GENDER AND SHOOTING BEHAVIOUR

**The Influence of Target Gender on Shooting Behaviour: An Examination of the Role of
Automatic Bias and Controlled Processes**

by

Evanya Musolino

**A thesis submitted to the Faculty of Graduate and Post Doctoral Affairs
in partial fulfillment of the requirements for the degree of**

Master of Arts

in

Psychology

**Carleton University
Ottawa, Ontario**

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Your file Votre référence

ISBN: 978-0-494-91565-3

Our file Notre référence

ISBN: 978-0-494-91565-3

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Abstract

Research in the U.S. has indicated that target race influences decisions to “shoot” or “not shoot” targets in simulated shooting tasks. The purpose of this thesis was to extend this line of research by examining gender. Specifically, males tend to be perceived as being more aggressive than females due to the existence of gender stereotypes. As a result of this, decisions to “shoot” or “not shoot” targets may be influenced by the gender of the target. Two studies were conducted using a shooting task similar to the task used in previous research to examine whether a gender bias was present in the shoot/don’t shoot decisions of Canadian participants. In addition, factors that were likely to increase or decrease the degree of gender bias in such decisions were examined. Study 1 ($n = 61$) found that participants tended to display a male bias in their shoot/don’t shoot decisions. Study 2 ($n = 123$) introduced scenes that varied by complexity. As expected, and consistent with Study 1, this study demonstrated that a male bias existed in the shooting decisions of participants and that this bias was exacerbated under conditions of high complexity. The theoretical and practical implications of this research are discussed, focusing primarily on potential reasons for the male shooting bias and what the bias might mean for use of force training. Directions for future research are also suggested.

Acknowledgements

This thesis is dedicated to my grandfather, affectionately referred to as 'Papa Joe'. I couldn't have asked for a better role model – you taught me to work hard for the things that I wanted, and above all, to persevere. In addition, you showed me that what matters is not where you come from or where you are going, but rather, the path that you choose to get there.

Thank you to my supervisor, Dr. Craig Bennell. It wasn't always easy, but we made it! Without your invaluable feedback and countless revisions, this thesis would never come close to approaching the quality that it is today.

Thank you to my committee members, Dr. Joanna Pozzulo and Dr. Evelyn Maeder – your feedback greatly elevated the quality of this thesis.

A special thank you to Natacha and Graeme – you two were instrumental during the proverbial crunch-time... we made it with seconds to spare!

To my sister, Elyssia - we may not have faced the same trials and tribulations, but your ability to not only overcome, but rise above, served as a major source of inspiration for me.

To my grandmother, 'Nonna Gina', you are the definition of strength – a silent soldier. Although I wasn't able to speak to you often, your support and encouragement was the light that lit the path on the darkest of days.

A special thank you to my parents - Mom and Dad, there were days when I couldn't see the light at the end of the tunnel. You two kept me going - sometimes out of sheer anger and frustration - but most times out of a need to prove that you two were right

about me. You continued to believe in me, regardless of the obstacles faced, and because of that, I continued to believe in me. I can never thank you enough.

And last but certainly not least, thank you to Eric. I couldn't have asked for a more supportive and patient boyfriend. I know I wasn't always easy to deal with, but you never gave up. Thank you for letting me cry, scream, rant, and swear. More importantly, thank you for bringing me ice cream sandwiches at midnight and keeping me company on the days when I felt I had nothing left to give. You lifted my spirit every time it fell, and because of that, my success is every bit as much your success.

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The Influence of Target Gender on Shooting Behaviour: An Examination of the Role of Automatic Bias and Controlled Processes

In the past, there have been a number of incidents where police officers have mistaken objects (e.g., wallets) for violent weapons (e.g., guns), which inevitably resulted in the police officers shooting at the perceived perpetrator(s). Unfortunately, some of these cases resulted in deaths, such as those involving Amadou Diallo, Ousmane Zongo, and Sean Bell. While each of these cases differed in numerous ways, there were a few common factors. Perhaps the most obvious commonality was that each of the suspects was Black, an issue that was certainly sensationalized by the media (e.g., “Sean Bell”, 2010; Cooper, 1999; McFadden, 2006; Newman & Worth, 2003). This fact opens up the interesting question of how suspect race influences shooting behaviour. The other commonality, which may be no less important, was that each of the suspects was male. This begs an equally interesting question: How does suspect gender influence shooting behaviour?

Research from the U.S. has consistently shown that race is an important factor that influences shooting decisions. For example, in a series of studies, numerous researchers (e.g., Correll, Park, Judd, & Wittenbrink, 2002; Plant & Peruche, 2005) have demonstrated that community members are more likely and quicker to shoot armed suspects when the suspects are Black, but more likely to not shoot unarmed suspects when the suspects are White. Interestingly, the degree to which these findings generalize to police officers is debatable (Correll, Park, Judd, Wittenbrink, Sadler, & Keese, 2007a; Plant & Peruche, 2005). However, while evidence is mounting that race is an important factor in lethal force decision-making, the issue of gender has been largely ignored, until

recently. Plant, Goplen, and Kuntsman (2011) conducted a study in which they examined the extent to which target race and gender influences shooting decisions. In line with previous research, their participants demonstrated a Black bias in their shooting responses, but also a bias towards shooting males.

Other than this single study, no other attempt has been made to examine the impact of gender on shooting decisions, and no such research has been conducted in Canada. This thesis attempts to fill this important gap.¹ Specifically, the goal of this thesis is to gain an understanding of how suspect gender may influence lethal force decisions among Canadian participants. To begin, I will discuss stereotypes as a broad concept and then turn my attention to a specific category of stereotypes, namely gender stereotypes. I will then examine some research studies that are relevant to the concept of gender stereotypes, specifically studies that show how gender stereotypes might influence peoples' behaviour. The focus in this discussion will be on aggression research, which is particularly relevant when examining gender stereotypes because of the perceived differences in levels of aggression exhibited by males and females. The introduction will end with a discussion of automatic and controlled processing, with particular attention being given to the role of these processes in stereotyped responding and how these processes are influenced by various factors.

¹ Although it can be argued that males pose a bigger threat to police officers than females, females can pose such a threat and thus, examining what happens when encountering female targets is still important. For example, from 1976 to 1998, females were responsible for 3% of all cases in the U.S. where police officers were killed, although in some years this figure rose to as high as 9% (involving 7 cases) (U.S. Department of Justice, 2001). Female involvement in less severe use of force encounters, where police officers are not killed but are seriously threatened, is even higher (e.g., representing 18% of all encounters in one report; U.S. Department of Justice, 2001).

Stereotypes

Weiten and McCann (2007) define a stereotype as a widely held belief that people have certain characteristics because of their membership in a particular group. For example, traditional ethnic stereotypes contend that Jews are mercenary (i.e., work solely for money or other material rewards; Weiten & McCann, 2007). Stereotyping is a normal cognitive process designed to conserve both time and mental effort when processing new stimuli or people (Weiten & McCann, 2007). However, although stereotypes are beneficial in some situations, they are often broad overgeneralizations that fail to acknowledge the diversity that exists within a particular social group. For example, while some Jewish people might be mercenary, clearly all are not.

The Relationship Between Stereotypes, Prejudice, and Discrimination

Although stereotypes are related to prejudice and discrimination, it is important to recognize that there are subtle differences amongst these constructs. As already indicated, a stereotype is a belief that members of a particular group possess specific characteristics (e.g., males are aggressive and females are nurturing) (Weiten & McCann, 2007).

Although they are not always negative (e.g., cheerleaders are usually female), stereotypes often have a negative implication when applied to members of an out-group (Cacioppo, Marshall-Goodell, Tassinary, & Petty, 1992). Cognitive in nature, stereotypes, which represent what we believe about particular groups, can lead to prejudice (Dovidio, Kawakami, Smoak, & Gaertner, 2009).

Prejudice is defined as an awareness of, and agreement with, a stereotype that results in an emotional reaction (Corrigan & Watson, 2002). Thus, whereas stereotypes are cognitive in nature, prejudice is fundamentally affective, representing how we feel

about a particular group of people. Again, while prejudice can consist of positive emotions about a particular group, we usually think of prejudice as consisting of negative emotions towards a group of people as a result of some existing stereotype about that particular group.

Related to these concepts is the concept of discrimination, defined as behaviour that creates, maintains, or reinforces advantage for some group of people at the expense of other groups of people, and is based on membership in a particular group (Dovidio, Hewstone, Glick, & Esses, 2010). Rather than just a belief about a group of people or a feeling towards that group, discrimination involves actual behavior being exhibited towards a group or members of a group. Taking this into account, discrimination is fundamentally behavioural, representing biased behavior towards a particular group of people as a result of an existing stereotype and prejudice.

The Origin of Stereotypes

There are many different theories that attempt to explain how and why stereotypes develop and persist over time. The theories that will be discussed in the subsequent section are evolutionary theory, developmental theory, and cognitive theory (Dovidio, Hewstone, Glick, & Esses, 2010).

According to the evolutionary perspective, stereotypes are psychological tendencies that can increase reproductive fitness, enabling humans to pass on their genes to subsequent generations (Brewer & Caporael, 2006). Thus, from an evolutionary perspective, stereotypes developed (and persist) because they aided (and continue to aid) the survival of human beings. But why is this the case? Generally speaking, our ancestral humans can be seen as relatively unimposing and defenseless. Compared to other species,

humans lacked protective characteristics like physical weaponry (fangs, claws) and armour (thick hide, hard shell). As a result, our human ancestors were in a position of vulnerability, which was amplified if the individual lived a solitary lifestyle. Given this, there were obvious fitness benefits for those individuals who chose to be part of a coalition (e.g., knowing where to find food, how to construct a weapon, etc.). As a result of these fitness benefits, a psychological mechanism is thought to have evolved that disposed humans towards obligatory interdependence (Brewer, 1997; Brewer & Caporael, 2006). However, interdependence was associated with a unique set of risks, including exploitation by others and insufficient resources. As a way to mitigate these risks, inter-group stereotypes and prejudice developed; mechanisms that resulted in members of a coalition behaving altruistically towards members of their own group, but not towards out-group members (Brewer, 1999; Brewer & Caporael, 2006). This ultimately served to enhance the reproductive fitness of in-group members by protecting resources from out-group members. Individuals would tend to become hyper vigilant to physical characteristics, such as race or gender, because these characteristics could serve as superficial markers for the distinction between coalition groups.

In contrast to the evolutionary perspective, the developmental perspective places an emphasis on the role of context and experience in the development of stereotypes. Although humans may have a predisposition to stereotype, judge, and discriminate, which is inline with evolutionary theory, this perspective maintains that they also have the ability to uphold principles of equality, act justly, and act fairly (Dovidio, Hewstone, Glick, & Esses, 2010). According to some, developmental history is what determines whether an individual develops stereotypes or not (Killen, Richardson, & Clark-Kelly,

2010). In line with this argument, research shows that if children are exposed to other children of different ethnicities within their developmental history, racial stereotypes do not develop (McGlothlin & Killen, 2006). For example, in one study, children who were enrolled in a racially diverse school did not show the same racial stereotypes as children who were enrolled in a racially homogenous school (McGlothlin & Killen, 2006). In this case, the developmental history of the child (i.e., exposure versus non-exposure to different racial groups) influenced the development of stereotypes. Other developmental factors related to stereotype development are the influence of parents and peers (Dovidio et al., 2010). For example, some parents have been found to encourage gender stereotypes early in the course of development by buying gender-specific clothes and toys and by creating same-gender peer groups (Pomerleau, Malcuit, & Sabatier, 1991).

In contrast to evolutionary theory and developmental theory, when it comes to why stereotypes develop and persist, cognitive theory puts the onus on cognition and the restricted nature of cognitive processing. Specifically, according to cognitive theory, stereotypes are a natural byproduct of human cognition and, specifically, of categorization (Allport, 1954). In fact, categorization, and in turn stereotypes, are thought to be necessary processes when attempting to navigate through a complex world. According to this perspective, having the ability to categorize objects in the environment is what enables an individual to respond appropriately to different stimuli. For example, if we did not have the ability to categorize furniture into tables and chairs, then we would be unable to respond appropriately to these objects in our surroundings (e.g., sitting in a chair and placing a drink on a table). Likewise, if we cannot categorize people into different categories, it is sometimes more difficult to determine how to respond

appropriately to a given individual, especially if we are unfamiliar with them. The categorization of people into social groups allows us to make inferences about their traits and attributes even when these traits or attributes have never been observed. This can be advantageous because it enables us to respond quickly without expending a great deal of cognitive resources. However, this inevitably leads to the creation of groups like “them” and “us” and these group categories can lead to generalizations that minimize within-group differences and exaggerate between-group differences, thus facilitating the persistence of stereotypes (Dovidio, Hewstone, Glick, & Esses, 2010).

The Formation of Stereotypes

In addition to knowing something about the origins of stereotypes, it is also important to examine how they are formed. There are a number of processes that lead to the emergence of stereotypes. First, researchers suggest that stereotypes can sometimes form as a result of non-conscious detection of covariation (Hilton & von Hippel, 1996). In essence, the behaviors of one group member become generalized to other group members (Hilton & von Hippel, 1996). Once two events are non-consciously correlated, individuals behave as though the relationship continues to exist regardless of whether the contingency was removed (Hill, Lewicki, Czyzewska & Boss, 1989). An example of this can be seen when an individual encounters stereotypic individuals (e.g., an aggressive man). With repeated exposure to stereotypic individuals, the relationship between subsets of people (i.e., men) and stereotypical characteristics (e.g., aggression) is detected non-consciously, strengthened, and is generalized to all members of the group in question (i.e., all men are aggressive).

The detection of 'illusory' correlations is another process that leads to the formation of stereotypes. An illusory correlation is said to exist when individuals perceive a relationship between a set of variables that they expect to see even when no such relationship exists (Weiten & McCann, 2007). For example, individuals may form illusory correlations between members of a particular minority group (e.g., a Black person) and certain negative behaviors (e.g., criminal involvement). One explanation for why such illusory correlations exist is that there can be a perceived association between a set of negative behaviors and members of a particular minority group (Hamilton & Sherman, 1989; Mullen & Johnson, 1990). Another explanation for why negatively valenced illusory correlations exist relates to the simple act of forgetting (also referred to as information loss). Specifically, research has shown that people are more likely to forget the ratio of positive to negative behaviors when the sample is smaller (i.e., a minority group) rather than larger (i.e., a majority group) (Hilton & von Hippel, 1996)). For example, Schaller et al. (2002) found that negative stereotypes for racial groups in Vancouver, B.C. increased as the prevalence of that group decreased. In fact, the racial groups that were least common in the study by Schaller et al. (e.g., Aboriginals as compared to Chinese) were associated with the most negative stereotypes. In this case, exposure to members of different racial groups (due to prevalence) appeared to influence the formation of stereotypes.

The last process that we will focus on here, which contributes to the formation of stereotypes, is the out-group homogeneity effect (Hilton & von Hippel, 1996). According to this line of thinking, members of out-groups are seen as relatively homogenous, which means that people have a tendency to believe that a member of the group that one has

encountered (e.g., one man) is representative of the out-group as a whole (e.g., all men) and that all members possess the same, often negative attributes (e.g., aggression) (Park & Hastie, 1987).

Gender Stereotypes

Stereotypes exist for almost every sub-group that comes to mind. There are racial stereotypes (e.g., all Blacks are dangerous), occupational stereotypes (e.g., all lawyers are liars), age stereotypes (e.g., all teenagers are wild), etc. There is also evidence that strong gender stereotypes exist. A gender stereotype is one that is concerned with perceptions of how men and women differ from one another (Phares & Chaplin, 1997). For example, traditional gender stereotypes purport that women are emotional, submissive, and passive, while men are unemotional, dominant, and aggressive (Weiten & McCann, 2007). There is also a wealth of stereotype research, which suggests that people tend to link males to the trait of aggression and females to the trait of dependence, and thus the opposite of aggression (Basow, 1986; Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972).

Gender stereotyping is something that begins at a very early age. For example, Rubin, Provenzano, and Luria (1974) conducted a study in which they interviewed new parents within one day of the birth of their infant. There were no significant differences between the male and female infants in body length, weight, or activity scores. However, the female infants were characterized by their parents as cute, little, beautiful, or pretty. On the other hand, male infants were characterized by their parents as firmer, more alert, and stronger.

Additionally, research shows that gender stereotypes influence how young children choose to express anger and aggression towards their peers. Maccoby (1998) speculated that young children internalize and use their knowledge of gender stereotypes to evaluate and guide their behaviour, particularly when it comes to expressing aggression. In fact, it appears as though young children are more accepting and cognizant of overt expressions of anger when it is coming from a male peer, as opposed to when it is coming from a female peer. An example of this can be seen in a study conducted by Leinbach, Hort, and Fagot (1997) in which three- to five-year-olds were asked to label an animal with an angry expression as 'the mommy' or 'the daddy'; not surprisingly, the children showed a strong tendency to label the angry animal face as 'the daddy', thus implying that the angry animal was male. Similarly, in another study where participants were asked to judge the negative facial expression of a doll, the expression was interpreted as sad if the doll was dressed as a female and angry if the doll was dressed as a male (Plant, Kling, & Smith, 2004).

As children grow older and the physical differences between males and females become more pronounced, gender stereotypes persist. In a study conducted by Broverman, Vogel, Broverman, Clarkson, and Rosenkratz (1972), for example, a sample of college students were asked to list personality characteristics that they felt differentiate men and women. From this, a list of characteristics was compiled and given to another sample of students. These students were asked to indicate which characteristics were likely to apply to a target person. However, the only information that was known about the target was that he/she was male or female. The results indicated that there was a general consensus between male and female participants about the characteristics of male

and female targets. Examples of some of the traits participants used to characterize men were aggressive, dominant, active, and direct. Examples of some of the traits participants used to characterize women were tactful, gentle, quiet, and expresses tender feelings.

The Source of Gender Stereotypes

There are a number of factors that contribute to the view that males are aggressive/dangerous whereas females are gentle/passive, but one of the biggest factors is the way in which the media portray the two genders. According to Gordon Allport (1954), the author of *The Nature of Prejudice*, “stereotypes are socially supported, continually revived and hammered in, by our media of mass communication – by novels, short stories, newspaper items, movies, stage, radio, and television” (p. 200). Interestingly, in line with this thinking, the results from longitudinal experimental studies designed to examine the impact of television viewing on adolescents’ sex role attitudes showed that greater television viewing produced more sexist attitudes six months to a year later (Morgan, 1982, 1987).

Interestingly, females are one of the most common groups to be stereotyped in the media. Content analysis studies have consistently demonstrated that the media presents distorted and stereotypic images with regards to females (Signorielli, 1990). Specifically, some of the common patterns that emerge in the media are: males outnumber females at a ratio of three to one; females tend to be younger than males and cast in traditional, stereotypic roles (e.g., housewife, teacher, etc); females tend to be depicted as having limited employment possibilities; and females, in comparison to males, are more likely to be displayed as married (Signorielli, 1990).

In addition, there are also studies that provide evidence that the portrayal of gender-based out-group members 'prime' prejudice and stereotyping. For example, in a study designed to examine the impact of media portrayals on attitudes and beliefs, participants were placed in either a stereotype-congruent group or a stereotype-incongruent group (Power, Murphy, & Coover, 1996). Participants were asked to evaluate a campus newsletter in which a female student was featured via an autobiographical essay. The autobiographical information was manipulated so that in one version of the newsletter (stereotype-congruent condition) the female student was described in a stereotypical fashion (e.g., overemotional, weak, passive), and in the other version (stereotype-incongruent condition) the female student was described using information that was inconsistent with the female stereotype (e.g., athletic, rational, assertive). The results of the study indicated that participants in the stereotype-congruent group were more likely to endorse negative stereotypes of women (e.g., as self-centered, weak, overemotional, and intelligent) than were participants in the stereotype-incongruent group. In addition, participants in the stereotype-congruent condition generalized these stereotypes to other situations (e.g., they were less likely to believe sexual harassment allegations).

Thus, it appears that media is capable of altering levels of prejudice and stereotypic thinking within an individual, particularly when it is biased in such a way to present stereotypically consistent information (e.g., men as aggressive and women as docile). But of course the media is not the only source that might lead people to perceive men as more aggressive than women. For example, people may in fact be aware of actual crime data that suggests that men are in reality more aggressive than women and come

into contact with the police more frequently. For example, according to a relatively recent report (U.S. Department of Justice, 2001), male civilians are involved in use-of-force situations 82% of the time whereas female civilians are involved in use-of-force situations 18% of the time.

Gender Stereotypes and Their Influence on Behaviour

One of the reasons why it is important to study and understand stereotypes is because they can have an influence on how people behave towards other people (Jones & McGillis, 1976). There are numerous theories that have been proposed to explain how and why stereotypes have this influence, most of which discuss how stereotypes influence perceptions. One of the most common theories is that stereotypes influence subsequent judgments by providing a source of expectancies about behaviour (Deaux & Farris, 1977; Jones & McGillis, 1976). Specifically, if a behavior is classified as stereotype-congruent, then it is attributed to internal, stable causes (e.g., ability) and the behaviour is expected to be exhibited again. On the other hand, if a behavior is classified as stereotype-incongruent, then it is attributed to external causes (e.g., luck or task characteristics) or to internal, unstable causes (e.g., effort), and is not necessarily expected to occur again (Cash, Gillen, & Burns, 1977; Deaux & Emswiller, 1974; Hansen & O'Leary, 1983).

With regards to aggression, for example, people tend to respond differently to instances of aggression depending on whether the aggressor is male (stereotype-congruent) or female (stereotype-incongruent) (Eagly & Steffen, 1986). It appears as though there is a higher tolerance for aggression resulting from females than for aggression resulting from males, presumably due to the fact that in the case of females,

the aggression is often attributed to external factors (i.e., females are seen as less inherently dangerous than males and thus, less likely to inflict harm) (Eagly & Steffen, 1986). Interestingly, this tendency is amplified when the subject (or observer) is also male. In other words, if the subject is male, he typically tends to respond with a greater level of aggression towards male targets rather than female targets (Borden & Taylor, 1973; Eagly & Steffen, 1986; Frodi, Macaulay, & Thome, 1977).

Of course, these sorts of gender stereotypes (e.g., with regard to perceived aggression or dangerousness on the part of a target) would be particularly problematic in a setting where a police officer must decide whether to discharge his/her weapon against a target. For example, as can be inferred from the above findings, the police officer may hesitate in the case of an armed female target because of stereotypical beliefs about females and their (supposed) lack of dangerousness (the opposite might apply when officers are faced with unarmed male targets). If we assume that stereotypes influence judgments because they provide expectancies with regard to target behaviour, then we can further assume that a police officer may choose to not shoot at a female suspect because he/she expects that this female suspect will react in a manner consistent with the 'female' stereotype (i.e., they will be non-aggressive/non-dangerous).

As alluded to above, these sorts of findings are exactly what is reported in shooting studies that examine stereotypes, such as race, and there is no reason to suspect that similar findings would not emerge from studies examining gender stereotypes (such as the preliminary effects recently reported by Plant et al., 2011). For example, the results from studies of target race tend to show that community members (but not necessarily police officers) frequently make errors on simulated shooting tasks that involve armed

and unarmed Black and White targets. However, error rates are not constant across all stimuli, but instead are usually disproportionately found on stereotype-inconsistent trials (defined in most studies as unarmed Black targets and armed White targets) (Correll et al., 2002; Plant, Peruche, & Butz, 2005; for a recent exception see Bennell & Taylor, 2010).

Interestingly, in addition to its influence on errors rates in shoot/don't shoot decisions, target race also impacts response times (Correll et al., 2002). Specifically, results from Correll et al.'s study revealed an interaction between object and race, indicating that participants were quicker to respond "shoot" when exposed to armed Black targets (a stereotype-congruent trial) as compared to armed White targets, but quicker to respond "don't shoot" when exposed to unarmed White targets (a stereotype-congruent trial) compared to unarmed Black targets. This finding was particularly true for those who believed that a strong cultural stereotype exists for Blacks in terms of being more aggressive, violent, and dangerous.

The research by Correll et al. (2002) has also utilized signal detection theory (SDT) to examine their results. Specifically, they focused on the two primary outcomes of SDT: *sensitivity* (commonly known as d'), which refers to the ability of participants to distinguish between armed and unarmed targets, and the *criterion* (commonly known as c), which refers to the tendency to make a shoot or don't shoot decision (Swets, 1973). With respect to d' , participants displayed a high degree of sensitivity (or accuracy) for both the Black and White targets (Correll et al., 2002). With respect to c , participants displayed a tendency to set a lower decision criterion for Black targets in comparison to White targets indicating that participants were more willing to shoot Black targets. These

findings have since been replicated in subsequent studies (Correll et al., 2007; Plant & Peruche, 2005).

Of particular relevance to the present study, Plant, Goplen, and Kuntsman (2011) conducted a study in which they examined the extent to which target gender influences decisions regarding use of force. Their findings indicated that target gender does, indeed, influence behaviour, and particularly threat-based response behaviour (e.g., deciding to shoot or not shoot). Participants in this study displayed a tendency to make errors on trials in which the target was male, regardless of whether the target was armed or unarmed. In addition, although participants were faster when responding on trials in which a gun was present overall, this was amplified on trials in which the target was male. Therefore, participants tended to be quicker when deciding to shoot at armed male targets than when deciding to not shoot unarmed male targets. With regards to the signal detection results, Plant et al. (2011) found that participants displayed a high degree of sensitivity for both the male and female targets. With respect to *c*, participants displayed a tendency to set a lower decision criterion for male targets, in comparison to female targets.

Automatic and Controlled Processes

Given research that shows the existence of very strong gender stereotypes, especially around traits such as aggression and danger (Broverman et al., 1972; Eagly & Steffan, 1986; Weiten & McCann, 2007) will gender stereotypes influence shooting decisions in a similar manner as racial stereotypes? The recent study by Plant et al. (2011) suggests that the answer is yes, at least with participants from the U.S., but this is a single study using a limited set of stimuli that combined the constructs of race and

gender. In order to answer this question and gain a better understanding of what is happening in stereotype-based shooting studies, not only do additional studies need to be conducted using other stimuli, but we must also explore the specific cognitive processes that are thought to contribute to performance in these tasks.

One common theory for understanding how stereotypes influence behaviour is referred to as the dual-process theory (Shiffrin & Schneider, 1977). Dual-process theories, generally speaking, provide an account of how an incident can occur in two different ways, or more specifically, as a result of two distinct processes. A number of dual-process theories exist in the literature and are popular candidates in explaining a wide range of events (e.g., errors in recognition memory; Scheider & Shiffrin, 1977; Shiffrin & Schneider, 1977). The dual-process theory commonly relied on in stereotype research suggests the social decisions are influenced by two factors: (1) the degree to which a factor, such as gender, activates an automatic stereotype and/or (2) the degree to which responses that result from an activated stereotype can be intentionally controlled.

An automatic (or implicit) process is one that operates unconsciously (Payne, 2001). What this means is that the process operates outside the realm of control. Automatic stereotype processes are thought to be triggered by external stimuli (e.g., a picture of a female) and cannot be intentionally overridden. An automatic process is considered to be efficient because it is activated instantaneously and does not require a great deal of cognitive resources. Thus, other operations are able to occur because of the absence of competition for attentional resources (Payne, 2001). However, automatic processes can result in problems, such as when the automatic activation of a stereotype

leads one to make a decision that is inconsistent with the situation at hand (e.g., shooting an unarmed male).

On the other hand, a controlled process is both conscious and intentional, and thus can be manipulated (Payne, 2001). However, the operation of a controlled process puts a great deal of strain on an individual's attentional system (Payne, 2001). What this means is that the availability of cognitive resources severely influences one's ability to use controlled processes. Why is this important? Because in order for an individual with biases/stereotypes to make a correct decision in a simulated shooting scenario, he/she must ignore irrelevant cues that can activate strong stereotypic responses, like target race or gender, and instead focus solely on whether the target is armed or unarmed. In other words, in order to make a correct decision with regards to shooting/not shooting a target, an individual with biases/stereotypes must utilize controlled processes rather than automatic processes in order to prevent incorrect decisions from being made.

The aforementioned dual-process theory has been used to explain the occurrence of biases in tasks that involve the identification of weapons and simulated shooting scenarios (Payne, 2001; Payne, Lambert, & Jacoby, 2002; Plant et al., 2005). In the weapon identification task, participants are first primed with either a Black or White face and then shown pictures of either a tool or a gun. Results from various studies indicate that participants are more likely to identify a tool as a gun when primed with a Black face as opposed to a White face (Payne et al. 2002; Payne, 2001; Sharps & Hess, 2008). In addition, participants are much quicker at identifying a gun as a gun when primed with a Black face as opposed to a White face (Payne, 2001). Similar findings emerge in actual shooting studies (e.g., Plant et al., 2005).

How do these findings relate to the dual-process theory? The automatic process is thought to be indicated to the extent that irrelevant cues, such as a target's Black face, influence the responses of participants (e.g., the decision to label an object as a gun or to shoot at the target). In contrast, the controlled process is indicated to the extent that objects are correctly categorized into the appropriate categories regardless of race (e.g., does the object fall into the gun category or the neutral object category?) and to the extent that participants respond appropriately to the object (gun or tool) that is present (Plant et al., 2005). In order to assess the contribution of each process, their role must somehow be isolated.

Isolating the Role of Automatic and Controlled Processes

Automatic and controlled processes are typically assessed individually using two separate procedures because they are assumed to be two separate processes (Sherman et al., 2008). Implicit measures, which tend to utilize participant reaction times, are often used to assess automatic processes, such as the implicit association that people make between Black people and whether they are dangerous or safe. On the other hand, explicit measures, which tend to utilize the self-report method, are often used to assess controlled processes, such as whether people consciously hold racist attitudes towards Black people (Richardson-Klavehn & Bjork, 1988). However, previous research has identified problems with relying on implicit and explicit measures to evaluate automatic and controlled processes, respectively (e.g., Payne, 2008; Sherman et al., 2008).

One of the biggest problems that arises when attempting to isolate automatic and controlled processes involves the apparent confound of processing style (automatic and controlled) with the form of measurement used (implicit and explicit) (Payne, Burkley, &

Stokes, 2008). The problem is that each type of measure (implicit and explicit) differs in a number of ways beyond the extent to which they tap into these different cognitive processes. Thus, it is difficult to know whether a particular set of findings that emerge from these different methods of measurement reflect the underlying cognitive processes at work or some other difference between the methods.

In order to examine the contribution of automatic and controlled processes on the responses to a particular task, it is important to utilize only one task/measure (i.e., to move away from task dissociation towards process dissociation). Doing this is likely to be beneficial because it will provide information regarding how the two processes interact and combine to influence responses (Payne & Stewart, 2007). Payne (2001) proposed the process dissociation procedure (PDP) to isolate the individual and collective influence of automatic and controlled processes on participant responses in the weapon identification task. This procedure is different from the task dissociation procedure, which equates a particular task with a particular process. By relying on one task, PDP helps to ensure that task and process are not confounded, which allows for the joint contribution of each component to be more accurately estimated.

The aim of PDP is to isolate the individual and collective influence of automatic and controlled processes on responses. To do this, the task in question must have congruent conditions and incongruent conditions. A congruent condition is one in which the decision outcome would be identical, regardless of whether automatic or controlled processes are relied upon (Payne, 2001; Plant et al., 2005). An example would be when a quick decision has to be made whether to shoot an armed Black target. In this case, both the automatic (i.e., Black people are dangerous) and controlled process (i.e., the target is

holding a weapon) would lead to the same decision outcome (i.e., to shoot the target). An incongruent condition is one in which the decision outcome depends on the process (i.e., the automatic process would lead to a different decision outcome than the controlled process) (Payne, 2001; Plant et al., 2005). An example would be when a quick decision has to be made whether to shoot an unarmed Black target.

On a stereotype-congruent trial, the probability (p) of a correct decision (i.e., a shoot response) is the probability of a controlled response (C) plus the probability of an automatic response (A) when a controlled response fails ($1 - C$) (Payne, 2001). Therefore, the algebraic equation for stereotype-congruent trials would look like this:

$$p_{\text{shoot}} = C + A (1 - C)$$

Conversely, on a stereotype-incongruent trial, the probability of a shoot response is the probability that an automatic response (A) favors the shoot response when the individual is unable to properly control the response ($1 - C$) (Payne, 2001). Therefore, the equation for stereotype-incongruent trials would look like this:

$$p_{\text{shoot}} = A (1 - C)$$

Payne (2001) utilized these two equations in an attempt to algebraically estimate the contribution of automatic and controlled processes. The contribution of a controlled response is calculated by examining the difference between the shoot response on stereotype-congruent and stereotype-incongruent trials. Thus:

$$C = \text{Congruent} - \text{Incongruent}$$

Conversely, an automatic response contribution is calculated by examining the probability of using a shoot response on stereotype-incongruent trials divided by $1 - C$. Thus:

$$A = \text{Incongruent} / (1 - C)$$

As can be seen from these equations, the A estimate reflects an automatic bias in which extraneous factors (e.g., race, age, or gender of the target) influence the response outcome. The C estimate reflects a degree of control that is applied to the stimuli to correctly process it (i.e., is a weapon present?) and make a decision that is based on that processing.

Factors that Influence Automatic and Controlled Processes

Research has shown that the presence of certain factors tends to influence the utilization of automatic and controlled processes. For example, having a high level of task experience is likely to decrease the amount of cognitive resources required to complete a task, whereas a factor like increased task difficulty is likely to increase the amount of cognitive resources that are necessary to successfully complete a task. Cognitive resources are an important aspect to consider because the amount available will determine whether an individual can rely on controlled processes when making a decision. If the task-at-hand is not particularly demanding, or if the individual has abundant experience performing a task, then the available cognitive resources should be substantial and the individual will likely rely on controlled processing.

However, there are also certain factors, like the presence of a stereotype, that influence whether the individual utilizes automatic processing. If an individual strongly endorses a stereotype (e.g., all Black people are dangerous and are thus associated with dangerous objects such as guns), then that stereotype will likely be activated upon the presence of the appropriate stimuli. Related to this is the consideration of time. For example, if a task is designed with decision accuracy being the end goal, the amount of

time that participants are allotted to make a decision must be considered. If participants are given sufficient time to make a controlled decision and their goal is to maximize accuracy, the possession of stereotypes will likely not matter – there is a shift from automatic responses to controlled responses in this case. On the other hand, if participants are given a very restricted amount of time to respond, the reverse would be true (there would be a shift from controlled responses to automatic responses).

I will now shift to an examination of particular factors that are likely to influence automatic and controlled processes in the context of gender-based simulated shooting tasks; factors that will be incorporated into the thesis studies.

Gender Stereotypes. As alluded to above, the possession of gender stereotypes is a factor that can potentially influence whether an individual relies on automatic or controlled processing in a simulated shooting task, and it will be one of the factors that is thoroughly examined in the current thesis. Presumably, if an individual subscribes to a gender-related stereotype (e.g., males are dangerous), he or she will likely rely on automatic processing in the simulated shooting task, at least under certain conditions (e.g., when the response window for the task is severely restricted). Of course if the individual does not possess gender stereotypes then it is unlikely that the individual will respond in a biased manner depending on the gender of the target, regardless of the length of the response window. The reason for this is that the stereotype that leads to biased responding (e.g., males are dangerous) will never become activated.

To establish the role that gender stereotypes play in simulated shooting tasks it is necessary to first measure one's stereotypes. This can generally be done in one of two ways, either by relying on explicit stereotype measures or implicit stereotype measures.

With regards to explicit stereotype measures, a variety of different measures exist. For example, one method is to provide participants with a series of statements (e.g., “females are generally not as dangerous as males”) and ask them to respond to those statements by agreeing or disagreeing (e.g., Henry & Sears, 2002; McConahay, 1986). Another way to assess explicit stereotypes is to provide participants with a series of adjectives (e.g., smart, criminal, aggressive) and ask them to categorize those adjectives based on whether they are representative of certain groups (e.g., males or females) (e.g., Devine & Elliot, 1995; Gilbert, 1951; Katz & Braly, 1933).

When using measures of explicit stereotypes, a distinction is often made between knowledge of a cultural stereotype (i.e., what do others think?) and personal beliefs surrounding stereotypes (i.e., what do I think?) (Augoustinos & Ahrens, 1994; Devine, 1989; Krueger, 1996). Interestingly, research has shown that an individual does not necessarily need to personally subscribe to existing stereotypes in order for stereotypes to influence behavior, including shooting behaviour (e.g., Correll et al., 2002) as knowledge of cultural stereotypes is often enough.

An obvious problem with explicit stereotype measures is the propensity for participants to respond in a socially desirable manner (Correll et al., 2007a; Lowery et al., 2001). For example, recent research has shown that participants have a tendency to misrepresent (i.e., control) true feelings about racial groups to appear more acceptable in the eyes of others (Crandall, Eshleman, & Brien, 2002). The reason for this is likely due to the fact that racism/subscribing to racist beliefs is frowned upon in modern-day culture. Reflecting this thinking is a study by Fazio, Jackson, Dunton, and Williams (1995). They selected participants based on the presence of extreme prejudice scores on

the Modern Racism Scale. These same participants were asked to complete the scale a second time, this time in front of a Black or White experimenter. As expected, many of the scores changed as a result of the presence of the experimenter. Participants had a tendency to portray themselves as less prejudiced when the experimenter was Black, which indicates that many of the participants' were inhibiting their true attitudes.

In an attempt to further our understanding of peoples' motivation to control their prejudiced reactions, Dunton and Fazio (1997) constructed the Motivation to Control Prejudiced Reactions Scale (MCPR) (Dunton & Fazio, 1997). The MCPR scale measures individual differences in terms of the extent to which people are motivated to control prejudiced reactions. The MCPRS consists of a two-factor structure: (1) concern with acting in a prejudiced manner or by appearing prejudiced to others and (2) inhibiting the expression of one's true thoughts and feelings in an attempt to avoid disputes with others. The MCPRS is important because it may provide information with respect to the relationship between scores on explicit stereotypes measures and shooting performance. Unfortunately, the MCPRS is an explicit scale too and may suffer the same problems as other explicit scales (e.g., socially desirable responding).

One way to mitigate the problem associated with explicit stereotype measures is by using implicit stereotype measures (Hofmann et al., 2005). As indicated above, an implicit thought is one that arises from an automatic association and occurs outside of conscious awareness (and therefore is less able to be controlled). However, implicit thoughts still have the ability to influence behavior (Devine, 1989; Greenwald & Banaji, 1995). A variety of measures are available to assess implicit stereotypes, but the most common is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998).

In essence, the IAT measures the strength of automatic associations (e.g., males and danger; females and safe).

One advantage associated with the IAT is that it appears to tap into personal stereotypic beliefs. Furthermore, it has the ability to access these personal stereotypic beliefs even when the individual is attempting to control biases (Kim & Greenwald, 1998). The test is based on the assumption that it will be easier to respond to certain questions if those questions are consistent with a personal stereotypic belief. For example, if I believe that all men are dangerous and all women are safe, I will be quicker when responding to a task that requires me to categorize words as women/safe or men/dangerous rather than women/dangerous or men/safe. Furthermore, even though it is possible to control my bias and thus categorize the words accurately, response-time will suffer and the use of controlled responding will be evident.

In brief, the IAT consists of a series of stages that are presented to the participant via a computer monitor. There are many different versions of the IAT available, but for the purpose of the present study we will examine a gender-IAT. During the first stage, participants are asked to categorize gender-specific words (e.g., grandmother, father, etc.) as either male or female. During the second stage, participants are asked to categorize words (e.g., stab, peace, etc.) as either dangerous or safe. Next, the categories are paired together (e.g., male or safe and female or dangerous) and the participants are asked to categorize the words into the appropriate category. Lastly, the category-pairs are reversed (e.g., male or dangerous and female or safe) and the participants are asked to complete the categorization task one last time. If the participants are able to make categorization decisions at a quicker pace during the stereotype-congruent trials (e.g., male-dangerous

and female-safe), then it is assumed that their concept of male is more strongly associated with the concept of “dangerous” while their concept of female is more strongly associated with the concept of “safe”. If the participants are able to make categorization decisions at a quicker pace during stereotype-incongruent trials (e.g., male-safe and female-dangerous), then the reverse is true.

In the current study, both explicit and implicit measures of gender stereotypes will be utilized and the responses from these measures will be correlated with performance on a shooting task.

Task Difficulty. Task difficulty is another factor that can potentially influence whether an individual relies on automatic or controlled processing in a simulated shooting task and this is a second feature that will be examined in the current thesis. Presumably, the higher the level of task difficulty, the less likely it is that a participant will be able to rely on controlled processing. Task difficulty can of course be manipulated in a variety of ways. For example, as demonstrated by Correll et al. (2002, Study 2), task difficulty can be manipulated by decreasing the window of time that the participant has to make a response after being exposed to a stimulus. Participants in Correll et al.’s study were only given 630ms (as opposed to the original 850ms) to respond to the target. This resulted in an increased number of stereotype-congruent shooting errors because participants were essentially forced to rely on automatic processing. This finding has since been replicated in many areas of cognitive psychological research (Correll et al., 2007a; Draine & Greenwald, 1998; Kane & Engle, 2003; Payne, 2001).

Another way to manipulate task difficulty, and the one that will be focused on in this thesis, is to alter scene complexity. Stinchcombe and Gagnon (2009) used this

method in a driving simulator study to assess driving performance under varying conditions. In this study, complexity was manipulated by altering the number of distracters present in each scene. Their results indicated that participants made more errors and took a longer amount of time to make driving responses when exposed to high complexity scenes (e.g., an urban city-centre) as opposed to low complexity scenes (e.g., a straight road). Interestingly, Sharps and Hess (2008) found comparable results in a study involving eyewitness memory. Specifically, they found that as the number of distracter items within a scene increased, one's ability to accurately recall important items (e.g., weapons) decreased.

Of particular relevance to the present study, Wigboldus, Sherman, Franzese, and Knippenberg (2004) conducted a study involving stereotype-congruent and stereotype-incongruent words. Participants were assigned to either a high-load or a low-load condition. In the high-load condition, a primary task was combined with a secondary task so as to increase the corresponding cognitive load. In the low-load condition, the participants had to complete only a primary task. In the primary task, all participants were asked to identify whether trait words had appeared in previous trait-implying sentences. These sentences could be either stereotype-congruent or stereotype-incongruent and participants were later asked whether specific stereotype confirming words had appeared in the sentences. The secondary task involved asking the participants to hold an eight-digit number in memory while they performed the experimental task. The results indicated that stereotypes influenced responses when cognitive load was high, but not when cognitive load was low. In cases of high load, participants were likely to rely on automatic processes and endorse stereotypic traits because cognitive capacity was

strained. Although these results are compelling, the existing research findings are not consistent. For example, research by Sherman, Conrey, and Groom (2004) suggests that participants tend to pay more attention to stereotype-incongruent rather than stereotype-congruent information when one's cognitive load is high.

Summary

To summarize, a review of the literature shows that there are numerous factors that appear to influence the role that automatic and controlled processes play in participant responses on certain tasks. The current study will explore some of these factors – including explicit and implicit gender stereotypes, and task difficulty – in an attempt to assess the impact that they have on performance in a gender-based simulated shooting task. Study 1 will examine the impact of target gender on participants' automatic and controlled processes in a simulated shooting task and examine whether explicit and implicit stereotypes relate to performance on the shooting task. Study 2 will examine the impact of scene complexity on shooting performance in the same task and also examine the relationship between shooting performance and explicit and implicit stereotypes. Each of the studies will now be discussed in detail.

Study 1: The Effect of Automatic and Controlled Processes in a Simulated Shooting

Task

Purpose

Study 1 will examine whether university students show a gender bias in a simulated shooting task and will assess the contribution of automatic and controlled processes to the participants' shooting decisions. In addition, this study will examine how

a variety of measures, including explicit and implicit gender stereotype measures, relate to performance on the shooting task.

Method

Sample for Construction of Experimental Stimuli

In order to carry out this study, photo stimuli must first be created. Similar to previous research (e.g., Correll et al., 2002; 2007a), models were photographed in a variety of poses (e.g., standing, kneeling, etc.) while holding a series of objects (e.g., cell phone, mock hand-gun, etc.). However, in contrast to previous research that used Black and White male models, the models for the current study were White males and females. Specifically, a total of 20 models served as the target individuals in the simulated shooting task (10 males and 10 females). These models were recruited from Carleton University and were paid \$10.00 for their participation. See Appendix A for an example of the shooting task stimuli.

Procedure for Construction of Experimental Stimuli

The photo shoot was conducted in the Police Research Lab (HCI 6113). Models were required to sign a consent form, which confirmed that they (a) were aware of the purpose of the photo shoot and (b) agreed to the usage of their photographs upon completion of the photo shoot. Once the consent form was signed, the models were then given detailed instructions with regards to the poses and hand positions required to complete the photo shoot.

Models were asked to pose in five different positions. Sample photographs of the various poses were used to give the models an example of each pose. While in each pose, models were asked to sequentially hold four different objects (two threatening: black

mock handgun and silver mock handgun; two non-threatening: black wallet and silver cell phone). In order to ensure the quality of each pose/object photograph combination, two photographs of each combination were taken. For example, there were two photographs of a model standing upright, left foot forward while holding the black mock handgun. There were a total of 40 photographs taken of each model to ensure that we had a sufficient number of high quality photos to select from (4 items x 5 poses x 2 photos each). A Sony Cyber-Shot digital camera was used to take the photos. Once the photo shoot was completed, the models were debriefed and given \$10.00 as compensation.

The photographs of the models were superimposed onto a series of real-world background images using Adobe PhotoShop. These background images were made up of various indoor/outdoor locations from the Carleton University Campus and the City of Ottawa. Twenty distinct background photographs were selected from a larger pool of background photographs for inclusion in the present study. The background photos were already taken as part of a previous research project.

Manipulation Check of Experimental Stimuli²

An independent sample of judges was used to ensure that the photos of the models superimposed on the backgrounds were acceptable for use in the study. Specifically, the judges were asked to estimate the number of objects present in each photo to examine photo complexity, indicate the visibility of the object in the photo (e.g., guns, wallet, and

² In addition to ensuring that the shooting stimuli are valid, which is accomplished by the manipulation check reported here, it is also important to ensure that the stimuli used in the IAT are valid. As described in more detail below, within the current study these stimuli include words representing the concepts male, female, safe, and dangerous. Manipulation checks for these stimuli were completed as part of a previous research project. That manipulation check confirmed that the words we are using are, in fact, representative of the concepts being focused on (i.e., dangerous words were perceived as dangerous by an independent sample of judges and safe words were perceived as safe). See Appendix B for a copy of the questions asked in the manipulation check.

cell phone), and rate each target on a scale of masculinity/femininity. See Appendix C for a copy of the questions that were asked.

Sample for Manipulation Check of Experimental Stimuli

A total of 40 undergraduate students from Carleton University were recruited as participants to complete the manipulation check. The participants were recruited from the undergraduate psychology subject pool (see Appendix D for a copy of the recruitment message). The task took approximately 15 minutes to complete and participants were compensated with a 0.25% course credit.

Procedure for Manipulation Check of Experimental Stimuli

Participants completed the manipulation check in the Police Research Lab (HCI 6113). Upon arrival, participants were presented with an informed consent form (see Appendix E) that they were required to sign. They were then presented with the photographs. The photographs were displayed on a computer screen for a total of 630 ms (i.e., the same length of time that the photographs will be displayed for participants in Study 1). Participants were then asked to estimate how many objects were present in each photograph, to rate each photograph with regards to visibility of the object the target was holding using a 9-point scale (1 = not at all visible, 9 = extremely visible), and to rate each target on degree of masculinity/femininity using a 9-point scale (1 = extremely masculine, 9 = extremely feminine). Upon completion of this task, participants were debriefed (see Appendix F).

Results of Manipulation Check of Experimental Stimuli

A paired-samples *t*-test was conducted to evaluate whether there were differences between the male and female photographs. The results indicated that the mean number of

perceived items in male photos ($M = 7.13$, $SD = 2.40$) was not significantly different than the mean number of items in female photos ($M = 7.13$, $SD = 2.41$), $t(39) = .14$, $p > .05$. In addition, the mean visibility of the object in male photos ($M = 7.81$, $SD = .59$) was not significantly different than the mean visibility of the object in female photos ($M = 7.71$, $SD = .68$), $t(39) = -.89$, $p > .05$. Lastly, there was a significant difference between the two sets of photos in terms of perceived masculinity/femininity, with male photos being rated significantly lower (more masculine) ($M = 1.43$, $SD = .19$) in comparison to female photos ($M = 8.42$, $SD = .22$), $t(39) = 144.24$, $p < .05$. We opted to use only the photos that met a pre-determined criterion on the masculinity and femininity scale. The criterion that we chose for the female photos was 7.00 or higher on the masculinity/femininity scale and the criterion that we chose for the male photos was 3.00 or lower on the masculinity/femininity scale.

Participants for Study 1

Participants for Study 1 consisted of 61 undergraduate students from Carleton University, all of whom were recruited from the undergraduate subject pool. The total gender make-up of the sample included 26 males and 35 females. The average age of participants was 22 years ($SD = 4.86$). The ethnicity of the participants in the sample was: White = 28, Black = 4, Asian = 11, Middle Eastern = 8, Other = 6, Prefer Not to Answer = 4.

Students were given course credit for their participation in the current study (see Appendix G for a copy of the recruitment announcement). In addition, all participants in Study 1 were eligible to win one of three cash prizes based on their performance on the shooting task (i.e., the participants with the three highest scores [the scoring system is

described below] were mailed a cheque, which corresponded to their rank; \$250 for the first place winner, \$200 for the second place winner, and \$150 for the third place winner).

Procedure for Study 1

After signing their informed consent form, participants in Study 1 completed a variety of tasks. The first task consisted of an experimental shooting task where participants were exposed to photos of armed and unarmed male and female targets and had to make shoot/don't shoot decisions. Following this, the participants completed, in random order, some measures of cognitive load, several measures of explicit or implicit stereotypes, and a measure of one's motivation to control prejudiced reactions. Finally, before being debriefed, participants completed a demographic questionnaire. Each of these measures will now be briefly discussed.

The Experimental Shooting Task. The experimental shooting task outlined in Correll et al. (2007a) was used as the basis for the task in the present study. In this task, participants are required to make shoot/don't shoot decisions based on the presence of armed and unarmed male and female targets. The participants are instructed to respond as quickly and accurately as possible by making the decision to "shoot" all armed targets (by hitting a designated computer key) and "don't shoot" all unarmed targets (by hitting another computer key). The task consisted of a total of 16 practice trials and 80 test trials. The computer program used to deliver the stimuli recorded the participant's shooting decisions and reaction times for subsequent analysis.

For each trial, a random number of background images, ranging from 0-3, appeared on the screen. These background images were taken from the set of 20 background images constructed during the stimuli development phase. Each background

image remained on the screen for a random amount of time, ranging from 500ms to 800ms. On the last assigned background within a trial, an armed or unarmed male or female target appeared superimposed on the screen in a randomly assigned location. The targets were randomly assigned to the background images. However, each type of target (e.g., male-Armed, female-Armed, etc.) appeared in each background image with an equal frequency.

Participants were given 630ms to make their shoot/don't shoot decision. After the participant made their decision, they received feedback on whether they made a correct or incorrect decision and were assigned a score for that decision. Upon completion of the test trials, the participants were presented with an overall score summarizing their performance. The scoring system used by Correll et al. (2007a) served as the basis for the scoring system. A "hit" (making a correct decision to shoot an armed target) earned 10 points and a "rejection" (making a correct decision to not shoot an unarmed target) earned 5 points. A "false alarm" (making an incorrect decision to shoot an unarmed target) resulted in the subtraction of 20 points from the participant's score and a "miss" (making an incorrect decision to not shoot an armed target) resulted in the subtraction of 40 points from the participant's score. Additionally, if participants did not respond in a quick enough manner (i.e., if a response was not made within the allotted time period of 630ms), a "timed out" penalty resulted in the subtraction of 10 points from the total score. These scoring guidelines were a means to motivate participants to perform well (given the performance-based monetary reward that was available).

Measures of Cognitive Load. Upon completion of the experimental shooting task, participants completed two measures that independently assess cognitive load (see

Appendix H; DeLeeuw & Mayer, 2008; Paas, 1992). The first measure assessed the degree of mental effort exerted by the participant on the experimental task by asking participants to complete a 9-point scale ranging from 1 (extremely low mental effort) to 9 (extremely high mental effort). The second measure assessed the degree of difficulty of the experimental task by asking participants to complete a 9-point scale ranging from 1 (extremely easy) to 9 (extremely difficult). Despite being very simple measures, these two rating scales are commonly used to assess cognitive load in other studies and they appear to be sensitive, reliable, and valid indicators of load (Paas, Tuovinen, Tabbers, & van Gerven, 2003). Both measures will be examined separately in the current study rather than summing or averaging them.

Explicit Stereotype Questionnaire. Participants were required to complete one measure that assessed explicit gender attitudes and stereotypes. Specifically, they completed a modified version of an approach used by Devine and Elliot (1995). Participants were provided with a list of 18 adjectives and were instructed to select words that best describe male and female individuals. There were two parts to this task. First, participants were asked to complete this classification task from the perspective of other people (i.e., knowledge of cultural stereotypes). Second, participants were asked to complete this classification task from their own personal perspective. See Appendix I for a copy of the adjective checklist, as well as the instructions provided to participants.

Many of the adjectives were associated with the construct of ‘dangerousness’ (e.g., criminal, violent, aggressive, etc.) because the focus of the current project is on perceived differences in dangerousness between males and females. Although there were a total of 18 adjectives in the scale, only 11 were included in the analysis. Those

adjectives that were not included in the analysis were deemed unrelated to the construct of dangerousness (e.g., cold, unapproachable, etc). See Appendix J for a list of the adjectives that were analyzed.

In order to ensure that the adjectives chosen for analysis related to the underlying construct of dangerousness internal consistency scores were calculated for each list of adjectives (e.g., for cultural female stereotypes, cultural male stereotypes, etc.). Specifically, Kuder-Richardson 20 values were calculated using SPSS (v. 20) given that the adjectives were coded in dichotomous form (as being relevant/not relevant to a particular stereotype). The values were .82 for the male-Personal adjectives; .88 for the male-Cultural adjectives; .70 for the female-Personal adjectives; and .69 for the female-Cultural adjectives. Given that a score of .70 is often used as a cut-off to signify an appropriate level of internal consistency (Pallant, 2010) the list of adjectives chosen to represent the construct of “dangerousness” was deemed appropriate.

Motivation to Control Prejudiced Reactions Scale. Participants were also required to complete a motivation to control prejudiced reactions measure. The scale that was used in the present study was the Motivation to Control Prejudiced Reactions (MCPR) scale (Dunton & Fazio, 1997). The MCPRS consists of 17 items that are measured on a 5-point scale. Within these 17 items, two factors are present. The first factor involves concerns that may arise as a result of acting in a prejudiced manner. The second factor involves inhibiting the expression of thoughts and feelings in an attempt to avoid disputes. The scores for each item were summed to provide an overall score of the participant’s motivation to control prejudice. This measure was selected because of its relevance to the present study as well as its good psychometric properties. For example,

across four independent samples, the alpha coefficients ranged from .74 - .81 (Dunton & Fazio, 1997). In the current study, the alphas levels were respectable (.37 for the external scale; .73 for the internal scale; .75 for the total scale). See Appendix K for a copy of this scale.

Implicit Stereotype Measure. Participants were required to complete an implicit stereotype measure, in addition to the explicit stereotype measures outlined above. The implicit stereotype measure that was used for the present study was a Gender-IAT (Greenwald, McGhee, & Schwartz, 1998). As outlined above, the Gender-IAT involves the categorization of stimuli (words; e.g., grandmother, attack) into four categories (Dangerous/Safe or male/female) by pressing specific keys on the computer keyboard. The words are flashed on the center of the screen and the participants are asked to categorize them correctly and as quickly as possible into one of the two categories, which are listed in the top two corners of the screen. If the participants are able to make categorization decisions at a quicker pace during the stereotype-congruent trials (e.g., male-Dangerous and female-Safe), then it is assumed that their concept of male is more strongly associated with the concept of “dangerous” while their concept of female is more strongly associated with the concept of “safe”. If the participants are able to make categorization decisions at a quicker pace during stereotype-incongruent trials (e.g., male-Safe and female-Dangerous), then the reverse is true. Therefore, response speed on the IAT depends on the implicit associations that each participant holds. Based on previous research it is expected that it will be easier (and thus quicker) for participants to categorize words as either male OR Dangerous and female OR Safe then it will be for them to categorize words as male OR Safe and female OR Dangerous. This result will be

consistent with the gender stereotypes that people appear to possess about gender and dangerousness. The difference in response times between the stereotype-congruent and the stereotype-incongruent key combinations was used to calculate an overall gender-IAT score, referred to as D (Greenwald et al., 1998; Kim & Greenwald, 1998). See Appendix L for a copy of the stimuli (words) to be used in the Gender-IAT.

Demographic Questionnaire. Upon completion of all the above tasks, participants were required to complete a demographic questionnaire. The questions that were asked in this questionnaire were: the participant's age, gender, ethnicity, amount of time playing first-person shooter video games, amount of time spent hunting, amount of actual shooting experience, and amount of law enforcement experience (if any).³ See Appendix M for a copy of this questionnaire.

Procedure for Study 1

Upon arrival at the Police Research Lab, participants were assigned a desktop computer on which the experimental task was completed. E-Prime software was used to electronically deliver all forms, tasks, and measures. After being assigned a computer, participants were first presented with a consent form, which outlined the nature of the study (see Appendix N for a copy of this form). After consenting to participate in the study, a series of instructions with regards to the experimental task were provided. Participants then completed the practice trials and the experimental trials of the shooting task. After participants completed the shoot task, they were then required to complete the remaining measures, which were presented in a random, counter-balanced fashion. These measures included the measures of cognitive load, the explicit stereotype measures, the

³ There was virtually no variation in regards to: amount of time playing first-person shooter games, time spent hunting, amount of shooting experience, and amount of law enforcement experience (i.e., responses were 0 for nearly all participants). As a result these variables were eliminated from any further analysis.

MCPRS, and the Gender-IAT. Lastly, participants were asked to complete the demographic questionnaire. Upon completion of all of these tasks/measures, participants were presented with a debriefing form (see Appendix O for a copy of this form).

Hypotheses for Study 1

Based on the previously cited literature, the following hypotheses were tested in Study 1:

1. The analysis of reaction times will reveal a Gender x Object interaction, whereby armed male targets will be shot quicker than armed female targets and participants will not shoot unarmed female targets more quickly than unarmed male targets.
2. The analysis of error rates will reveal a Gender x Object interaction, whereby armed female targets will be shot less often than armed male targets and participants will shoot unarmed male targets more often than unarmed female targets.
3. The criterion (c) for male targets will be lower (more lenient) than for female targets, indicating a stronger bias towards shooting male targets.
4. Sensitivity (d') will not vary as a function of gender, indicating that participants are equally able to distinguish armed from unarmed targets for both genders (both armed and unarmed males will be perceived as dangerous and both armed and unarmed females will be perceived as safe).
5. The degree of automatic stereotype activation (A), as calculated using Payne's PDP approach, will be higher for male targets than for female targets (due to the particularly strong danger stereotype associated with males)
6. The degree of controlled processing (C), as calculated using Payne's PDP approach, will not differ between male and female targets (given that the instructions provided to participants require them to use controlled processing for all stimuli in an attempt to make accurate responses).
7. (a) Cognitive load should be positively correlated with automatic responding (as measured by A), and thus biased responding. This is because as cognitive resources

are depleted automatic processing should be relied on.

(b) Cognitive load should be negatively correlated with controlled responding (as measure by C).

8. (a) Explicit and implicit stereotype measures (where higher scores indicate a more negative stereotype towards males) will be positively correlated with a male gender bias on the shooting task (as measured by reactions times, errors, c , d' , A , and C).

(b) The relationship between the male-Personal explicit stereotype and the levels of male gender bias on the shooting task (as measured by reactions times, errors, c , d' , A , and C) will be moderated by the degree to which participants are motivated to control their prejudice (i.e., a positive correlation between this stereotype measure and the male gender bias is expected, but only for participants who score relatively low on the MCPRS).

Results

Preliminary Data Screening

A preliminary screening was conducted on the raw data to ensure the accuracy of subsequent results and to inform the selection of appropriate statistical tests. All data (i.e., shooting data, measures of cognitive load, explicit/implicit stereotype data) was examined for the following issues: missing data, outliers, and normality.

Missing Data.

Shooting Data. The shooting task was delivered to participants through a computer program called E-Prime. As a result, participants were required to complete each task before proceeding to the next task. This ensured that participants were exposed to, and completed, all aspects of the shooting task. Thus, missing data was not an issue with respect to the shooting task.

Cognitive Load and Stereotype Data. All measures of cognitive load and stereotypes were also delivered to participants through E-Prime. Again, participants were required to enter a response in order to proceed to the next question. Thus, missing data was not an issue with respect to cognitive load and stereotype data.

Demographic Data. Unlike the shooting task and measures of cognitive load and stereotypes, the demographic questions were delivered to participants in a manner that allowed them to proceed to the next question without completing the previous question. However, a review of the data indicated that missing responses on the demographic questionnaire were minimal (< 5%) and so no adjustments were made to the data (Tabachnick & Fidell, 2007).

Outliers.

Shooting Data. Outliers in shooting errors were examined by looking at each target type (i.e., female-Armed, female-Unarmed, male-Armed, male-Unarmed). For the female-Armed targets, there were no outliers present. For the female-Unarmed targets, there were a total of 4 outliers (determined by having a z-score ± 3.29). For the male-Armed targets, there were a total of 5 outliers. Lastly, for the male-Unarmed targets, there was a total of 1 outlier. In accordance with the procedure outlined in Tabachnick and Fidell (2007), each of these extreme values was substituted for a value one standard deviation higher than the next most extreme value in the distribution.

The reaction time data revealed one participant that was exceptionally fast at responding to one type of trial (e.g., male-Unarmed), but no one participant was consistently fast across all trials. Therefore, the reaction time data was not modified. The timeout data was examined in a similar fashion in order to identify outliers. A trial was

considered a timeout if the participant responded slower than 630ms. For the female-Armed targets, there were no outliers present. For the female-Unarmed targets, there were a total of 6 outliers. For the male-Unarmed targets, there were a total of 2 outliers. For the male-Armed targets, there was a total of 1 outlier. Consistent with the procedure outlined by Correll et al. (2007b), participants who timed out on over half of the experimental trials would be deleted from the sample, however this never occurred.

Cognitive Load and Stereotype Data. No outliers were found for the cognitive load, IAT, or MCPRS data. With regards to the IAT, participants that were slower than 10,000ms or faster than 300ms on 10% or more of all trials would have been removed from the sample, which is consistent with the procedure outlined by Greenwald et al. (2003). However, no participants met these criteria and so the IAT data remained unmodified.

Demographic Data. There were no outliers found pertaining to the demographic data. As a result, adjustments were not made to the data (Tabachnick & Fidell, 2007).

Normality.

Shooting Data. The error data was examined for normality using Q-Q plots, histograms, and Shapiro-Wilk (S-W) tests. The results indicated that there was a slight positive skew on female-Armed trials (.65), a strong positive skew on female-Unarmed trials (1.37), a slight positive skew on male-Armed trials (.62), and a strong positive skew on male-Unarmed trials (1.13). The S-W tests revealed that there was significant skewness for all types of targets (all p 's < .003). Given these results, log transformations were completed. The original data and the log transformations are both reported throughout the results section for Study 1. However, because there were no differences in

the error analyses between the original and the transformed data, the original data was used in all subsequent statistical analyses to assist with interpretation.

The reaction time data was also examined for normality using normal Q-Q plots, histograms, and S-W tests. The S-W tests indicated that there was a slight positive skew on female-Armed trials (.20), a slight positive skew on female-Unarmed trials (.42), a slight positive skew on male-Armed trials (.31), and a slight negative skew on male-Unarmed trials (-.71). The S-W tests revealed that the reaction time data was normally distributed (all p 's < .05), and so the original data remained unmodified and log transformations were not carried out.

Cognitive Load and Stereotype Data. According to the S-W tests, both measures of cognitive load were found to be significantly skewed (both p 's < .05). However, log transformations did little to improve the skewness and so the data remained in its original form. Normality tests of the IAT D scores using the S-W tests revealed non-significant results and skewness was minimal ($p = .79$). Lastly, normality tests of the MCPRS scores revealed non-significant results and skewness was minimal ($p = .12$). Similar findings were observed for the MCPR external and internal subscales ($p = .07$; $p = .81$).

Main Analyses

Reaction Time. When examining reactions times, only *correct* responses were used. Reactions times for each participant were averaged separately for each type of target (i.e., male and female) and for each type of object (i.e., Armed and Unarmed). Averages were analyzed using a 2 (Gender: male vs. female) x 2 (Object: Armed vs. Unarmed) repeated measures ANOVA. A summary of the reaction time data is provided in Table 1.

Table 1

Means and Standard Deviations of Reaction Times for Study 1

Reaction Time	Participants	
	Male	Female
	M (SD)	M (SD)
Armed		
Milliseconds	491.59 (33.36)	498.72 (32.36)
Unarmed		
Milliseconds	534.80 (26.36)	531.59 (27.78)

There was a significant main effect found for object, $F(1, 60) = 179.11, p < .05$, $\eta^2 = .75$, but not for gender, $F(1, 60) = .98, p > .05$, $\eta^2 = .02$. This indicates that participants were faster to shoot when targets were armed than to not shoot when targets were unarmed, irrespective of target gender. The Gender x Object interaction was also significant, $F(1, 60) = 7.22, p > .05$, $\eta^2 = .107$, indicating that armed male targets were *shot* at faster than armed female targets (no significant difference existed between unarmed male and female targets although the trend was in the right direction with unarmed female targets being not shot quicker). On the basis of these results, Hypothesis 1 was supported.

Error Rates. Participant error rates (i.e., mistakes/ timeouts) were calculated for each type of target (i.e., males and females) and type of object (i.e., Armed and Unarmed). The mean percentage of incorrect responses for the sample was 14.69%,

which is similar to previous shooting studies of this type (Correll et al., 2007a).

Participants' error rates were subjected to a 2 (Gender: male vs. female) x 2 (Object: Armed vs. Unarmed) repeated measures ANOVA. A summary of the data is provided in Table 2.

Table 2

Means and Standard Deviations of Error Rates for Study 1

	Participants	
	Male	Female
Error Rates	M (SD)	M (SD)
Armed		
Error Rates	.12 (.09)	.14 (.11)
Log Transform	-1.99 (.53)	-2.01 (.65)
Unarmed		
Error Rates	.17 (.13)	.15 (.14)
Log Transform	-1.83 (.64)	-1.87 (.65)

There was a significant effect found for object, $F(1, 60) = 5.80, p < .05, \eta^2 = .09$, but not for gender, $F(1, 60) = .06, p > .05, \eta^2 = .001$. This indicates that participants made more errors on trials involving unarmed targets, irrespective of target gender. The Gender x Object interaction was also not significant, $F(1, 60) = 3.40, p > .05, \eta^2 = .05$, however, the errors were in the expected direction (i.e., fewer errors were made on

stereotype congruent trials). On the basis of these results, Hypothesis 2 was not supported.

Signal Detection Analysis. In order to conduct a signal detection analysis, correct and incorrect responses (i.e., excluding timeouts) were used. Two criterion estimates, c , were calculated to assess the threshold for making a shoot response: one for male targets and one for female targets. Also, two sensitivity estimates, d' , were calculated to assess the ability to accurately discriminate between armed and unarmed targets: one for male targets and one for female targets. An overall summary of the data is provided in Table 3.

Table 3

Means and Standard Deviations of Decision Criterion and Sensitivity Estimates for Study 1

	Participants	
	Male	Female
Signal Detection	M (SD)	M (SD)
Criterion (c)	-.04 (.05)	.02 (.31)
Sensitivity (d')	2.17 (.98)	2.35 (.85)

Criterion Analysis. When a participant places the criterion to shoot at 0 this indicates that he/she is equally likely to make a 'shoot' response or a 'don't shoot' response (Correll et al., 2007a). If the criterion is in the positive direction, then this

means that there is a bias towards a 'don't shoot' response. On the other hand, if the criterion is in the negative direction, then this means that there is a bias towards a 'shoot' response.

The mean c for female targets was .02 ($SD = .98$) and the mean c for male targets was -.04 ($SD = .05$) suggesting that participants showed a bias towards not shooting female targets, but a bias towards shooting male targets. However, although the results were in the expected direction, a paired-sample t -test indicated that there was no significant difference in c across genders, $t(49) = 1.34, p > .05$. On the basis of these results, Hypothesis 3 is not supported.

As a follow-up analysis, I also conducted one-sample t -tests designed to determine whether a positive or negative bias existed for each gender. This test compares the c obtained for a specific gender to a baseline score of 0 (indicating no bias). The one-sample t -test indicated that there was a significant shoot bias for male targets, $t(60) = -4.81, p < .05$, but there was not a significant no shoot bias for female targets, $t(60) = -.15, p > .05$.

Sensitivity Analysis. The value d' indicates the extent to which participants are able to discriminate between armed and unarmed targets. Higher values of d' indicate that participants are effectively able to discriminate between these two types of targets. The mean d' for female targets was 2.35 ($SD = .85$) and the mean d' for male targets was 2.17 ($SD = .98$). A paired-sample t -test designed to determine if the d 's differed significantly across the genders indicated that there was no significant difference, $t(49) = 1.54, p > .05$. On the basis of this result, Hypothesis 4 is supported.

Process Dissociation Procedure (PDP). In order to calculate *A* and *C* using the process dissociation procedure (PDP), correct and incorrect responses (i.e., excluding timeouts) were used. Two estimates of *A* were calculated to determine the degree to which automatic processes influenced the response outcome: one for male targets and one for female targets. Also, two estimates of *C* were calculated to determine the degree of control that was applied to the stimuli in order to correctly process it and respond appropriately (i.e., is there a weapon present?): one for male targets and one for female targets. An overall summary of the data is provided in Table 4.

Table 4

Means and Standard Deviations of Automatic and Controlled Estimates for Study 1

	Participants	
	Male	Female
Process Dissociation Procedure	M (SD)	M (SD)
Automatic Estimates	.58 (.17)	.49 (.21)
Controlled Estimates	.67 (.19)	.66 (.19)

Automatic (A) Estimates. Automatic estimates were calculated for male and female target trials separately. For the male target trials, the automatic estimate was computed as the probability of false alarms when a male target was unarmed

(incongruent condition) divided by $(1-C)$. For the female target trials, the automatic estimate was computed as the probability of false alarms when a female target was armed divided by $(1-C)$. The mean automatic estimate was higher for the male target trials at .58 ($SD = .17$) in comparison with the female target trials at .49 ($SD = .21$). This was a significant difference, $t(60) = 2.55, p < .05$, thus supporting Hypothesis 5.

Controlled (C) Estimates. Controlled estimates were calculated for male and female target trials separately. For the male target trials, the controlled estimate was calculated by subtracting the probability of false alarms when a male target was unarmed (incongruent condition) from correct responses when a male target was armed (congruent condition). For the female target trials, the controlled estimate was calculated by subtracting the probability of false alarms when a female target was armed from the probability of correct responses when a female target was unarmed. The mean controlled estimate for males was .67 ($SD = .19$) and the mean controlled estimate for females was .66 ($SD = .19$). A paired-samples t -test indicated that this was not a significant difference, $t(60) = .24, p > .05$. Thus, Hypothesis 6 is supported.

Analysis of Cognitive Load and Stereotype Measures. In an attempt to shed some light on the shooting results, the cognitive load data, the implicit and explicit stereotype measures, and the motivation to control prejudiced reaction scores (MCPRS) were all examined. The relevant data for these analyses are presented in Table 5.

Table 5

Means and Standard Deviations of Cognitive Load Items and Stereotype Measures for Study 1

	M (SD)
Cognitive Load Items	
Perceived Difficulty (/9)	6.07 (1.77)
Mental Effort Expended (/9)	6.13 (1.88)
IAT	.29 (.45)
Adjective Checklist	
Cultural Male Stereotype (/11)	6.31 (3.58)
Cultural Female Stereotype (/11)	2.51 (2.18)
Personal Male Stereotype (/11)	3.95 (3.07)
Personal Female Stereotype (/11)	2.18 (2.05)
Motivation to Control Prejudice Reactions	
External Scale (/45)	29.36 (6.71)
Internal Scale (/40)	23.18 (3.70)
Total Scale (/85)	52.54 (9.21)

Cognitive Load Measures. Recall that there were two questions that assessed cognitive load, both rated on a scale from 1 to 9. One of the questions addressed the perceived difficulty of the task and the other question addressed mental effort expended

on the task. The mean perceived difficulty of the task was 6.07 ($SD = 1.77$) while the mean mental effort expended on the task was 6.13 ($SD = 1.88$).

Implicit Association Test. D scores can range between ± 2 . More positive scores on the IAT in the current study indicate an implicit association between female-Safe and male-Dangerous, whereas more negative scores indicate an implicit association between female-Dangerous and male-Safe. The typical range for D on the Gender-IAT tends to fall between .30 and .90 (e.g., IAT Corp., 2010). The average D score in the present study was .29 ($SD = .45$, range $-.79$ to 1.25). This result reveals a moderate implicit association between the concepts of female-Safe and male-Dangerous (i.e., a moderate negative male bias).

Adjective Checklist. Participants were asked to highlight adjectives from a prescribed list of 18 adjectives (e.g., violent, dangerous, etc.) that they felt characterized: (a) a cultural stereotype of males and females and (b) their own personal stereotype of males and females. However, recall that only 11 out of the 18 words were used due to the nature of the words. The words that were used were: aggressive, arrogant, assertive, criminal, dangerous, frightening, hostile, intimidating, loud, noisy, and violent.

The data was submitted to a paired samples t -test to determine if significant differences existed between the genders. With regards to the cultural stereotype data, there was a significant difference between male cultural stereotype scores ($M = 6.31$, $SD = 3.58$) and female cultural stereotype scores ($M = 2.51$, $SD = 2.18$), $t(60) = 8.00$, $p < .05$. Specifically, participants selected more negative adjectives to represent male cultural stereotypes in comparison to female cultural stereotypes. With regards to the personal stereotype data, there was also a significant difference between male personal stereotype

scores ($M = 3.95$, $SD = 3.07$) and female personal stereotype scores ($M = 2.18$, $SD = 2.05$), $t(60) = 4.96$, $p < .05$. Specifically, participants selected more negative adjectives to represent male personal stereotypes in comparison to female stereotypes.

Motivation to Control Prejudiced Reactions Scale. Recall that the MCPRS is comprised of two scales: (1) the extrinsic concern about appearing prejudiced scale, which has a possible range of 9 – 45, and (2) the internal restraint to avoid disputes scale, which has a possible range of 8 to 40. The overall score on the MCPRS can range from 17 to 85. The mean external subscale score for all participants was 29.36 ($SD = 6.71$). The mean internal subscale score was 23.18 ($SD = 3.70$). The overall MCPRS score for all participants was 52.54 ($SD = 9.21$).

Correlation and Moderator Analyses. In this section, the cognitive load and stereotype data were examined to determine the extent to which there is a relationship between these data and the shooting data. First, simple correlations will be examined. Then, the results from various analyses will be presented to determine if motivation to control prejudiced reactions moderates the relationship between the explicit stereotype measure and shooting performance. A summary of the results is provided in Table 6.

Note that for all of these analyses indices of gender bias had to be calculated for each of the outcome measures (so that there was a single score, for example, to indicate a male bias with respect to reaction times). Following the logic used by Correll et al. (2007b), the male gender bias indices that will be used in the correlation and moderator analyses were calculated as follows: c index = $c_{\text{female}} - c_{\text{male}}$; d' index = $d'_{\text{female}} - d'_{\text{male}}$; RT index = $(RT_{\text{unarmed male}} - RT_{\text{unarmed female}}) + (RT_{\text{armed female}} - RT_{\text{armed male}})$; error index = $(\text{errors}_{\text{unarmed male}} - \text{errors}_{\text{unarmed female}}) + (\text{errors}_{\text{armed female}} - \text{errors}_{\text{armed male}})$.

armed female – errors armed male); A index = $A_{\text{male}} - A_{\text{female}}$; and C index = $C_{\text{female}} - C_{\text{male}}$. For each of the indices described above, higher values represent a greater gender bias towards male targets on the shooting task.

As displayed in Table 6, the correlation analyses revealed no significant correlations. Interestingly, none of the hypotheses were supported by the results of the correlation analyses, including Hypotheses 7(a) and 7(b), which dealt with the predicted correlations between the cognitive load ratings and estimates of A and C , and Hypothesis 8(a), which dealt with the predicted correlations between explicit and implicit stereotype measures and male gender bias on the shooting task (as measured by reactions times, errors, c , d' , A , and C).

Moderator analyses were conducted to determine if participants' motivation to control prejudiced reactions were moderating the relationship between the explicit stereotype measure (specifically male-Personal) and the indices of gender bias (i.e., c , d' , RT, Errors, A , C). MCPRS scores are continuous, which means that the scores can be divided into smaller units. As a result of this, moderated hierarchical regression was the most appropriate analysis to examine this issue since this procedure is able to maintain the greatest degree of statistical power (Bauer, Preacher, & Gil, 2006; Cohen & Cohen, 1983; Evans, 1991). This procedure involves a series of steps. First, the potential moderator variable (MCPRS scores) and the predictor variable (male-Personal scores) were standardized into z-scores. Next, the moderator and predictor were then regressed separately for each of the six gender indices (c , d' , RT, Errors, A , C). Finally, the interaction term (male-Personal * MCPRS) was regressed on these indices. The size of the R^2_{change} is an indicator of the size of the moderator effect.

With regards to Hypothesis 8(b), the results indicated that the MCPRS score was a significant moderator for both the criterion estimate and errors, $c: \beta = .03, t(57) = 2.36, p < .05, R^2_{change} = .08$; Error: $\beta = .02, t(57) = 2.31, p < .05, R^2_{change} = .37$. However, the MCPR score was not a significant moderator for any of the other indices, $A: \beta = .02, t(57) = 1.90, p > .05, R^2_{change} = .06$; $C: \beta = -.003, t(57) = -.39, p > .05, R^2_{change} = .002$; $d': \beta = -.02, t(57) = -.50, p > .05, R^2_{change} = .004$; $RT: \beta = -1.16, t(57) = -.85, p > .05, R^2_{change} = .01$. Thus, Hypothesis 8(b) was partially supported.

Table 6

Pearson Correlations between Cognitive Load Items, Stereotype Measures, Demographics, and Criterion, Sensitivity, and Reaction Time Biases for Study 1

	Criterion Male Bias	Sensitivity Male Bias	RT Male Bias	Error Male Bias	Automatic	Controlled
Cognitive Load Items						
Perceived Difficulty	-.08	.08	.01	-.03	-.60	.08
Mental Effort Expended	-.05	.13	.02	-.01	-.01	.05
IAT	.06	.15	.17	.13	.04	.06
Adjective Checklist						
Cultural Male	-.17	-.11	.03	-.11	-.11	-.18
Cultural Female	-.04	-.01	.04	-.10	-.01	.01
Personal Male	-.04	-.09	.12	-.05	-.05	-.10
Personal Female	-.02	.00	.23	-.13	-.17	.05
Motivation to Control Prejudice						
External	.15	.21	.04	.14	.12	.22
Internal	.29	.31	.18	.29	.18	.25
Total	.23	.28	.10	.22	.16	.26
Demographics						
Age	.04	-.18	.14	-.08	-.02	-.11
Gender	-.15	.14	.27	.00	-.12	.00
Minority	-.13	.15	.04	.03	.01	.12
Education Level	-.22	.02	.03	-.10	-.04	-.11

Note. Point-biserial correlations were used for the gender and minority variables.

Discussion

The primary goal in Study 1 was to determine whether participants exhibited a gender bias in a simulated shooting task. It was expected that armed male targets would be shot at quicker and more often than armed female targets and that no shoot decisions would be made quicker and more often for unarmed female targets versus unarmed male targets. It was also expected that measures of sensitivity (d') and response bias (c) would reflect a male shooting bias and that decisions for male targets would be effected more by automatically activated stereotypes (A) than decisions for female targets. A secondary goal of this study was to determine how a range of measures relate to shooting bias in the gender-based shooting task. The measures included assessments of task-related cognitive load, explicit and implicit stereotypes, and one's motivation to control prejudiced reactions.

Reaction Time. Based on previous research it was expected (though not hypothesized explicitly given the focus of our research) that there would be a main effect of Object, whereby armed targets would be shot at faster than unarmed targets, and also a Gender x Object interaction, whereby armed male targets would be shot at faster than armed female targets and that participants would refrain from shooting unarmed female targets more quickly than unarmed male targets.

The results indicated that there was main effect of Object indicating that participants were indeed faster when shooting at targets that were armed as opposed to not shooting targets that were unarmed. This finding is in line with the findings of previous research (e.g., Bennell & Taylor, 2010; Correll et al., 2002, 2007a; Watt, 2010; Yoshida, 2009). There are two potential explanations for this result. First, the finding could be explained by evolutionary research, which suggests that individuals should

respond quicker in threatening situations as opposed to non-threatening or neutral situations (e.g., when participants are faced with armed targets; Panksepp, 1998; Rolls, 1999). Alternatively, a cognitive explanation could be provided for these results in that it would arguably be easier (cognitively speaking) to make an active response (i.e., hit a computer key) to initiate an action (e.g., shoot the target) than it would be to make an active response (i.e., hit a computer key) to initiate a lack of action (e.g., not shoot the target).

The hypothesized interaction between Gender and Object was also found in that armed male targets were shot at quicker than armed female targets. Interestingly, however, don't shoot decisions were not made significantly quicker for unarmed female targets compared to unarmed male targets. The interaction that was found supports traditionally defined danger stereotypes, which indicate that males are perceived as more aggressive and dangerous than their female counterparts.

Error Rates. Like reaction times, it was expected (though not hypothesized) that errors would be minimized when participants were encountered with armed targets. This was found to be the case, presumably for one of the two reasons (or both of the reasons) that was discussed above (the evolutionary or cognitive perspective).

It was also expected that there would be a Gender x Object interaction, whereby participants would exhibit fewer errors in stereotype-congruent trials (armed male targets and unarmed female targets) compared to stereotype-incongruent trials (unarmed male targets and armed female targets). Contrary to what was expected, the Gender x Object interaction was not significant, however the result was in the expected direction (i.e., participants tended to make fewer errors on stereotype-congruent trials). It could be that the sample size in this study was not large enough to yield a significant result with

respect to errors. Alternatively, it could be the case that the task was set up in such a way that participants had sufficient time to process the information presented to them and thus, make reasonably accurate shooting responses based on the presence of weapons (for both genders).

Signal Detection Analysis. In the case of signal detection indices, it was expected that participants would set a lower shoot criterion (c) for male versus female targets, indicating a “shoot” bias for males and a “no shoot” bias for females, but it was not expected that sensitivity (d') would differ between male and female targets, indicating that it would be equally difficult for participants to distinguish armed from unarmed targets, irrespective of gender.

Contrary to what was expected, the analyses of criterion estimates showed no significant effect of gender, however the results were in the expected direction in that participants displayed a tendency to set a lower (shoot) criterion for male versus female targets. Again, this suggests that with a larger sample size, a significant difference in c might have been found. In addition, it could be the case that participants were able to adequately process the information they were presented with, which would have enabled them to set their shooting thresholds based on weapon presence to some extent (perhaps in addition to activated stereotypes).

In line with what we expected, however, the analyses of sensitivity showed no significant effect of gender. As briefly mentioned previously, this makes sense. Indeed, sensitivity for male targets was expected to be relatively low because it was assumed that both armed and unarmed targets would be perceived as dangerous within the very short response window that participants had available to observe targets (due to gender stereotypes). A similar argument could be made for female targets, but simply in the

opposite direction. In other words, in the case of female targets, sensitivity would be expected to be low because both armed and unarmed females would be perceived as safe.

Process Dissociation Procedure (PDP). It was expected that participants would display a higher degree of automatic processing (*A*) for male versus female targets. However, no gender differences were expected with respect to controlled processing (*C*).

Consistent with our hypothesis, the analyses of automatic estimates indicated that there was a significant effect of gender. Specifically, the mean automatic estimate was significantly higher for male targets than for female targets meaning that the participants were responding to males in more of an automatic, unintentional fashion presumably because the male danger stereotype has such a strong influence on simulated shooting decisions. Also consistent with our hypothesis, the analyses of controlled estimates indicated no significant effect of gender with both estimates being relatively high. In fact, the controlled estimates for males and females were almost identical (.66 vs. .67). Presumably this is because the participants were applying our instructions to use controlled processing (i.e., “make as accurate decisions as possible when encountering the armed and unarmed targets”) equally across the gendered targets.

Thus, the gender manipulation clearly affected the automatic component, leaving the controlled component unchanged, which is in line with previous research. For example, the findings of the current study are in line with Payne’s (2001) study. Specifically, Payne found similar results in his study using the Weapon Identification Task, where participants who are primed with Black (vs. White faces) mistakenly perceived subsequently presented images of tools as guns. In this case, Payne’s racial manipulation influenced the automatic component of participant decision making, but not the controlled component. Payne concluded that this result shows how racial biases can

exert their influence in an automatic way, independent of conscious intentions. It seems that the same can be true of gender biases.

Cognitive Load Ratings and Stereotype Measures. Despite our expectations that we would observe a variety of significant correlations between various measures of cognitive load, explicit/implicit stereotypes, and indices of gender bias on the shooting task, none of the correlations that we calculated were significant. Generally speaking, the most logical explanation for the lack of significant correlations relates to the validity (or lack of validity) associated with these other measures.

For example, although we expected that a higher degree of cognitive load would generally relate to higher levels of biased responding on the shooting task, this was not found to be the case, at least not when using the two self-report measures of cognitive load that were relied on in this study. Despite what others have argued with respect to the validity of these measures (e.g., Paas et al., 2003) it may be the case that these two items simply don't capture one's level of cognitive load, or not in a way that is sensitive enough to find significant correlations (De Jong, 2010). More sensitive physiological measures might have revealed the significant correlations we were expecting (unfortunately these are quite expensive to use).

A similar argument can be made for why no significant correlations were found when we examined the stereotype measures. For example, we expected to see a positive correlation between the explicit stereotype measure (i.e., the Adjective Checklist) and measures of gender bias. However, the correlations were far from statistically significant. The reason for the lack of significance may be due to socially desirable responding on the explicit measure. Indeed, one of the well-known problems with explicit stereotype measures involves socially desirable responses due to the shame and embarrassment

associated with endorsing sensitive attitudes, such as racial biases (Nosek, Greenwald, & Banaji, 2007). Alternatively, an individual may not even be aware that he/she has a particular attitude and therefore the attitude can't be expressed on any sort of explicit measure (Nosek, Greenwald, & Banaji, 2007).

Given this problem with explicit stereotype measures, an implicit stereotype measure was also included in the study, as was the MCPRS, which might have allowed us to determine the degree to which participants were responding in a socially desirable way on the Adjective Checklist. Interestingly, the inclusion of these two measures did not prove productive as no significant correlations were found between the implicit stereotype measures and the indices of gender bias, and the MCPRS did not moderate the relationship between the explicit measure and the various indices of gender bias, with the exception of two of the indices (the criterion estimate and errors). It could of course be that the IAT we used was also invalid. For example, the Dangerous-Safe words we used might not capture the sorts of associations that are relevant to simulated shooting decisions. In addition, with respect to the MCPRS, it may be that participants respond to this scale in the same way they do to the explicit stereotype measure – in a socially desirable way, thus making it an invalid measure to examine moderating effects. In the future, an attempt should be made to rely on implicit measures of motivation to control prejudice that may be more resistant to social desirability effects (e.g., the Implicit Motivation to Control Prejudice Scale; Glaser & Knowles, 2008).

Study 2: Scene Complexity and its Influence on Automatic and Controlled Processes in a Simulated Shooting Task

Purpose

Study 1 produced results that supported many of our hypotheses that there would be a gender bias in simulated shooting responses. However, not all of the hypotheses were supported. For example, a gender bias was not found with respect to shooting errors or the criterion measure (*c*) from SDT. In each case, the lack of significant results might be attributable to the relatively small sample size. However, alternatively, it may be that the shooting task that was presented in Study 1 was sufficiently easy that participants could actually base their shooting responses on a (somewhat) careful analysis of the targets they were presented with, specifically whether the targets were holding weapons or non-threatening objects.

Study 2 was designed to determine whether scene complexity, a factor that would be expected to impact one's ability to rely on controlled or intentional processing when making rapid decisions, influences the degree to which a gender bias is exhibited in simulated shoot/don't shoot decisions. As in previous research, (e.g., Sharps and Hess, 2008), scene complexity was manipulated by increasing or decreasing the number of objects visible in the photograph. In addition, this study will examine how a variety of measures, including explicit and implicit gender stereotype measures, relate to performance on the shooting task.

Method

Procedure for Construction of Experimental Stimuli

In order to explore whether target gender and scene complexity influence gender biases in shooting decisions, photo stimuli for the shooting task had to be created. All of

the photographs of the models used in Study 1 were also used in Study 2. As in Study 1, the photographs of the models were superimposed on background images. However, a new set of background photographs was used in Study 2. These background photographs were comprised of scenes in which the complexity varied (from low to high) with regards to the number of objects present in the images.

Five scenes were used for the complexity photographs – an office, a library, a kitchen, a closet, and a garage. In each scene, the number of items present in the photographs varied and increased by approximately 50% for the two levels. For example, the number of items present in the high complexity office-scene increased by approximately 50% from the low complexity office-scene. Also, the type of objects varied depending on the specific scene. For example, the objects present in the kitchen scene were kitchen-appropriate. There were a total of 10 different background images (low and high complexity for each of the five scenes). Adobe PhotoShop was used to create the final images for the shooting task.

Manipulation Check of Experimental Stimuli

An independent sample of judges was used to ensure that the background photographs (with male and female targets superimposed on them) represented different degrees of complexity (i.e., low complexity vs. high complexity). The judges were asked to rate each background photograph on the degree of complexity to ensure that there was a consensus with regards to the perceived complexity. In addition, the judges were asked to estimate the number of objects present in each photograph and indicate the visibility of the object in the photo (e.g., guns, wallet, and cell phone). See Appendix P for a copy of the questions that were asked.

Sample for Manipulation Check of Experimental Stimuli

A total of 25 undergraduate students from Carleton University were recruited as participants to complete the manipulation check. The participants were recruited from the undergraduate psychology subject pool (see Appendix Q for a copy of the recruitment message). The task took approximately 15 minutes to complete and participants were compensated with a 0.25% course credit.

Procedure for Manipulation Check of Experimental Stimuli

Participants completed the manipulation check in the Police Research Lab (HCI 6113). Upon arrival, participants were presented with an informed consent form (see Appendix R) that they were required to sign. Afterwards, they were presented with the background photographs (with the targets superimposed on the images) that represented 'low' complexity and 'high' complexity scenes. The background photographs were displayed on a computer screen for a total of 630 ms (i.e., the same length of time that the photographs were displayed for participants in Study 1). Participants were then asked to estimate how many objects were present in each photograph, indicate the visibility of the object in the photo (e.g., guns, wallet, and cell phone), and rate each photograph with regards to its visual complexity using a 9-point scale. Upon completion of this task, participants were debriefed (see Appendix S).

The complexity ratings from the 25 participants were used to calculate an average complexity score for each photograph. If the assumed to be 'low' complexity photographs did not fall in the bottom half of the participants' complexity rankings, then new 'low' complexity photographs would have been constructed and the manipulation check would be repeated. The same was true of the assumed to be 'high' complexity

photographs. However, all of the 'low' complexity photographs were ranked as low and all of the 'high' complexity photographs were ranked as high.

Results of Manipulation Check of Experimental Stimuli

A paired-samples *t*-test was conducted to evaluate whether there were differences across low and high complexity photos in the visibility of the object that the target was holding, as well as the general visual complexity of the photographs. The results indicated that there were no differences in terms of visibility of object between low complexity ($M = 7.71$, $SD = .68$) and high complexity ($M = 7.44$, $SD = .87$) photographs, $t(24) = -.89$, $p > .05$. In addition, participants perceived significantly fewer items in the low complexity photographs ($M = 52.92$, $SD = 43.47$) than in the high complexity photographs ($M = 960.56$, $SD = 1043.16$), $t(24) = -4.39$, $p < .05$. In addition, the participants found the low complexity photographs to be significantly less complex ($M = 1.94$, $SD = .70$) than the high complexity photographs ($M = 6.51$, $SD = 1.08$), $t(24) = -19.27$, $p < .05$.

Participants for Study 2

Participants for Study 2 consisted of 123 undergraduate students from Carleton University. The total gender make-up of the sample included 43 males and 80 females. The average age of participants was 23 years ($SD = 4.71$). The ethnicity of the entire sample was as follows: White = 73, Black = 7, Asian = 16, Middle Eastern = 3, Aboriginal = 1, Other = 10, Prefer Not to Answer = 13.

The incentives and recruitment announcements were the same as those in Study 1.

Procedure for Study 2

The procedure for Study 2 was the same as that of Study 1, with one exception. The armed and unarmed male and female targets were now superimposed on 'low' or

'high' complexity backgrounds. As mentioned previously, increasing the number of objects present in a photograph should make it more difficult (within the very limited time span available to scan the photograph) for a participant to identify whether a target is armed or unarmed (i.e., holding a gun or a wallet/cell phone). Therefore, as the degree of scene complexity increases, there should be an increased tendency to rely on automatic processes rather than controlled processes when making shooting decisions and gender biases should increase.

Hypotheses for Study 2

As indicated in the following list of hypotheses, the same sorts of issues examined in Study 1 will be examined in Study 2. However, there are several noticeable differences for the Study 2 hypotheses. One key difference is that the role of cognitive load, and implicit/explicit stereotypes, while still examined, are underemphasized in the hypotheses. Not only is this because these variables seemed to shed little light on why the shooting bias emerged in Study 1, but also because the focus of Study 2 is on the impact of scene complexity on shooting performance. The following hypotheses were tested in Study 2:

1. (a) Reaction times will vary as a function of scene complexity, whereby participants will be faster to make correct responses on low, compared to high, complexity trials.
(b) The analysis of reaction times will reveal a Gender x Object interaction, whereby armed male targets will be shot quicker than armed female targets, but participants will not shoot unarmed female targets more quickly than unarmed male targets.
(c) The analysis of reactions times will also reveal a Gender x Object x Complexity interaction. Specifically, it is expected that the gender bias hypothesized in 1(b) will be even more pronounced under conditions of high vs. low complexity.
2. (a) Error rates will vary as a function of scene complexity, whereby participants will make fewer errors on low versus high complexity trials.
(b) The analysis of error rates will reveal a Gender x Object interaction, whereby

armed female targets will be shot less often than armed male targets and participants will shoot unarmed male targets more often than unarmed female targets

(c) The analysis of error rates will also reveal a Gender x Object x Complexity interaction. Specifically, it is expected that the gender bias hypothesized in 2(b) will be even more pronounced under conditions of high vs. low complexity.

3. (a) The criterion (c) for male targets will be lower (more lenient) than for female targets, indicating a bias towards shooting male targets.

(b) The criterion will vary as a function of scene complexity, such that a lower criterion will be set on high, compared to low, complexity trials.

(c) The analysis of the criterion will reveal a Gender x Complexity interaction. The criterion is expected to be lower for male targets on high complexity versus low complexity trials, but the criterion is expected to be similar for female targets across high and low complexity trials.

(d) Sensitivity (d') will not vary as a function of target gender.

(e) Sensitivity will vary as a function of scene complexity, whereby sensitivity scores will be lower for high, compared to low, complexity trials.

4. (a) The degree of automatic processing (A), calculated using Payne's PDP approach, will be higher for male targets than for female targets.

(b) The degree of automatic processing will vary as a function of scene complexity, such that a higher degree of automatic processing will be apparent on high, compared to low, complexity trials.

(c) The analysis of automatic processing will reveal a Gender x Complexity interaction. Automatic processing is expected to be higher for male targets on high versus low complexity trials, but automatic processing is expected to be similar for female targets across high and low complexity trials.

5. (a) The degree of controlled processing (C), calculated using Payne's PDP approach, will not vary as a function of target gender.

(b) The degree of controlled processing will vary as a function of scene complexity, such that a lower degree of controlled processing will be used on high, compared to low, complexity trials.

Results

Preliminary Data Screening

A preliminary screening was conducted on the raw data to ensure the accuracy of subsequent results and to inform the selection of appropriate statistical tests. All data (i.e., shooting data, measures of cognitive load, explicit/ implicit stereotype data) was examined for the following issues: missing data, outliers, and normality.

Missing Data.

Shooting Data. The shooting task was delivered to participants through a computer program called E-Prime. As a result, participants were required to complete each task before proceeding to the next task. This ensured that participants were exposed to, and completed, all aspects of the shooting task. Thus, missing data was not an issue with respect to the shooting task.

Cognitive Load and Stereotype Data. All measures of cognitive load and stereotypes were also delivered to participants through E-Prime. Again, participants were required to enter a response in order to proceed to the next question. Thus, missing data was not an issue with respect to cognitive load and stereotype data.

Demographic Data. Unlike the shooting task and measures of cognitive load and stereotypes, the demographic questions were delivered to participants in a manner that allowed them to proceed to the next question without completing the previous question. Participants were able to press 'ESC' to move to the next question without having filled in a response for the previous question. However, a review of the data indicated that

missing responses on the demographic questionnaire were minimal (< 5%) and so no adjustments were made to the data (Tabachnick & Fidell, 2007).

Outliers.

Shooting Data. Outliers were examined by looking at each target type (i.e., female-Armed Low, female-Unarmed Low, female-Armed High, female-Unarmed High, male-Armed Low, male-Unarmed Low, male-Armed High, male-Unarmed High). As in Study 1, outliers were identified by having a z-score of ± 3.29 . For the female-Armed Low, there were a total of 2 outliers. For the female-Unarmed Low, there were no outliers present. For the female-Armed High, there were a total of 2 outliers. For the female-Unarmed High, there was a total of 1 outlier. For the male-Armed Low, there were no outliers present. For the male-Unarmed Low, there were a total of 3 outliers. For the male-Armed High, there were no outliers present. For the male-Unarmed High, there was a total of 1 outlier. In accordance with the procedure outlined in Tabachnick and Fidell (2007), each of these extreme values was substituted for a value one standard deviation higher than the next most extreme value in the distribution.

With regards to the reaction time data, there were no participants that were consistently fast (or slow) across all trials. Therefore, the reaction time data was not modified. Consistent with the procedure outlines by Correll et al. (2007b), participants who time out on over half of the experimental trials would have been deleted from the sample, however, this never occurred.

Cognitive Load and Stereotype Data. No outliers were found for the cognitive load, IAT, or MCPRS data. With regards to the IAT, participants that were slower than 10,000ms or faster than 300ms on 10% or more of all trials would have been removed from the sample, which is consistent with the procedure outlined by Greenwald et al.

(2003). However, no participants met these criteria and so the IAT data remained unmodified.

Demographic Data. There were no outliers found pertaining to the demographic data. As a result, no adjustments were made to the data (Tabachnick & Fidell, 2007).

Normality.

Shooting Data. The error data was examined for normality using Q-Q plots, histograms, and S-W tests. The results indicated that there was a positive skew on the female-Armed Low trials (1.26), a positive skew on the female-Unarmed Low trials (.98), a positive skew on the female-Armed High trials (1.12), a positive skew on the female-Unarmed High trials (1.21), a positive skew on the male-Armed Low trials (1.03), a positive skew on the male-Unarmed Low trials (1.61), a positive skew on the male-Armed High trials (.91), and a positive skew on the male-Unarmed High trials (.71). The S-W tests revealed that the error data was normally distributed (all p 's < .05), and so the original data remained unmodified and log transformations were not carried out.

The reaction time data was also examined for normality using Q-Q plots, histograms, and S-W tests. The results indicated that there was a positive skew on the female-Armed Low trials (1.57), a positive skew on the female-Unarmed Low trials (1.23), a positive skew on the female-Armed High trials (.55), a positive skew on the female-Unarmed High trials (.70), a positive skew on the male-Armed Low trials (2.17), a positive skew on the male-Unarmed Low trials (1.49), a positive skew on the male-Armed High trials (2.20), and a positive skew on the male-Unarmed High trials (.40). The S-W tests revealed that the error data was normally distributed (all p 's < .05), and so the original data remained unmodified and log transformations were not carried out.

Cognitive Load and Stereotype Data. According to the S-W tests, both measures of cognitive load were found to be significantly skewed (both p 's < .05). Log transformations did little to improve the skewness and so the data remained in its original form. Normality tests of the IAT D scores using the S-W tests revealed non-significant results and skewness was minimal ($p = .71$). Lastly, normality tests of the MCPRS scores revealed non-significant results and skewness was minimal ($p = .08$). Similar findings were observed for the MCPR external and internal subscales ($p = .09$; $p = .64$).

Main Analyses

Reaction Time. As in Study 1, when analyzing reaction times, only correct responses were used. Reaction times for each participant were averaged separately for each type of target (i.e., male and female) and each type of object (i.e., Armed and Unarmed), as well as for the different levels of scene complexity (i.e., Low Complexity and High Complexity). Averages were analyzed using a 2 (Gender: male vs. female) x 2 (Object: Armed vs. Unarmed) x 2 (Complexity: Low vs. High) repeated measures ANOVA. A summary of the reaction time data is provided in Table 7.

Table 7

Means and Standard Deviations of Reaction Times for Study 2

Reaction Time	Participants	
	Male	Female
	M (SD)	M (SD)
Armed Low Complexity Milliseconds	473.87 (35.03)	483.57 (37.89)
Armed High Complexity Milliseconds	492.26 (36.42)	502.83 (36.54)
Unarmed Low Complexity Milliseconds	512.34 (35.90)	522.70 (39.23)
Unarmed High Complexity Milliseconds	526.32 (39.69)	528.55 (29.48)

There was a significant main effect found for object, $F(1, 122) = 219.88, p < .05$, $\eta^2 = .64$, for gender, $F(1, 122) = 22.62, p < .05$, $\eta^2 = .16$, and for complexity, $F(1, 122) = 67.68, p < .05$, $\eta^2 = .36$. These results indicate that participants were faster to shoot when targets were armed, male, and presented in a Low complexity scene, in comparison to when targets were unarmed, female, and presented in a High complexity scene. These results support Hypothesis 1a.

In addition to the main effects found, the Object x Complexity interaction was also significant, $F(1, 122) = 7.50, p < .05$, $\eta^2 = .06$, indicating that armed targets presented in the Low complexity scenes were *shot* at faster than armed targets presented in the High complexity scenes. The Object x Gender, Gender x Complexity, Object x

Complexity x Gender interactions were not significant. Thus, Hypotheses 1b and 1c were not supported.

Error Rates. For each participant, errors were calculated. In addition, error rates (i.e., mistakes/timeouts) were calculated for each type of target (i.e., males and females), for each type of object (i.e., armed and unarmed), and for each level of scene complexity (i.e., Low complexity and High complexity). The minimum number of errors across the 80 test trials was 0 and the maximum was 9. The mean percentage of incorrect responses for the sample was 11.56%. A summary of the data is provided in Table 8.

Table 8

Means and Standard Deviations of Error Rates for Study 2

	Participants	
	Male	Female
Error Rates	M (SD)	M (SD)
Armed Low Complexity Error Rates	.12 (.13)	.17 (.15)
Armed High Complexity Error Rates	.16 (.15)	.23 (.19)
Unarmed Low Complexity Error Rates	.18 (.17)	.15 (.15)
Unarmed High Complexity Error Rates	.28 (.20)	.19 (.18)

Participants' error rates were subjected to a 2 (Gender: male vs. female) x 2 (Object: Armed vs. Unarmed) x 2 (Complexity: Low vs. High) repeated measures

ANOVA. There was a significant effect found for object, $F(1, 122) = 5.87, p < .05, \eta^2 = .05$, and complexity, $F(1, 122) = 42.87, p < .05, \eta^2 = .26$, but not for gender, $F(1, 122) = .01, p > .05, \eta^2 = .00$. This indicates that participants made more errors on trials involving targets that were unarmed (vs. armed) and on trials on which targets were presented in a high (vs. low) complexity scene. These results support Hypothesis 2a.

In addition to the main effects found above, the Gender x Complexity interaction was also significant, $F(1, 122) = 43.57, p < .05, \eta^2 = .26$, indicating that participants made more errors on trials involving male targets in High complexity scenes than female targets in High complexity scenes. In addition, the Gender x Object x Complexity interaction was also significant, $F(1, 122) = 6.89, p < .05, \eta^2 = .05$, indicating that participants made more errors on trials involving armed male targets than armed female targets in High complexity scenes (see Figures 1 and 2). The Gender x Object and Complexity x Object interactions were not significant. These results support Hypotheses 2b and 2c.

Figure 1. Error Rates for Object Type as a function of Gender for Low Complexity Trials.

Figure 2. Error Rates for the Object Type as a function of Gender for High Complexity Trials.

Signal Detection. As in Study 1, in order to conduct signal detection analyses correct and incorrect responses (i.e., excluding timeouts) were used. Four criterion estimates, c , were calculated, which indicate the threshold participants adopt for making shoot responses: one for male-Low, one for male-High, one for female-Low, and one for female-High. Also, four sensitivity estimates, d' , were calculated, which indicate the ability to accurately discriminate between armed and unarmed targets: one for male-Low,

one for male-High, one for female-Low, and one for female-High. These signal detection estimates were submitted to a 2 (Gender: male vs. female) x 2 (Complexity: Low vs. High) ANOVA. An overall summary of the data is provided in Table 9.

Table 9

Means and Standard Deviations of Decision Criterion and Sensitivity Estimates for Study 2

	Participants	
	Male	Female
Signal Detection	M (SD)	M (SD)
Criterion (<i>c</i>) – low complexity	-.09 (.31)	.03 (.32)
Criterion (<i>c</i>) – high complexity	-.19 (.31)	.06 (.33)
Sensitivity (<i>d'</i>) – low complexity	2.00 (.81)	1.90 (.81)
Sensitivity (<i>d'</i>) – high complexity	1.53 (.87)	1.59 (.91)

Criterion Analysis. When a participant places the criterion to shoot at 0, then this indicates that he/she is equally likely to make a 'shoot' response or a 'don't shoot' response (Correll et al., 2007a). If the criterion is in the positive direction, then this means that there is a bias towards a 'don't shoot' response. On the other hand, if the criterion is in the negative direction, then this means that there is a bias towards a 'shoot' response.

As indicated above, participants' criterion estimates (c) were subjected to a 2 (Gender: male vs. female) x 2 (Complexity: Low vs. High) repeated measures ANOVA. There was a significant effect found for gender, $F(1, 122) = 45.74, p < .05, \eta^2 = .27$, but not for complexity, $F(1, 122) = 1.84, p > .05, \eta^2 = .02$. This indicates that participants displayed a tendency to set a lower criterion (more lenient) for male targets than for female targets. These results support Hypothesis 3a but not Hypothesis 3b.

In addition to the gender main effects, the Gender x Complexity interaction was also significant, $F(1, 122) = 6.13, p < .05, \eta^2 = .05$, indicating that participants displayed a tendency to set a lower criterion for male targets than for female targets on High complexity (but not Low complexity) trials. These results support Hypothesis 3c.

Sensitivity Analysis. The value d' indicates the extent to which participants are able to discriminate between armed and unarmed targets. Higher values of d' indicate that participants are effectively able to discriminate between these two types of targets.

As indicated above, participants' sensitivity estimates (d') were subjected to a 2 (Gender: male vs. female) x 2 (Complexity: Low vs. High) repeated measures ANOVA. There was a significant effect found for complexity, $F(1, 122) = 46.31, p < .05, \eta^2 = .28$, but not for gender, $F(1, 122) = .69, p > .05, \eta^2 = .00$. This indicates that participants were less able to discriminate between armed and unarmed targets on trials that were classified as High complexity, irrespective of gender. The Gender x Complexity interaction was not significant, $F(1, 122) = 2.35, p > .05, \eta^2 = .02$. These results support Hypotheses 3d and 3e.

Process Dissociation Procedure (PDP). As in Study 1, in order to calculate A and C using the process dissociation procedure (PDP), correct and incorrect responses (i.e., excluding timeouts) were used. Four estimates of A were calculated, which indicates

the degree of automatic in response outcome: one for male-Low, one for male-High, one for female-Low, and one for female-High. Also, four estimates of C were calculated, which indicates the degree of control that is applied to the stimuli in order to correctly process it and respond appropriately: one for male-Low, one for male-High, one for female-Low, and one for female-High. An overall summary of the data is provided in Table 10.

Table 10

Means and Standard Deviations of Automatic and Controlled Estimates for Study 2

	Participants	
	Male	Female
Process Dissociation Procedure	M (SD)	M (SD)
Automatic Estimates – Low Complexity	.55 (.20)	.47 (.20)
Automatic Estimates – High Complexity	.61 (.18)	.46 (.20)
Controlled Estimates – Low Complexity	.63 (.22)	.61 (.22)
Controlled Estimates – High Complexity	.50 (.26)	.52 (.27)

Automatic (A) Estimates. As in Study 1, automatic estimates were calculated for male and female target trials (for Low and High complexity scenes separately). For the male target trials, the automatic estimate was computed as the probability of false alarms when a male target was unarmed (stereotype-incongruent condition) divided by $(1 - C)$.

For the female target trials, the automatic estimate was computed as the probability of false alarms when a female target was armed divided by $(1 - C)$.

Participants' automatic estimates (A) were subjected to a 2 (Gender: male vs. female) $\times$ 2 (Complexity: Low vs. High) repeated measures ANOVA. There was a significant effect found for gender, $F(1, 122) = 39.54, p < .05, \eta^2 = .25$, but not for complexity, $F(1, 122) = 1.69, p > .05, \eta^2 = .01$. This indicates that participants displayed a tendency to use a greater degree of automatic processing on trials in which male targets, rather than female targets, were displayed. These results support Hypothesis 4a but not Hypothesis 4b.

In addition to the main effects found above, the Gender $\times$ Complexity interaction was also significant, $F(1, 122) = 4.55, p < .05, \eta^2 = .04$, indicating that participants displayed a tendency to use a greater degree of automatic processing on trials in which male targets were displayed in high complexity scenes. These results support Hypothesis 4c.

Controlled (C) Estimates. Controlled estimates were calculated for male and female target trials (for Low and High complexity scenes separately). For the male target trials, the controlled estimate was calculated by subtracting the probability of false alarms when a male target was unarmed (stereotype-incongruent condition) from correct responses when a male target was armed (stereotype-congruent condition). For the female target trials, the controlled estimate was calculated by subtracting the probability of false alarms when a female target was armed from the probability of correct responses when a female target was unarmed.

Participants' controlled estimates (C) were subjected to a 2 (Gender: male vs. female) $\times$ 2 (Complexity: Low vs. High) repeated measures ANOVA. There was a

significant effect found for complexity, $F(1, 122) = 49.78, p < .05, \eta^2 = .29$, but not for gender, $F(1, 122) = .06, p > .05, \eta^2 = .00$. This indicates that participants displayed a tendency to use a higher degree of controlled processing on trials that were classified as Low complexity rather than High complexity. These results support Hypothesis 5a.

In addition to the main effects found above, the Gender x Complexity interaction was also significant, $F(1, 122) = 2.22, p < .05, \eta^2 = .02$, indicating that under conditions of High complexity, controlled processing was lower, but primarily on trials in which the target was male. These results support Hypothesis 5b.

Analysis of Cognitive Load and Stereotype Measures. In an attempt to shed some light on the shooting results, the cognitive load data, the implicit and explicit stereotype measures, and the motivation to control prejudiced reactions (MCPRS) were all examined. The relevant data for these analyses are presented in Table 11.

Table 11

Means and Standard Deviations of Cognitive Load Items and Stereotype Measures for Study 2

	M (SD)
Cognitive Load Items	
Perceived Difficulty (/9)	6.30 (1.89)
Mental Effort Expended (/9)	6.67 (1.76)
IAT	.52 (.65)
Adjective Checklist	
Cultural Male Stereotype (/11)	7.53 (2.94)
Cultural Female Stereotype (/11)	2.83 (2.36)
Personal Male Stereotype (/11)	4.38 (2.92)
Personal Female Stereotype (/11)	2.56 (2.25)
Motivation to Control Prejudice Reactions	
External Scale (/45)	28.17 (4.26)
Internal Scale (/40)	24.47 (2.89)
Total Scale (/85)	52.64 (5.16)

Cognitive Load Measures. Recall that there were two questions that assessed cognitive load. One of the questions addressed the perceived difficulty of the task and the other question addressed mental effort expended on the task. The mean perceived difficulty of the task was 6.30 ($SD = 1.89$) while the mean mental effort expended on the task was 6.67 ($SD = 1.76$).

Implicit Association Test. Recall that D scores can range between ± 2 . More positive scores on the IAT indicate an implicit association between female-Safe and male-Dangerous, whereas more negative scores indicate an implicit association between female-Dangerous and male-Safe. The typical range for D tends to fall between .30 and .90 (e.g., IAT Corp., 2010). The average D score in this study was .52 ($SD = .65$, range -1.36 to 1.99). This result shows a moderate implicit association between the concepts of female-Safe and male-Dangerous (i.e., a moderate negative male bias).

Adjective Checklist. Recall that participants were asked to highlight adjectives from a prescribed list of 18 adjectives (e.g., violent, dangerous, etc) that they felt characterized: (a) a cultural stereotype of males and females and (b) their own personal stereotypes of males and females. Eleven of the variables were used to assess a danger stereotype. The data was submitted to a paired-sample t -test to determine if significant differences existed between the two genders.

With regards to the cultural stereotype data, there was a significant difference between male cultural stereotype scores, $M = 7.53$ ($SD = 2.94$), and female cultural stereotype scores, $M = 2.83$ ($SD = 2.36$), $t(122) = 15.87$, $p < .05$. Specifically, participants selected more negative adjectives to represent male cultural stereotypes in comparison to female cultural stereotypes. With regards to the personal stereotype data, there was also a significant difference between male personal stereotype scores, $M = 4.38$ ($SD = 2.92$), and female personal stereotype scores, $M = 2.56$ ($SD = 2.25$), $t(122) = 6.79$, $p < .05$. Specifically, participants selected more negative adjectives to represent male personal stereotypes in comparison to female personal stereotypes.

Motivation to Control Prejudiced Reactions Scale. Recall that the MCPRS is comprised of two scales: (1) the extrinsic concern about appearing prejudiced scale,

which has a possible range of 9 to 45, and (2) the internal restraint to avoid disputes scale, which has a possible range of 8 to 40. The overall score on the MCPRS can range from 17 to 85. The mean external subscale score for all participants was 28.17 ($SD = 4.26$). The mean internal subscale score was 24.47 ($SD = 2.89$). Lastly, the overall MCPRS score was 52.64 ($SD = 5.16$).

Correlation and Moderator Analyses. In this section, the cognitive load and stereotype data were examined to determine the extent to which there is a relationship between these data and the shooting data. Simple correlations were calculated between these measures and the indices of gender bias that were calculated in Study 1 (note that these correlations were calculated separately for Low complexity and High complexity trials). A summary of the results from the correlation analyses are provided in Table 12 (Low complexity) and Table 13 (High complexity). As displayed in Table 12, the correlation analyses revealed only one significant correlation at the level of $p < .05$. Likewise, as displayed in Table 13, the correlation analyses revealed no significant correlations.

Table 12

Pearson Correlations between Cognitive Load Items, Stereotype Measures, Demographics, Criterion, Sensitivity, Reaction Time, Errors, A, and C Biases for Study 2 – Low Complexity

	Criterion Male Bias	Sensitivity Male Bias	RT Male Bias	Error Male Bias	Automatic	Controlled
Cognitive Load Items						
Perceived Difficulty	.15	.02	-.03	.17	.14	-.02
Mental Effort Expended	-.08	-.01	.10	.11	.05	.03
IAT	.27	.03	*.20	.07	.10	-.04
Adjective Checklist						
Cultural Male	.07	.06	.16	.12	.03	-.11
Cultural Female	-.12	.03	.07	-.07	-.13	-.10
Personal Male	.00	.09	.10	.06	-.06	-.12
Personal Female	-.08	.07	.14	-.02	-.15	-.11
Motivation to Control Prejudice						
External	-.01	-.15	.15	-.01	-.03	.13
Internal	.04	-.04	.06	.01	.06	.01
Total	.01	-.14	.15	-.01	.01	.12
Demographics						
Age	-.09	.04	-.04	-.06	-.10	-.01
Gender	-.14	.04	.17	-.17	-.11	-.05
Minority	.09	.06	.07	.10	.07	-.11
Education Level	-.07	.18	.02	-.07	-.06	-.13

Note. *Correlation is significant at the $p < .05$ level; point-biserial correlations were used for the gender and minority variables.

Table 13

Pearson Correlations between Cognitive Load Items, Stereotype Measures, Demographics, Criterion, Sensitivity, Reaction Time, Errors, A, and C Biases for Study 2 – High Complexity

	Criterion Male Bias	Sensitivity Male Bias	RT Male Bias	Error Male Bias	Automatic	Controlled
Cognitive Load Items						
Perceived Difficulty	.02	-.06	.00	.08	-.01	.07
Mental Effort Expended	-.08	.02	-.04	-.05	-.09	.00
IAT	.04	.05	.10	.04	.03	-.02
Adjective Checklist						
Cultural Male	.02	.12	-.01	.01	.05	-.14
Cultural Female	.10	.05	.04	.10	.11	-.09
Personal Male	-.06	.02	-.04	-.04	-.06	-.02
Personal Female	.09	.00	.09	.11	.06	.00
Motivation to Control Prejudice						
External	-.05	.01	.15	-.06	-.06	.01
Internal	.01	.04	-.05	.00	-.02	-.03
Total	-.04	.03	.10	-.05	-.05	-.01
Demographics						
Age	-.06	.01	-.03	-.07	-.05	.01
Gender	-.02	.03	-.06	-.04	-.01	.01
Minority	-.05	.07	.07	-.05	-.07	.04
Education Level	-.07	.02	.11	-.09	-.06	.02

Note. Point-biserial correlations were used for the gender and minority variables.

As in Study 1, moderator analyses were conducted to determine if participant scores on the MCPRS moderate the relationship between the explicit stereotype measure (i.e., male-Personal) and gender bias (i.e., c , d' , RT, errors, A , and C). These moderator analyses were conducted separately for Low complexity and High complexity conditions.

Once again, the potential moderator (MCPRS scores) and the predictor (male-Personal) were standardized into z-scores. Next, the moderator and predictor were then regressed separately for each of the six gender indices (c , d' , RT, errors, A , and C). Finally, the interaction term was regressed on these indices. The size of the R^2_{change} is an indicator of the size of the moderator effect. The results of the moderator analyses are presented in Tables 14 (Low complexity) and 15 (High complexity). As displayed in Table 14, the MCPRS score was a significant moderator for three out of the six predictors: the criterion estimate, errors, and automatic processes. Interestingly, based on the results in Table 15, the MCPRS score was not a significant moderator for any of the predictors in High complexity scenes.

Table 14

Results of Moderator Analyses – Low Complexity for Study 2

	Beta Weights	<i>t</i> value	<i>R</i> ² Change
Criterion (<i>c</i>)	.08	2.12*	.04
Sensitivity (<i>d'</i>)	.07	.92	.01
Reaction Time	2.16	.47	.00
Errors	.05	2.25*	.04
Automatic (<i>A</i>)	.05	1.95*	.03
Controlled (<i>C</i>)	-.02	-.80	.01

Note. *Correlation is significant at the $p < .05$ level.

Table 15

Results of Moderator Analyses – High Complexity for Study 2

	Beta Weights	<i>t</i> value	<i>R</i> ² Change
Criterion (<i>c</i>)	.03	.65	.00
Sensitivity (<i>d'</i>)	-.06	-.78	.01
Reaction Time	.63	.13	.00
Errors	.03	1.13	.01
Automatic (<i>A</i>)	.00	-.07	.00
Controlled (<i>C</i>)	.02	.68	.00

Note. *Correlation is significant at the $p < .05$ level.

Discussion

The primary goal in Study 2 was to determine whether scene complexity influenced the presence of a gender bias in a simulated shooting task given that scene complexity should increase the demand on cognitive load and thus decrease one's ability to rely on controlled processes (i.e., basing decisions on the presence of a weapon). It was expected that participants would show a greater degree of gender bias on trials in which the scene was categorized as High complexity rather than Low complexity. Similar to Study 1, a range of measures (e.g., assessments of task-related cognitive load, explicit and implicit stereotype measures, and motivation to control prejudiced reactions scale) were also collected in the hope that they would shed light on any shooting biases that emerged.

Reaction Time. As in Study 1, it was expected that participants would exhibit a Gender x Object interaction whereby they would be quicker to shoot participants in stereotype-congruent conditions (i.e., male-Armed and female-Unarmed) than stereotype-incongruent conditions (i.e., male-Unarmed and female-Armed). It was also expected that this bias in reaction times would be magnified under conditions of High complexity given that participants would presumably be less able to rely on controlled processes under such conditions.

While manipulating complexity clearly did have an impact on participants' ability to make quick decisions, as demonstrated by the hypothesized main effect that was found for complexity reflecting slower responding on high complexity trials, neither of the hypotheses related to biased responding were supported. That is, gender-based shooting biases, as measured by reaction times, did not appear to exist, either in a generalized way, or under conditions of higher complexity.

The inclusion of very Low complexity trials might explain why we did not find a Gender x Object interaction in Study 2 (in contrast to Study 1, where moderately complex trials were used and a bias was found). In these Low complexity trials, participants presumably had sufficient resources to carefully scan the scenes and make quick, but appropriate, shoot/don't shoot decisions – this would have potentially reduced (compensated for) any bias found on High complexity trials. However, it is less clear why a reaction time bias did not emerge on High complexity trials when participants did not have as many resources to make decisions, unless of course the inclusion of distracter items on these trials did not impact the participants' ability to use controlled processing (something that is not supported by our other research findings in this study, such as the impact that complexity had on controlled processing, or *C*; see below).

Error Rates. Similar hypotheses were proposed for error rates, but in this case the results of Study 2 clearly supported our expectations. Not only did error rates increase as a function of complexity, a bias emerged with respect to error rates such that more incorrect decisions were made on stereotype-incongruent trials (vs. stereotype congruent trials). Furthermore, this bias was magnified under conditions of High complexity as we thought it would be.

While it is interesting that the same finding did not emerge with respect to reaction times, indicating possibly that the time to make decisions and the actual decisions made rely on two separate processes, the fact that gender biases in terms of decision errors became more pronounced under conditions of High complexity supports the idea that it becomes more difficult to make accurate decisions in simulated shooting tasks in the presence of a large number of distracter items. This is presumably because cognitive resources are taxed under such conditions, which forces participants to rely on

automatic processes; processes which may be influenced by negative male stereotypes (and positive female stereotypes).

Signal Detection. As in Study 1, it was expected that participants would set a more lenient shoot criterion for male versus female targets. However, in the case of Study 2, it was also expected that the shoot criterion for males would be even lower under conditions of High complexity. Across conditions of Low and High complexity, the analyses of the criterion estimates, or c , showed a significant effect of gender with participants exhibiting a don't shoot bias towards female targets, but a shoot bias towards male targets. Also as expected, this bias became more pronounced under conditions of High complexity.

Interestingly, the criterion for male targets was set substantially lower when the targets were presented on High complexity trials (from $-.09$ to $-.19$). Less of an impact was seen in the criterion estimates for female targets, with values of c increasing from $.03$ to $.06$ as complexity increased. But, even here, there was an increase in c . Thus, the impact of complexity seems to be that it does, in fact, force participants to rely on automatic processing. In the case of male targets, this encourages a greater reliance on a danger stereotype and a consequent reduction in c (more likely to shoot), but in the case of female targets, this encourages a greater reliance on a safe stereotype and a consequent (non-significant) increase in c (more likely to not shoot).

With respect to d' , an effect of complexity was observed, whereby participants were less able to discriminate armed from unarmed targets due presumably to the presence of distracter items. However, we did not expect, nor did we find any effects related to gender. As we hypothesized, it could be the case that the danger stereotype associated with males caused participants to perceive weapons regardless of whether the

male targets actually possessed a weapon (thus resulting in a moderate level of d'). On the other hand, the safe stereotype associated with females could arguably have caused participants to perceive non-threatening objects regardless of whether the female targets actually possessed these items (thus also resulting in a moderate level of d').

Process Dissociation Procedure (PDP). With regards to the hypotheses related to the measures coming from PDP, most of these were supported with respect to A , or the degree to which automatic processing (i.e., stereotypes) were driving performance. Specifically, estimates of A were significantly larger for male targets compared to female targets, although A estimates were not larger under conditions of higher complexity in the way we expected. Most importantly, however, the expected Gender x Complexity interaction was significant in the case of A , indicating that stereotyped responding became more severe, at least for male targets, when a participant's cognitive resources were taxed on the High complexity trials.

With regards to both Low and High complexity, the analyses of controlled estimates, which represents the degree to which controlled processing was being used, showed no significant effect of gender, but C did vary as a function of complexity. These results were as we expected. One would think that one's ability to use controlled processing would decrease as complexity increases because cognitive resources would be used up scanning distracter items. One might also think that C should be similar across the genders given the nature of the shooting task and the instructions that preceded this task. In all cases, participants were specifically told to use controlled processing to try and determine if the target had a gun and whether a shoot decision should be made (i.e., make quick, but *accurate* shoot decisions). The observed Gender x Complexity

interaction in the analysis of *C* indicated that under High complexity conditions controlled processing did suffer somewhat, but primarily for male targets.

Cognitive Load Ratings and Stereotype Measures. Based on the results from Study 1 and those reported by Correll et al. (2002), it was not surprising that the cognitive load ratings and implicit/explicit stereotype measures did not provide any clear explanations for the shooting results. Indeed, as in Study 1, no meaningful pattern of results emerged when the various measures were correlated with the indices of gender bias. The various explanations for why significant correlations were not observed in Study 1 apply equally well in this study (e.g., socially desirable responding on the Adjective Checklist likely reduced our chances of finding significant correlations related to this measure).

The moderator analyses did suggest that participants' motivation to control their prejudiced reactions might explain the lack of significant correlations for certain measures of gender bias (e.g., the criterion estimate, errors, and automatic processes). In these cases, it appears that personal negative stereotypes towards Males might correlate with these outcome measures, but only for those participants that are not concerned with controlling their prejudiced reactions. However, very interestingly, this does not seem to be the case when participants are presented with High complexity trials. This might suggest that the use of stereotypes in making shooting decisions is less controllable in these High complexity situations.

General Discussion

The primary goal of this thesis was to examine the influence of target gender on the split-second shooting decisions made by Canadian participants within the context of a

simulated shooting task. It was initially hypothesized that there would be a shooting bias against male targets as a result of the existence of traditional danger/aggression gender stereotypes (Study 1). A second goal of this thesis was to examine whether factors, specifically scene complexity, that have previously been shown to influence one's ability to make controlled, intentional decisions, would increase the gender biases exhibited by the participants in the current studies (Study 2). While each of these studies has been discussed in detail already, this section will briefly highlight the main findings that emerged, present some of their implications, and discuss some limitations of the research and useful directions for the future.

Evidence of a Male Shooting Bias

As expected, Study 1 found some evidence for a male shooting bias on the simulated shooting task (e.g., with respect to reaction time, participants tended to react faster on trials in which the target was an armed male rather than an armed female). However, given the sample size, the bias found in Study 1 was not always significant for all outcome measures (e.g., error rates), but even in cases where non-significant results were found, distinct trends emerged in the data, which reflected the expected gender bias (e.g., participants did display a tendency to make more errors on trials involving stereotype-incongruent targets, particularly unarmed male targets). This bias can arguably be explained by the existence of gender stereotypes.

Specifically, the general social psychological literature suggests that males are typically associated with characteristics such as aggressiveness, dominance, and dangerousness, whereas females are typically associated with characteristics like passiveness and submissiveness (Weiten & McCann, 2007). These types of gender stereotypes are reinforced every day through the media and likely caused our participants

to be primed to behave in a particular way when exposed to targets of different genders on the simulated shooting task.

With all that being said, the stereotypes that emerged in Study 1 on the more standard stereotype measures (e.g., ACL, IAT) did not correlate significantly with the gender biases found on the shooting task. There are various explanations for this finding, such as the fact that socially desirable responding influences participant responses on the ACL. In addition, it is not uncommon for stereotype measures to not correlate with one another. For example, research has found that explicit and implicit stereotype measures (the shooting task arguably being an implicit measure) often do not correlate with one another (Blair, 2001; Fazio & Olson, 2003; Hofmann et al., 2005), and even different implicit measures do not always relate well to one another (Fazio & Olson, 2003).

The Impact of Scene Complexity on the Male Shooting Bias

Drawing on dual process theory, which suggests that responses to stereotypes have an automatic and controlled component, Study 2 examined whether the male shooting bias that was observed in Study 1 (for certain outcome measures) would be magnified under conditions of High complexity. Specifically, it was expected that with the addition of distracter items in the background scenes (i.e., High complexity trials), there would be an increased strain on attentional resources. As a result of this strain, participants would be less likely to utilize controlled processing (i.e., scan the scene to determine whether a weapon is present) and more likely to utilize automatic processing (i.e., relying on gender stereotypes when making a decision).

Not only did a male shooting bias emerge in Study 2, but as expected, the results from Study 2 indicated that this bias was indeed amplified under conditions of High complexity in the majority of cases. Due to the increased strain on attentional resources,

it appears that participants were unable to utilize controlled processing (this is most directly seen in the calculation of C) and instead were relying more on automatic processing, at least in the case of male targets. Arguably, it was this change in cognitive processing that resulted from the manipulation of scene complexity that resulted in the more pronounced gender bias seen on High complexity trials.

Lack of a Relationship Between Stereotype Measures and Shooting Bias

In an attempt to replicate the methodology of similar studies (e.g., Correll et al., 2002, 2007a; Plant, Goplen, & Kuntsman, 2011), the current study also examined the relationship between a range of stereotype measures and simulated shooting performance. It was thought that significant positive correlations might be observed between the stereotype measures we used (and cognitive load measures) and gender biases on the shooting task. However, perhaps unsurprisingly given findings from previous research (e.g., Correll et al., 2002, 2007a), there was a total lack of meaningful results in this regard.

It is not entirely clear why we (and others) did not find the expected correlations between the stereotype (and cognitive load) measures and gender biases on the shooting task. The answer likely lies with the function of each measure. For example, explicit stereotype measures are highly susceptible to issues like socially desirable responding (Fazio & Olsen, 2003). As a result of this, participants may not have been responding in an honest fashion. With regards to the IAT, it is entirely possible that it is measuring some aspect of stereotypes (e.g., cultural stereotypes) that is unrelated to the stereotypes that might be influencing performance on the shooting task (e.g., personal stereotypes) (Karpinski & Hilton, 2001; Olson & Fazio, 2004).

Implications of the Findings

The findings that emerged from Study 1 and Study 2 are potentially important, for both theoretical and practical reasons. Theoretically, the findings shed some light on how stereotypes operate and they also provide support for the idea that there are two processes at play – automatic and controlled – in the manifestation of stereotypes (Payne, 2001). Indeed, it does seem to be the case that automatically activated stereotypes can influence perception and behavior (i.e., gender biases do emerge when people have to make very rapid decisions) and that the impact of these stereotypes is magnified under conditions where participants are unable to rely heavily on controlled processes (i.e., carefully scanning scenes in order to make accurate decisions).

Practically, the findings speak to the potential problems that might emerge when police officers encounter lethal force situations. If future research does in fact show that the results reported here generalize to samples of police officers, and to more realistic use-of-force scenarios, then it suggests that under conditions of time constraint, police officers may show strong gender biases in their shooting responses (e.g., being more likely and quicker to shoot armed suspects when the suspects are male and being more likely and quicker to not shoot unarmed suspects when the suspects are female). These biases have potential implications for suspects (particularly male suspects) and for police officers (especially when encountering dangerous, weapon yielding females).

If the results reported here generalize to the real world, the findings also speak to the importance of use-of-force training and potentially provide insight into how such training might be conducted. For example, scene complexity is a naturally occurring factor that police officers must deal with on a daily basis (i.e., police officers will sometimes encounter lethal force situations in Low complexity environments and

sometimes encounter them in High complexity environments). Given that scene complexity appears to increase the likelihood of biased responding in the simulated shooting task we examined, this finding might suggest that we have to prepare officers to deal with changes in scene complexity. Given the fact that one's ability to control responses to stereotypes under conditions of High complexity is diminished, it might be worthwhile to consider training programs that do not focus on attempts to increase one's ability to override stereotypes (something that will arguably be difficult for officers to do under conditions of High complexity). Rather, if training focused on decreasing gender stereotypes, instead of focusing on attempts to increase controlled responding, then police officers would not find themselves in a position where they had to override gender stereotypes – the stereotypes would not be activated in the first place.

Limitations and Future Directions

The two studies reported in this thesis sought to replicate the methodology of previous shooting studies (e.g., Correll et al., 2002, 2007a). However, as with any type of research, limitations exist. These limitations will be discussed below. As these limitations are discussed, potential directions for future research will also be proposed.

Lack of Realism

The most significant limitation of the present study is the lack of realism of the simulated shooting task. The photo stimuli used in the present study was two-dimensional and stationary. In addition, the armed and unarmed targets were positioned in unnatural ways (e.g., holding guns across their chest or up in the air). Furthermore, participants were always given a very limited time frame (630 ms) in which to respond. In a real world setting, police officers would obviously be exposed to moving, three-dimensional targets, and the targets would often show “signs” that the situation might be dangerous.

Objects would not necessarily be in open view throughout the situation, but rather be hidden from view or pulled from clothing. While rapid decisions frequently need to be made in use of force encounters (Sharps & Hess, 2008), it is also not unusual that police officers have time to carefully assess a use-of-force encounter.

Moving forward, it would be beneficial to use more realistic shooting stimuli. This is becoming more possible. For example, future researchers might take advantage of use-of-force simulators to conduct similar research to that reported here. These simulators would allow researchers to present more realistic situations to participants (real actors carrying out realistic situations in real time) while being able to capture the same sorts of outcome measures that were captured in the present study. Motion capture technology could also be explored. In fact, research in the Police Research Lab is currently using this technology to develop animated targets that can mimic the behavior of real life suspects. These targets, despite being animated, might allow research to increase the ecological validity of their studies.

Limited Sample and Stimuli

Related to issues of realism are two other limitations with the current research. The first relates to the sample used in the two studies reported here. In both cases, university students were relied upon. While this is not unusual in research of this type (e.g., Correll et al., 2002, 2007a; Plant, Goplen, & Kuntsman, 2011), if this research is to inform police practice, it will obviously be necessary to sample active police officers. With that said, existing research does not always show that police officers respond differently than students do to the simulated shooting task. For example, both Plant et al., (2011) and Taylor (2011) have shown that police officers (and police recruits in the case of Taylor, 2011) act surprisingly similar to university students, with each group showing

similar racial biases. It might be the case, however, that these groups do differ from one another with respect to other (non-racial) stimuli, such as the gender-based stimuli used here.

In addition, the stimuli that was used here was very limited. We focused solely on the gender of the target and manipulations of scene complexity. Clearly there are many more stereotypes that could be examined in future research (e.g., the age of the target) and many more factors that could be manipulated. For example, target attractiveness and attire are two factors that could potentially impact shooting decisions. In addition, lighting conditions and level of noise are two background factors that could potentially impact shooting decisions. All of these factors could influence shooting decisions and each is a factor that naturally varies in the real world where police officers have to make decisions.

Potentially Problematic Measures

A final limitation is the potentially problematic nature of some of the measures that were used in the current studies. Problems with the explicit stereotype measures have already been discussed, as have some of the problems with the MCPRS and the IAT. Certainly other explicit and implicit measures should be explored in future studies to see if responses to those new measures correlate more significantly to measures of gender bias on the shooting task. Changes could also be made, however, to the measures used in this study. For example, the IAT could be reconfigured so that different constructs are used (perhaps safe and dangerous did not capture the constructs that relate to performance on the shooting task). There are other options for the MCPRS as well, such as using an implicit version of this task (IMCP; Glaser & Knowles, 2008).

It might also be interesting to revise some of the other measures that were used in these studies. For example, despite research, which suggests that our cognitive load measures are valid measures of load, it would be interesting to use other measures of load, especially if complexity is examined again in the future. At the very least, future researchers should change the way this measure is used in future studies of scene complexity. For example, in Study 2, the cognitive load measures were simply collected at the end of the study and they related to all of the trials that participants were exposed to. This prevented us from examining how cognitive load varied as a function of scene complexity (i.e., we could not separate out the load experienced by participants when they were exposed to Low vs. High complexity trials).

Conclusion

In conclusion, there was a clear tendency for the participants sampled to demonstrate a shooting bias towards male targets. This gender bias was heightened when scenes were made more complex through the addition of distracter items in the background. Future research should focus on replicating this bias using more valid stimuli, a police sample, and better measures. Once shooting biases have been reliably shown to exist under more realistic conditions, attempts can be made to reduce these biases. A reduction in such biases will aid to increase the safety of police officers and the community as a whole.

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Appendices

Appendix A

A Sample of Shooting Task Stimuli

*Appendix B***Manipulation Check of the IAT Words for Study 1**

Instructions: Please categorize each of the following words into one of the three categories. Select 'dangerous' if you feel the word is closely tied with this concept, and select 'safe' if you feel it best represents that concept. If you feel the word does not fit into either category, select 'neither'.

Violent

Dangerous	Safe	Neither
-----------	------	---------

Calm

Dangerous	Safe	Neither
-----------	------	---------

Shoot

Dangerous	Safe	Neither
-----------	------	---------

Quiet

Dangerous	Safe	Neither
-----------	------	---------

Relax

Dangerous	Safe	Neither
-----------	------	---------

Hit

Dangerous	Safe	Neither
-----------	------	---------

Busy

Dangerous	Safe	Neither
-----------	------	---------

Joy

Dangerous	Safe	Neither
-----------	------	---------

Hazardous

Dangerous	Safe	Neither
-----------	------	---------

Risk

Dangerous	Safe	Neither
-----------	------	---------

Peace

Dangerous	Safe	Neither
-----------	------	---------

Evil

Dangerous	Safe	Neither
-----------	------	---------

Love

Dangerous	Safe	Neither
-----------	------	---------

Hurt

Dangerous	Safe	Neither
-----------	------	---------

Cat

Dangerous	Safe	Neither
-----------	------	---------

Destructive

Dangerous	Safe	Neither
-----------	------	---------

Murder

Dangerous	Safe	Neither
-----------	------	---------

Agony

Dangerous	Safe	Neither
-----------	------	---------

Guard

Dangerous	Safe	Neither
-----------	------	---------

Gun

Dangerous	Safe	Neither
-----------	------	---------

Dove

Dangerous	Safe	Neither
-----------	------	---------

House

Dangerous	Safe	Neither
-----------	------	---------

War

Dangerous	Safe	Neither
-----------	------	---------

Forceful

Dangerous	Safe	Neither
-----------	------	---------

Punch

Dangerous	Safe	Neither
-----------	------	---------

Rest

Dangerous	Safe	Neither
-----------	------	---------

Plate

Dangerous	Safe	Neither
-----------	------	---------

Attack

Dangerous	Safe	Neither
-----------	------	---------

Harmony

Dangerous	Safe	Neither
-----------	------	---------

Stab

Dangerous	Safe	Neither
-----------	------	---------

Protect

Dangerous	Safe	Neither
-----------	------	---------

Tranquil

Dangerous	Safe	Neither
-----------	------	---------

Aggressive

Dangerous	Safe	Neither
-----------	------	---------

Pleasure

Dangerous	Safe	Neither
-----------	------	---------

Happy

Dangerous	Safe	Neither
-----------	------	---------

Kill

Dangerous	Safe	Neither
-----------	------	---------

Hostile

Dangerous	Safe	Neither
-----------	------	---------

Chair

Dangerous	Safe	Neither
-----------	------	---------

Bliss

Dangerous	Safe	Neither
-----------	------	---------

Secure

Dangerous	Safe	Neither
-----------	------	---------

Innocent

Dangerous	Safe	Neither
-----------	------	---------

Shelter

Dangerous	Safe	Neither
-----------	------	---------

Defend

Dangerous	Safe	Neither
-----------	------	---------

Pain

Dangerous	Safe	Neither
-----------	------	---------

Warm

Dangerous	Safe	Neither
-----------	------	---------

*Appendix C***Manipulation Check of the Photo Stimuli for Study 1**

Instructions: You will be shown several different photos of scenes and you will have to answer questions related to each specific scene.

Picture _____

1. How many items do you think are in the background scene? _____

2. How visible is the object that the target is holding? _____

1	2	3	4	5	6	7	8	9
Not at all visible				Moderately visible				Extremely visible

3. In terms of appearance, how masculine/ feminine do you find the target to be?

1	2	3	4	5	6	7	8	9
Extremely Masculine				Neutral				Extremely Feminine

*Appendix D***Recruitment Announcement: Manipulation Check for Study 1**

Study Name: A Manipulation Check for Police Shooting Photo Stimuli

Purpose: The purpose of this study is to validate certain photo stimuli that will be used to examine shooting decision making in future studies.

Description: In this study, you will be asked to look at a variety of photos presented on a computer screen and rate them on a number of aspects (i.e., whether the target looks masculine or feminine).

Duration: 15 minutes

Percentage: 0.25% towards your mark in PSYC 1001 or 1002

*Appendix E***Informed Consent Form: Manipulation Check for Study 1**

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent must provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.

Study Title: The validation of photo stimuli for examining stereotype effects on shooting decisions

Faculty Sponsor: Dr. Craig Bennell	Phone: 520-2600.1769	EMAIL: craig_bennell@carleton.ca
Principal Investigator: Evanya Musolino	Phone: 520-2600.1728	EMAIL: emusolin@connect.carleton.ca

If you have any ethical concerns about how this study is conducted, please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173).

Purpose and Task requirements: Future research in the Police Research Lab is going to use photos of armed and unarmed suspects that differ with respect to gender (male vs. female) to examine how this factor influences shooting decisions. In addition, future research will determine if measures of pre-existing attitudes relate to participant shooting decisions when they are exposed to this factor. The aim of the present study is to validate the photo stimuli that will be used in these future studies. Your task will essentially be to examine photos and rate them on a number of aspects.

Potential risk/discomfort. Some of the photos you will be rating will subsequently be used in studies that look at gender stereotypes and shooting behavior. It is possible that these scenes may be disturbing to view and that you may be uncomfortable making shooting decisions. We would like to stress that all of the stimuli that you view have been created for the purpose of this study and that none of the weapons used in these photos are real.

Right to withdraw and confidentiality. Your participation in this study is entirely voluntary. At any point during the study you have the right to withdraw and there will be no penalty whatsoever. The data collected in this experiment are confidential and your name will never be associated with your responses. The responses that you select will be compiled into a statistical file to be analyzed for validity purposes only.

I have read the above description of the study entitled "The validation of photo stimuli for examining stereotype effects on shooting decisions". The data collected will be used for research and/or teaching purposes. Signing on the line below indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.

Name: _____

Researcher: _____

Signature: _____

*Appendix F***Debriefing Form: Manipulation Check for Study 1**

We would like to thank you for participating in this study. Your time and efforts are greatly appreciated! This post-session information is to help you understand the nature of this research.

Our current research program involves: (1) identifying factors (e.g., target race or gender) that influence shooting decisions (amongst university students) and (2) developing training strategies to minimize the impact of these factors. Some of the stimuli that you just validated (the background photos) will be used in subsequent phases of this research. Participants will be shown these photos with a superimposed armed or unarmed target and will be asked to make split-section decisions as to whether or not they are looking at a threatening scene (e.g., handgun present) or a non-threatening scene (e.g., cell phone present). The participants will have to choose either to shoot the target or not shoot depending on whether the suspect is armed (by pressing separate computer keys). By measuring decision outcomes and reaction times, the computer program will be used to identify which factors result in participants making accurate/inaccurate decisions. Based on previous research, we expect that university students will make shooting decisions that are consistent with danger stereotypes (e.g., that males are more dangerous than females). For example, we are predicting that students will be more likely to shoot unarmed males as opposed to unarmed females (or armed females).

Once we determine if irrelevant cues, such as target gender, influence shooting decisions, the next phase of our research program will be to examine different training strategies to see if we can minimize the extent to which participants focus on irrelevant cues when making shooting decisions and maximize their use of relevant cues (e.g., the presence/absence of a weapon).

This research program has important theoretical implications. For example, we will learn whether stereotypes about gender translate into biased behavior in settings where the stakes can be very high (i.e., shooting scenarios). In addition, we will learn about ways that people can control their responses to stereotypes so that inappropriate decisions are not made. In practical terms, the research is also very important. For example, the studies we conduct have the potential to inform use-of-force training programs, allowing police officers to receive higher quality training than is currently the case. Better training should result in more justifiable shooting decisions, which will ultimately enhance public safety.

To learn more about this research, you can read the following articles:

Correll, J. Park, B., Judd, C. H. & Wittenbrink, R. (2002). The police officer's dilemma: Using ethnicity to disambiguate potentially threatening individuals. *Journal of Personality and Social Psychology*, 83, 1314-1329.

Correll, J., Park, B., Judd, C. M., Wittenbrink, B., Sadler, M. S., & Keesee, T. (2007). Across the thin blue line: Police officers and racial bias in the decision to shoot. *Journal of Personality and Social Psychology*, 92, 1006-1023.

If you have any questions or comments, please feel free to contact Dr. Craig Bennell (520-2600 x. 1769). If you have any ethical concerns about how this study was conducted please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600 x. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600 x. 4173). If you are anxious after completion of this study please contact Carleton University's Health and Counseling Services (613-520-6674).

*Appendix G***Recruitment Announcement: Study 1**

Study Name: An Attempt to Identify Factors that Influence Police Shooting Decisions

Purpose: The purpose of this study is to identify factors that may influence shooting decisions in simulated encounters with potentially threatening targets.

Description: In this study, you will be exposed to a variety of simulated encounters on a computer and will be asked to make shoot/don't shoot decisions based on whether or not you perceive the target in the scene to be threatening (e.g., holding a weapon) or non-threatening (e.g., holding a neutral object). Depending on how accurately you make your shooting decisions, you may be eligible to win a monetary reward. After the task, you will also be asked to complete a range of questionnaires.

Duration: 30 minutes

Percentage: 0.5% towards your mark in PSYC 1001 or 1002

*Appendix H***Cognitive Load Measures**

1. Please rate the level of mental effort that you exerted on this task.

1	2	3	4	5	6	7	8	9
Extremely Low Effort								Extremely High Effort

2. Please rate how difficult you found this task.

1	2	3	4	5	6	7	8	9
Extremely Easy								Extremely Difficult

Appendix I

Adjectives Checklist

Instructions: Please select the adjectives that you feel best describe the *cultural stereotypes* surrounding males/females. In other words, when you think of other people, how do you think they perceive males/females? You may choose as many adjectives as you wish. Keep in mind that this is not a measure of your personal beliefs towards a specific gender group, but rather your views of existing cultural stereotypes.

Immoral	Hostile	Frightening	Loud	Confident
Criminal	Unfriendly	Dangerous	Assertive	Opportunistic
Pushy	Unapproachable	Violent	Arrogant	
Intimidating	Cold	Aggressive	Noisy	

Instructions: Please select the adjectives that you feel best describe your own *personal beliefs* about males/females. You may choose as many adjectives as you wish.

Immoral	Hostile	Frightening	Loud	Confident
Criminal	Unfriendly	Dangerous	Assertive	Opportunistic
Pushy	Unapproachable	Violent	Arrogant	
Intimidating	Cold	Aggressive	Noisy	

*Appendix J***Adjectives Checklist – Words Included in the Analysis**

Hostile	Frightening	Loud
Criminal	Dangerous	Assertive
Intimidating	Violent	Arrogant
	Aggressive	Noisy

*Appendix K***Motivation to Control Prejudiced Reactions Scale**

1. In today's society it is important that one not be perceived as prejudiced in any manner.

1	2	3	4	5
Strongly Disagree				Strongly Agree
2. I always express my thoughts and feelings, regardless of how controversial they might be. *

1	2	3	4	5
Strongly Disagree				Strongly Agree
3. I get angry with myself when I have a thought or feeling that might be considered prejudiced.

1	2	3	4	5
Strongly Disagree				Strongly Agree
4. If I were participating in a class discussion and a Black student expressed an opinion with which I disagreed, I would be hesitant to express my own viewpoint.

1	2	3	4	5
Strongly Disagree				Strongly Agree
5. Going through life worrying about whether you might offend someone is just more trouble than its worth. *

1	2	3	4	5
Strongly Disagree				Strongly Agree
6. It's important to me that older people not think I'm prejudiced.

1	2	3	4	5
Strongly Disagree				Strongly Agree
7. I feel it's important to behave according to society's standards.

1	2	3	4	5
Strongly Disagree				Strongly Agree
8. I'm careful not to offend my friends, but I don't worry about offending people I don't know or don't like. *

1	2	3	4	5
Strongly Disagree				Strongly Agree
9. I think that it is important to speak one's mind rather than to worry about offending someone. *

1	2	3	4	5
Strongly Disagree				Strongly Agree

Note: items with an asterisk (*) require reverse coding.

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 2 3 4 5
Strongly Disagree Strongly Agree

1 **2** **3** **4** **5**

Strongly Disagree **Strongly Agree**

Appendix L

Stimuli (words) to be used in the Gender-IAT

Female Words: Girl, Female, Aunt, Daughter, Wife, Woman, Mother, Grandma

Male Words: Man, Boy, Father, Male, Grandpa, Husband, Son, Uncle

Dangerous Words: Violent, Shoot, Attack, Aggressive, Hostile, Kill

Safe Words: Calm, Peace, Harmony, Protect, Tranquil, Secure

Appendix M

Demographic Questionnaire

1. Current Age: _____
2. Gender:
_____ Male
_____ Female
3. Do you consider yourself to be a member of a visible minority?
_____ Yes
_____ No
4. If yes, please check which group(s) to which you belong:
_____ White
_____ Black
_____ Asian
_____ Middle Eastern
_____ Aboriginal
_____ Other (please specify): _____
_____ Prefer not to answer
5. Approximately how many hours per week do you play videogames that involve some type of shooting component (e.g., first-person shooter games)? _____.
6. Approximately how many times have you been hunting? _____.
7. Do you have any current or previous law enforcement experience?
_____ Yes
_____ No
8. If yes, please describe your law enforcement experience:

*Appendix N***Informed Consent Form: Study 1**

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent must provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.

Study Title: The Identification of Factors that Influence Shooting Decisions

Faculty Sponsor: Dr. Craig Bennell	Phone: 520-2600.1769	EMAIL: craig_bennell@carleton.ca
Principal Investigator: Evanya Musolino	Phone: 520-2600.1728	EMAIL: emusolin@connect.carleton.ca

If you have any ethical concerns about how this study is conducted, please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173).

Purpose and Task requirements: The aim of the present study is to identify factors that influence shooting behaviour. You will be exposed to an experimental task on a computer where you will be asked to make shoot/don't shoot decisions based on whether or not you encounter an armed or unarmed target who will either be male or female. Depending on your performance on this task, you may be eligible to win a monetary reward. After you have completed the experimental task, you will be asked to complete a range of computerized questionnaires. The entire process should take no longer than 30 minutes.

Potential risk/discomfort. You will be viewing scenes where a male or female target may be holding a mock-handgun and you will be asked to make shoot/don't shoot decisions. It is possible that these scenes may be disturbing to view and that you may be uncomfortable making shooting decisions. We would like to stress that all of the stimuli that you view have been created for the purpose of this study and that none of the weapons used in these photos are real. However, in order to participate in this study you should feel comfortable viewing these images and making these decisions.

Right to withdraw and confidentiality. Your participation in this study is entirely voluntary. At any point during the study you have the right to withdraw and there will be no penalty whatsoever. The data collected in this experiment are confidential. None of the questionnaire or shooting data will be identifiable and it will not be used for research and/or teaching purposes.

I have read the above description of the study entitled "The Identification of Factors that Influence Shooting Decisions". The data collected will be used for research and/or teaching purposes. Clicking on continue below indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.

*Appendix O***Debriefing Form: Study 1**

We would like to thank you for participating in this study. Your time and efforts are greatly appreciated! This post-session information is to help you understand the nature of this research.

The current study is an attempt to determine whether target gender influences shooting decisions. You were shown photos of armed and unarmed male and female suspects and were asked to make split-second decisions as to whether or not you would shoot the suspect. Previous research has examined similar factors, like race, and has found that participants often rely on pre-existing stereotypes to make shoot/don't shoot decisions (e.g., in studies examining race, Black individuals are perceived as more dangerous than White individuals). It is important to note that factors like target gender and race are not related to the dangerousness of a situation. In fact, relying on factors like gender or race often results in inaccurate decision-making.

To determine whether your attitudes towards males and females relates to your shooting performance, you completed a range of explicit and implicit attitude measures, as well as a measure of your desire to control prejudiced reactions. Explicit attitude measures simply ask you to report your views. Because these measures can be biased by a desire to respond in a socially desirable way, we also used an implicit measure of attitudes known as the Implicit Association Test. Unlike explicit tests, implicit tests do not rely on self-reported attitudes. Instead, they rely on reaction times as a proxy for your unconscious attitudes. Essentially, if you hold a negative view of males, you would have found it easier to categorize stimuli into categories when male and bad were paired together (vs. female and bad) and this would be reflected in quicker reaction times in this condition. The next phase of this research, if gender is found to influence shooting decisions, will be to explore a training strategy to minimize participants' focus on target gender and maximize their focus on weapon presence.

This research program has important theoretical implications. For example, we will learn whether stereotypes about males translate into biased behavior in settings where the stakes can be very high (e.g., shooting scenarios). In addition, we will learn about ways that people can control their responses to stereotypes so that inappropriate decisions are not made. This research also has practical value. For example, the studies we conduct have the potential to inform use of force training programs, allowing police officers to receive higher quality training. Better training should result in more justifiable shooting decisions, which will ultimately enhance public safety.

If you have any questions or comments, please feel free to contact Evanya Musolino (emusolin@connect.carleton.ca). If you have any ethical concerns about this study, please contact Dr. Monique Senechal (Chair of the Carleton University Ethics Committee for Psychological Research, (613) – 520 - 2600 x 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, (613) – 520 - 2600 x 4173).

If you are anxious after this study, please contact Carleton University's Health and Counseling Services (613-520-6674) or the Health Centre at the Ontario Police College.

*Appendix P***Example of the Manipulation Check of the Photo Stimuli for Study 2**

Instructions: You will be shown several different photos of scenes and you will have to answer questions related to each specific scene.

High Complexity **Low Complexity**

1. How many items do you think are in the current scene? _____.

2. How visually complex do you find the current scene?

1	2	3	4	5	6	7	8	9
Not at all				Moderately				Extremely
Complex				Complex				Complex

3. How visible is the object that the target is holding?

1	2	3	4	5	6	7	8	9
Not at all				Moderately				Extremely
Visible				Visible				Visible

*Appendix Q***Recruitment Announcement: Manipulation Check for Study 2**

Study Name: A Manipulation Check for Police Shooting Photo Stimuli

Purpose: The purpose of this study is to validate certain photo stimuli that will be used to examine shooting decision making in future studies.

Description: In this study, you will be asked to look at a variety of photos presented on a computer screen and rate them on their level of visual complexity. For example, you may be shown a background photo that includes several items in a garage and asked to rate the scene complexity.

Duration: 15 minutes

Percentage: 0.25% towards your mark in PSYC 1001 or 1002

*Appendix R***Informed Consent Form: Manipulation Check for Study 2**

The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent must provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.

Study Title: The validation of photo stimuli for examining stereotype effects on shooting decisions

Faculty Sponsor: Dr. Craig Bennell	Phone: 520-2600.1769	EMAIL: craig_bennell@carleton.ca
Principal Investigator: Evanya Musolino	Phone: 520-2600.1728	EMAIL: emusolin@connect.carleton.ca

If you have any ethical concerns about how this study is conducted, please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173).

Purpose and Task requirements: Future research in the Police Research Lab is going to use photos of armed and unarmed suspects that differ with respect to gender (male vs. female) to examine how this factor influences shooting decisions. In addition, future research will determine if measures of pre-existing attitudes relate to participant shooting decisions when they are exposed to this factor. The aim of the present study is to validate the photo stimuli that will be used in these future studies. Your task will essentially be to examine photos and rate their level of visual complexity. For example, you will be shown a photo that includes several items in a garage and asked to rate the scene complexity.

Potential risk/discomfort. Some of the photos you will be rating will subsequently be used in studies that look at gender stereotypes and shooting behavior. However, the current study simply asks you to rate the complexity of scenes. It is possible that these scenes may be disturbing to view and that you may be uncomfortable making shooting decisions. We would like to stress that all of the stimuli that you view have been created for the purpose of this study and that none of the weapons used in these photos are real.

Right to withdraw and confidentiality. Your participation in this study is entirely voluntary. At any point during the study you have the right to withdraw and there will be no penalty whatsoever. The data collected in this experiment are confidential and your name will never be associated with your responses. The responses that you select will be compiled into a statistical file to be analyzed for validity purposes only.

I have read the above description of the study entitled "The validation of photo stimuli for examining stereotype effects on shooting decisions". The data collected will be used for research and/or teaching purposes. Signing on the line below indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.

Name: _____

Researcher: _____

Signature: _____

*Appendix S***Debriefing Form: Manipulation Check for Study 2**

We would like to thank you for participating in this study. Your time and efforts are greatly appreciated! This post-session information is to help you understand the nature of this research.

Our current research program involves: (1) identifying factors (e.g., target race or gender) that influence shooting decisions (amongst university students) and (2) developing training strategies to minimize the impact of these factors. Some of the stimuli that you just validated (the background photos) will be used in subsequent phases of this research. Participants will be shown these photos with a superimposed armed or unarmed target and will be asked to make split-section decisions as to whether or not they are looking at a threatening scene (e.g., handgun present) or a non-threatening scene (e.g., cell phone present). The participants will have to choose either to shoot the target or not shoot depending on whether the suspect is armed (by pressing separate computer keys). By measuring decision outcomes and reaction times, the computer program will be used to identify which factors result in participants making accurate/inaccurate decisions. Based on previous research, we expect that university students will make shooting decisions that are consistent with danger stereotypes (e.g., that males are more dangerous than females). For example, we are predicting that students will be more likely to shoot unarmed males as opposed to unarmed females (or armed females).

Once we determine if irrelevant cues, such as target gender, influence shooting decisions, the next phase of our research program will be to examine different training strategies to see if we can minimize the extent to which participants focus on irrelevant cues when making shooting decisions and maximize their use of relevant cues (e.g., the presence/absence of a weapon).

This research program has important theoretical implications. For example, we will learn whether stereotypes about gender translate into biased behavior in settings where the stakes can be very high (i.e., shooting scenarios). In addition, we will learn about ways that people can control their responses to stereotypes so that inappropriate decisions are not made. In practical terms, the research is also very important. For example, the studies we conduct have the potential to inform use-of-force training programs, allowing police officers to receive higher quality training than is currently the case. Better training should result in more justifiable shooting decisions, which will ultimately enhance public safety.

To learn more about this research, you can read the following articles:

- Correll, J. Park, B., Judd, C. H. & Wittenbrink, R. (2002). The police officer's dilemma: Using ethnicity to disambiguate potentially threatening individuals. *Journal of Personality and Social Psychology*, 83, 1314-1329.
- Correll, J., Park, B., Judd, C. M., Wittenbrink, B., Sadler, M. S., & Keese, T. (2007). Across the thin blue line: Police officers and racial bias in the decision to shoot. *Journal of Personality and Social Psychology*, 92, 1006-1023.

If you have any questions or comments, please feel free to contact Dr. Craig Bennell (520-2600 x. 1769). If you have any ethical concerns about how this study was conducted please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600 x. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600 x. 4173). If you are anxious after completion of this study please contact Carleton University's Health and Counseling Services (613-520-6674).