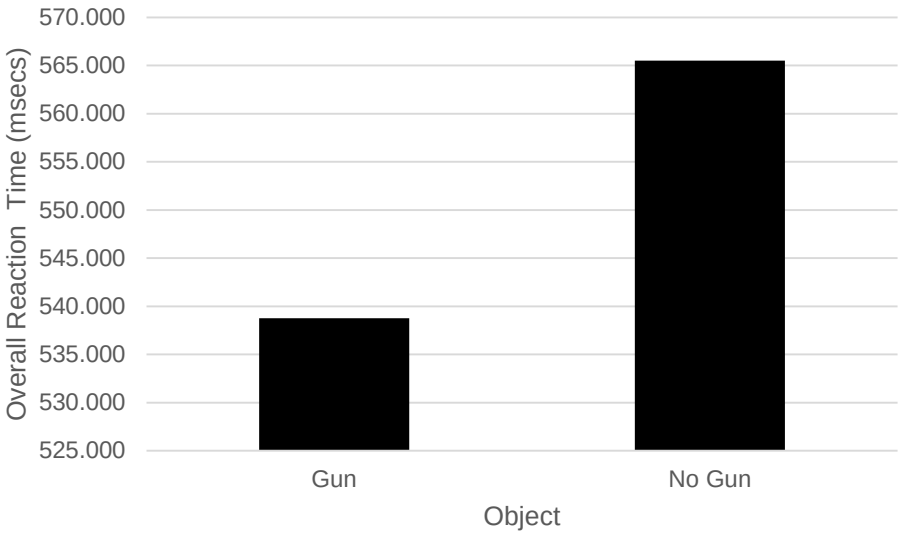

Figure 2. Overall Reaction Time (msecs): The main effect of Object.

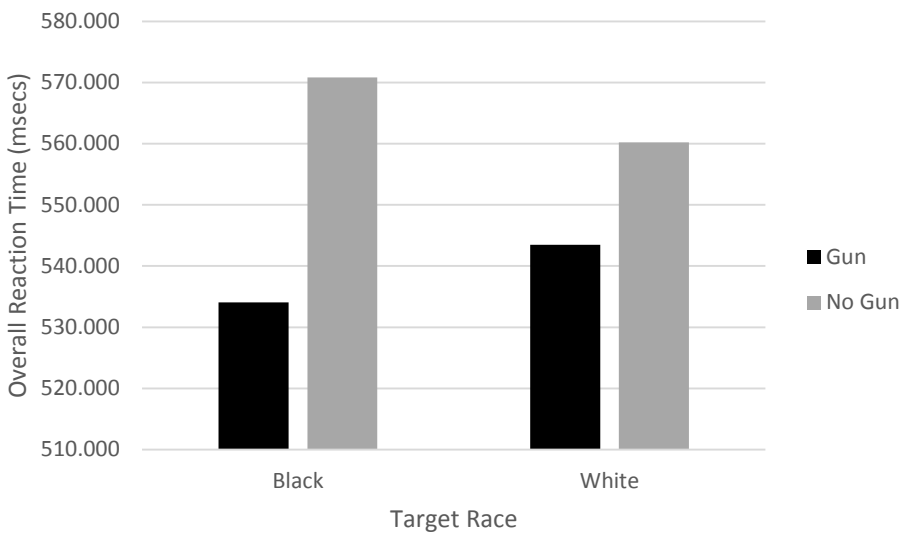

Figure 3. Overall Reaction Time (msecs): The interaction of Target Race and Object.

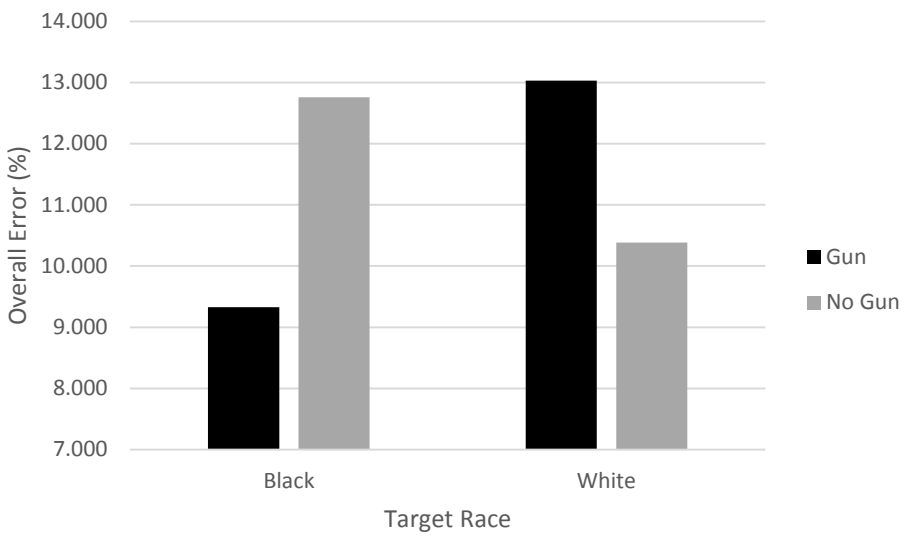

Figure 4. Overall Error Rate (%): The interaction of Target Race & Object.

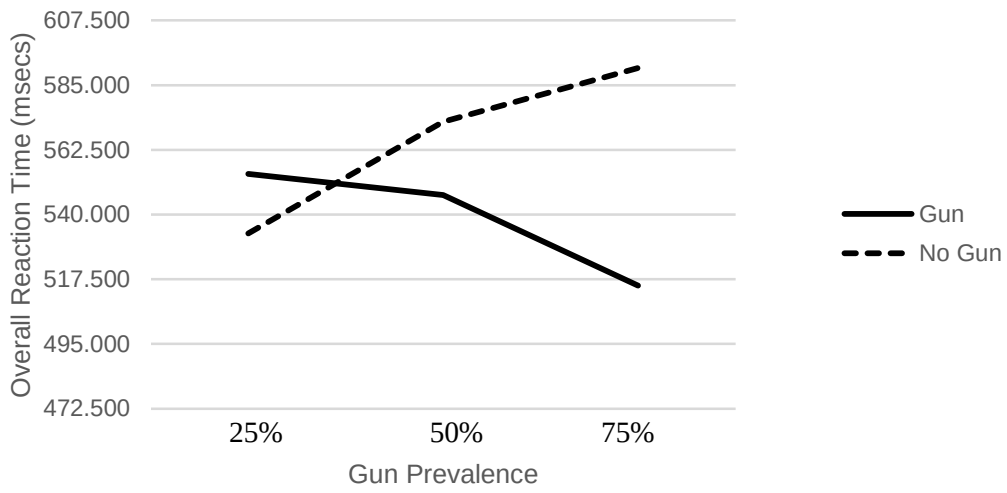

Figure 5. Overall Reaction Time (msecs): The interaction of Object and Gun Prevalence.

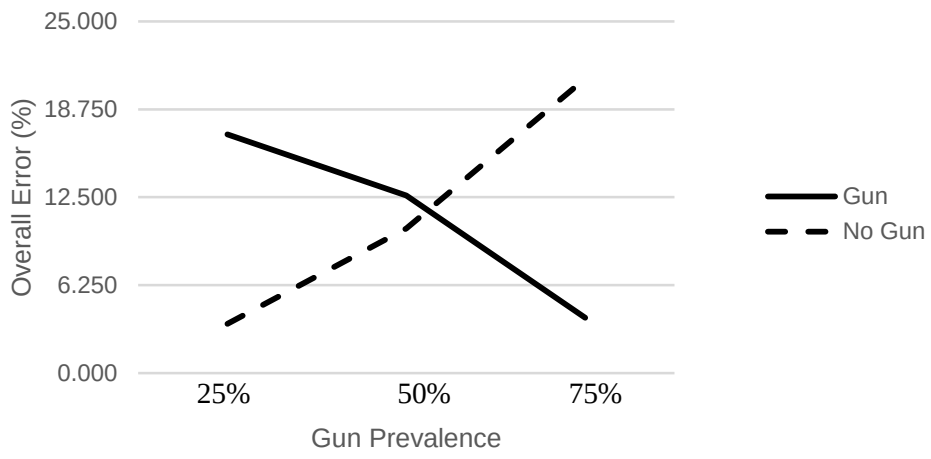

Figure 6. Overall Error Rate (%): The interaction of Object and Gun Prevalence.

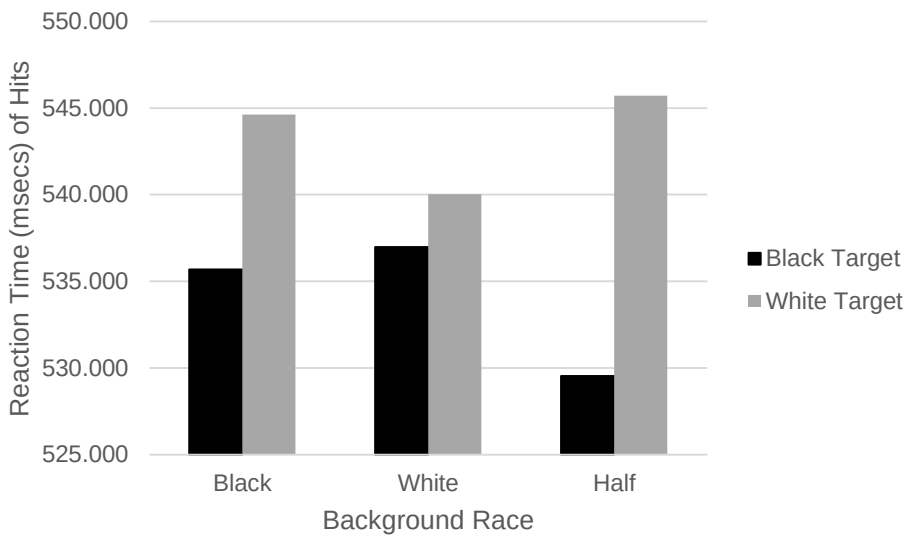

Figure 7. Hits Reaction Time (msecs): The interaction of Target Race and Background Race. Hits are defined as the correct decision to shoot a target holding a gun.

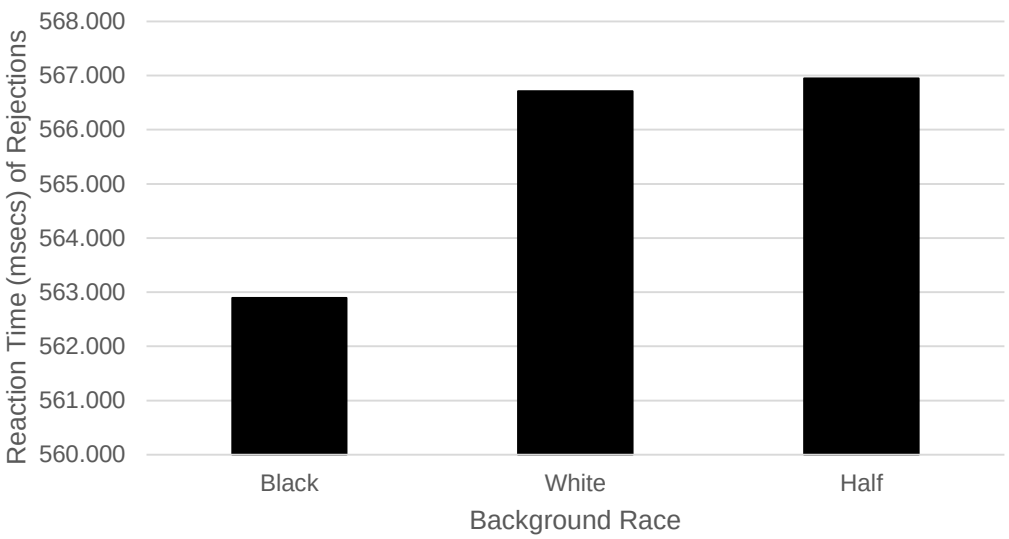

Figure 8. Rejection Reaction Time (msecs): The main effect of Background Race. Rejections are defined as the correct decision not to shoot a target holding a harmless object.

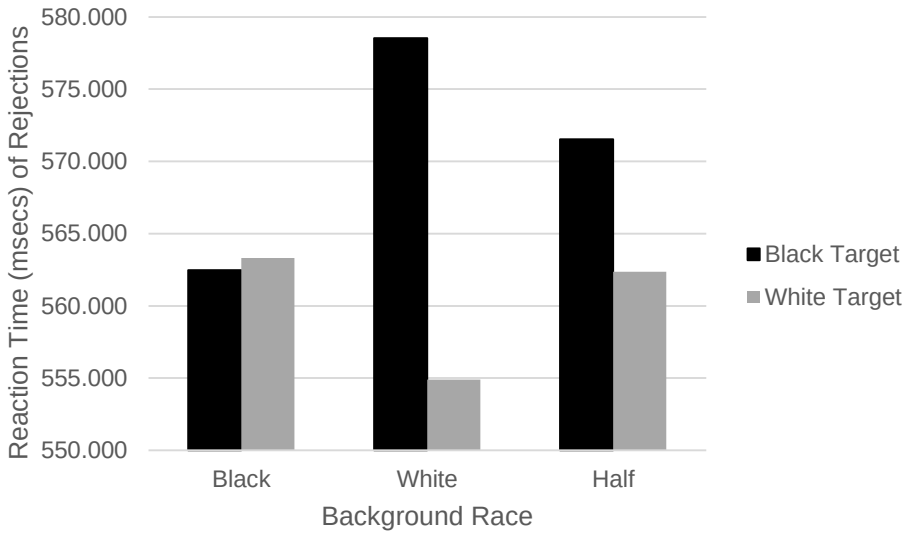

Figure 9. Rejection Reaction Time (msecs): The interaction of Target Race and Background Race.

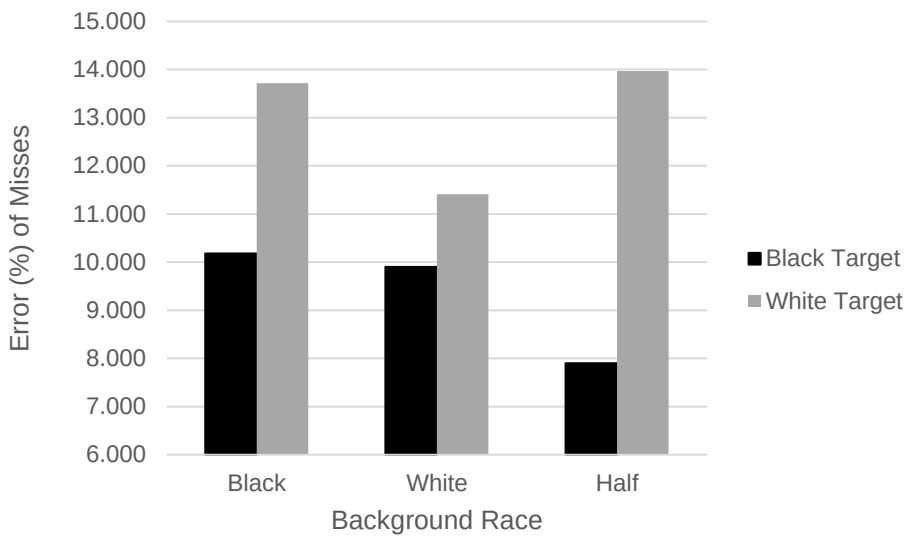

Figure 10. Misses Rate (%): The interaction of Target Race and Background Race. Misses are defined as the error of not shooting a target holding a gun.

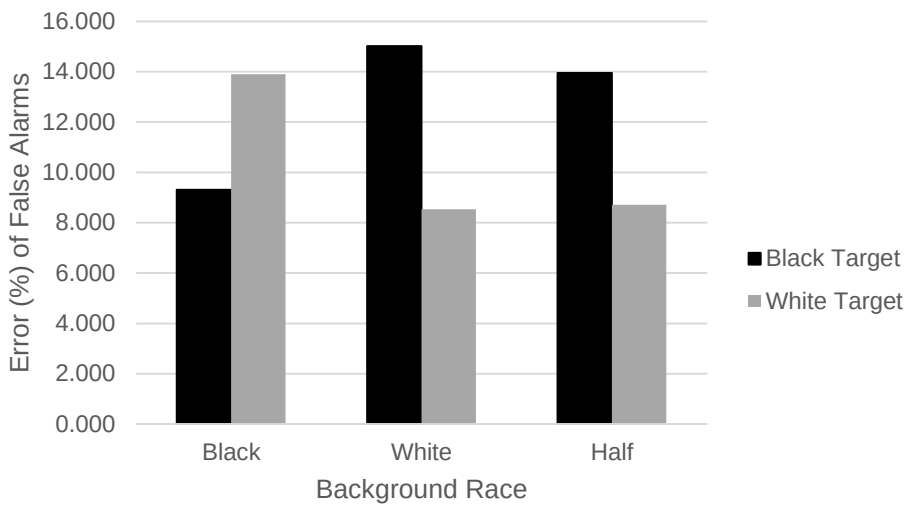

Figure 11. False Alarms Rate (%): The interaction of Target Race and Background Race. False Alarms are defined as the error of shooting a target holding a harmless object.

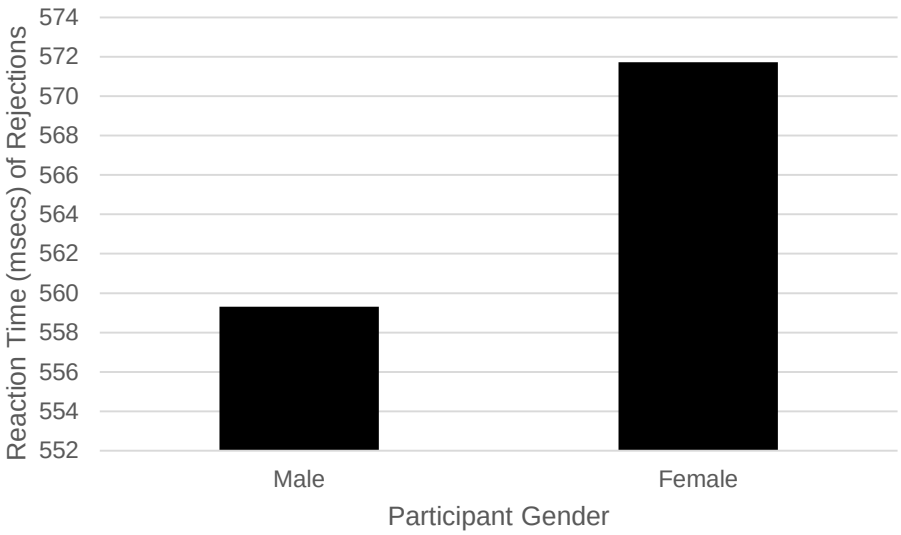

Figure 12. Rejections Reaction Time (msecs): The main effect of Participant Gender.

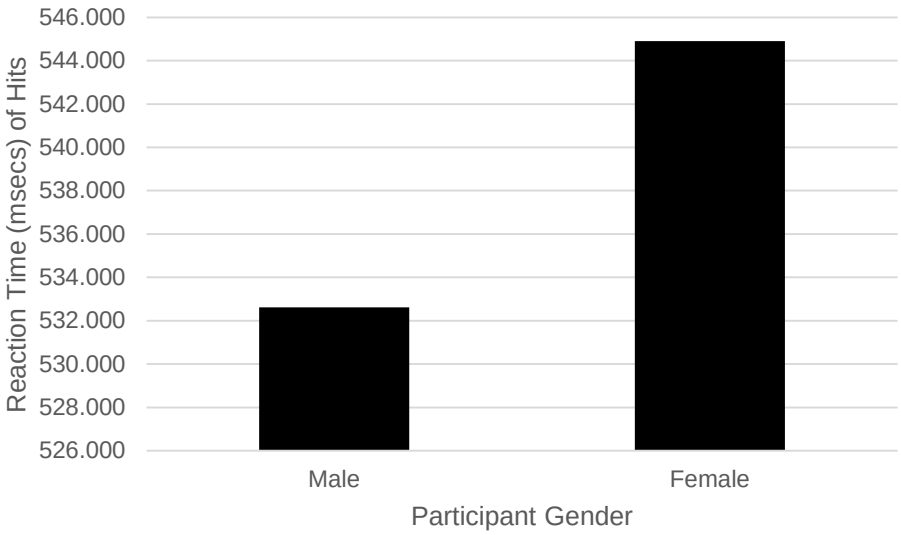

Figure 13. Hits Reaction Time (msecs): The main effect of Participant Gender.

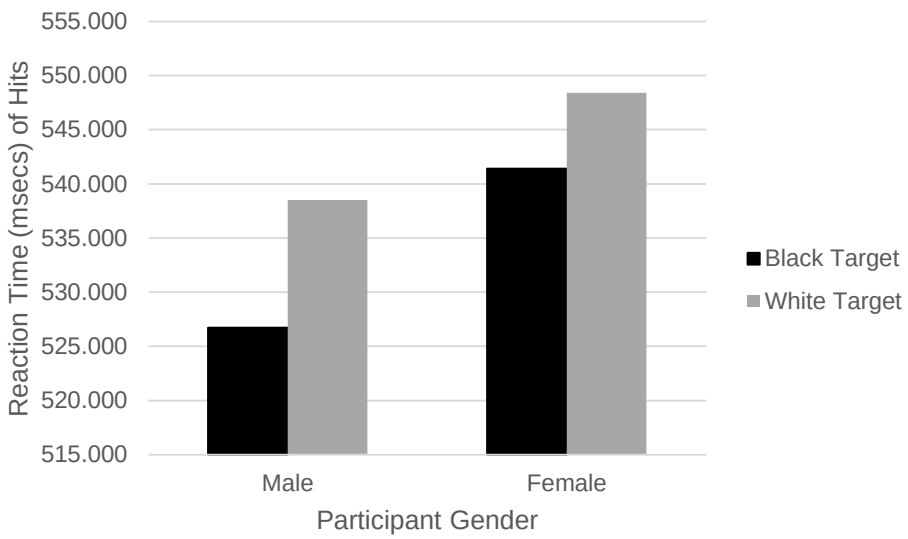

Figure 14. Hits Reaction Time (msecs): The interaction between Target Race and Gender.

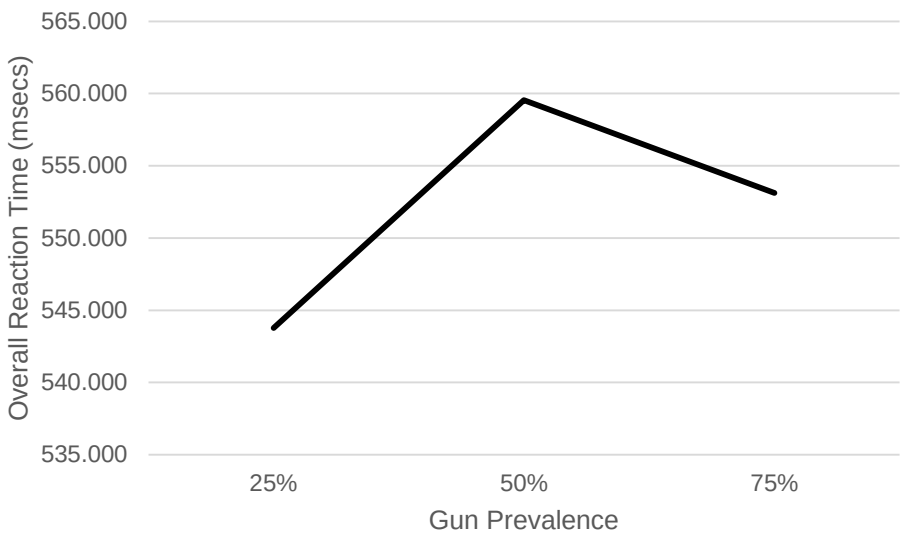

Figure 15. Overall Reaction Time (msecs): The main effect of Gun Prevalence.

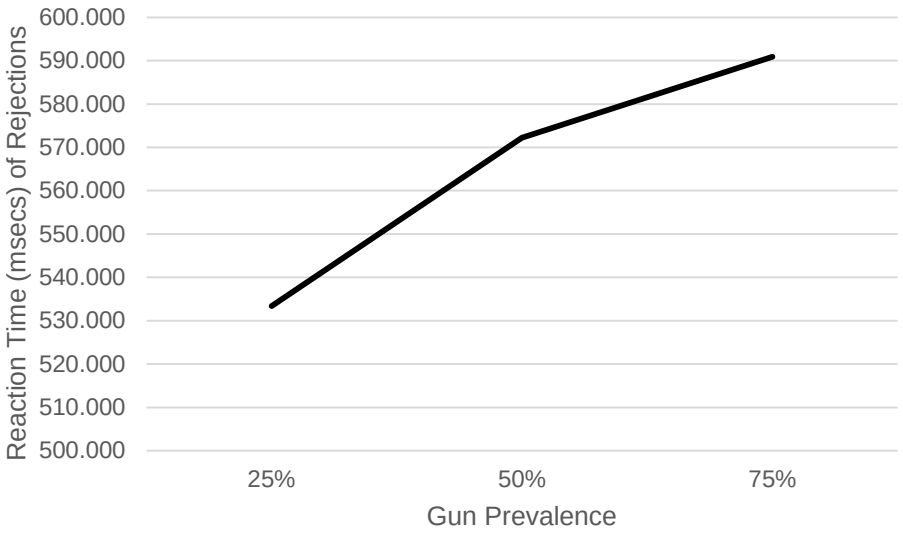

Figure 16. Rejection Reaction Time (msecs): The main effect of Gun Prevalence.

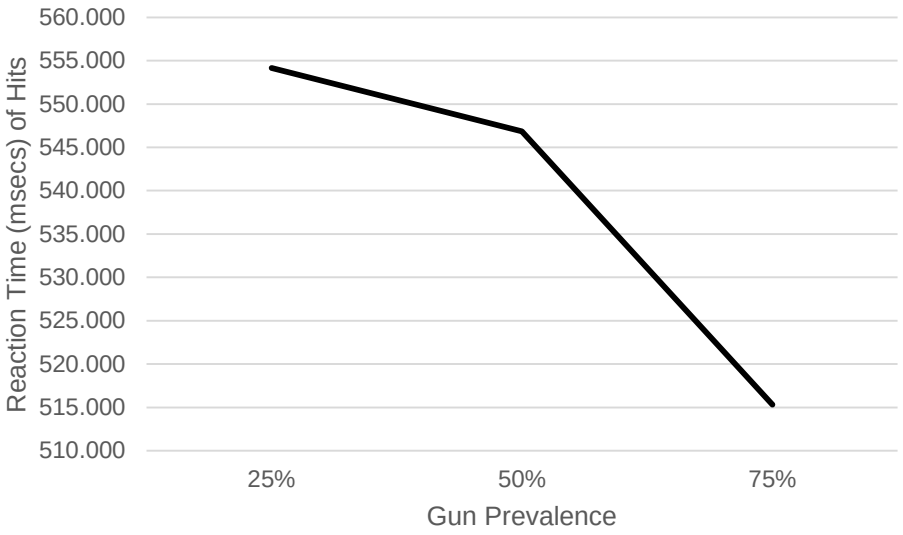

Figure 17. Hits Reaction Time (msecs): The main effect of Gun Prevalence.

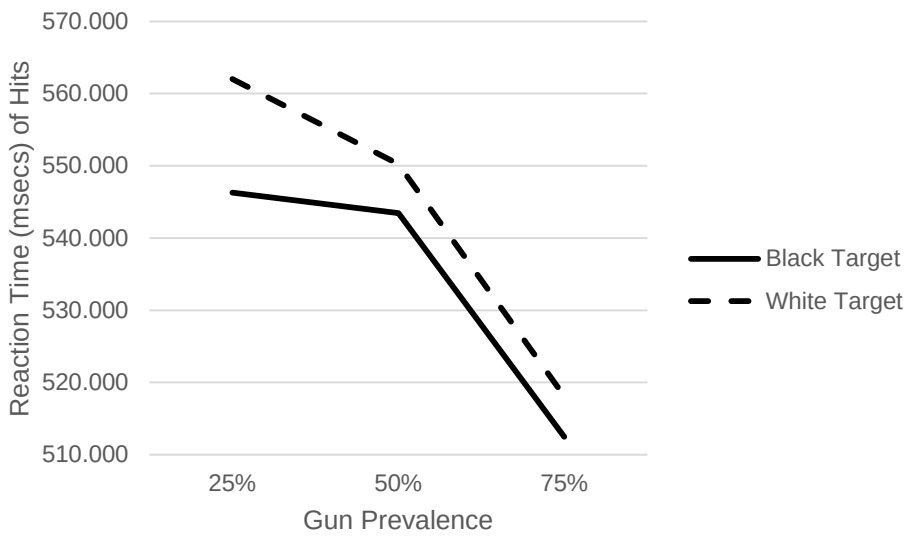

Figure 18. Hits Reaction Time (msecs): The interaction of Target Race and Gun Prevalence.

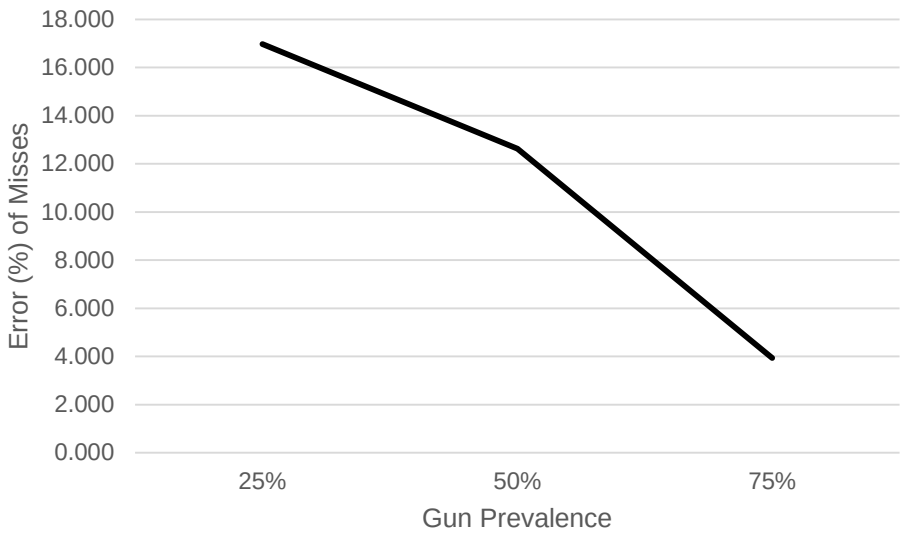

Figure 19. Misses Rate (%): The main effect of Gun Prevalence.

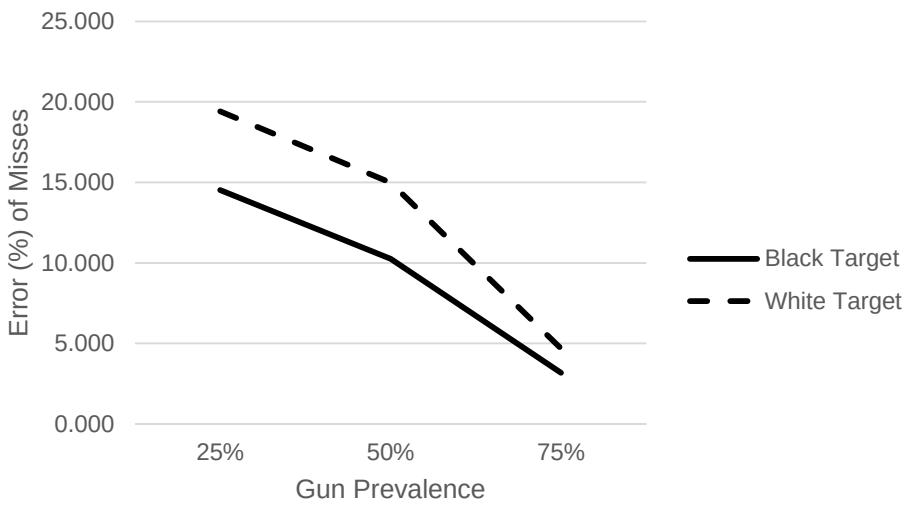

Figure 20. Misses Rate (%): The interaction of Target Race and Gun Prevalence.

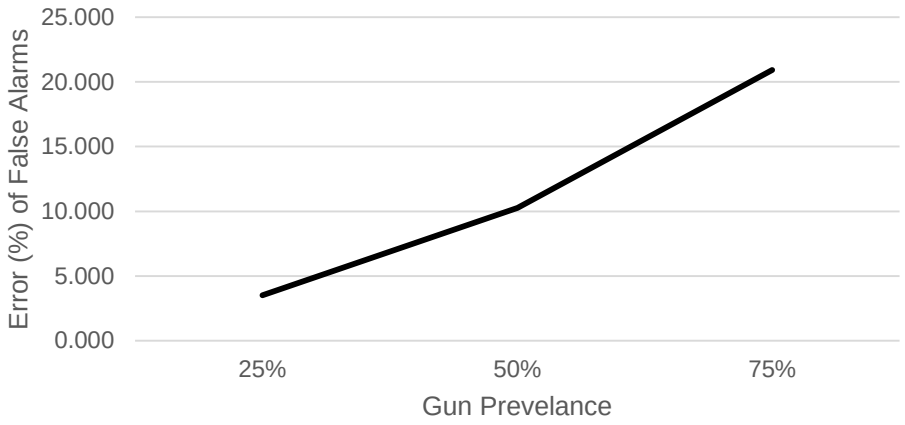

Figure 21. False Alarms Rate (%): The main effect of Gun Prevalence.

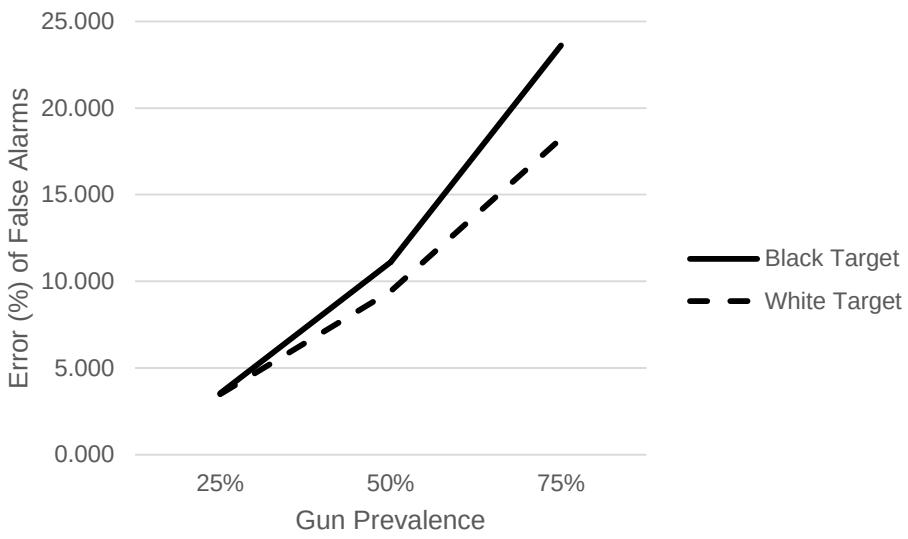

Figure 22. False Alarms Rate (%): The interaction of Target Race and Gun Prevalence.

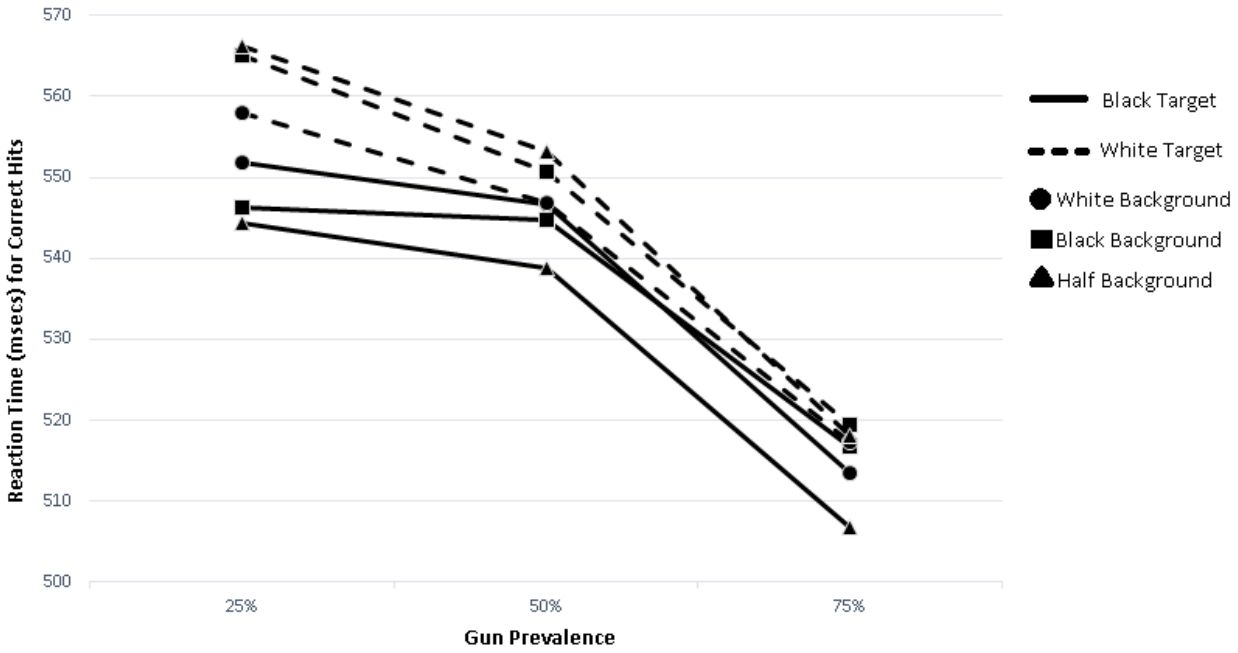

Figure 23. Hits Reaction Time (msecs): The interaction of Target Race, Background Race and Gun Prevalence.

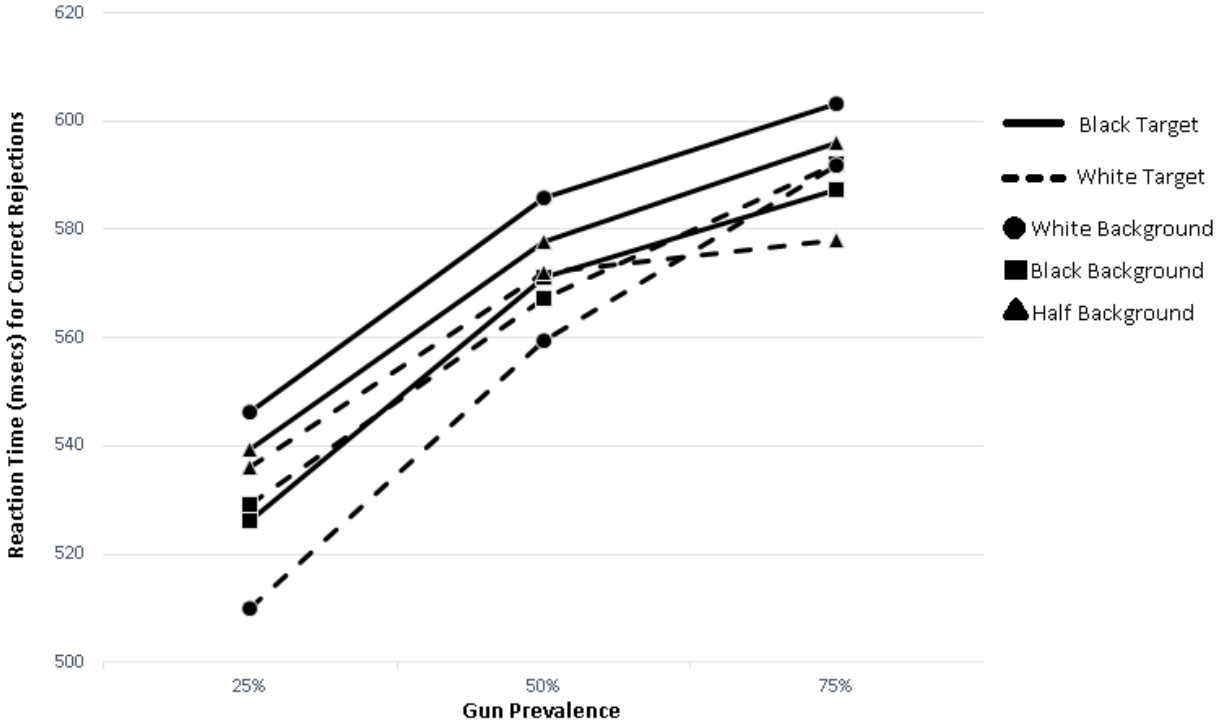

Figure 24. Rejection Reaction Time (msecs): The interaction of Target Race, Background Race and Gun Prevalence.

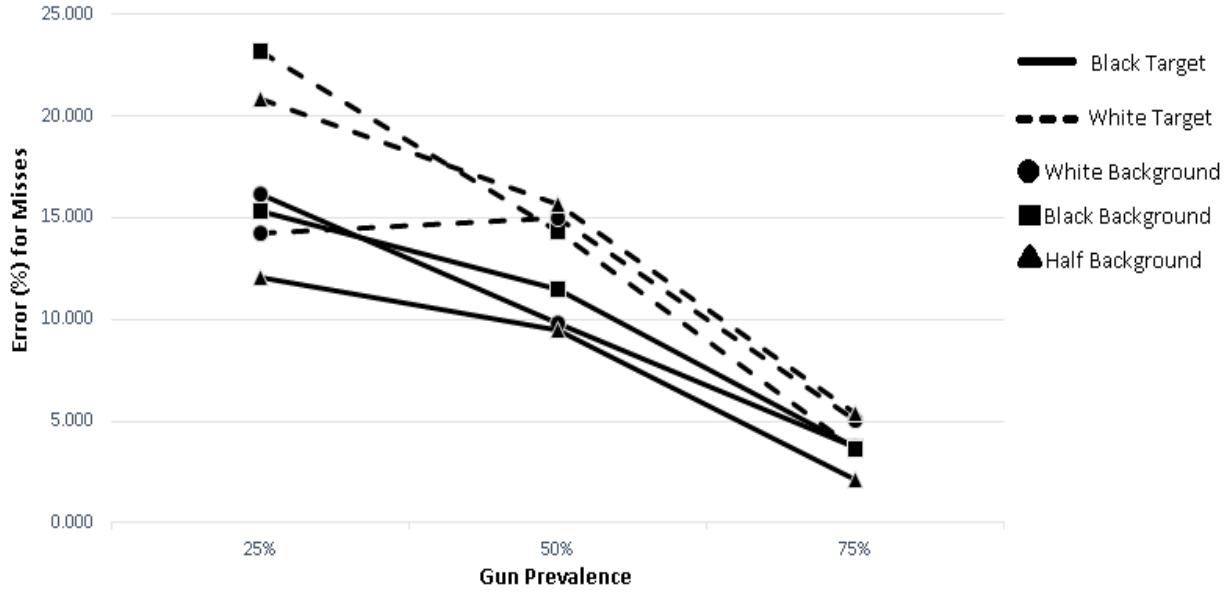

Figure 25. Misses Rate (%): The interaction of Target Race, Background Race and Gun Prevalence.

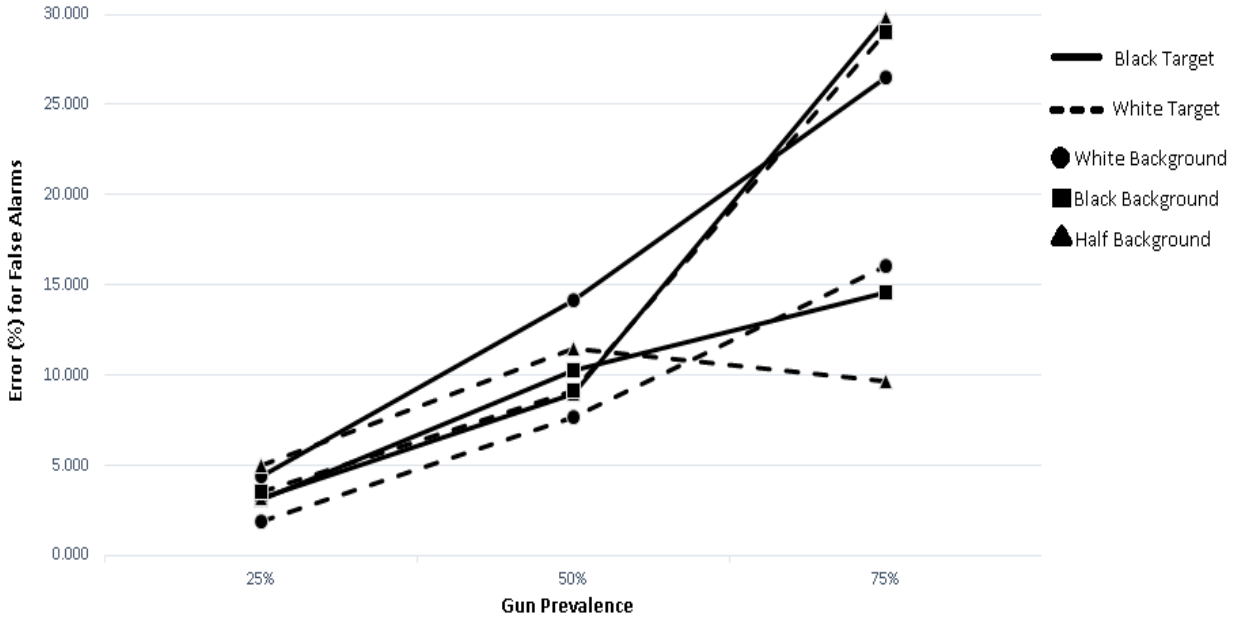

Figure 26. False Alarms Rate (%): The interaction of Target Race, Background Race and Gun Prevalence.

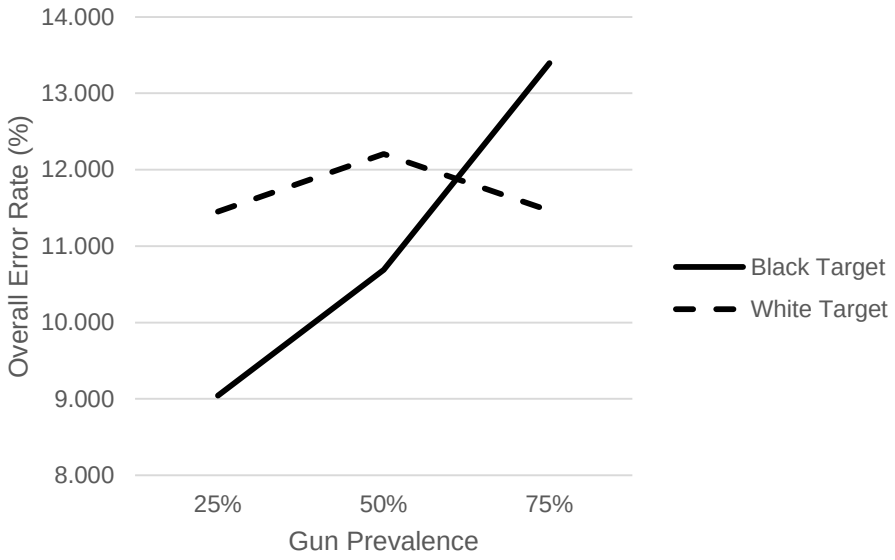

Figure 27. Overall Error Rate (%): The interaction of Target Race and Gun Prevalence.

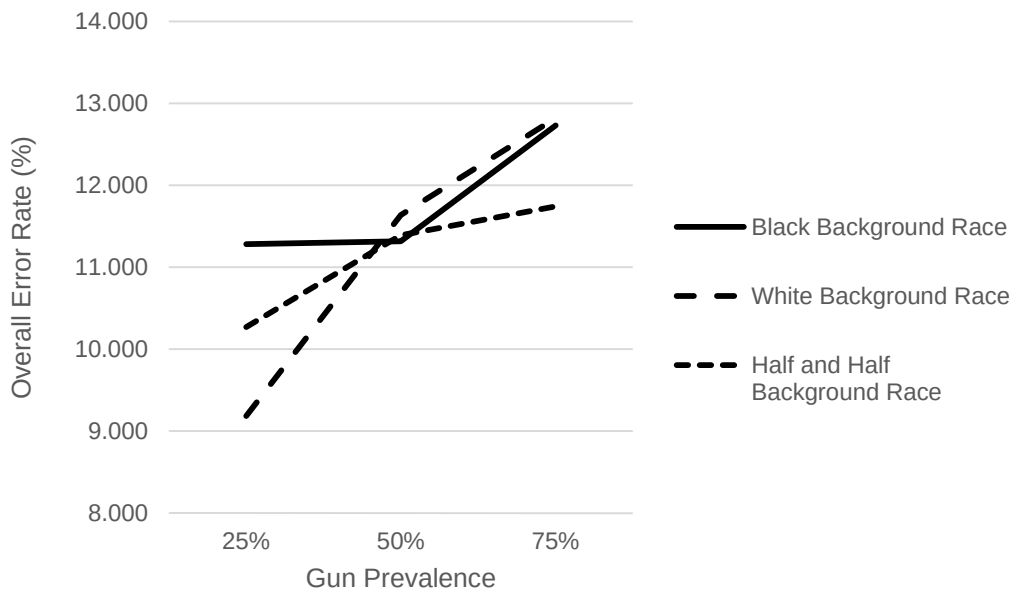

Figure 28. Overall Error Rate (%): The interaction of Background Race and Gun Prevalence.

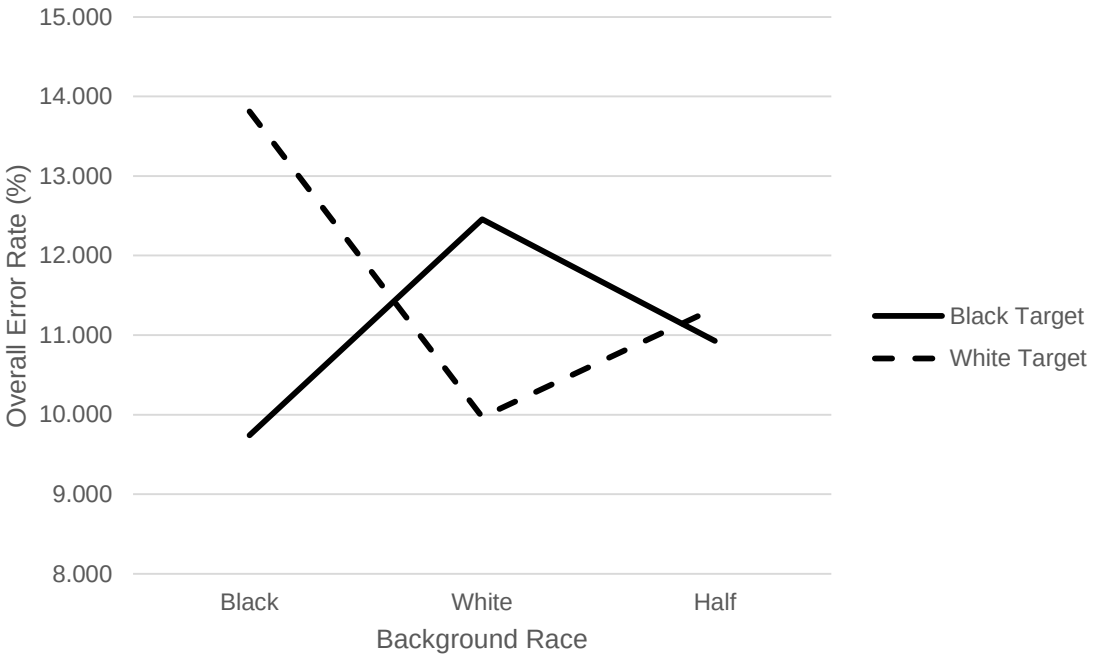

Figure 29. Overall Error Rate (%): The interaction of Target Race and Background Race.

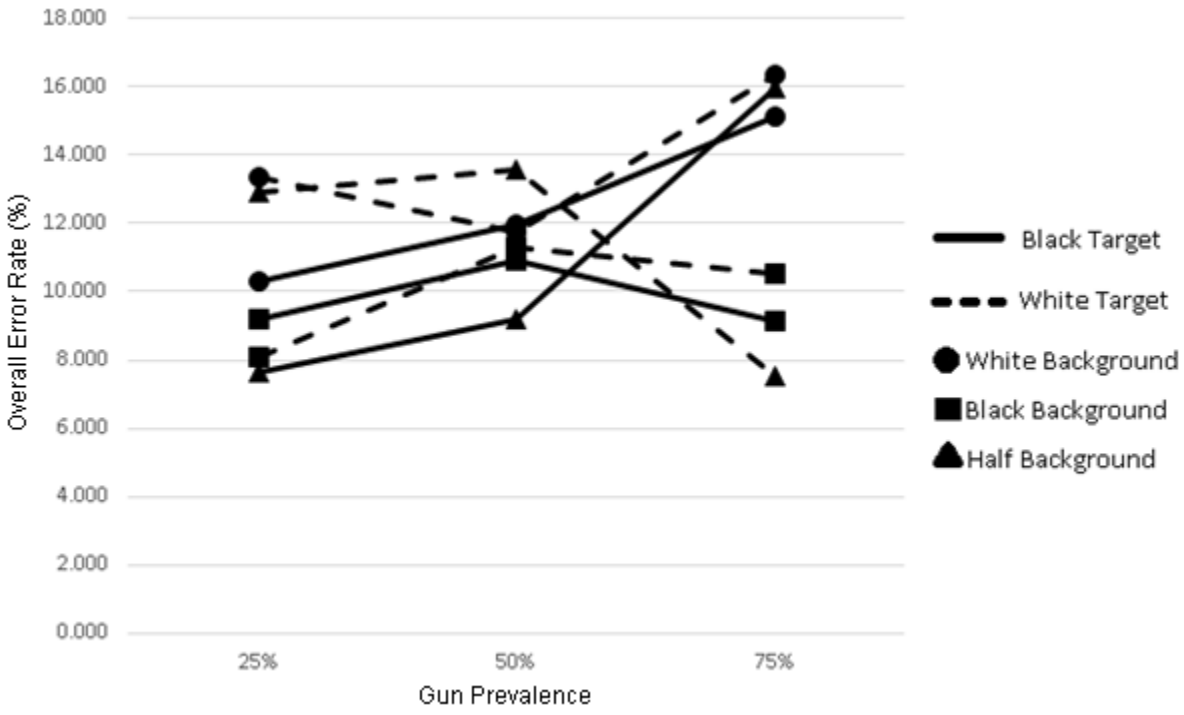

Figure 30. Overall Error Rate (%): The interaction of Target Race, Background Race and Gun Prevalence.

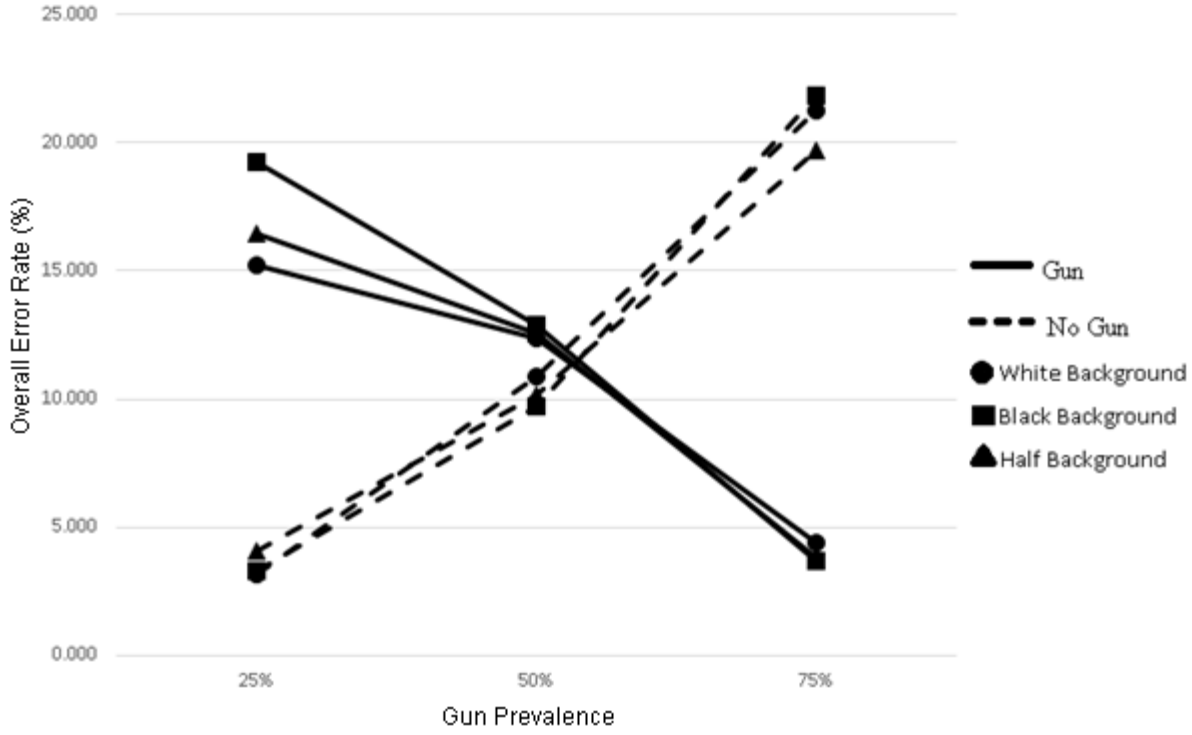

Figure 31. Overall Error Rate (%): The interaction of Object, Background Race and Gun Prevalence.

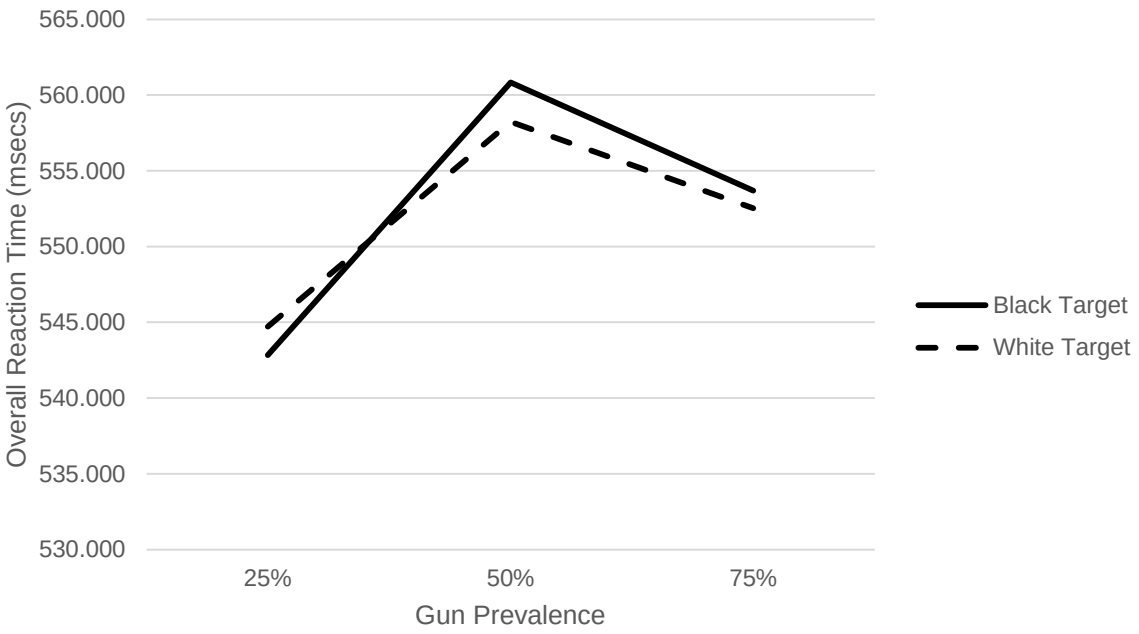

Figure 32. Overall Reaction Time (msecs): The interaction of Target Race and Gun Prevalence.

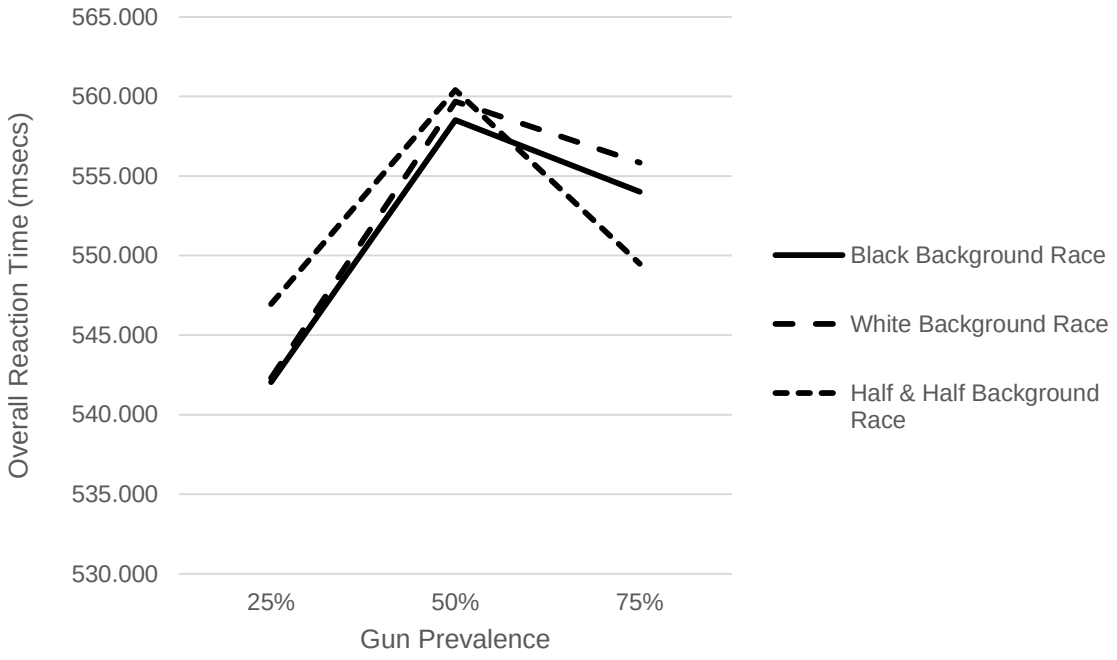

Figure 33. Overall Reaction Time (msecs): The interaction of Background Race and Gun Prevalence.

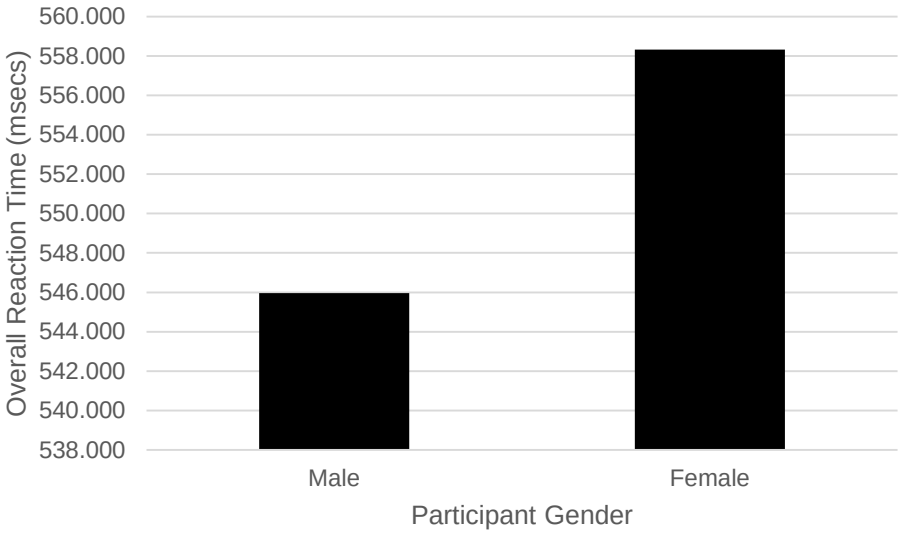

Figure 34. Overall Reaction Time (msecs): The main effect of Participant Gender.

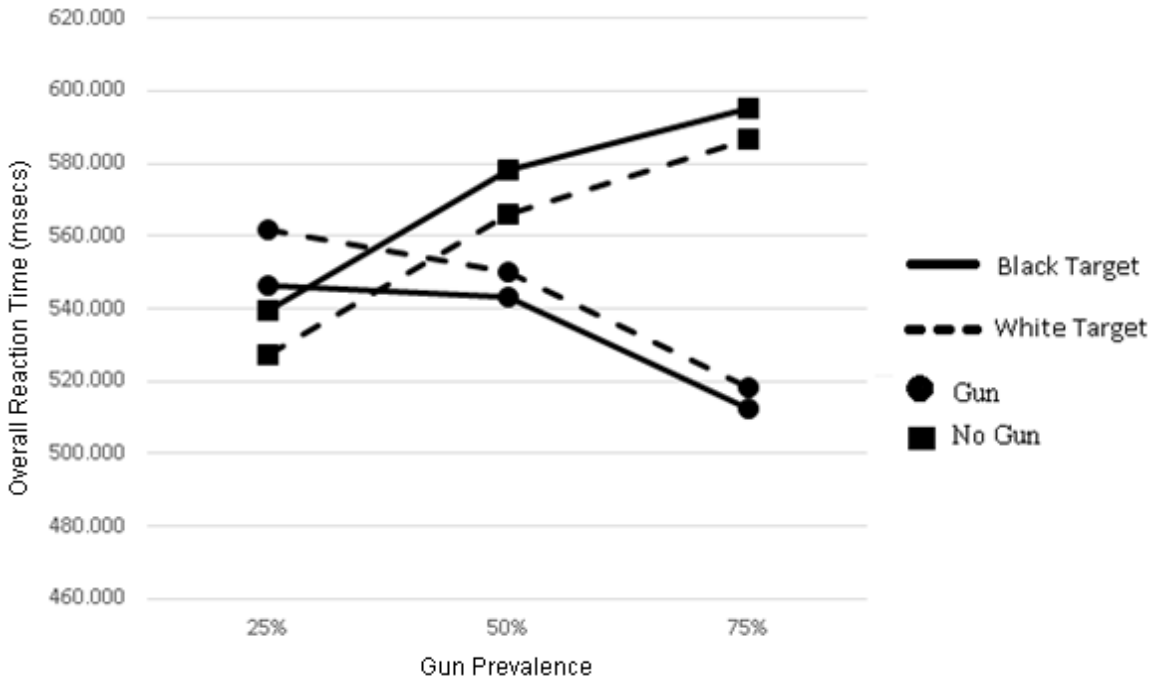

Figure 35. Overall Reaction Time (msecs): The interaction of Target Race, Object and Gun Prevalence.

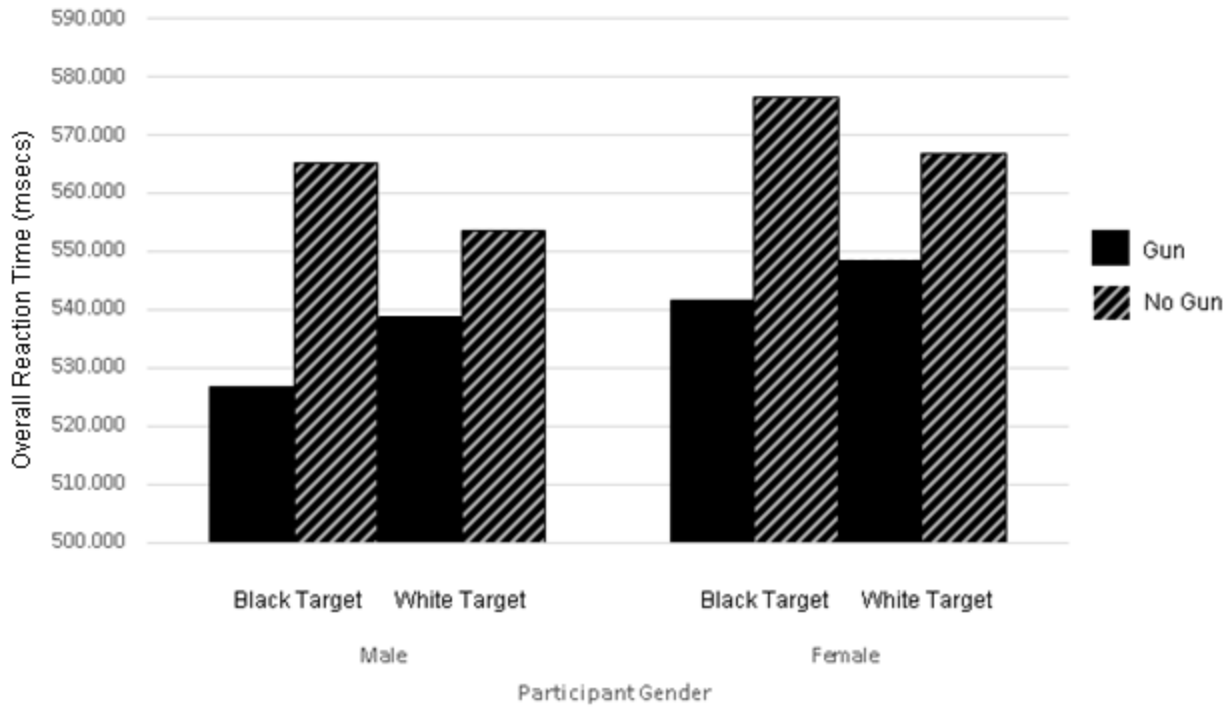

Figure 36. Overall Reaction Time (msecs): The interaction of Target Race, Object and Participant Gender.

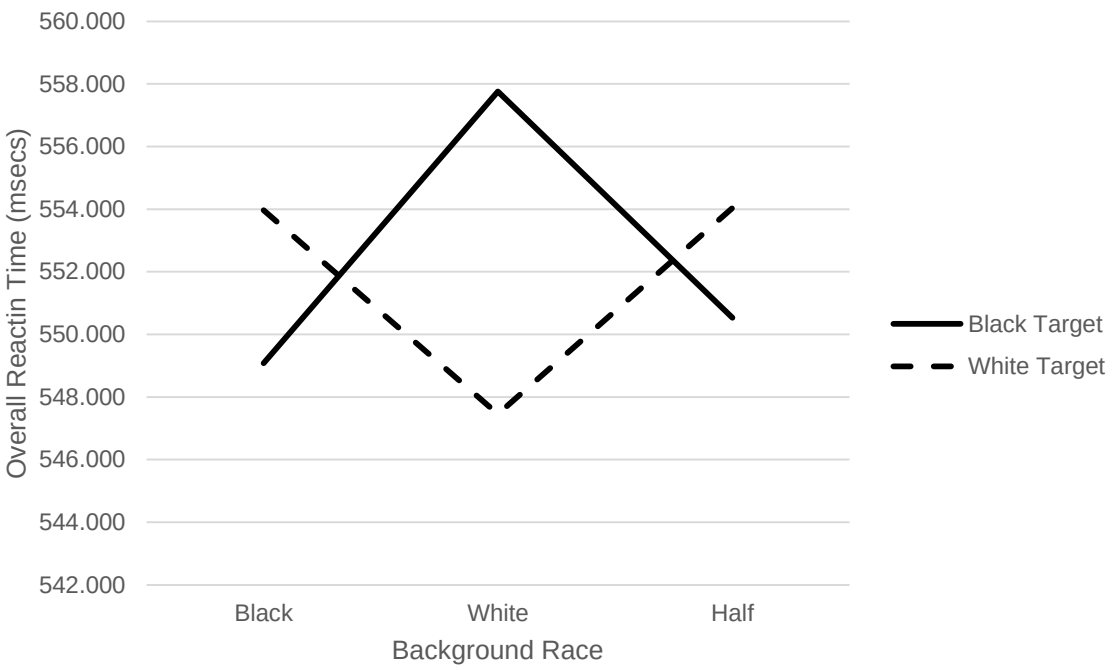

Figure 37. Overall Reaction Time (msecs): The interaction of Target Race and Background Race.

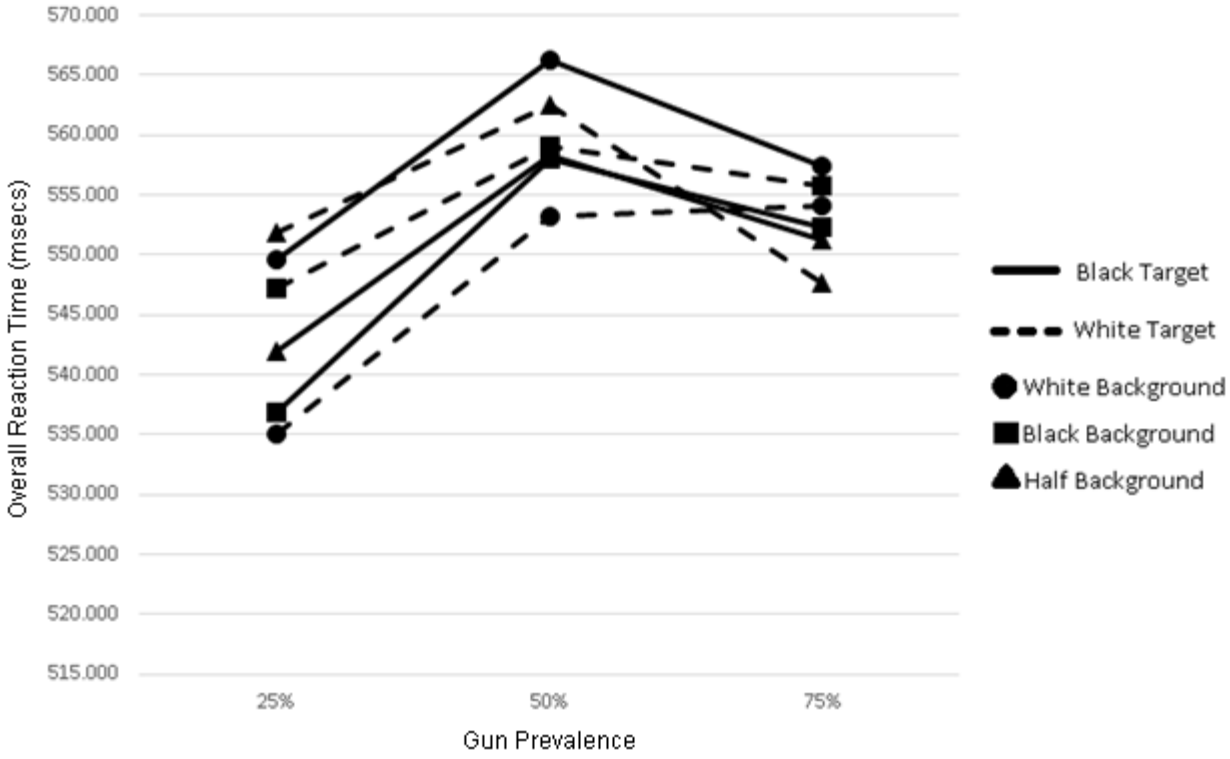

Figure 38. Overall Reaction Time (msecs): The interaction of Target Race, Background Race and Gun Prevalence.

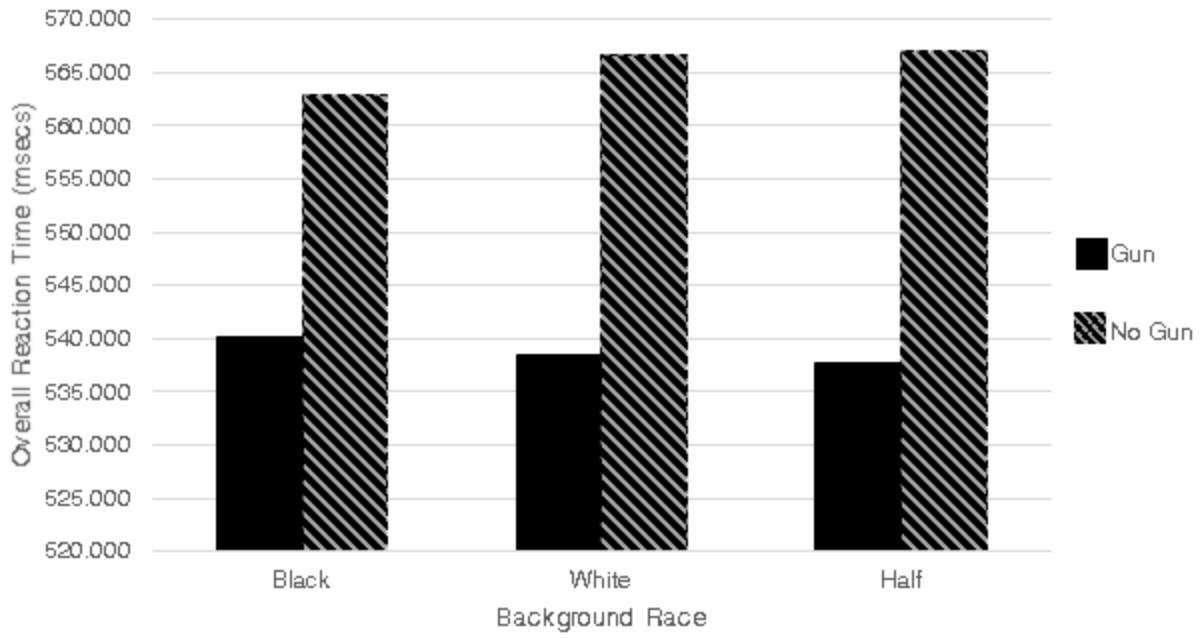

Figure 39. Overall Reaction Time (msecs): The interaction of Object and Background Race.

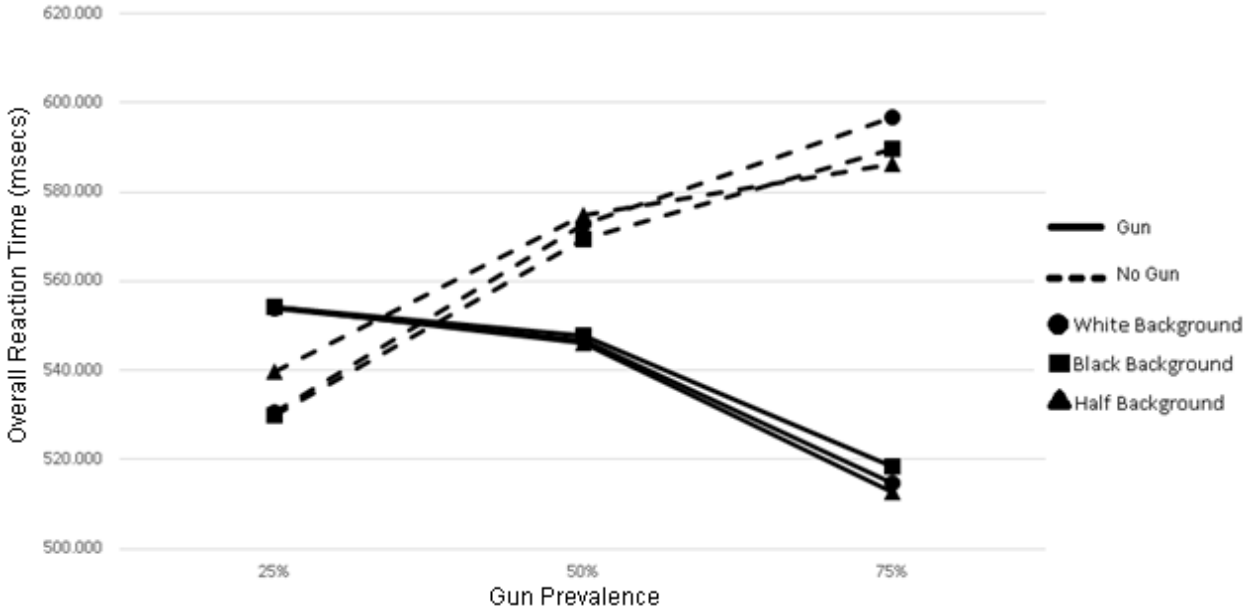

Figure 40. Overall Reaction Time (msecs): The interaction of Object, Background Race and Gun Prevalence.

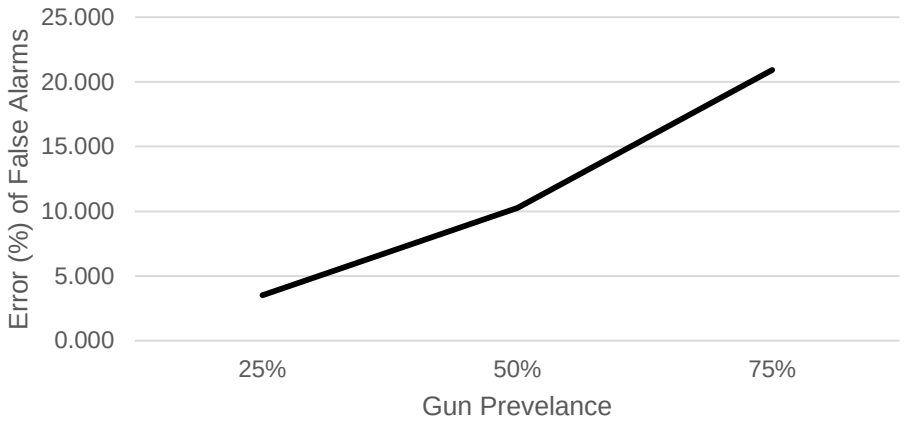

Figure 41. False Alarm Rate (%): The main effect of Gun Prevalence.

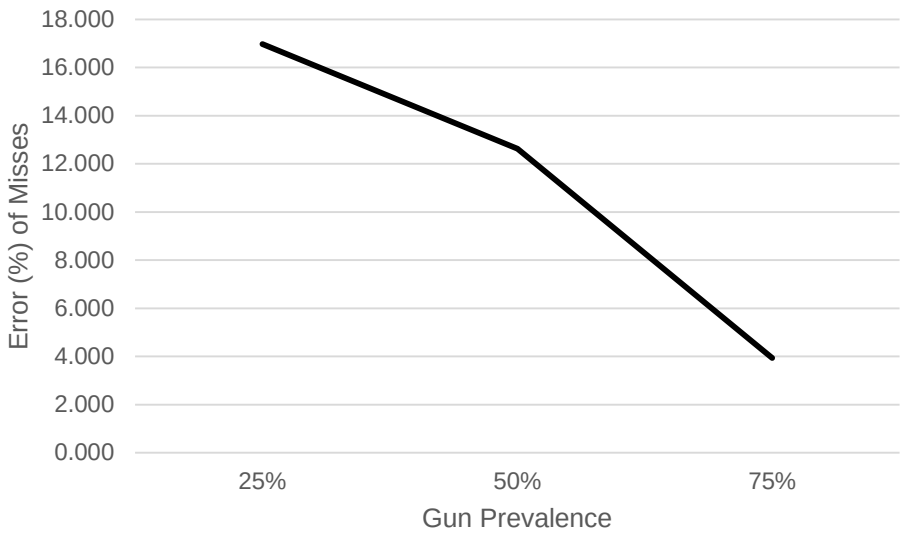

Figure 42. Misses Rate (%): The main effect of Gun Prevalence.

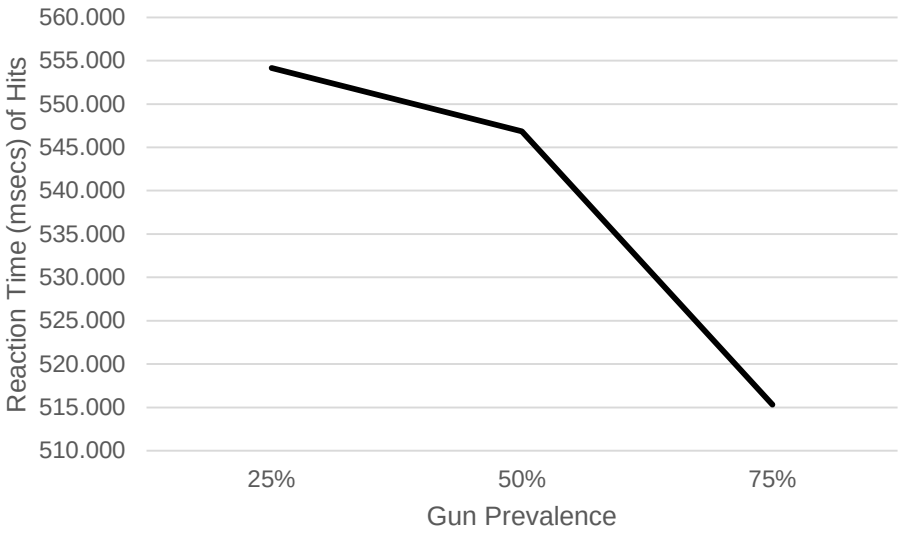

Figure 43. Hits Reaction Time (msecs): The main effect of Gun Prevalence.

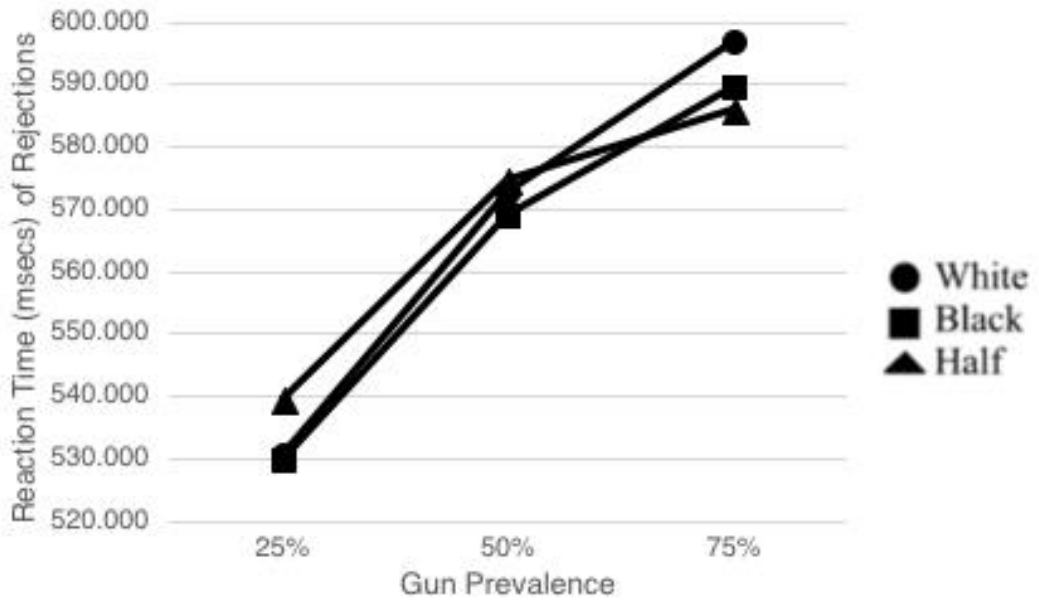

Figure 44. Rejections Reaction Time (msecs): The interaction of Background Race and Gun Prevalence.

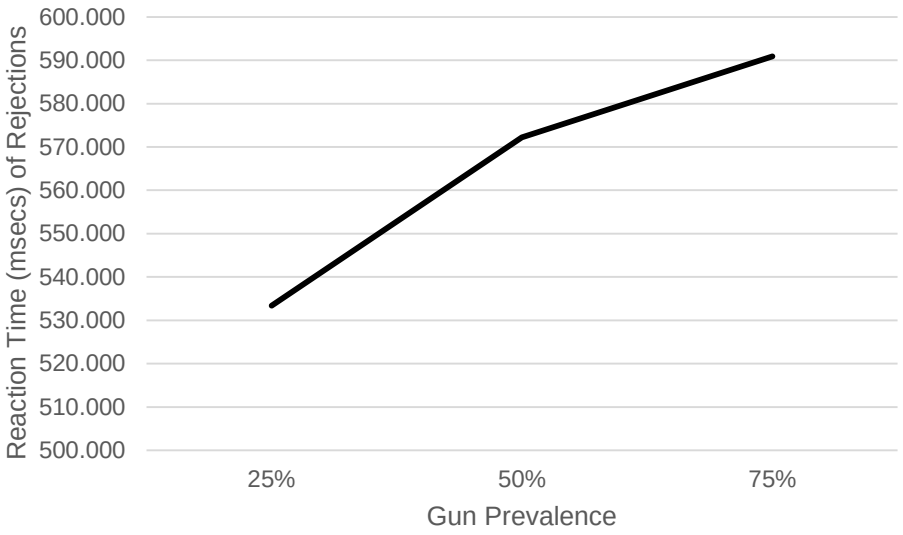

Figure 45. Rejections Reaction Time (msecs): The main effect of Gun Prevalence.

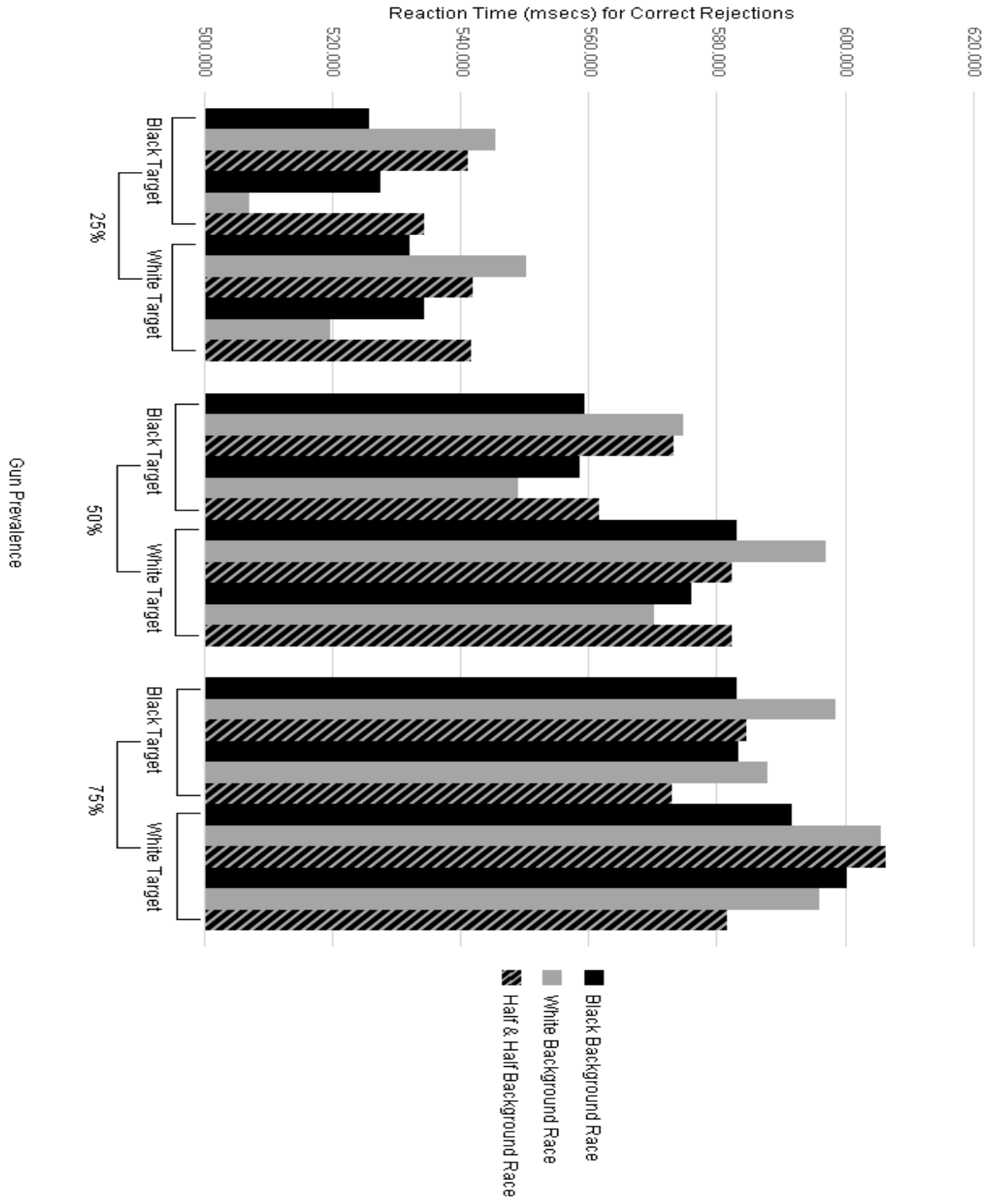

Figure 46. Rejections Reaction Time (msecs): The interaction of Target Race, Background Race and Gun Prevalence.

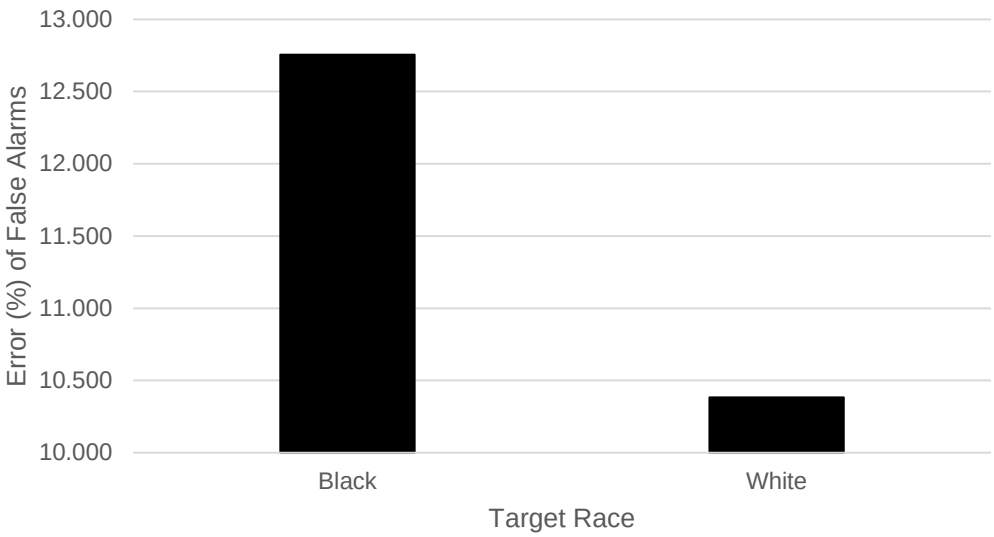

Figure 47. False Alarms Rate (%): The main effect of Target Race.

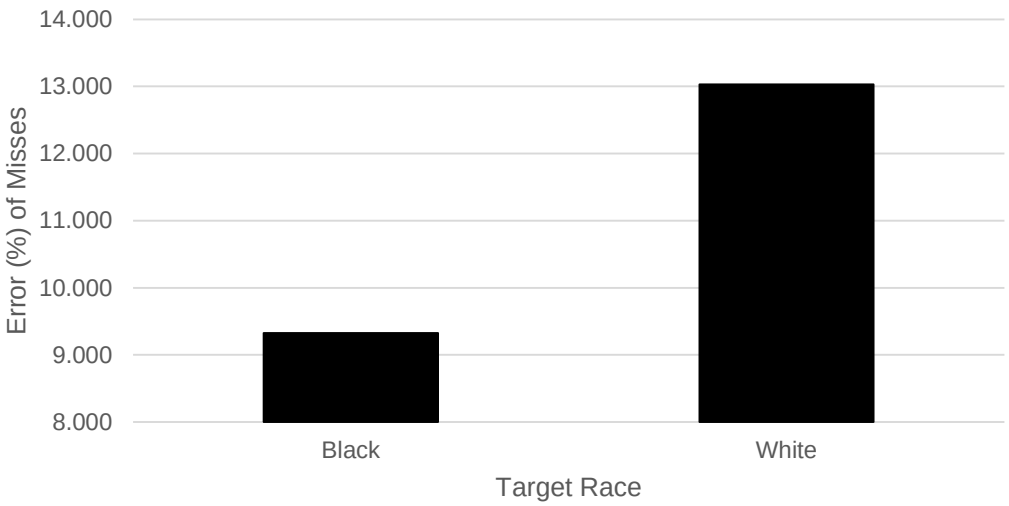

Figure 48. Misses Rate (%): The main effect of Target Race.

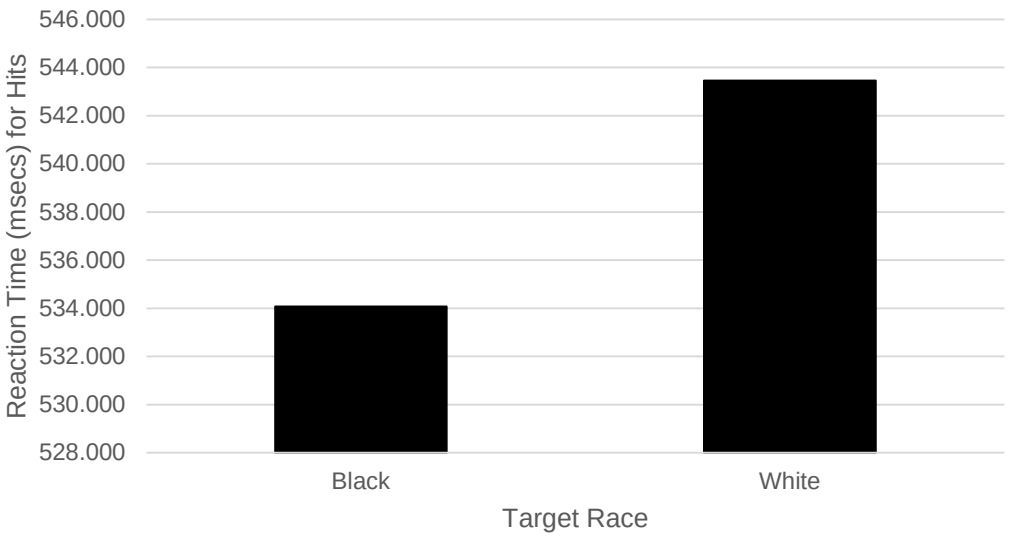

Figure 49. Hits Reaction Time (msecs): The main effect of Target Race.

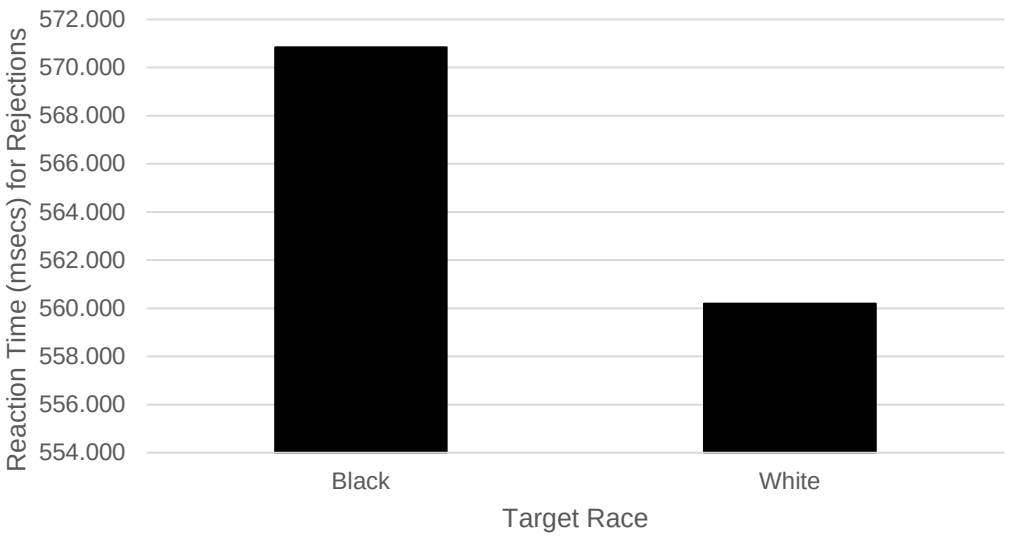

Figure 50. Rejections Reaction Time (msecs): The main effect of Target Race.

Table 1.
Descriptive Statistics for Overall Reaction Time (msecs)

	M	SD	N
Target Race			
Black	552.40	22.24	112
White	551.83	20.81	112
Object			
Gun	539.32	39.45	112
No Gun	564.90	33.47	112
Background Race			
Black Background	551.48	21.42	112
White Background	552.52	22.51	112
Half Background	552.34	22.39	112
Gun Prevalence			
25%	543.98	20.31	40
50%	560.14	19.41	35
75%	553.31	21.11	37
Participant Gender			
Male	545.59	17.90	53
Female	557.97	22.34	59

Table 2.
Descriptive Statistics for Overall Error Rate (%)

	M	SD	N
Target Race			
Black	11.06	7.56	112
White	11.75	7.35	112
Object			
Gun	11.36	10.72	112
No Gun	11.43	11.10	112
Background Race			
Black Background	12.21	11.61	112
White Background	10.78	10.64	112
Half Background	11.09	11.51	112
Gun Prevalence			
25%	10.23	7.68	40
50%	11.58	6.88	35
75%	12.47	6.89	37
Participant Gender			
Male	10.46	7.29	53
Female	12.23	7.18	59

Table 3.
Overall Error Rate (%)
ANOVA Summary for Target Race, Object, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	147.695	1	147.695	3.761	.055
Target Race * Gun Prevalence	1187.012	2	593.506	15.112	< .001
Target Race * Gender	6.121	1	6.121	.156	.694
Target Race * Gun Prevalence * Gender	65.316	2	32.658	.832	.438
Error (Target Race)	4163.088	106	39.274		
Object	50.933	1	50.933	.157	.693
Object * Gun Prevalence	54236.818	2	27118.409	83.720	< .001
Object * Gender	60.523	1	60.523	.187	.666
Object * Gun Prevalence * Gender	797.576	2	398.788	1.231	.296
Error (Object)	34335.099	106	323.916		
Background Race	109.341	2	54.670	10726	.180
Background Race * Gun Prevalence	340.949	4	85.237	2.691	.032
Background Race * Gender	31.060	2	15.530	.490	.613
Background Race * Gun Prevalence * Gender	112.369	4	28.092	.887	.473
Error (Background Race)	6714.808	212	31.674		
Gun Prevalence	1105.739	2	552.87	.897	.411
Gender	1171.160	1	1171.760	1.899	.171
Gun Prevalence * Gender	1030.082	2	515.041	.835	.437
Error (Gun Prevalence * Gender)	65365.391	106	616.655		
Target Race * Object	3081.281	1	3081.281	74.250	< .001
Target Race * Object * Gun Prevalence	56.837	2	28.418	.685	.506
Target Race * Object * Gender	6.341	1	6.341	.153	.697
Target Race * Object * Gun Prevalence * Gender	.977	2	.488	.012	.988
Error (Target Race * Object)	4398.852	106	41.499		
Target Race * Background Race	2399.654	2	1199.827	29.850	< .001
Target Race * Background Race * Gun Prevalence	4206.950	4	1051.737	26.165	< .001
Target Race * Background Race * Gender	17.461	2	8.730	.217	.805
Target Race * Background Race * Gun Prevalence * Gender	76.721	4	19.180	.477	.752

Table 3, Continued

Source	SS	df	Mean Square	*F*	Significance
Error (Target Race*Background Race)	8521.510	212	40.196		
Object * Background Race	118.605	2	59.302	1.731	.180
Object * Background Race * Gun Prevalence	396.186	4	99.046	2.890	.023
Object * Background Race * Gender	74.473	2	37.237	1.087	.339
Object * Background Race * Gun Prevalence * Gender	68.047	4	17.012	.496	.738
Error (Object * Background Race)	7264.981	212	34.269		
Target Race * Object * Background Race	2278.585	2	1139.292	26.396	< .001
Target Race * Object * Background Race * Gun Prevalence	5369.884	4	1342.471	31.103	< .001
Target Race * Object * Background Race * Gender	50.070	2	25.035	.580	.561
Target Race * Object * Background Race * Gun Prevalence * Gender	96.674	4	24.169	.560	.692
Error (Target Race * Object * Background Race)	9150.277	212	43.162		

Table 4.
Overall Reaction Time (msecs)
ANOVA Summary for Target Race, Object, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	133.621	1	133.621	.805	.372
Target Race * Gun Prevalence	1181.212	2	590.606	3.559	.032
Target Race * Gender	201.510	1	201.510	1.214	.273
Target Race * Gun Prevalence * Gender	21.458	2	10.729	.065	.937
Error (Target Race)	17591.425	106	165.957		
Object	238938.312	1	238938.312	136.942	< .001
Object * Gun Prevalence	534762.925	2	267381.462	153.243	< .001
Object * Gender	1.375	1	1.375	.001	.978
Object * Gun Prevalence * Gender	3791.433	2	1895.717	1.086	.341
Error (Object)	184950.396	106	1744.815		
Background Race	276.461	2	138.231	.640	.528
Background Race * Gun Prevalence	5571.337	4	1392.834	6.447	< .001
Background Race * Gender	283.523	2	141.761	.656	.520
Background Race * Gun Prevalence * Gender	822.456	4	205.614	.952	.435
Error (Background Race)	45800.951	212	216.042		
Gun Prevalence	56579.969	2	28289.984	6.16	.003
Gender	50979.087	1	50979.087	11.100	.001
Gun Prevalence * Gender	2497.084	2	1248.542	.272	.763
Error (Gun Prevalence * Gender)	486842.352	106	4592.852		
Target Race * Object	33507.580	1	33507.580	195.535	< .001
Target Race * Object * Gun Prevalence	2919.510	2	1459.755	8.518	< .001
Target Race * Object * Gender	872.015	1	872.015	5.089	.026
Target Race * Object * Gun Prevalence * Gender	691.326	2	345.663	2.017	.138
Error (Target Race * Object)	18164.559	106	171.364		
Target Race * Background Race	15692.950	2	7846.475	46.661	< .001
Target Race * Background Race * Gun Prevalence	6937.483	4	1734.371	10.314	< .001
Target Race * Background Race * Gender	.081	2	.040	.000	1.000
Target Race * Background Race * Gun Prevalence * Gender	1349.618	4	337.405	2.006	.095

Table 4, Continued

Source	SS	df	Mean Square	*F*	Significance
Error (Target Race * Background Race)	35649.630	212	168.159		
Object * Background Race	2759.082	2	1379.541	7.439	.001
Object * Background Race * Gun Prevalence	2964.126	4	741.032	3.996	.004
Object * Background Race * Gender	828.363	2	414.181	2.233	.110
Object * Background Race * Gun Prevalence * Gender	1058.782	4	264.696	1.427	.226
Error (Object * Background Race)	39315.990	212	185.453		
Target Race * Object * Background Race	5967.628	2	2983.814	16.231	< .001
Target Race * Object * Background Race * Gun Prevalence	2395.458	4	598.865	3.258	.013
Target Race * Object * Background Race * Gender	49.080	2	24.540	.133	.875
Target Race * Object * Background Race * Gun Prevalence * Gender	1655.345	4	413.836	2.251	.065
Error (Target Race * Object * Background Race)	38972.276	212	183.831		

Table 5.
Descriptive Statistics for Error Rate (%) of False Alarms

	M	SD	N
Target Race			
Black	12.58	12.67	112
White	10.27	10.16	112
Background Race			
Black Background	11.46	12.58	112
White Background	11.59	11.58	112
Half Background	11.22	10.44	112
Gun Prevalence			
25%	3.48	3.71	40
50%	10.39	6.89	35
75%	20.10	12.43	37
Participant Gender			
Male	10.36	9.51	53
Female	12.38	12.35	59

Table 6.
Descriptive Statistics for Error Rate (%) of Misses

	M	SD	N
Target Race			
Black	9.49	9.91	112
White	13.23	12.00	112
Background Race			
Black Background	12.21	11.61	112
White Background	10.78	10.64	112
Half Background	11.09	11.51	112
Gun Prevalence			
25%	16.99	13.55	40
50%	12.76	7.76	35
75%	3.95	2.29	37
Participant Gender			
Male	10.55	11.69	53
Female	12.08	9.82	59

Table 7.
Descriptive Statistics for Reaction Time (msecs) of Rejections

	M	SD	N
Target Race			
Black	570.20	33.06	112
White	559.60	34.59	112
Background Race			
Black Background	562.28	34.50	112
White Background	566.04	37.54	112
Half Background	566.38	31.65	112
Gun Prevalence			
25%	533.57	25.89	40
50%	573.05	21.45	35
75%	591.08	20.78	37
Participant Gender			
Male	558.63	32.55	53
Female	570.54	33.55	59

Table 8.
Descriptive Statistics for Reaction Time (msecs) of Hits

	M	SD	N
Target Race			
Black	534.59	30.06	112
White	544.06	30.10	112
Background Race			
Black Background	540.67	29.60	112
White Background	539.01	30.05	112
Half Background	538.30	31.88	112
Gun Prevalence			
25%	554.41	24.07	40
50%	547.23	21.03	35
75%	515.53	27.07	37
Participant Gender			
Male	532.56	28.76	53
Female	545.40	28.96	59

Table 9.
False Alarms (Error data)
ANOVA Summary for Target Race, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	939.884	1	939.884	20.210	< .001
Target Race * Gun Prevalence	835.666	2	417.833	8.985	< .001
Target Race * Gender	.001	1	.001	.000	.996
Target Race * Gun Prevalence * Gender	39.805	2	19.903	.428	.653
Error (Target Race)	4929.619	106	46.506		
Background Race	22.193	2	11.096	.350	.705
Background Race * Gun Prevalence	248.895	4	62.224	1.964	.101
Background Race * Gender	39.942	2	19.971	.630	.533
Background Race * Gun Prevalence * Gender	109.508	4	27.377	.864	.486
Error (Background Race)	6718.253	212	31.690		
Gun Prevalence	35251.825	2	17625.912	42.530	< .001
Gender	882.077	1	882.077	2.128	.148
Gun Prevalence * Gender	1559.793	2	779.897	1.882	.157
Error (Gun Prevalence * Gender)	43929.866	106	414.433		
Target Race * Background Race	4097.095	2	2048.547	43.300	< .001
Target Race * Background Race * Gun Prevalence	8621.440	4	2155.360	45.558	< .001
Target Race * Background Race * Gender	44.083	2	22.042	.466	.628
Target Race * Background Race * Gun Prevalence * Gender	44.284	4	11.071	.234	.919
Error (Target Race * Background Race)	10029.838	212	47.311		

Table 10.
Misses (Error data)
ANOVA Summary for Target Race, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	2289.092	1	2289.092	66.801	< .001
Target Race * Gun Prevalence	408.183	2	204.091	5.956	.004
Target Race * Gender	12.461	1	12.461	.364	.548
Target Race * Gun Prevalence * Gender	26.487	2	13.244	.386	.680
Error (Target Race)	3632.322	106	34.267		
Background Race	205.753	2	102.877	3.003	.052
Background Race * Gun Prevalence	488.240	4	122.060	3.564	.008
Background Race * Gender	65.592	2	32.796	.957	.386
Background Race * Gun Prevalence * Gender	70.908	4	17.727	.518	.723
Error (Background Race)	7261.535	212	34.253		
Gun Prevalence	20090.733	2	10045.366	19.093	< .001
Gender	349.605	1	349.605	.664	.417
Gun Prevalence * Gender	267.865	2	133.932	.255	.776
Error (Gun Prevalence * Gender)	55770.624	106	526.138		
Target Race * Background Race	581.144	2	290.572	8.061	< .001
Target Race * Background Race * Gun Prevalence	955.394	4	238.848	6.626	< .001
Target Race * Background Race * Gender	23.447	2	11.724	.325	.723
Target Race * Background Race * Gun Prevalence * Gender	129.111	4	32.278	.895	.468
Error (Target Race * Background Race)	7641.949	212	36.047		

Table 11.
Hits (Reaction Time data)
ANOVA Summary for Target Race, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	14704.633	1	14704.633	76.822	< .001
Target Race * Gun Prevalence	3508.105	2	1754.053	9.164	< .001
Target Race * Gender	955.953	1	955.953	4.994	.028
Target Race * Gun Prevalence * Gender	428.906	2	214.453	1.120	.330
Error (Target Race)	20289.764	106	191.413		
Background Race	732.028	2	366.014	1.912	.150
Background Race * Gun Prevalence	673.046	4	168.262	.879	.477
Background Race * Gender	1006.551	2	503.275	2.628	.075
Background Race * Gun Prevalence * Gender	745.594	4	186.399	.973	.423
Error (Background Race)	40592.311	212	191.473		
Gun Prevalence	192317.211	2	96158.605	28.557	< .001
Gender	25225.484	1	25225.484	7.491	.007
Gun Prevalence * Gender	1772.956	2	886.478	.263	.769
Error (Gun Prevalence * Gender)	356927.227	106	3367.238		
Target Race * Background Race	4823.348	2	2411.674	15.794	< .001
Target Race * Background Race * Gun Prevalence	1095.074	4	273.769	1.793	.131
Target Race * Background Race * Gender	24.676	2	12.338	.081	.922
Target Race * Background Race * Gun Prevalence * Gender	1044.190	4	261.048	1.710	.149
Error (Target Race*Background Race)	32371.579	212	152.696		

Table 12.
Rejections (Reaction Time data)
ANOVA Summary for Target Race, Background Race, Gender and Gun Prevalence

Source	SS	df	Mean Square	*F*	Significance
Target Race	18936.568	1	18936.568	129.785	< .001
Target Race * Gun Prevalence	592.617	2	296.308	2.031	.136
Target Race * Gender	117.573	1	117.573	.806	.371
Target Race * Gun Prevalence * Gender	283.879	2	141.940	.973	.381
Error (Target Race)	15466.220	106	145.908		
Background Race	2303.514	2	1151.757	5.484	.005
Background Race * Gun Prevalence	7862.417	4	1965.604	9.359	< .001
Background Race * Gender	105.335	2	52.667	.251	.778
Background Race * Gun Prevalence * Gender	1135.643	4	283.911	1.352	.252
Error (Background Race)	44524.630	212	210.022		
Gun Prevalence	399025.683	2	199512.842	67.166	< .001
Gender	25754.978	1	25754.978	8.670	.004
Gun Prevalence * Gender	4515.561	2	2257.781	.760	.470
Error (Gun Prevalence * Gender)	314865.521	106	2970.429		
Target Race * Background Race	16837.230	2	8418.615	42.242	< .001
Target Race * Background Race * Gun Prevalence	8237.867	4	2059.467	10.334	< .001
Target Race * Background Race * Gender	24.485	2	12.242	.061	.940
Target Race * Background Race * Gun Prevalence * Gender	1960.772	4	490.193	2.460	.047
Error (Target Race*Background Race)	42250.327	212	199.294		