PERCEPTIONS OF LIFE HISTORY STRATEGY AND THE DECISION TO SHOOT

By

Jenna Anne Harder

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ABSTRACT

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In the First-Person Shooter Task (FPST), participants make rapid shoot/don't-shoot responses to Black and White targets holding guns or harmless objects. It is possible that participants' responses in this task are influenced by perceptions of targets' social class, as Blacks are more likely to be low social class, and lower-class individuals are more likely to be pursuing a fast life strategy and therefore more likely to need to resort to physical conflict. Participants across three studies completed a FPST in which Black and White targets were dressed in upper-class outfits or lower-class outfits. Errors and reaction times were recorded and analyzed using the Drift Diffusion Model (DDM). DDM results indicate that participants interpreted the evidence for a shoot decision as stronger for lower-class targets. However, DDM results in two studies also demonstrated a bias against White targets, and differences in error rate and reaction time did not emerge when controlling for random effects by target individual, suggesting that results may have been strongly influenced by characteristics of the targets other than race, social class, and object. Thus while results may demonstrate that perceptions of social class play a role in shooting decisions, further research is needed to confirm this. Implications for the generalizability of shooter research are discussed.

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KEY TO ABBREVIATIONS

DDM: Drift Diffusion Model

ESS: Effective Sample Size

FPST: First-Person Shooter Task

HDI: Highest Density Interval

δ: Drift rate

β: Starting point

INTRODUCTION

In recent years, incidents in which unarmed Black men were killed by police officers have received a great deal of media attention and sparked protests across the United States. Protesters claim that these police officers' decisions were influenced by factors such as racial stereotypes and prejudice and that the suspects would not have been killed had they been White. Many police feel differently, arguing that the stress and time pressure of interactions with potentially threatening civilians can lead to errors regardless of the civilian's race.

Social psychologists have tried to inform this debate by focusing on two main questions: (1) Does the race of a person influence someone's decision to shoot that person, and (2) if so, why? A number of studies have addressed the first question, and according to a recent meta-analysis (Mekawi & Bresin, 2015), the answer is yes. Like most experimental studies addressing this question, the majority of the meta-analyzed studies employ some variation of the First-Person Shooter Task (FPST) in order to study shooting behavior in a controlled laboratory environment. The FPST is a computerized task in which participants must quickly decide to press a "shoot" or a "don't shoot" button depending on whether a target individual is armed (holding a gun) or unarmed (holding a harmless object). "Shooter bias" exists when responses to unarmed targets are slower and/or less accurate if the target is Black, and responses to armed targets are slower and/or less accurate if the target is White. This pattern is typical of civilian participants (Correll, Park, Judd & Wittenbrink, 2002, 2007; Correll, Park, Judd, Wittenbrink, et al., 2012; Ma et al., 2013; Sadler, Correll, Park, & Judd, 2012) as well as, possibly to a lesser extent, police officers (Correll, Park, Judd, Wittenbrink, et al., 2007; Ma et al., 2013; Sadler et al., 2012; but see James, Vila, & Daratha, 2013).

However, the evidence regarding the second question—why does the race of a target influence a person's likelihood to shoot him?—is more ambiguous. Most investigations of this question have focused on stereotypic beliefs about African-Americans. However, a possibility that has received relatively little attention is that participants' responses to a target may be influenced by their perceptions of the target's social class. Since members of different races differ in median income and other markers of social class (DeNavas-Walt, Proctor, & Smith, 2013), participants may heuristically use a target's race to judge his class, and shooting decisions based on these class estimates would thus produce different results for targets of different races, like those observed in past studies.

Specifically, one might expect a connection between perceived social class and shooting behavior because of the connection between social class and life history strategy. According to life history theory (Del Giudice, Gangestad, & Kaplan, 2015), people who grow up under conditions of harshness and uncertainty (as might be typical in lower-class households) are likely to follow "fast life strategies." On the other hand, people who grow up under conditions of resource-security and predictability (such as members of upper-class households) are likely to pursue "slow life strategies." Each strategy is composed of a particular constellation of behaviors likely to be adaptive in the individual's environment—including behaviors related to competition with other individuals. Slow life strategists tend to prefer low-risk forms of competition, such as competition of an economic or relational nature, whereas fast life strategists, living under uncertain conditions in which low-risk options may not pay off, are more likely to engage in high-risk, winner-takes-all types of competition such as physical conflict (Daly & Wilson, 2001).

I propose that people learn the connection between race and social class and therefore heuristically expect African-Americans to be from lower-class backgrounds, and that people likewise expect individuals from lower-class backgrounds to be more likely to escalate physical conflict (see Williams, Sng, & Neuberg, 2016). This could lead people to respond differently to members of different races when assessing the amount of threat they pose, as in decisions to shoot in police work or the FPST.

Shooter Bias in Civilians and Police

In a given trial of the typical FPST (e.g. Correll et al., 2002), several empty neighborhood scenes appear on the screen, followed by a still image of a target person holding either a gun or a harmless object. The target appears on the computer screen for a brief time—generally less than a second—during which the participant must press a “shoot” button to shoot the target if he is holding a gun, or a “don’t shoot” button to not shoot him if he is holding a harmless object. Usually half of the targets are White and half are Black, and all are men; an FPST with targets of both genders found that participants were less likely to shoot women than men of both races (Plant, Goplen, & Kunstman, 2011).

Most typically, analyses in FPST studies have employed ANOVAs to compare mean error rates and reaction times for responses to each type of target, although some have also employed signal detection analyses. Using such analyses, most samples of students and other non-police participants have shown “shooter bias” such that responses to unarmed targets are slower and/or less accurate if the target is Black than if he is White, and responses to armed targets are slower and/or less accurate if the target is White than if he is Black (Correll et al., 2002; Correll, Park, Judd, & Wittenbrink, 2007; Correll, Park, Judd, Wittenbrink, et al., 2007; Ma et al., 2013; Sadler et al., 2012). Of the few samples of police officers included in FPST studies to date, most have shown a similar pattern of bias (e.g. Ma et al., 2013; Sadler et al., 2012). However, police usually make fewer errors and show smaller magnitudes of bias. In fact, Correll, Park, Judd, Wittenbrink, et al. (2007) found that although police officers—like community members—showed bias in their reaction times, signal detection analyses of error rates found that only one of their two samples of police officers set a lower criterion for Black targets, indicating that the *shoot* decision was made more readily for Black than White targets. Sim, Correll, and Sadler (2013) found no bias at all among police officers except for those whose work reinforced associations of African-Americans with violent behavior, such as officers who regularly dealt with minority gang members. A study by James et al. (2013) even found the opposite effect for both police and civilians, such that participants were biased toward shooting Whites more than Blacks. Nevertheless, some degree of bias toward shooting Black targets characterizes most police samples in the shooting literature (Mekawi & Bresin, 2015).

These analyses, however, provide limited information. ANOVA-based analyses must analyze error rates and reaction times separately, missing any connections between these two variables that may be present in the data. Furthermore, ANOVAs reveal nothing about the psychological processes underlying the behavioral data. Signal detection analyses do provide some process information, but rely exclusively on error rate data, losing any information present in participants' reaction times. Moreover, while signal detection analyses do indicate the direction of bias in shooting responses, they provide no information about the psychological processes producing these biases. To avoid these limitations, I will instead use the Drift Diffusion Model (DDM), which combines both error and reaction time data to estimate parameters representing different components of the decision process as it plays out over time. Using the DDM, I can assess how different variables affect these different components.

The Drift Diffusion Model

The Drift Diffusion Model (DDM) is a single-process sequential sampling model of two-choice decision making (Ratcliff & Rouder, 1998; although variations and extensions on the two-choice design have been made; see Diederich & Busemeyer, 2003; Gomez, Ratcliff, & Perea, 2007; Krajbich & Rangel, 2011; Pleskac & Busemeyer, 2010; Ratcliff, Van Zandt, & McKoon, 1999; Smith, 2015). According to the DDM, when a target appears, participants begin to acquire evidence from the stimulus which accumulates over time toward one of two thresholds representing the two choices (see Figure 1). In this case, the upper threshold would represent the *shoot* decision and the lower threshold would represent the *don't shoot* decision. A choice is selected if accumulated evidence reaches the decision threshold for that choice.

When the stimulus first appears, evidence accumulation begins at the starting point, β. The starting point can be anywhere between the two thresholds, and indicates the participant's inclination toward one or the other choice. When the starting point is closer to the correct boundary than the incorrect boundary, there will be shorter reaction times and fewer errors for that response.

The distance between the response thresholds, α, is associated with the amount of evidence required to make a choice. If threshold distance is larger, more evidence will be accumulated before a decision is reached and accuracy will be greater; however, responses will occur more slowly. Threshold distance therefore represents a speed-accuracy trade-off.

The drift rate, δ, indicates the strength of the evidence per unit of time in favor of the *shoot* decision if the drift rate is positive or in favor of the *don't shoot* decision if the drift rate is negative. Greater absolute value indicates stronger evidence. Steeper average drift rates for a certain type of target indicate that participants are rapidly acquiring evidence in favor of the correct decision for that type of target. Steeper drift rates therefore correspond to faster reaction times and fewer errors.

The nondecision time, τ, represents the time per trial spent on processes other than evidence accumulation and decision formation—i.e., tasks such as encoding the stimulus and performing the motor response. Since all variability not associated with the other parameters is incorporated into the nondecision time, this parameter effectively serves as an error term as well.

DDM analyses reveal which parameters differ according to predictors of interest (such as the target's race and object in FPST stimuli). Past FPST research employing the DDM has found that the race of targets affects participants' drift rates (Correll, Wittenbrink, Crawford, & Sadler, 2015; Pleskac, Cesario, & Johnson, under review). Specifically, drift rates are higher (i.e., steeper) for armed Black targets than for armed White targets, indicating that the strength of accumulated evidence for a shoot decision is greater for Black than for White targets. This results in faster and more accurate responses for armed Black targets—i.e., participants are faster to correctly shoot an armed target if he is Black, and are more likely to accidentally not shoot an armed target if he is White.

The DDM is particularly valuable for understanding what causes shooter bias, because while traditional methods can indicate *that* behavioral outcomes change in response to a manipulation, the DDM can indicate *how* the manipulation influences behavior. That is, different factors may affect different parts of the shooting decision process, producing changes in different DDM parameters. By observing which parameters change in response to a manipulation, researchers can identify precisely how the manipulated factors affect the decision to shoot.

Identifying the Cause of Shooter Bias

A number of hypotheses have been put forward as to the precise cause or causes of race bias in the FPST. Knowledge of stereotypic associations between African-Americans and violent crime are associated with greater shooter bias (Correll et al., 2002), and Correll, Park, Judd, and Wittenbrink (2007) present experimental evidence that increased accessibility of such associations increases shooter bias. Sim et al. (2013), however, found that this stereotype accessibility manipulation had no effect if participants had prior experience with the shooter task or with police work, unless that experience reinforced an association between African-Americans and gun possession.

Nonetheless, these results should be treated with caution due to the limitations of the studies that produced them. The studies cited above were based on relatively small samples (ranging from N = 22 to N = 75), and the original study (Correll et al., 2002) discovered the association of shooter bias and knowledge of stereotypes only after measuring 10 possible predictors with no *a priori* expectation as to which would predict bias. Further, no correction was made for family-wise error in the 55 comparisons that were performed in this study (such a correction would have rendered the correlation in question nonsignificant had it been carried out). Each of these factors increases the risk of false positives in this line of work. It would therefore be premature to declare stereotypes the definitive cause of shooter bias.

Although stereotype accessibility has inspired, perhaps, the most research as a possible source of shooter bias, a variety of other possibilities also have at least some empirical support. Kenworthy, Barden, Diamond, and Del Carmen (2011) found that White participants who self-reported higher racial ingroup identification were biased toward shooting Black FPST targets. Furthermore, participants in a minimal groups paradigm exhibit shooter bias against outgroup members (Miller, Zielaskowski, and Plant, 2012), indicating that bias exists against outgroups in general, which may engender bias specifically against *racial* outgroups in the decision to shoot. Other studies have demonstrated that shooter bias increases when the racial prototypicality of targets' appearances increases (Ma & Correll, 2011) and that fatigue or ego depletion can increase shooter bias (Ma et al., 2013). Correll, Wittenbrink, Park, Judd, and Goyle (2011) also found that participants erroneously shot Whites at the same rate as Blacks if the targets appeared against a 'dangerous' background scene, whereas the typical shooter bias results only emerged if targets appeared in a 'neutral' scene.

A range of potential causes, therefore, have received at least some empirical support. Many of these may warrant further investigation, as it is likely that shooter bias has multiple causes, but the final study listed above is particularly striking because the scenes classified as 'dangerous' backgrounds typically depicted poor, dilapidated neighborhoods. It is therefore possible that participants were responding not to the dangerousness of the target's environment, but to their perceptions of his social class.

Social Class and Life History Strategy

Perceived social class would be likely to inform shooting decisions if participants were using class as an indicator of the target's life strategy—a concept from life history theory referring to certain physical and psychological characteristics that vary according to conditions in the individual's childhood environment. It should be noted that although other explanations exist as to why social class might affect shooting decisions, applying a life history framework to the study of shooting behavior ties the research to a theory that has received extensive empirical support from biological research, which may increase the likelihood of accuracy in hypotheses about shooting behavior. Moreover, there is some evidence (discussed below) that perceptions of life strategy may underlie many racial stereotypes, and this suggests a variety of hypotheses not only about shooting behavior but also about the connection between perceived life strategy and other judgments. For example, the life strategy perspective suggests that racial stereotypes should be more likely to be activated when Black targets are lower-class rather than upper-class, but only for those stereotypes that involve life strategy-related behaviors. I therefore address the role of social class in shooter task judgments through a life history theory lens in the expectation that this perspective can usefully organize and direct research on stereotyping and discrimination.

Life history theory is a framework for understanding how individuals, given the conditions of their environments, adaptively allocate resources (including immaterial or internal resources such as time and calories; Del Giudice, Gangestad, & Kaplan, 2015). Since resources are finite, decisions must be made as to how to spend them, creating trade-offs: resources allocated toward addressing one challenge cannot be spent on another. Life history theory focuses on two such trade-offs: The trade-off between current and future reproduction and the trade-off between quality and quantity of offspring (Kaplan, Lancaster, & Robson, 2003).

The first trade-off exists in main part because juveniles must allocate some resources toward sexual development and some toward developing embodied capital, which refers to (in a physical sense) organized somatic tissue (muscles, brain, etc.) or (in a functional sense) qualities such as strength, immune function, or knowledge (Del Giudice et al., 2015). Devoting more resources toward sexual development speeds attainment of reproductive age, but devoting more resources toward accruing embodied capital can confer benefits in intrasexual competition for mates and increase one's eventual mate value once reproductive age is reached (Kaplan et al., 2003). This is a trade-off between current and future reproduction because the former strategy allows for reproduction at an age when individuals following the latter strategy are not yet ready to reproduce, but the latter strategy may lead to greater reproductive success later on. Similarly, an example of the trade-off between quantity and quality of offspring is the fact that devoting time to attracting mates will increase the quantity of offspring produced, but time devoted to this task cannot be spent providing food for existing offspring or passing on knowledge and skills—i.e., developing the offspring's embodied capital. In addition, of those resources that are invested in offspring, fewer will be available per offspring if more offspring exist (thus potentially lowering offspring quality).

The optimal ratio of resource allocation to one or the other side of each trade-off depends on certain environmental factors. Consequently, strategies of resource allocation are influenced by these factors and thus vary by environment both across species and across individuals within species. Important environmental factors include extrinsic morbidity-mortality (Ellis, Figueredo, Brumbach, & Schlomer, 2009), as well as the availability of resources and the predictability of variation in environmental conditions (Del Giudice et al., 2015). Extrinsic morbidity-mortality is the risk of disability or death from causes that are relatively insensitive to adaptive strategies, although it is important to note that sources of extrinsic morbidity-mortality are defined less by the type of event they represent than by the individuals whom they affect (Ellis et al., 2009). For example, if local diseases primarily endanger the young and the weak, then disease is not a source of extrinsic morbidity-mortality, because fitness can be enhanced by weakness-reducing strategies—i.e., developing aspects of embodied capital such as immune strength (Ellis et al., 2009). However, if healthy adults with strong immune systems are also at substantial risk for death or disability from local diseases, then disease is a source of extrinsic morbidity-morality, and the fitness payoff for developing health and immune function will be lower.

As a rule, when levels of extrinsic morbidity-mortality are low, an individual's likelihood of death or disability at any given point during the lifespan is determined by age as well as by qualities such health, strength, skills, and other forms of embodied capital (Ellis et al., 2009). When levels of extrinsic morbidity-mortality are high, however, likelihood of death or disability is difficult to predict. Under low levels, therefore, fitness will be improved by greater allocation of resources to accruing embodied capital for oneself and, eventually, one's offspring (via parental investment), thereby reducing the likelihood of mortality at any given point in time. The developmental timeline and behaviors accompanying this pattern of resource allocation constitute a "slow life strategy." On the other hand, under high levels of extrinsic morbidity-mortality, it is more adaptive to pursue a "fast life strategy." Fast life strategies involve greater allocation of resources to sexual development and mating effort, leading to earlier reproduction and more numerous offspring (Del Giudice et al., 2015). These outcomes respectively reduce the chances of mortality prior to reproduction and increase the chances that some offspring will survive to reproductive age in the face of high rates of extrinsic morbidity-mortality (Ellis et al, 2009).

The adaptive value of different life strategies is further influenced by the *predictability* of variation in survival-related environmental factors, such as resource availability. When there are no reliable predictive cues to changes in these factors, individuals' capacity to compensate for deleterious variation decreases, increasing extrinsic morbidity-mortality and promoting faster life strategies (Del Giudice et al., 2015).

The mean level of resource availability also plays an important role. Resource availability determines the amount of resources that can be allocated in the first place, such that when average resource availability is high, individuals can allocate more resources to both reproduction and accruing embodied capital. However, when average resource availability is low, variation around that mean increases the risk of periods of extreme scarcity, increasing extrinsic morbidity-mortality rates (e.g. due to famine, drought). Lower resource availability, therefore, promotes faster life strategies.

Among modern-day humans, these environmental factors are often related to social class, resulting in life strategy differences such that higher social class is associated with slower life strategies (Griskevicius, Tybur, Delton, & Robertson, 2011). Accordingly, lower social class is associated with earlier age at first intercourse (Brewster, 1994), greater probability of teenage pregnancy (Woodward, Fergusson, & Horwood, 2001), and earlier pubertal timing (Ellis & Essex, 2007). This class difference in life strategy is particularly important in the context of shooting incidents because life strategy also has implications for behaviors relevant to interpersonal conflict.

Life History and Physical Conflict

Although different reproductive timelines are the most obvious consequence of different life strategies, these strategies also influence the frequency of other behaviors, including risk-taking (Griskevicius et al., 2011). Risk-taking behaviors entail potentially high rewards as well as potentially high costs, and the fitness implications of those rewards and costs are partially dependent on an individual's reproductive schedule. The delayed reproductive timelines of slow life strategists lower the payoff for risk-taking by increasing the probability of mortality before reproduction (Del Giudice et al., 2015). To decrease this probability, therefore, it is generally adaptive for slow life strategists to avoid taking risks and instead allocate resources to the pursuit of smaller but more certain rewards. Likewise, the payoff for risk aversion is lower for individuals under conditions of high extrinsic mortality—i.e., fast life strategists—since extrinsic mortality is by definition insensitive to variation in behaviors, including risk-aversion. The increased certainty of reward in a risk-averse strategy, therefore, is attenuated in the face of uncertain survival.

These differences in risk-taking lay the groundwork for the connection between social class and shooting behavior in the FPST. Like other life strategy characteristics, risk-taking behaviors vary by social class. For example, individuals from lower-class backgrounds shift preferences toward riskier financial choices in response to cues of mortality risk, whereas preferences of individuals from upper-class backgrounds shift toward more risk-averse options in response to the same cues (Griskevicius et al., 2011). These social class differences have implications for the FPST paradigm because life strategy differences in risk-taking also apply to interpersonal conflict, which can take both low-risk and high-risk forms. For slow life strategists, low-risk forms of competition (e.g. social competition) are adaptive for the reasons discussed above. For fast life strategists, however, fitness payoffs are higher for high-risk forms of competition such as physical conflict and even homicide (Daly & Wilson, 2001), despite the potential high costs of these behaviors (e.g. death, disability, loss of status).

Physical conflict can have high costs for all individuals involved—not only the person who initiates it. For this reason, selection favors abilities and behaviors that allow a person to assess the potential threat posed by a potential competitor and engage in cost-reducing behaviors, such as attempting to deescalate the conflict—or striking first. This initial assessment of whether a threat exists can employ a number of criteria. For example, people can accurately estimate the upper-body strength of others not only from images of their bodies but also from images of their faces alone (Sell, Cosmides, et al., 2009) and recordings of their voices (Sell, Bryant, et al., 2010), suggesting a mechanism to assess damage-inflicting potential from cues that may be more easily observed than actual muscle size. But since threat is determined not only by people's physical formidability but also by their behavior, another component of threat assessment that could be subject to this selection pressure is estimation of the likelihood that a person will escalate conflict to the point of violence. The ability to predict this likelihood from cues related to life strategy would increase fitness, allowing individuals to better estimate whether and when competitors pose a physical threat and adjust their own behavior accordingly to minimize potential costs. Since direct information about another person's life strategy is not always available, humans may learn to associate certain visual or other cues with individuals from different environments and thus use them to infer the likelihood of life strategy-related behaviors. This raises a potential explanation for why judgments in the FPST are made along racial lines. Race is related to social class, which in turn is related to life history strategy, and learning of these associations could lead participants to make life strategy estimates along racial lines in the absence of more direct life history information when making judgments about threat.

A study by Williams et al. (2016) confirms the prediction that members of different races are perceived as pursuing different life strategies, and is worth discussing in some detail here. Williams and her colleagues instructed participants to imagine an individual who in one condition was described as either Black or White, in another condition was described as from one or another type of environment, and in a third condition was described by both race and environment. Environments, like race, came in two types; the first, "hopeful ecologies," were described to participants as communities "where money and jobs are plentiful and expected to be available well into the future" and the second, "desperate ecologies," as communities "where money and jobs are scarce and unpredictable, and opportunities are limited" (Williams et al., 2016, p. 314). Hopeful ecologies were intended to reflect environments that would promote a slow life strategy, and desperate ecologies were intended to reflect environments that would promote a fast life strategy.

Participants were then asked to judge the likelihood that the imagined individual would engage in each of a set of life-strategy related behaviors (Williams et al., 2016). Participants in the first two conditions ascribed behaviors associated with fast life strategies (e.g. “have sex at a young age,” “act impulsively”) to Blacks or to individuals from desperate ecologies, and ascribed behaviors associated with slow life strategies (e.g. “be monogamous,” “make financial investments for the future”) to Whites or to individuals from hopeful ecologies. However, when both race and ecology information was provided, responses varied only according to ecology without regard to race—suggesting that the reason for race’s effect on life strategy judgments was its role as a source of information about the target’s ecology. Notably, the scale of life history behaviors used in this study included items related to physical conflict (e.g. “be physically aggressive,” “resort quickly to violence”), and the overall pattern of results held true for this category as well. Together, these results suggest that people use race as a cue to life history strategy, possibly due to the connection between race and social class (DeNavas-Walt et al., 2013), and that this relationship informs predictions about the likelihood of physically aggressive behaviors for targets of different races. If so, judgments like these could affect responses in tasks like the FPST in which one must assess the amount of threat a target poses. Specifically, judgments about the life strategies of FPST targets based on target race could explain or contribute to shooter bias in these studies.

The association between race and social class (DeNavas-Walt et al., 2013) has substantial face validity as an explanation for why people would use race as a cue to life strategy, although the precise mechanism for the formation of judgments of social class from race could take either of two forms. On the one hand, people may form associations between race *per se* and specific levels of social class such that categorizing another person as belonging to a certain race leads to an social class judgment. However, it may also be that other, more general cues to social class (apparel, body type, etc.) are differentially distributed across races. For example, African-Americans may be more likely than White Americans to wear clothing indicative of low social class, and social class judgments of individual African-Americans who wear such clothing may have the aggregate result that African-Americans are perceived as being of low social class more often than are White Americans.[1] Either possibility has the potential to create shooter bias in the lab or in actual police-civilian interactions.

A FPST study by Sadler et al. (2012) provides partial support for the hypothesis that perceived social class (whatever cues may be driving this perception) affects shooting responses to targets of different races. Targets in this study were Black, Latino, White, or Asian, and bias was found to be strongest against Blacks, second strongest against Latinos, and third strongest against Whites, with Asians being erroneously shot the least often. This order of racial/ethnic groups matches the rankings of these groups from lowest social class to highest social class as measured by median income (DeNavas-Walt et al., 2013). These findings, in addition to the Correll et al. (2011) study in which Whites pictured in dangerous/poor backgrounds elicited the same pattern of responses as did Black targets overall, suggest that shooter bias may be at least partially explicable by perceptions of targets' social class.

If target social class does influence or explain shooter bias, more direct indicators of class in the FPST should interfere with target race effects, either eliminating them (just as ecology

[1] This could occur for various reasons—African-Americans may be more likely to wear clothing associated with low social class because they themselves are likely to be of low social class, or because clothing associated with low social class is also associated with Black culture. Or it may be that clothing associated with Black culture has come to be perceived as lower-class clothing because African-Americans are more likely to be of low social class.

information eliminated race effects in the Williams et al. (2016) study) or changing their pattern in some other way (for example, results might mirror Correll et al.'s (2011) results, in which White targets depicted in poor neighborhoods were shot as often as Blacks were regardless of background). The present studies test this hypothesis.

OVERVIEW

Three studies were conducted which followed identical procedures. Each study employed a FPST in which targets were Black and White men wearing upper-class and lower-class outfits. The first study was a pilot study intended to identify any problems with the stimuli created for this research. After the pilot results were analyzed, a subset of the stimuli were replaced. Study One used this updated stimulus set, and Study Two was a direct replication of Study One.

The present studies tested the prediction that FPST participants would respond to the apparent social class of a target such that they would be biased toward shooting lower-class targets relative to upper-class targets. The studies also explored the question of how target race and target social class interact, testing whether social class partially or fully overwhelmed any race effects (as in Williams et al., 2016) or whether race effects were apparent under high-social class conditions but not low-social class conditions (as in Correll et al., 2011).

METHOD

Participants

Undergraduate students at Michigan State University completed these studies in partial completion of a course requirement. In the pilot study, 104 participants completed the task, but one participant was excluded for shooting on every trial so that the total sample for analyses was N = 103. Study One collected data from 200 participants and Study Two from 211 participants; all participants from both studies were included in analyses.

Materials

The present studies employed a 320-trial FPST task. Each stimulus displayed one of 40 men (20 Black, 20 White), who were holding either a gun or a harmless object (phone case or wallet) and wearing clothing suggestive of low or high social class (see Figures 2-3). Each of the 40 men appeared in four pictures—unarmed lower-class, armed lower-class, unarmed upper-class, and armed upper-class—for a total of 160 pictures, each of which appeared twice during the task. Some of the stimuli used in the pilot study were replaced with stimuli of the same race, class, and object before Study One (see below), but Studies One and Two employed identical stimulus sets.

Pretesting

To verify whether the targets' clothing effectively manipulated perceived social class as intended, a separate sample of 300 undergraduate students estimated the socioeconomic status of a randomized subset of targets in this stimulus set. Each participant rated 32 targets on a scale from 0 (low socioeconomic status) to 100 (high socioeconomic status); thus approximately 60 ratings were obtained for each target. Upper-class targets were consistently rated above the scale midpoint (M = 61.5, SE = 1.05), and lower-class targets were consistently rated below the midpoint ($M = 30.6$, $SE = 1.08$); this difference was significant ($F(1,38.9) = 666.94$; $p < 0.001$) according to a linear mixed model using random intercepts by both participants and the identities of the target individuals as well as random slopes for target social class by target individuals.

Procedure

Participants completed the FPST described above. Before completing the task, participants were instructed that their task was to determine the amount of threat posed to them by each target and respond by pressing one key on the keyboard if he was holding a gun and therefore a threat, or a different key if he was holding a harmless object and therefore not a threat. To motivate correct performance, participants were further told that they would gain points for correct responses and lose points for incorrect responses or responses after the time limit, and that the participant with the greatest number of points would receive a $50 gift card to a local store. During each trial, a stimulus picture appeared for 650 ms and, after the participant responded, feedback appeared including the point value of the response and the participant's total point value so far. The participant's decision and reaction time were recorded for each trial.

ANALYSES

Behavioral Data

Reaction time was modeled using a multilevel model from an ANOVA framework, treating target class, target race, and object as categorical variables. Error rate was modeled using multilevel logistic regression. Fixed effects for both models included target race, target class, object, and their two- and three-way interactions. Random effects included random intercepts for participant and for target individual. Random slopes were also included for target class, object, and their interaction by target individual (i.e., the actor in the stimulus photo).

The reaction times used in these analyses excluded trials on which the participant made an error or did not respond in time and responses faster than 300 ms. In addition, responses more than 2.5 standard deviations above the mean within each participant's distribution of responses after these exclusions were replaced with the value of the participant's mean plus 2.5 standard deviations.

Drift Diffusion Model Analyses

Finally, the data were analyzed using Bayesian hierarchical modeling of the Drift Diffusion Model (DDM) to determine whether decision parameters varied by target features. Since past FPST studies have found race bias in drift rate differences, it was hypothesized that biases in the present studies' data would emerge in drift rate. Higher drift rates (that is, more positive drift rates for armed targets and less negative drift rates for unarmed targets) for lower-class targets would indicate that participants interpreted the evidence for a *shoot* decision as stronger for these targets.

Modeling used a 12,000-step Markov chain Monte Carlo process and 1,000-step burn-in period, thinned such that every fifth step was retained. In each study's analysis, chains were checked for convergence and results were acceptable. Threshold, starting point, and nondecision time were estimated for each race/class combination. Prior distributions for these three parameters were uniform and ranged from 0.1 to 5 for threshold distance, from 0.1 to 0.9 for starting point, and from 0.001 to 1 for nondecision time, respectively. The parameter of interest was drift rate, which was estimated for each race/social class/object combination and had a uniform prior distribution ranging from -5 to 5 (8436.8 < ESS[2] < 11465.8).

[2] Effective sample size, the estimated number of independent samples represented by the Markov chain Monte Carlo output. To obtain stable estimates of the parameters, these analyses required a minimum ESS of 8431 as estimated by Flegal, Hughes, and Vats's (2016) method.

PILOT STUDY

After an initial set of stimuli was created, a pilot study was conducted to identify whether any stimuli elicited unusually high error rates so that any problematic stimuli could be replaced. The materials, procedure, and analyses for the pilot study were as described above.

Effect of Target Pose on Error Rate

Before the analyses of interest were conducted, average error rates were calculated for each pose in which targets could appear.

Each target stimulus appeared in one of five poses (see Figure 4). Poses 2 – 5 have been used in previous FPST studies (e.g., Correll et al., 2002), but Pose 1, in which the target stood with the object held straight out in front of him as if pointing it at the camera, was (to my knowledge) novel in the FPST paradigm.

Targets in Pose 1 elicited an overall error rate of 0.43. This was noticeably higher than targets in the other four poses, whose mean error rates ranged from 0.33 to 0.37. Additional exploration suggested that this high error rate stemmed from erroneous shooting of unarmed targets in Pose 1. Armed targets in Pose 1 elicited similar error rates (M = 0.33) to armed targets in other poses ($0.25 < M < 0.34$). However, unarmed targets in Pose 1 elicited error rates (M = 0.52) that were not only higher than those of unarmed targets in all other poses ($0.36 < M < 0.47$) but also worse than chance: That is, participants were more likely to select *shoot* than *don't sho*ot for unarmed targets in Pose 1.

These data suggest that participants strongly associate Pose 1 with guns and/or aggression and respond to it accordingly in the FPST. To further explore the effect of pose in these data, a mixed logistic regression model was computed predicting the odds of error from target pose, controlling for main effects of target race, target class, and object. Random effects included random intercepts by participant and by target individual, and random slopes for target class, object, and their interaction by target individual. Target pose significantly predicted error rate controlling for all these effects ($F(4,144) = 3.686$, $p = 0.007$). However, when trials were removed in which targets appeared in Pose 1, pose no longer significantly predicted error rate ($F(3,144) = 0.32$, $p = 0.811$).

These analyses raise the concerning possibility that the effect of pose could mask any race or social class effect for the Pose 1 stimuli. Therefore, these stimuli were replaced with targets in other poses in the final stimulus set used in Studies One and Two, and the analyses reported here exclude trials in which targets appeared in Pose 1.

Behavioral Data

Complete information regarding means for error rates and reaction times is presented in Tables 1 and 2.

Reaction time was significantly predicted only by object ($F(1,38) = 70.09$, $p < 0.001$; Table 3). The odds of error was also significantly predicted only by object ($F(1,38) = 47.39$, $p < 0.001$; Table 4).

Drift Diffusion Model Analyses

Drift rates (Figure 5) were assessed to determine whether participants treated evidence for a *shoot* or *don't shoot* decision as stronger for targets of different races or social class groups. Although drift rates for armed targets did not differ by either race or social class, results for unarmed targets showed a pattern consistent with the present hypothesis. That is, drift rates (see Tables 5 & 6) did not differ by race but did reveal a social class difference. Drift rates were shallower, indicating weaker evidence for a *don't shoot* decision (or stronger evidence for a *shoot* decision), for lower-class targets (modal $\delta = -0.373$; 95% HDI: (-0.471, -0.253)) than for upper-class targets (modal δ = -0.618; 95% HDI: (-0.728, -0.512); modal difference in δ (upper-class – lower-class) = -0.083; 95% HDI: (-0.136, -0.033)).

Interestingly, starting point estimates (see Table 7) also varied by social class, such that participants set lower starting points for lower-class targets (modal β = 0.500; 95% HDI: (0.490, 0.510)) than for upper-class targets (modal β = 0.523; 95% HDI: (0.513, 0.532)). In other words, participants' initial inclination toward the *shoot* decision was stronger for upper-class targets than for lower-class targets (modal difference in β = 0.007; 95% HDI: (0.003, 0.012)).

In short, therefore, drift rates showed bias against lower-class targets, whereas starting points showed bias against upper-class targets.

STUDY ONE

The procedure for Study One (N = 200) was identical to that of the pilot study, but targets in pose 1 had been replaced by targets in poses 2-5.

Behavioral Data

Complete information regarding means for error rates and reaction times is presented in Tables 8 and 9.

Again, reaction time was significantly predicted only by object ($F(1,38.1) = 57.57$, $p < 0.001$; Table 11), as was the odds of making an error ($F(1,38) = 16.49$, $p < 0.001$; Table 10).

Drift Diffusion Model Analyses

No race or class differences emerged for unarmed targets. Contrary to hypotheses, however, drift rates (Figure 6; Tables 12-14) for armed targets were higher when targets were White (modal $\delta = 1.123$; 95% HDI: (1.048, 1.200)) than when they were Black (modal $\delta = 0.854$; 95% HDI: (0.784, 0.935)), indicating that the evidence for shooting White targets was treated as stronger than the evidence for shooting Black targets (modal difference in δ (White – Black) = 0.271; 95% HDI: (0.164, 0.379)).

Drift rates for armed targets also showed a class difference like that observed in the pilot study; drift rates were higher—indicating stronger evidence for a shoot decision—for lower-class (modal $\delta = 1.070$; 95% HDI: (1.000, 1.150)) than upper-class (modal $\delta = 0.905$; 95% HDI: (0.829, 0.981)) targets (modal difference in δ (upper – lower) = -0.058; 95% HDI: (-0.091, -0.020)).

Starting point (Table 15) was again lower for lower-class targets (modal $\beta = 0.519$, 95% HDI: (0.511, 0.525)) than for upper-class targets (modal $\beta = 0.531$; 95% HDI: (0.524, 0.538)), indicating that participants' starting inclination to shoot is more pronounced for upper-class targets (modal difference in β (upper – lower) = 0.004; 95% HDI: (0.001, 0.008)). There was also a starting point difference in race (modal difference in β (White – Black) = -0.016, 95% HDI: (-0.025, -0.006)); participants' starting inclination to shoot was more pronounced (higher starting point) for Black targets (modal β = 0.533, 95% HDI: (0.525, 0.539)) than for White targets (modal β = 0.517, 95% HDI: (0.510, 0.523)).

In sum, class biases were similar to the pilot study: drift rates showed bias against lower-class targets, and starting points showed bias against upper-class targets. However, race differences also emerged such that drift rates showed bias against Whites, and starting points showed bias against Blacks.

STUDY TWO

The inconsistencies in results between the pilot study and Study One could result from some difference in the stimuli used, from an unlikely (but possible) degree of random variation, or from other, unmeasured variables such as the influence of current events. To resolve these inconsistencies and to investigate whether Study One's results might be specific to its stimulus set, Study Two (N = 211) was conducted as a direct replication of Study One (using the same stimuli as Study One).

Behavioral Data

Complete information regarding means for error rates and reaction times is presented in Tables 16 and 17.

Again, reaction time was significantly predicted only by object ($F(1,38.0) = 74.28$, $p < 0.001$; Table 18), as was the odds of making an error ($F(1,38) = 18.89$, $p < 0.001$; Table 19).

Drift Diffusion Model Analyses

Drift rate results (Figure 7; Table 20) were similar to the findings of the pilot study. No race or class bias emerged for unarmed targets. However, race bias (Table 21) was observed for armed targets in the same direction as in Study One; the evidence for shooting White targets (modal $\delta = 0.930$; 95% HDI: (0.866, 1.000)) was treated as stronger than the evidence for shooting Black targets (modal $\delta = 0.835$; 95% HDI: (0.764, 0.900); modal difference in δ (White – Black) = 0.106; 95% HDI: (0.003, 0.193))

Social class bias (Table 22) was observed for armed targets such that the evidence for shooting lower-class targets (modal $\delta = 0.951$; 95% HDI: (0.883, 1.018)) was treated as stronger than the evidence for shooting upper-class targets (modal $\delta = 0.818$; 95% HDI: (0.743, 0.879); modal difference in δ (upper-class – lower-class) = -0.143, 95% HDI: (-0.224, -0.040)).

Study Two also revealed a starting point race difference (modal difference in β (White – Black) = -0.011, 95% HDI: (-0.019, -0.002)) like that observed in Study One; participants set lower starting points for White targets (modal β = 0.510, 95% HDI: (0.504, 0.516)) than for Black targets (modal β = 0.521, 95% HDI: (0.515, 0.527)). That is, participants' starting inclination to shoot was stronger for Black targets.

In summary, Study Two found bias against lower-class targets in drift rate and, like Study One, revealed drift rate bias against White targets and starting point bias against Black targets.

DISCUSSION

Consistencies across Studies

In all three studies, participants showed drift rate bias against lower-class targets, as predicted: That is, in Studies One and Two, participants treated the evidence for a *shoot* decision as stronger for lower-class targets, and in the pilot study, participants treated the evidence for a *don't shoot* decision as weaker for lower-class targets.

In addition, participants in the pilot study and Study One showed a stronger starting inclination toward the *shoot* decision for upper-class targets, and participants in Studies One and Two treated the evidence for a *shoot* decision as stronger for White than Black targets.

Inconsistencies

It should be noted that while the drift rate bias against lower-class targets appeared for unarmed targets in the pilot study, in Studies One and Two it appeared for armed targets. This nuance is not especially informative. Drift rates represent the strength of the evidence for one decision versus the other decision, which are essentially two sides of the same coin, and there is little reason to interpret a drift rate difference differently depending on which decision it emerged for. In all studies, drift rates indicated that relative to the evidence for not shooting, the evidence for shooting lower-class targets was perceived as stronger than the evidence for shooting upper-class targets; therefore, all three results can be taken as indicating bias against lower-class targets.

Interpretation

The class difference in drift rate is in line with the hypothesis that perceptions of life strategy influence shooting behavior, although further research is needed to ascertain whether perceptions of life history play the hypothesized role in this effect. The observed drift rate effects may indicate that lower-class targets' clothing was used as a source of evidence for whether the targets were armed, or that objects were interpreted as more gunlike—i.e., the object-related evidence was interpreted as stronger—in the hands of lower-class targets.

Starting point biases in two of the studies, however, indicated an initial inclination toward shooting upper-class targets, and may have reflected a conscious attempt to avoid overshooting lower-class targets. This would be an interesting possibility for future research to pursue, as it would indicate that people are capable of exerting at least some control over biases in their shooting responses.

In Studies One and Two, drift rates showed bias against Black targets. Since race bias toward shooting Blacks is typically observed in shooter studies (Mekawi & Bresin, 2015), including those that employ the drift diffusion model (Correll et al., 2015), the reversal of this race effect is striking. It is possible that this is an artefact of the stimulus set used in these studies.

Class versus Race

There were three main possibilities for the role race might play when social class was manipulated. Race might serve solely as an indicator of class, in which case no race effect should remain when class is manipulated. Race might partially serve as an indicator of class yet also play a unique role in shooter bias in its own right. And finally, race might be used as an indicator of threat only for upper-class targets, as observed by Correll et al. (2011), with all Black and/or lower-class targets eliciting equally high drift rates.

Since race differences emerged in the opposite of the predicted direction, it is unclear which of these accounts is most supported. The pilot study results (Table 8) were most in line with the possibility that race acts entirely as a proxy to class. This interpretation predicts that drift rates should come in pairs by class: That is, within the object condition for which a class difference emerged (i.e., unarmed targets for the pilot study and armed targets for Studies One and Two), upper-class Black and White targets would elicit similar drift rates to each other, and lower-class Black and White targets would elicit similar drift rates to each other.

However, Studies One and Two (Tables 18 and 28) are arguably more in line with the second possibility, that race has some effect independent of its role as an indicator of class. While neither study produced the pattern in drift rates that would be most likely in this scenario—i.e., highest drift rates for lower-class Blacks and lowest drift rates for upper-class Whites—both studies did find differences in starting point showing inclinations to shoot Black targets. This might indicate that any race bias not resulting from inferences about class operates through different psychological processes than the observed class bias.

The present studies do provide some evidence against the possibility of an effect like that reported by Correll et al. (2011)—i.e., high levels of bias against all Black and/or lower-class targets relative to upper-class White targets—since this pattern of results would predict race differences that emerged only among upper-class targets, which was not the case in any of the three studies.

But since the three studies differed in the pattern of drift rates across each combination of race and class, and since the drift rate bias against White targets is difficult to explain, the present research cannot conclusively distinguish between the first two possibilities; i.e., whether or not drift rate bias is affected by race for any reasons other than its role as a cue to class. The differences in starting point may be the strongest evidence that race does have a unique effect on shooting; it would be informative to test whether these starting point effects replicate across similar studies in the future.

Implications for Shooting Behavior

The overall social class differences in drift rate appeared reliably across studies, providing strong evidence for the existence of a class bias. Nonetheless, it is worth discussing what biases in drift rate can and cannot tell us. Drift rates represent psychological processes—i.e., the accumulation of evidence for one or another decision. Biases in drift rates are informative in what they indicate about the type of information used to make decisions, or the interpretation of available information. However, drift rates operate in conjunction with other psychological processes, which limits the extent to which they affect error rates. In the present studies, drift rates showed bias toward shooting lower-class targets while in two studies, starting points showed bias toward shooting upper-class targets, and no pattern of bias emerged in errors. This is important to keep in mind, because the practical concern at the heart of shooter research is the shooting of innocent, unarmed civilians, which in the FPST is represented in errors on unarmed-target trials.

Future research, therefore, must seek an explanation for the lack of race or social class differences in error rate in these data. It may be that circumstances exist under which the drift rate bias does produce class bias in shooting errors—for example, due to any boundary conditions or moderators affecting the magnitude of the starting point bias. This could pose a concern for the data quality if the bias in starting point is a result of deliberate effort to avoid showing class bias. In real police work, incidents in which an officer must decide whether to shoot someone are rare and highly stressful, and it may not always occur to officers in these situations to be concerned about showing bias. Under such circumstances, starting inclination to shoot may not be affected by the perceived social class of the suspect, and biases in evidence accumulation could have deadly effects. Future studies can evaluate this possibility by investigating the source of starting point bias, the conditions under which it appears, and whether biases in error data change if this starting point bias can be eliminated.

Alternatively, it could also be that the null results for race and class in the error and reaction time data indicate that other stimulus characteristics are playing a powerful role, given that these models included random effects for target individual. This could perhaps also explain why drift rate bias against Whites emerged. More broadly, the possibility that strong stimulus set effects exist carries serious implications for all research using the FPST paradigm. A large proportion of shooter studies have all used the stimulus set developed by Joshua Correll and colleagues (2002), and if individual target features can have such a large impact on results, it is possible that results from that stimulus set may not generalize to other stimuli—or to police work. Within-subject comparisons across stimulus sets or the development of larger sets of stimuli in follow-up research will be useful to address these concerns.

Life History Theory Interpretation: Alternatives and Implications

Drawing conclusions from these results about whether race serves as a cue to life strategy via social class is made difficult by the ambiguity as to whether these results will generalize to other stimuli and the difficulty of explaining the drift rate bias against Whites. However, the social class effect does suggest that inferences about life strategy may influence the decision to shoot, at least insofar as people may infer life strategy from clothing cues to social class.

Nevertheless, this research did not assess whether perceptions of life history are the reason why class influenced shooting decisions, and a number of alternative explanations exist. One important consideration is that different expectations of aggressive behavior for different social classes may not come from a specific evolved mechanism to learn cues to life strategy, but rather are learned through the same mechanisms by which other stereotypes are learned (Macrae

& Bodenhausen, 2000). That is, the fact that a group difference likely exists because of life strategy differences does not mean that inferences about life strategy are necessary to store information about that group difference.

It could also be that class bias on the shooting task does not at all reflect expectations of whether the target is about to aggress against the participant. Instead, participants may be guided by greater affective positivity toward upper-class individuals and/or negativity toward lower-class individuals. Such prejudice could make participants more willing to shoot lower-class targets than upper-class targets. Alternatively, participants may be assessing the relative costs of shooting people of different classes. Aggression against upper-class individuals may carry greater costs, as the target and their family, friends, or other allies may be better equipped to seek revenge; moreover, people who commit crimes against upper-class victims tend to receive more severe sentences (Farrell & Swigert, 1986). If this explanation is accurate, we might expect that class bias would not emerge if a version of the FPST asked participants to respond to armed targets with a defensive behavior—e.g., pressing a "dodge" or "shield" button instead of a "shoot" button. However, since bias against lower-class targets was observed in drift rates, which are interpreted as representing the strength of evidence for a decision, there are problems with any explanation that does not implicate the decision about whether a target is holding a gun. It is most likely that the source of the social class bias lies in some process affecting perceptions of (or assumptions about) the target himself.

If people do have a specialized mechanism to learn cues to life strategy, future research should be able to determine what information that learning mechanism uses as input (e.g. information about childhood environment, behavioral cues to life strategy, etc.) and demonstrate that participants still form assumptions about life history-related behaviors based on such information even if it is presented in a way that does not permit inferences about social class (or if social class information is presented that conflicts with the life history information). Since such evidence is not yet available, it is not yet possible to draw strong inferences about this. However, the present studies are not inconsistent with the possibility that individuals learn cues to judge others' life strategies and adjust their behavior accordingly—a hypothesis that opens many possibilities for new avenues of research. For example, to the extent that cues to one's own life strategy can be controlled or manipulated, people may try to accentuate or reverse these cues in order to send signals that will elicit desired behavior from others (e.g., when motivated to avoid being perceived as threatening, people may make deliberate clothing choices that make them look like a slow life strategist).

Life history theory is generally presented as an explanation for behavioral patterns that differ as a function of childhood environment, and the potential for adaptations to form and use impressions of others' life strategies has not received much attention in the life history literature. Future studies confirming this hypothesis would add a new dimension to the theory, and point to fresh directions for life history research.

CONCLUSION

Much research attention has been directed toward understanding why police disproportionately shoot unarmed African-American men, generally emphasizing stereotypes (Correll, Park, Judd, & Wittenbrink, 2007), outgroup bias (Miller et al., 2012), and personal or situational factors such as experience (Sim et al., 2013) or fatigue (Ma et al., 2013). However, the results of the present studies demonstrate that the key factor of social class has been missing from our understanding of biases in the decision to shoot. Further work is needed, however, to clarify how class bias interacts with race bias, and the extent to which the observed effects generalize to other stimuli.

These results leave open the question of whether humans are capable of estimating each other's life strategies based on superficial visual details (race, clothing) and using those estimates to adjust their interpersonal behavior. If evidence from future studies bears out this hypothesis, our understanding of life history theory will expand in interesting new directions.

APPENDICES

APPENDIX A

Tables

Table 1

Mean Error Rates in the Pilot Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	0.42 (0.49)	0.42 (0.49)	0.30 (0.46)	0.31 (0.46)
Upper-Class	0.38 (0.49)	0.40 (0.49)	0.30 (0.46)	0.30 (0.46)

Note. Standard deviations are presented in parentheses.

Table 2

Mean Reaction Times in the Pilot Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	528.82 (70.51)	528.38 (68.91)	503.69 (67.23)	500.75 (69.27)
Upper-Class	532.44 (66.86)	534.18 (68.15)	494.38 (68.74)	498.87 (69.83)

Note. Trials were excluded on which the participant made an error or did not respond in time, as were responses faster than 300 ms. Responses more than 2.5 standard deviations above the mean within each participant's distribution of responses after the above exclusions were replaced with the value of the participant's mean plus 2.5 standard deviations. Responses to stimuli with targets in Pose 1 were also excluded. (But note that DDM analyses used raw reaction times excepting those from Pose 1 stimuli.)
Standard deviations are presented in parentheses.

Table 3

Predicting Reaction Time from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Identity: Pilot Study

	Fixed Effects			
Variable		*F*	*p*	
Target Class		0.48	0.49	
Object		70.09	< 0.0001	
Target Race		0.18	0.67	
Target Class X Object		3.46	0.07	
Target Race X Object		0.01	0.93	
Target Race X Object X Class		0.15	0.70	
		Random Effects		
Subject	Parameter	Estimate	*SE*	*z*
Participant	Intercept	671.28	98.31	6.63***
Target	Intercept	97.91	24.78	3.95***
	Target Class	75.41	19.65	3.84***
	Object	67.05	17.66	3.80***
	Class X Object	44.01	12.33	3.57***
Residual		3953.24	42.70	92.57***

Note. *$p < 0.05$, **$p < 0.01$, **$p < 0.001$, df for fixed effects = (1,38). Social class and object were dummy coded (Lower Class = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 4

Predicting Probability of Error from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Individual: Pilot Study

	Fixed effects		
Variable	*OR*	*SE*	*t*
Intercept	0.56	0.061	-9.58***
Target Class	0.99	0.043	-0.15
Object	0.75	0.041	-6.88***
Target Race	1.02	0.050	0.40
Target Class X Object	1.00	0.037	-0.02
Target Race X Object	0.99	0.041	-0.24
Target Race X Object X Class	1.01	0.037	0.30
	Random effects		
	N	*SD*	
Participant	103	0.076	
Residual		0.469	

Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, df = 38. Social class, race, and object were effects coded (Lower Class = 1, Black = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 5

Modal Drift Rates by Race, Class, and Object: Pilot Study

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	-0.340 [-0.499, -0.181]	-0.390 [-0.542, -0.245]	1.050 [0.892, 1.220]	0.955 [0.805, 1.110]
Upper-Class	-0.664 [-0.828, -0.520]	-0.572 [-0.718, -0.418]	0.952 [0.785, 1.100]	0.865 [0.702, 1.000]

Note. Highest density intervals specified in brackets.

Table 6

Modal Drift Rates by Class: Pilot Study

Target Class	Nongun	Gun
Lower-Class	-0.373 [-0.471, -0.253]	1.010 [0.894, 1.120]
Upper-Class	-0.618 [-0.728, -0.512]	0.892 [0.790, 1.010]

Note. 95% highest density intervals specified in brackets.

Table 7

Modal Starting Points by Class and Race: Pilot Study

Target Class	White	Black
Lower-Class	0.498 [0.483, 0.512]	0.504 [0.490, 0.517]
Upper-Class	0.522 [0.509, 0.537]	0.522 [0.509, 0.536]

Note. Distributions for upper-class Whites and Blacks were not identical, but were very similar and shared the same modes and HDI boundaries.
95% Highest density intervals are specified in brackets.

Table 8.

Mean Error Rates in the Study One Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	0.35 (0.48)	0.34 (0.47)	0.26 (0.44)	0.29 (0.45)
Upper-Class	0.33 (0.47)	0.37 (0.48)	0.28 (0.45)	0.30 (0.46)

Note. Standard deviations are presented in parentheses.

Table 9

Mean Reaction Times in the Study One Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	533.15 (69.61)	531.19 (68.80)	502.02 (68.49)	502.48 (69.75)
Upper-Class	538.06 (66.86)	538.99 (68.01)	502.25 (69.38)	503.94 (70.48)

Note. Trials were excluded on which the participant made an error or did not respond in time, as were responses faster than 300 ms. Responses more than 2.5 standard deviations above the mean within each participant's distribution of responses after the above exclusions were replaced with the value of the participant's mean plus 2.5 standard deviations. Responses to stimuli with targets in Pose 1 were also excluded. (But note that DDM analyses used raw reaction times excepting those from Pose 1 stimuli.)
Standard deviations are presented in parentheses.

Table 10

Predicting Reaction Time from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Identity: Study One

	Fixed Effects	
Variable	*F*	*p*
Target Class	1.57	0.22
Object	57.57	<0.0001
Target Race	0.12	0.73
Target Class X Object	0.23	0.63
Target Race X Object	0.52	0.47
Target Race X Object X Class	0.04	0.85

		Random Effects		
Subject	Parameter	Estimate	*SE*	*z*
Participant	Intercept	695.61	72.11	9.65***
Target	Intercept	83.73	20.24	4.14***
	Target Class	135.60	32.14	4.22***
	Object	109.81	26.37	4.16***
	Class X Object	103.79	24.90	4.17***
Residual		3768.21	27.85	135.31***

Note. *$p < 0.05$, **$p < 0.01$, **$p < 0.001$, df for fixed effects = (1,38). Social class and object were dummy coded (Lower Class = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 11

Predicting Probability of Error from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Identity: Study One

	Fixed effects		
Variable	*OR*	*SE*	*t*
Intercept	0.43	0.057	-14.65***
Target Class	0.97	0.050	-0.59
Object	0.85	0.041	-4.06***
Target Race	1.05	0.049	0.92
Target Class X Object	0.99	0.045	-0.19
Target Race X Object	1.01	0.041	0.19
Target Race X Object X Class	1.03	0.045	0.74
	Random effects		
	N	*SD*	
Participant	103	0.076	
Residual		0.469	

Note. ***p < 0.001, **p < 0.01, *p < 0.05, df = 38. Social class, race, and object were effects coded (Lower Class = 1, Black = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 12

Modal Drift Rates by Race, Class, and Object: Study One

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	-0.715 [-0.835, -0.626]	-0.853 [-0.951, -0.737]	1.220 [1.110, 1.330]	0.922 [0.825, 1.040]
Upper-Class	-0.859 [-0.958, -0.749]	-0.752 [-0.862, -0.650]	1.040 [0.922, 1.140]	0.773 [0.673, 0.887]

Note. Highest density intervals specified in brackets.

Table 13

Modal Drift Rates by Race: Study One

Target Race	Nongun	Gun
White	-0.789 [-0.865, -0.715]	1.123 [1.048, 1.200]
Black	-0.806 [-0.875, -0.726]	0.859 [0.784, 0.935]

Note. 95% highest density intervals specified in brackets.

Table 14

Modal Drift Rates by Class: Study One

Target Class	Nongun	Gun
Lower-Class	-0.786 [-0.863, -0.712]	1.070 [1.000, 1.150]
Upper-Class	-0.802 [-0.874, -0.729]	0.905 [0.829, 0.981]

Note. 95% highest density intervals specified in brackets.

Table 15

Modal Starting Points by Class and Race: Study One

Target Class	White	Black
Lower-Class	0.511 [0.500, 0.520]	0.526 [0.516, 0.535]
Upper-Class	0.523 [0.513, 0.532]	0.539 [0.529, 0.548]

Note. 95% Highest density intervals are specified in brackets.

Table 16

Mean Error Rates in the Study Two Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	0.35 (0.48)	0.36 (0.48)	0.29 (0.45)	0.30 (0.46)
Upper-Class	0.36 (0.48)	0.39 (0.49)	0.32 (0.47)	0.31 (0.46)

Note. Standard deviations are presented in parentheses.

Table 17

Mean Reaction Times in the Study Two Shooting Task by Target Race, Target Class, and Object

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	519.05 (73.83)	520.66 (72.19)	492.29 (70.11)	491.35 (70.47)
Upper-Class	527.05 (71.26)	526.33 (71.44)	492.89 (71.10)	494.29 (73.58)

Note. Trials were excluded on which the participant made an error or did not respond in time, as were responses faster than 300 ms. Responses more than 2.5 standard deviations above the mean within each participant's distribution of responses after the above exclusions were replaced with the value of the participant's mean plus 2.5 standard deviations. Responses to stimuli with targets in Pose 1 were also excluded. (But note that DDM analyses used raw reaction times excepting those from Pose 1 stimuli.)
Standard deviations are presented in parentheses.

Table 18

Predicting Reaction Time from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Identity: Study Two

Fixed Effects		
Variable	*F*	*p*
Target Class	2.038	0.16
Object	74.28	<0.0001
Target Race	0.18	0.68
Target Class X Object	0.16	0.70
Target Race X Object	0.17	0.69
Target Race X Object X Class	0.40	0.53

Random Effects				
Subject	Parameter	Estimate	*SE*	*z*
Participant	Intercept	883.68	88.72	9.96***
Target	Intercept	75.40	18.34	4.11***
	Target Class	78.27	19.01	4.12***
	Object	93.87	22.60	4.15***
	Class X Object	93.96	22.72	4.14***
Residual		4040.25	29.32	137.79***

Note. *$p < 0.05$, **$p < 0.01$, **$p < 0.001$, df for fixed effects = (1,38). Social class and object were dummy coded (Lower Class = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 19

Predicting Probability of Error from Object, Target Class, and Their Interaction with Random Effects by Participant and Target Individual: Study Two

	Fixed effects		
Variable	*OR*	*SE*	*t*
Intercept	0.47	0.055	-13.62***
Target Class	0.96	0.047	-0.87
Object	0.86	0.034	-4.35***
Target Race	0.86	0.046	0.57
Target Class X Object	1.00	0.043	0.04
Target Race X Object	0.97	0.034	-0.78
Target Race X Object X Class	1.03	-0.043	0.59
	Random effects		
	N	*SD*	
Participant	103	0.076	
Residual		0.469	

Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, df = 38. Social class, race, and object were effects coded (Lower Class = 1, Black = 1, gun = 1). I used an unstructured covariance matrix for the random effects, but covariances were small and nonsignificant, so they are not reported.

Table 20

Modal Drift Rates by Race, Class, and Object: Study Two

	Nongun		Gun	
Target Class	White	Black	White	Black
Lower-Class	-0.650 [-0.749, -0.560]	-0.702 [-0.798, -0.609]	1.033 [0.931, 1.122]	0.877 [0.779, 0.970]
Upper-Class	-0.683 [-0.773, -0.588]	-0.584 [-0.679, -0.491]	0.834 [0.742, 0.933]	0.796 [0.693, 0.886]

Note. Highest density intervals specified in brackets.Table 21

Table 21

Modal Drift Rates by Race: Study Two

Target Race	Nongun	Gun
White	-0.643 [-0.708, -0.576]	0.835 [0.764, 0.900]
Black	-0.672 [-0.734, -0.601]	0.930 [0.866, 1.000]

Note. 95% highest density intervals specified in brackets.

Table 22

Modal Drift Rates by Class: Study Two

Target Class	Nongun	Gun
Lower-Class	-0.674 [-0.745, -0.610]	0.951 [0.883, 1.018]
Upper-Class	-0.625 [-0.699, -0.567]	0.818 [0.743, 0.879]

Note. 95% highest density intervals specified in brackets.

APPENDIX B

Figures

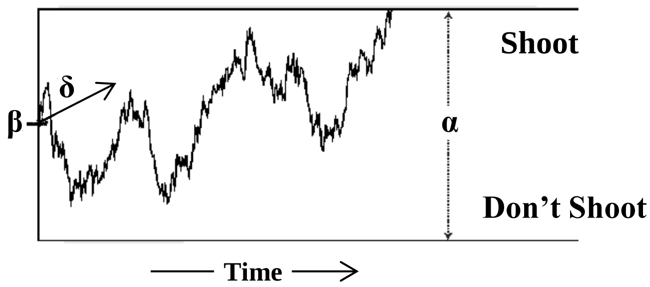

Figure 1. *Evidence Accumulation in the Decision Process According to the Drift Diffusion Model.*

Figure 2. *Example Stimulus.*

Figure 3. *Close-up Examples of a Target Individual.*

Pose 1 Pose 2 Pose 3 Pose 4 Pose 5

Figure 4. *Close-ups of Targets in Poses 1 through 5.*

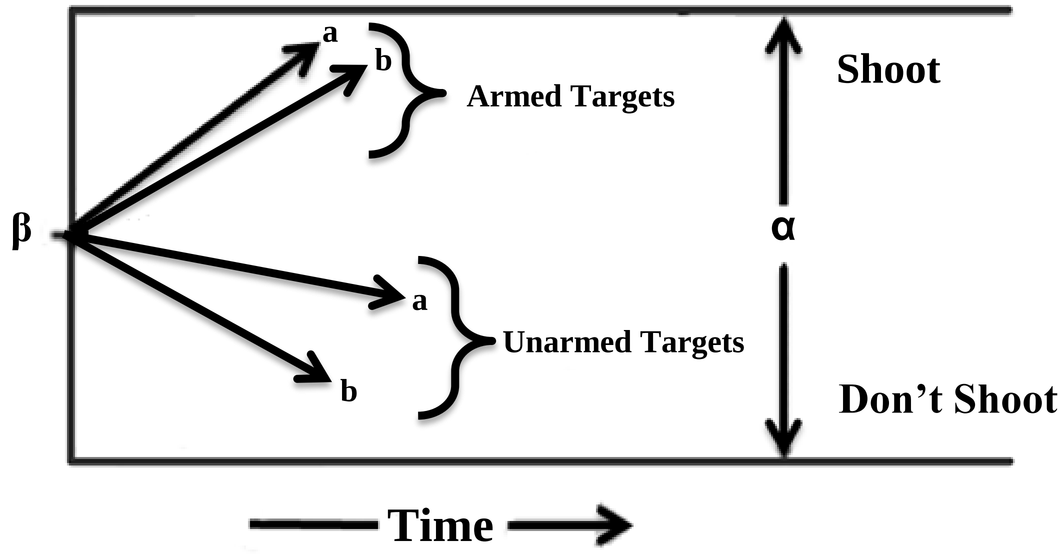

Figure 5. *Drift Rates from Pilot Study.*
Line a represents lower-class targets; line b represents upper-class targets. Drift rate did not vary by race. Image not to scale; differences in starting point not shown.

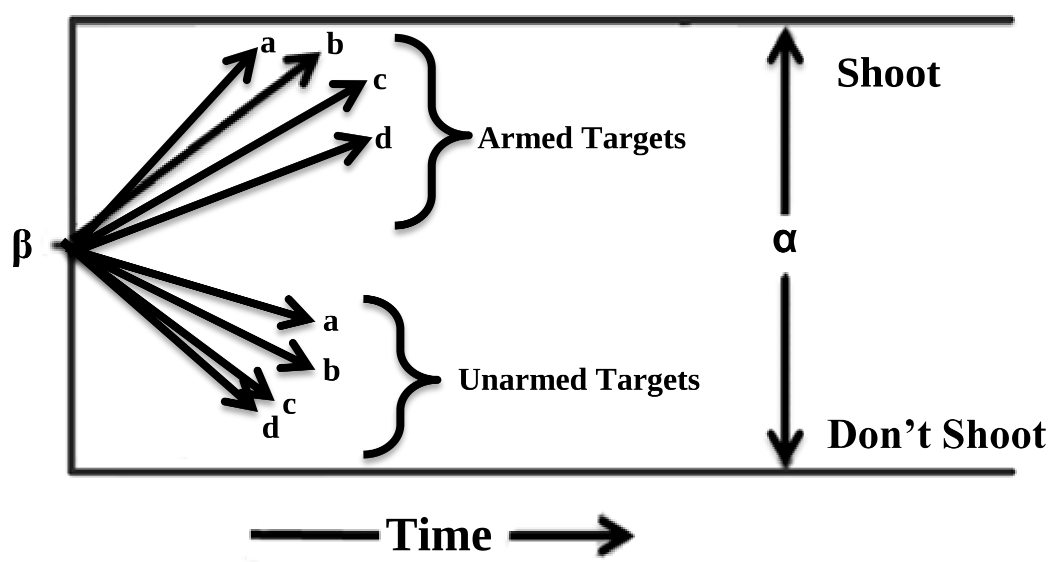

Figure 6. *Drift Rates from Study One.*
From line a to line d: lower-class White, upper-class White, lower-class Black, upper-class Black; lower-class White. Image not to scale; differences in starting point not shown.

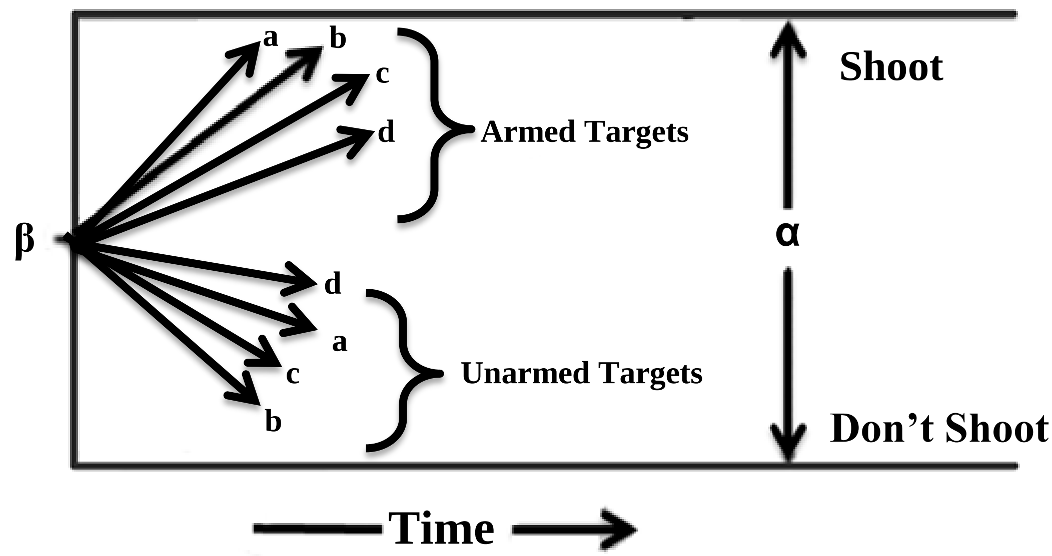

Figure 7. *Drift Rates from Study Two.*
From line a to line d: lower-class White, lower-class Black, upper-class White, upper-class Black; lower-class White. Image not to scale; differences in starting point not shown.

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