INFLUENCE OF VICTIM CHARACTERISTICS AND CRIME TYPE ON EYEWITNESS RECALL OF PERCEIVED STEREOTYPICALITY

by

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Abstract

Previous research in Canada and the United States has shown that activated racial stereotypes about a given crime type can influence an eyewitness’ memory of perceived stereotypicality for the perpetrator of that given crime. Specifically, it has been shown that participants who are exposed to a surveillance video of a highly stereotypical Black crime (i.e., drive-by shooting) falsely recall the perpetrator from the video to be higher on perceived Black stereotypicality than those who are exposed to a surveillance video of a highly stereotypical White crime (i.e., serial killing). Victim characteristics such as the race of the victim (i.e., Black adult males vs. White adult males), in conjunction with crime type, were examined in the current research to determine their influence on the accuracy of eyewitness recall. The perceived deservingness of these victims was also examined. The results replicated and confirmed previous research that has shown how crime type (i.e., drive-by shooting vs. serial killing) can influence an individual’s eyewitness recall of perceived stereotypicality (i.e., $M = 54.03$ vs. $M = 50.18$, respectively). In the present research, however, the race of the victim did not exacerbate the effect of the crime type findings. The race of the victim did matter in terms of perceived deservingness, however, with Black adult males being viewed as more deserving of the purported crime than White adult males (i.e., $M = 6.90$ and $M = 4.53$, respectively). In the United States alone, eyewitness identification errors account for approximately 75% of all wrongful convictions. Of these wrongful convictions, 70% involve the wrongful conviction of individuals from minority groups. The findings of the present research will not only help to address the issues related to eyewitness (mis)identifications, but will also contribute to educating the public on how these errors may disproportionately impact certain minority groups, and the need for positive change.
Preface

The University of British Columbia’s Behavioural Research Ethics Board granted ethics approval for this research. The ethics approval certificate number for the current research is H11-01943. To date, the data included in this thesis has not been published.
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Dedication

You’re braver than you believe, stronger than you seem, and smarter than you think.

- Winnie The Pooh (A.A. Milne)

I dedicate this work to each and every student who is involved in the pursuit of research.

Never give up hope that one day your hard work will pay off—indeed, today is my day.

I also dedicate this work to my Mom. Thank you for always being there for me, and encouraging me to do my best. You’re going to have to get a bigger fridge magnet to hang this one on the fridge! 😊
CHAPTER 1 Introduction

“I am absolutely sure.” – Jennifer Thompson (Innocence Project, 2013)

With that quote came the sentencing of Ronald Cotton to life in prison plus 54 years for the rape and assault of Jennifer Thompson in 1984—a crime he did not commit. Cotton spent 10.5 years in prison before DNA tests exonerated him, and Thompson’s actual assailant was discovered. Sadly, cases like Cotton’s are not unique. There have been 310 post-conviction DNA exonerations in the United States since 1989, and eyewitness misidentification was the primary factor in 75% of those cases of injustice (Innocence Project, 2013). On average, exonerees spent 13.6 years in prison, and 18 people were sentenced to death before DNA testing proved their innocence. Related to the current study, approximately 70% of the 306 exonerees were from minority groups, and an overwhelming proportion (62%) of those individuals self-identified as Black (Innocence Project, 2013). It is the job of researchers to discover how these errors in eyewitness identification occur in the first place, and how to prevent them from happening in the future. The goal of this research is to identify when errors are likely to occur, and who is likely to fall victim to these errors.

1.1 The Fallibilities of Eyewitness Identifications

Understandably, the testimony of an eyewitness can be very convincing for judges, jurors, and law enforcement officials. This is especially true in the absence of indisputable forms of evidence like DNA (Abshire & Bornstein, 2003; Cutler, Penrod, & Dexter, 1990; Lindsay, Lim, Marando, & Cully, 1986). Juries are highly influenced by the confidence of the eyewitness, and rely on such confidence as an indicator of credibility (Cutler, Penrod, & Dexter, 1990). Further, there is a belief that eyewitness testimony is both reliable (Wise & Safer, 2004) and valid (Brigham & Wolfskeil, 1983). Unfortunately, what is not commonly understood is the fallibility of this type of testimony; in fact, the relationship between eyewitness confidence and
accuracy is weak (Bothwell, Deffenbacher, & Brigham, 1987; Leippe & Eisenstadt, 2007; Lindsay, Read, & Sharma, 1998; Luus & Wells, 1994; Penrod & Cutler, 1995; Read, Lindsay, & Nichols, 1998; Shaw, McClure, & Dykstra, 2007). Further, individuals of the criminal justice system underestimate the role that post-event information (e.g., lineup procedures) plays in the accuracy of eyewitness recall (Davis & Loftus, 2007; Memon & Wright, 1999; Ross, Read, & Toglia, 1994; Wright, Self, & Justice, 2000).

There have been over 2000 studies conducted assessing the reliability of eyewitness identifications (Cutler & Penrod, 1995), and the findings have highlighted the misconceptions about the accuracy of eyewitness testimony. These misconceptions have contributed to the debate surrounding the admission of eyewitness expert testimony in a court of law (Benton, Ross, Bradshaw, Thomas, & Bradshaw, 2006). As Benton et al. (2006) note, it is assumed that the inclusion of expert eyewitness testimony aids jurors in understanding the issues and helps in the decision-making process; however, many jurors, lawyers, and judges believe the fallibility of eyewitness testimony to be commonsense knowledge (Wells, Memon, & Penrod, 2006). In other words, people believe they are able to identify the factors that contribute to errors in eyewitness recall, and can take those factors into account when making their decisions. In this way, they are arguing that eyewitness expert testimony fails to contribute knowledge beyond what is considered commonsense. Therefore, it fails to meet the “necessity” component of the Mohan criteria (i.e., criteria to be deemed an expert witness), and therefore is not considered for inclusion as expert testimony in a court of law (Glancy & Bradford, 2007). Research has shown, however, that jurors have a limited ability in distinguishing inaccurate testimony from accurate testimony (Lindsay, Wells, & O’Connor, 1989). Further, research has shown that jurors have a limited understanding of the factors that impact eyewitness testimony (Lindsay & Webber, 1994), and if they are familiar with the factors, tend to underestimate the influence of the
variables under the control of the justice system (e.g., lineup procedures) (Shaw, Garcia, & McClure, 1999).

Research by Wise and Safer (2004) among others (see Brigham & Wolfskeil, 1983; Deffenbacher & Loftus, 1982; Loftus, 1979; Yarmey & Jones, 1983) provides compelling evidence regarding the knowledge of jurors, lawyers, and judges, and the perceived commonsensical nature of eyewitness testimony. Wise and Safer (2004) surveyed 160 US judges regarding their knowledge about eyewitness testimony and common misconceptions. The judges’ answers were compared to those of eyewitness experts. Wise and Safer (2004) discovered that the judges had a very limited knowledge of the factors affecting eyewitness testimony, only correctly scoring 55% of the items on the 14-item scale. For example, the researchers found that the judges were not aware of the relationship (or lack there of) between accuracy and confidence, the effectiveness of sequential (e.g., one at a time) lineups, and that jurors have difficulty differentiating between inaccurate and accurate eyewitness testimony (Wise & Safer, 2004). This line of research highlights the importance of eyewitness expert testimony, and the need for greater awareness of the issues associated with eyewitness identifications.

1.2 How Do Eyewitness Errors Occur In The First Place?

There are many variables thought to impact the eyewitness identification process. These variables have been categorized by researchers (see Wells, 1978) as influencing eyewitness recall either during the crime (i.e., estimator variables), or during the identification process (i.e., system variables).

1.2.1 Estimator Variables.

Estimator variables are those that take place during a crime, and are not under the direct control of the criminal justice system (Wells, 1978; Wells & Olson, 2003). As Wells and Olson
(2003) discuss, there are many factors of a crime that can prove influential in the later recall of a suspect. Such factors can include the length of time a witness has viewed the suspect (MacLin, MacLin, & Malpass, 2001; Meissner & Brigham, 2001; Memon, Hope, & Bull, 2003; Pezdek & Blandon-Gitlin, 2005), the presence or absence of a weapon (Fawcett, Russell, Peace, & Christie, 2013; Kramer, Buckout, Eugenio, 1999; Loftus, Loftus, & Messo, 1987; Pickel, Ross, Truelove, 2006) and/or an eyewitness’ level of cognitive attention (Bodenhausen & Lichtenstein, 1987; Bodenhausen & Wyer, 1985; Bornstein, Liebel, & Scarberry, 1998; Fiske & Neuberg, 1990; Gilbert & Hixon, 1991; Macrae, Bodenhausen, Milne, & Ford, 1997; Stangor & Duan, 1991). Important to this line of research is the fact that the race of the suspect can also influence the accuracy of eyewitness testimony (Wells, 1978). One goal of the present research is to examine this latter phenomenon further.

The race of the suspect can prove influential in the accuracy of eyewitness recall. For example, the own-race bias, or cross-race effect, is a phenomenon that states that individuals are more accurate at remembering faces of their own race (Behrman & Davey, 2001; Brigham, Maass, Snyder & Spaulding, 1982; Kramer, Buckhout, & Eugenio, 1990; Meissner & Brigham, 2001; Pezdek, Blandon-Gitlin, & Moore, 2003; Platz & Hosch, 1988; Wright, Boyd, & Tredoux, 2001). This finding is consistent not only across racial groups, but also across cultural groups (Kassin, Ellsworth, & Smith, 1989). Pezdek et al., (2003) argue that this phenomenon is a major contributing factor to the accuracy of eyewitness memory. Specifically, greater accuracy in eyewitness recall is seen if the observer and the perpetrator are of the same race, rather than of different races.

Another troubling estimator variable is the fact that memory accuracy decreases over time (Flin, Boone, Knox, & Bull, 1992). As noted by Ebbinghaus (1885), the rate to which individuals forget information is steepest right after an event takes place. Understandably, this can have great implications for the criminal justice system, as often individuals are called in at a
later date (e.g., often weeks or months later) to identify a suspect. Indeed, researchers have found that the accuracy of eyewitness identifications greatly decreases the longer the time between the event and the identification (Behrman & Davey, 2001; Meissner & Brigham, 2001).

Memory inaccuracy over time coupled with the influence of the cross-race effect illustrates how easily eyewitness inaccuracies can occur, and the potential severity of these errors. Estimator variables, or factors that take place during a crime, are difficult to control, so the focus needs to be on identifying and preventing errors from taking place once a crime has been committed (i.e., focus on system variables).

1.2.2 System Variables.

System variables are those that fall under the direct control of the criminal justice system (Wells & Olson, 2003). For example, Malpass and Devine (1981) investigated the degree to which inaccurate identifications are influenced by whether or not the eyewitness is told that the suspect is present in the lineup. Police investigators have the option of informing eyewitnesses that the suspect “may or may not be present” in the lineup, or simply asking the eyewitness to identify the suspect without any reference to whether or not the suspect is in the lineup. Failing to inform eyewitnesses that the suspect may or may not be present in the lineup is referred to as providing biased instructions, and can negatively impact the identification process. Specifically, identifying an innocent rather than a guilty individual from the lineup (i.e., false alarm), is more likely to occur if the eyewitness is not explicitly told that the perpetrator may not actually be in the lineup (Brewer & Wells, 2006; Steblay, 1997). In other words, false alarms are more likely to occur in situations where eyewitnesses are given biased instructions from law enforcement officials. This finding has led to the suggested policy change that law enforcement officials provide unbiased instructions, and inform individuals that the suspect “may or may not be present” in the lineup (Wells, Small, Penrod, Malpass, Fulero, & Brimacombe, 1998).
The way in which the suspects are presented in the lineup can also impact the accuracy of an eyewitness’ judgments, as there is a tendency to use relative judgments when suspects are presented in a simultaneous, or in an all-at-once format (Wells, 1984). This format yields higher false alarm rates than a sequential, or one-at-a-time presentation method. In a sequential presentation, eyewitnesses make absolute rather than relative judgments; they judge each individual on their own, and they are unable to make direct comparisons to other potential suspects. A reliance on simultaneous rather than sequential presentation methods often leads to inaccuracies in identifications (Cutler & Penrod, 1988; Lindsay & Wells, 1985). Furthermore, using suspect foils that do not match the description of the suspect can also result in misidentifications (Lindsay & Wells, 1980). It is important to include suspect foils that match the description of the suspect, and are not overly unique (e.g., only one foil is wearing glasses or a hat).

Caution should be taken both in delivering the instructions for the eyewitness and in the lineup construction. Eyewitnesses need to be provided with unbiased instructions, and with a lineup that includes individuals that match the description of the suspect. Ultimately, failure to adhere to these practices leads to greater false alarm hit rates, and greater overall inaccuracies in eyewitness testimony.

1.3 Stereotypes, Race, and Crime

1.3.1 The Racialization of Crime.

This research paradigm focuses on the racialization of crime, which has perpetuated the belief that perpetrators of specific crimes come from specific racial groups (Bull & Rumsey, 1988; Goldstein, Chance, & Gilbert, 1984; MacLin & Herrera, 2006; Shoemaker, South, & Lowe, 1973; Soss, Langbein, & Metelko, 2003). The question remains, however, how do certain races become associated with certain crimes? Work by Welch (2007) has helped to shed light on
this issue by arguing that the stereotyping of criminals by race has been, historically, a large part of Canadian and United States’ culture. Further, the mass media provides representations of criminality that help to shape and maintain these perceptions about race and crime. Work by Schneider (2012) has shown that crimes in the United States, as portrayed by the media, can impact perceptions of crime in Canada. In addition, Dixon (2006) found that television exposure to specific types of suspects, leads to the belief that the world is dangerous, and that those suspects responsible are more culpable for their actions (Dixon, 2006). As noted by Katheryn Russell in her work The Color of Crime, most Americans believe that Blacks are responsible for the majority of crime, and it is the focus on violent crime in the media that “fuels the stereotype of Black criminality” in the United States (1998, p. 2)

Coupled with an overrepresentation of Blacks in the criminal justice system (Welch, 2007) is the perception of Blacks as violent and criminal (Allport & Postman, 1947; Correll, Park, Judd, & Wittenbrink, 2002; Devine, 1989; Payne, 2001). The association between Blacks and criminality is not only widespread, but also automatic (Payne 2001; Payne, Jacoby, & Lambert, 2004). Further, as Gilens (1996) notes, the perception in Canadian and United States’ society is that Blacks commit the majority of crime, when in fact it is Whites who commit most of the crime. Nearly half of respondents in a survey conducted by Henry, Hastings, and Freer (1996), reported believing a relationship existed between race and crime, and of those who believed in the relationship, 65% believed that Black individuals commit more crime than any other racial group.

1.3.2 The Formation of Stereotypes.

At the most basic level, labels create expectancies and/or activate beliefs that can influence an individual’s judgment for the given label (Eberhardt, Dasgupta, & Banaszynski, 2003). As Eberhardt et al. (2003) argue, assigning a racial label to an individual not only impacts
the perception of the individual, but also the memory for that individual. When we encounter another individual, an automatic social categorization process occurs, and it is the result of that process that impacts further perceptions of that individual (Fazio & Dunton, 1997). The importance of this process centers on whether or not it evokes positive (e.g., intelligent, trustworthy, kind) or negative (e.g., untrustworthy, criminal) attitudes or connotations about a given race.

One of the earliest definitions of stereotypes conceptualized them as pictures in our mind about a given group that are maintained by our environment (e.g., social, cultural, and institutional) (Lippman, 1922). These mental representations tend to minimize the differences of people in the same group (e.g., Whites vs. Whites), and exaggerate the differences between groups (e.g., Whites vs. Blacks) (Ford & Stangor, 1992). Stereotypes are often automatic (Schater, Gilbert, & Wegner, 2011), and are well defined for many groups of people (e.g., males vs. females, youths vs. elderly, amongst races). Information processing can be influenced by the formation of these stereotypes (Kunda, 1999), and as Kunda, Davies, Adams, and Spencer (2002) suggest, exposure to an individual of a stereotyped group can automatically generate stereotypes and attitudes targeting that group. This automatic generation of attitudes can lead to perceptions of stereotype-consistent behaviour. That is, individuals become more likely to interpret the behaviour of others in ways that are consistent with their labels and beliefs (Cantor & Mischel, 1977; Yarmey, 1993).

Work by Araya, Ekehammer, and Akrami (2003) uncovered that priming participants with a social category, and then asking them to remember stereotypic and non-stereotypic words, led to an increase in the number of recalled words for the primed rather than unprimed condition. In other words, the priming of a social category enabled participants to better recall words associated with that category, rather than those words not associated with that category. This again reflects the idea that stereotype-consistent information is easier to recall than stereotype-
inconsistent information (Macrae, Milne, & Bodenhausen, 1994). This is especially true when the information is about an outgroup rather than an ingroup (Koomen & Dijker, 1997). The above research is fundamental to the discussion of how stereotype-consistent information can distort memories.

1.3.3 Perceived Black Stereotypicality.

The concept of perceived stereotypicality is central to the present line of research. Perceived stereotypicality is the “degree to which a person is perceived to possess physical features that are believed to be representative of a given racial group” (Osborne & Davies, 2012, p. 9). In terms of race, perceived Black stereotypicality is the degree to which a person is viewed to be physically representative of the Black racial group. For example, an individual high on perceived Black stereotypicality may have a darker skin tone, broader nose, and fuller lips than someone low on perceived Black stereotypicality (Blair, Judd, & Chapleau, 2004; Blair, Judd, & Fallman, 2004; Blair, Judd, Sadler, & Jenkins, 2002; Livingston & Brewer, 2002; Maddox & Gray, 2002).

Research in laboratory settings has shown that participants will shoot unarmed Black individuals more often than unarmed White individuals (Correll, Park, Judd, & Wittenbrink, 2002), and there exists a greater shooter bias against Blacks who are high on perceived Black stereotypicality than those low on perceived Black stereotypicality (Kahn & Davies, 2011). For example, in the work of Kahn and Davies (2011), it was found that Black individuals high on perceived Black stereotypicality were more likely to be “accidentally shot” during the experiment, than those Black individuals low on perceived Black stereotypicality.

Findings such as these are not limited to the laboratory; an individual’s level of perceived Black stereotypicality can have enormous implications in the criminal justice system. Research by Eberhardt, Goff, Purdie, and Davies (2004) has shown that police officers rate those
individuals who are high on perceived Black stereotypicality as being more likely to be criminal than those individuals low on perceived Black stereotypicality. In a court of law, Blair, Judd, and Chapleau (2004) found that sentences were longer for individuals high on perceived Black stereotypicality than individuals low on perceived Black stereotypicality. Further, work by Eberhardt, Davies, Purdie-Vaughns, and Johnson (2006) showed that an individual’s level of perceived Black stereotypicality was influential in their likelihood of receiving the death penalty for the murder of a White individual. In this research it was found that those individuals high on perceived Black stereotypicality, as compared to those low on perceived Black stereotypicality, were over twice as likely to be sentenced to death for crimes against White victims (Eberhardt et al., 2006). The importance and influence of the work by Eberhardt et al. (2006) cannot be ignored. The researchers were able to show that the decision to end another individual’s life rested solely on how stereotypically Black the defendant was perceived to be. This effect was found even when controlling for a variety of factors (e.g., aggravating/mitigating circumstances, severity of the murder, defendant/victim SES, and defendant attractiveness). Previous research in Canada and the United States established a link between perceived Black stereotypicality and crime, but the work of Eberhardt et al. (2006) expands on this research to show how perceived Black stereotypicality can not only impact perceptions of criminality, but also perceptions of “deathworthiness” (p. 385).

It is important to note that perceived Black stereotypicality is a socially-relevant concept that affects individuals from a variety of cultural and racial backgrounds (Osborne & Davies, 2012). For example, research has shown a preference for low perceived Black stereotypical individuals to marry individuals also low on perceived Black stereotypicality, rather than individuals high on perceived Black stereotypicality (Freeman, Armor, Ross, & Pettigrew, 1966). Further, work by Harvey (1995) discusses the difficulties lighter skinned Black individuals face in appearing to lack the strength and masculinity often conveyed by their darker skinned
counterparts. These works highlight that biases in perceived stereotypicality exist both outside and within the Black community.

Research suggests that there is a relationship between what a person looks like, and what crime they are likely to commit (Bull & Green, 1980; Goldstein, Chance, & Gilbert, 1984; Gordon, Michels, & Nelson, 1996; Jones & Kaplan, 2003; MacLin & Herrera, 2006; Shoemaker, South, & Lowe, 1973; Sunnafrank & Fontes, 1983). In the case of perceived Black stereotypicality, features that are characteristic of high perceived Black stereotypicality (e.g., broad nose, full lips, dark skin tone) are thought to impact the observer’s memory of the individual more so than those characteristics of low perceived Black stereotypicality. Indeed, Corneille, Huart, Becquart, and Bredart (2004) found that the presence of strong ethnic features was to blame for the distortion in the participant’s memory for facial characteristics.

Expectations about what type of person commits what type of crime can influence the image individuals retrieve when having to make their identification (Araya, Ekehammar, & Akrami, 2003; Lenton, Blair, Hastie, 2001; Sherman, Groom, Ehrenberg, & Klauer, 2003). In this way, memories are encoded in a stereotype-consistent way (Martin & Halverson, 1981; Pendry & Macrae, 1999), and they become reconstructions rather than reproductions of real-world events (Osborne & Davies, 2012). The way in which an individual’s memory is reconstructed is central to the current research.

1.4 The Contextual Model of Eyewitness Identification (CMEI)

To better understand the issues surrounding race and crime type, Osborne and Davies (2012) conducted a series of studies comparing different crimes in terms of their seriousness, violence, and associated race. Forty-seven separate crimes were selected for analyses as they were considered to be major crimes in the United States (FBI Report, 2009). The researchers had undergraduate students rate these crimes across the three dimensions discussed above (i.e.,
seriousness, violence, and associated race). The crimes were rated for seriousness and violence using a 7-point Likert scale ranging from -3 (Not at All) to 3 (Extremely), and for associated race using a 7-point Likert scale ranging from -3 (Definitely White) to 3 (Definitely Black). The results of these studies concluded that crimes such as “drive-by shooting”, “carjacking”, and “street gambling” were found to be highly stereotypical Black crimes, while “hate crime”, “embezzlement” and “serial killing” were found to be highly stereotypical White crimes.

From the above analyses, Osborne and Davies (2012) reanalyzed the highly stereotypical Black and White crimes to identify a pair of crimes that were equal in seriousness and violence, but differed in terms of associated race. The researchers were able to identify a pair of crimes that were rated by participants as similar in seriousness and violence, but significantly differed in terms of the racial group believed to commit each crime. It is important to note that in order to isolate the effects of the stereotypicality of crime type on eyewitness recall, seriousness and violence of the crime must be controlled because both of these factors are strongly linked with the Black stereotype. The analyses uncovered that the crimes of “drive-by shooting” and “serial killing” were appropriate as they matched on seriousness and violence (\(M = 2.67\) vs. \(M = 2.82\), and \(M = 2.67\) vs. \(M = 2.76\) respectively), but differed significantly in terms of associated race (\(M = 2.36\) vs. \(M = -1.27\)). That is, while matched on seriousness and violence, drive-by shooting was rated a highly stereotypical Black crime, while serial killing was rated a highly stereotypical White crime (see Figure 1). These findings support the use of the pair of crimes, drive-by shooting and serial killing, in the present research.

The current research is also based on the Contextual Model of Eyewitness Identification (CMEI) as developed by Osborne and Davies (2012). This model combines the literature of stereotype activation, perceived stereotypicality, and stereotype-consistent memory biases (Osborne & Davies, 2012). Specifically, this model suggests that the type of crime committed influences the identification process. As the researchers discuss, crime types are hypothesized to
activate related stereotypes about the appearance of the perpetrator. In the case of perceived stereotypicality, the CMEI would suggest that crime types influence the eyewitnesses’ memory of the perpetrator’s perceived stereotypicality (Osborne & Davies, 2012). The CMEI can further be applied to perceived Black stereotypicality. According to the CMEI, crime type is thought to influence the eyewitnesses’ memory of the perpetrator’s perceived Black stereotypicality. In other words, a stereotypically White crime (e.g., serial killing) would cause individuals to remember the perpetrator as lower on perceived Black stereotypicality (e.g., darker skin tone, broader nose, fuller lips), than a stereotypically Black crime (e.g., drive-by shooting). In this way, crime types are influencing eyewitness recall by activating related stereotypes that are changing the way in which the memory of the perpetrator is committed to memory (see Figure 2). Osborne and Davies (2012) were able to show that activated racial stereotypes about a given crime type can influence an eyewitness’ memory of perceived stereotypicality for that perpetrator of that given crime.

Through the work of Osborne and Davies (2012) it was determined that participants who were shown a video of a suspect of a highly stereotypical Black crime remembered the Black target as being higher on perceived Black stereotypicality than in reality. These findings occurred even though all that was manipulated in the study was the type of crime. Osborne and Davies (2012) were able to show not only when eyewitness errors were likely to occur, but also who was likely to be a victim of these errors. The current research aims to expand on this research by including victim characteristics, and measuring their influence on eyewitness recall in conjunction with crime type.

1.5 New Directions and Overview of the Current Paradigm

Victim characteristics play a large role in the criminal justice system, especially with regards to sentencing (Glaeser & Sacerdote, 2003). For example, victim characteristics such as
race are influential in homicide sentencing even when controlling for all other aspects of the homicide (Tonry, 1995; Waldfogel, 1996). Of relevance to this research, Auerhahn (2007) found that the race (and gender) of the victim significantly influenced the length of sentencing in non-capital homicide cases.

In terms of race, research has shown that Black individuals convicted of murder receive shorter sentences if the victim is Black, and longer sentences if the victim is White (Glaeser & Sacerdote, 2003). Not all Black individuals convicted of murdering White individuals are treated the same, however. As discussed, Eberhardt, Davies, Purdie-Vaughns, and Johnson (2006) found that the more stereotypically Black the defendant was perceived to be, the more likely that person was to be put to death for murdering a White individual. This finding supports the work of numerous researchers who have previously examined the factors that influence sentencing (Baldus, Pulaski, & Woodworth, 1983; Baldus, Woodworth, & Pulaski, 1985, 1990, 1994; Baldus, Woodworth, Zuckerman, Weiner, & Broffitt, 1998; Bowers, Pierce, & McDevitt, 1984; Gross & Mauro, 1989).

The work of Eberhardt et al. (2006) found that the perceived Black stereotypicality of the defendant influenced the likelihood of a death sentence but only when the victims were White. In other words, the perceived Black stereotypicality of the defendant did not significantly predict the likelihood of perpetrators receiving the death sentence when targeting Black victims. The researchers note that the race-salience hypothesis may help to explain this discrepancy (Eberhardt et al., 2006). According to this hypothesis, the interracial nature of crimes involving Black defendants and White victims brings the issue of race to the forefront. In crimes involving Black defendants and Black victims, however, the issue of race is not as salient. Instead, individuals are more inclined to attribute the crime to conflict within individuals rather than conflict between groups (Prentice & Miller, 1999). The way in which individuals attribute race conflict (i.e., interpersonal vs. intergroup) will be examined in the present research. The focus
will be on victim characteristics in conjunction with crime type (i.e., drive-by shooting and serial killing) to examine the combined influence of victim characteristics (i.e., race) and crime type on eyewitness recall of perceived stereotypicality.

Given the findings of Eberhardt et al. (2006), it can be inferred that crimes committed by Black adult males targeting White adult male victims may be viewed as more heinous by some individuals than those crimes committed against Black adult male victims. Further support for this hypothesis stems from the work of Polinsky and Shavell (1984) who suggest that certain types of victims are considered more valuable by society. The researchers argue that society is more judgmental of those individuals who target certain types of victims (e.g., children), and will be more likely to endorse sentencing that prevents the perpetrator from committing further harmful acts (Polinsky & Shavell, 1984). The above research is related to the notion of victim deservingness. Research on deservingness suggests a discrimination against Black victims (Carter, 1988). As Carter (1988) notes, the value of a Black individual’s life is worth substantially less; when a Black individual kills a White individual they are over twenty times more likely to receive the death penalty than if they were to have killed a Black individual (Carter, 1988). This discrepancy leads to perceptions that “rationalizes the seeming contradiction” of criminal activity, by “denying that there has been a crime”, in cases with Black rather than White victims (Carter, 1988, p. 447).

As discussed, prior research (Osborne & Davies, 2012) has established that participants who are exposed to a surveillance video of a suspect of a highly stereotypical Black crime (i.e., drive-by shooting) recall the target as higher on perceived Black stereotypicality than participants who are exposed to the same suspect of a highly stereotypical White crime (i.e., serial killing). Prior research (Eberhardt et al., 2006) has also established that perceived Black stereotypicality becomes a critical factor in sentencing when race becomes salient; that is, when a Black male kills a White male. The race of the victim, in conjunction with crime type, will be
examined in the present research to determine the influence each has on accuracy of eyewitness recall. It is hypothesized that the race of the victim, in conjunction with crime type, will influence eyewitness recall of perceived stereotypicality.

There are several reasons to expect that the race of the victim would exacerbate the established crime type effect of eyewitness recall of perceived stereotypicality. For one, the race-salience hypothesis suggests that the nature of crime is a product of interpersonal or intergroup conflict (Prentice & Miller, 1999). As discussed, perceived stereotypicality proves influential in cases where the crime is interracial in nature (Eberhardt et al., 2006). In other words, this occurs in situations where a Black individual targets a White individual. Cases in which a Black individual targets a Black individual are deemed interpersonal in nature, and are considered less racially salient than those conflicts that are intergroup in nature. Further, as has been discussed through the work of Kahn and Davies (2011), higher perceived stereotypicality equates to higher perceived criminality. Individuals high on perceived Black stereotypicality were more likely to be shot for mistakenly being seen as carrying a weapon than those individuals low on perceived Black stereotypicality. Through this research it was found that the level of perceived Black stereotypicality influenced the availability of relevant Black-crime related stereotypes. This in turn contributes to racial biases wherein individuals high on perceived Black stereotypicality are seen as more dangerous and threatening. This is further supported by the work of Eberhardt, Goff, Purdie, and Davies (2004) who found that police officers’ judgments of criminality were directly related to levels of perceived Black stereotypicality, and the work of Blair, Judd, and Chapleau (2004) who uncovered a relationship between level of perceived Black stereotypicality and sentencing decisions. Finally, it is important to consider the view of Canadian and United States’ society that crimes against Whites are more heinous than those against other types of victims (Carter, 1988). When these three lines of research are considered together, they strongly
support that the race of the victim should exacerbate the effects of crime type on eyewitness recall.

Replicating previous research, it is expected that participants who are exposed to a surveillance video of a suspect of a highly stereotypical Black crime (i.e., drive-by shooting) will recall the suspect as higher on perceived Black stereotypicality than participants who are exposed to the same suspect of a highly stereotypical White crime (i.e., serial killing). In addition, it is hypothesized that participants exposed to an individual who is accused of killing White adult males will falsely recall the target as being higher on perceived Black stereotypicality than those participants who are exposed to the same individual accused of killing Black adult males. Finally, it is hypothesized that participants who believe the victims are Black will rate those victims as more deserving than those participants who believe the victims are White.
CHAPTER 2 Methods

2.1 Important Considerations

It is important to note that the methodological procedures used in the current study are built on those used in the work of Osborne and Davies (2012). Their work established a pair of crimes that were equal in seriousness and violence, but significantly differed in terms of race. Further, their work determined that individuals who were exposed to a highly stereotypical Black crime (i.e., drive-by shooting) remembered the target as being higher on perceived Black stereotypicality than those individuals who were exposed to a highly stereotypical White crime (i.e., serial killing). Relying on a paradigm that has been previously used and assessed for its reliability and validity strengthens the current research. It is now possible to include victim characteristics (i.e., race of the victim) and assess them alone for their ability to influence eyewitness recall over and above the established effects of crime type.

2.1 Recruiting Method: Amazon Mechanical Turk

It is necessary to introduce one of the participant recruiting sources, Amazon Mechanical Turk (M-Turk), that was used in this study. The Amazon Mechanical Turk Recruiting System, or M-Turk, is a unique service that allows for “Requesters” (i.e., the researcher), to design “HITs” (i.e., human intelligence tasks), and hire “Workers” (i.e., the participants) to complete these tasks (Amazon Mechanical Turk: About Us, 2013, p. 1). Workers are paid, on average, between $0.25-$1.25/30 minutes for their services. Once a worker has completed a HIT, the Requester is given the decision of either rejecting or accepting their work. Amazon M-Turk provides an inexpensive, but reliable source of data collection, which helps to enhance the external validity of this study (Buhrmester, Kwang, & Gosling, 2011). Buhrmester et al., (2011) note that the quality of data provided by Amazon M-Turk is comparable, if not better, than the data obtained through traditional methods (e.g., collecting data from undergraduates). Instead of relying on
undergraduates as a source of information, Amazon M-Turk allows for greater variability in the type of data collected. Participants are of varying ages, ethnicities, socioeconomic statuses, and locations (Berinsky, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2011; Mason & Suri, 2011). As discussed, this sample diversity helps to increase the external validity of this study.

2.2 Participants

Participants were recruited for this study via the SONA Online Recruitment System at UBC (Okanagan) and the Amazon Mechanical Turk (M-Turk) Recruiting System. Participants who were recruited via SONA (N = 13) were awarded 0.5 course credit compensation for their participation, while those participants who were recruited via Mechanical Turk (N = 597) were awarded $0.25 for their participation. In order for their data to be included in the analyses, the participants would have had to pass a series of manipulation checks. These manipulation checks were designed to confirm if participants were paying attention to the study, by asking questions related to information that was provided to participants multiple times at the beginning of the study (i.e., if the target committed a crime, what crime the target was suspected of committing, if there were victims of the crime, the demographics of the victims, if the target in the identification video was present at the beginning of the study, and what colour sweatshirt the target was wearing). Further, those participants who did not express confidence in their identification (i.e., slightly uncertain, uncertain, or very uncertain) were removed from the analyses. In total, 610 participants passed the manipulation checks and confidence rating check, and as such, their data was included in the analyses.

Collapsing across both recruitment sources, participants ranged in age from 18 years of age to 73 years of age (M = 30.75, SD =10.71), were relatively equally represented in terms of gender (Males: N = 280, Females: N = 330), and self-identified as either White (N = 430), Black
(N = 52), Latino/a (N = 31), Asian (N = 74), or “Other” (N = 23). In the case of an “Other” designation, participants were asked to provide a description of their race/ethnicity. Amazon M-Turk participants (N = 597) were asked further demographic questions concerning their level of education (M = 3.32: College Diploma/Degree), income (M = 4.37: $40,000-$49,999), place of residency (majority from Canada and the US), and type of residency (city vs. rural, N = 443 and 154 respectively). For more details regarding the demographics of the Amazon M-Turk participants please refer to Tables 1-4.

2.3 Design

This study was a 2 (Crime Type: Stereotypically Black vs. Stereotypically White) x 2 (Race of Victim: Black vs. White) between-participants design. The primary dependent variable in this study was the participants’ memory of the target’s perceived Black stereotypicality on a scale of 0-100 with a score of “0” representing the lowest score of perceived Black stereotypicality, and a score of “100” representing the highest score of perceived Black stereotypicality. As will be discussed, the value on the dependent measure is the frame at which participants stopped the target identification video. The secondary dependent variable, perceived deservingness of the victims, was measured on a scale of 0-100 with a score of “0” representing the lowest score of perceived deservingness, and a score of “100” representing the highest score of perceived deservingness.

2.4 Materials

Four covariate measures were included in this research: the Social Dominance Orientation (SDO) Scale, the Right-Wing Authoritarianism (RWA) Scale, the Modern Racism (MR) Scale, and the Need for Closure (NFC) Scale. These measures used in conjunction form an excellent individual differences measure for contemporary racism. It is important to note that these measures are not included in the analyses for mediation or moderation purposes, but rather
as covariates, as a way to control for individual differences in level of racism that random assignment may have missed.

2.4.1 Social Dominance Orientation (SDO) Scale.

The 14-item Social Dominance Orientation (SDO) scale is used to measure individual beliefs that certain groups should dominate (Pratto, Sidanius, Stallworth, & Malle, 2004). Specifically, the SDO scale measures “an individual’s degree of preference for inequality among social groups” (p. 741). In other words, this scale helps to measure an individual’s desire for ingroup over outgroup domination (e.g., ingroup superiority). It is postulated that individuals scoring high on the SDO scale will favour hierarchical ideologies, where there is clear division between superior and inferior groups (Pratto, Sidanius, Stallworth, & Malle, 2004). This scale helps to identify individual attitudes and opinions towards intergroup relations. Examples of questions from this scale would include: “some groups of people are simply inferior to other groups”, “inferior groups should stay in their place”, and reversed scored items such as “group equality should be ideal”, and “no group should dominate in society”. A complete list of the SDO scale questions that were used in this study can be found in Appendix I.

2.4.2 Right-Wing Authoritarianism (RWA) Scale.

A shortened version (15-items) of the Right-Wing Authoritarianism (RWA) scale was used to measure authoritarian attitudes (Zakrisson, 2005). The RWA scale measures “conventionalism, authoritarianism submission, and authoritarian aggression” (Ekehammer, Akrami, Gylje, & Zakrisson, 2004, p. 465). Individuals scoring high on RWA “tend to favour traditional values, are submissive to authority figures, are highly ethnocentric, and can be expected to act aggressively towards outgroups” (Altemeyer, 1998 as cited in Ekehammer et al., 2004, p. 465). In other words, it would be expected that high RWA individuals would act negatively towards outgroups, and as such, may have stronger views in terms of punishment for
crimes committed by those groups. In particular, research has shown that scores on the RWA scale correlate with negative attitudes toward Black individuals (Altemeyer, 1998; Lambert & Chasteen, 1997), and is related to blatant and subtle forms of prejudice (van Hiel & Mervielde, 2002). As Ekehammar et al., (2004) note, the RWA scale is a useful tool in determining level of prejudice and negative attitudes towards outgroup members. Questions from this scale include, “our country needs a powerful leader, in order to destroy the racial and immoral currents prevailing in society today”, and “there are many radical, immoral people trying to ruin things; the society ought to stop them”. Reverse scored items for this scale include, “people ought to put less attention to the Bible and religion, instead they ought to develop their own moral standards”, and “it is better to accept bad literature than to censor it”. A complete list of the RWA scale questions that were used in this study can be found in Appendix I.

2.4.3 Modern Racism (MR) Scale.

The 9-item Modern Racism Scale measures both subtle racism (modern) and overt racism (Akrami, Ekehammar, & Araya, 2000). As McConahay (1986) notes, this scale aims to measure racial attitudes, and asks participants to agree or disagree with a set of beliefs about minorities. Although originally intended to ask White individuals about beliefs about Black individuals (McConahay, 1986) this scale has been revised to ask questions regarding minorities in general. This scale includes subtle racism questions such as, “it is easy to understand the anger of minority people in Canada” and overt racism questions such as “over the past few years, the government and news media have shown more respect for minorities than they deserve”. The goal of this scale is to identify racial attitudes towards minority groups that may lead to individual differences in racist beliefs. A complete list of the Modern Racism scale questions that were used in this study can be found in Appendix I.
2.4.4 Need for Closure (NFC) Scale.

A shortened version of the Need for (Cognitive) Closure Scale (15-items) helps to identify an individual's level of motivation in terms of judgment and information processing (Webster & Kruglanski, 1994). This scale is important for inclusion in this study as it helps to identify individuals’ motivation for information processing and judgment. Individuals scoring low on this measure would show low levels of motivation to process information, and would be less likely to accept authoritarian ideologies, supporting instead conservative ideologies that “rely on tradition and are aimed at societal stability” (Kossowska & Hiel, 2003, p. 501). Further, an individual with a heightened need for closure would be more likely to react negatively to “individuals who disrupt closure (e.g., someone whose opinion deviates in a group) (Webster & Kruglanski, 1994, p. 1050). Arguably, some individuals may believe that minority groups may represent individuals who disrupt closure. Examples of questions from this scale include, “I don’t like situations that are uncertain”, and “I don’t like to be with people who are capable of unexpected actions”. A complete list of the Need for Closure scale questions that were used in this study can be found in Appendix I.

2.5 Procedure

For both recruiting sources (i.e., SONA and Amazon M-Turk), this study was provided as an online survey via Qualtrics. Qualtrics is an online survey software program that allows for researchers to develop highly sophisticated survey-based studies for their research (Qualtrics Lab Inc., 2008). Researchers develop their studies via this software, and once the study has been designed, researchers are provided with a research study link that they can provide to participants to complete their study. All of the participants’ data is stored in the Qualtrics database, and is fully accessible by the researcher.

When participants from SONA registered to participate in the study (see Appendix A)
they were provided with the link to the study, a consent form, and an identification number. This identification number was used to help ensure confidentiality of the participant’s data, but allow for researchers to identify and remove data if need be. Once the participants completed the study on SONA they were compensated with 0.5-course credit for SONA. Participants were provided with course credit regardless of any reported problems, or inability to complete the study properly.

Amazon M-Turk participants were provided the link to the study via the recruitment ad on Amazon (see Appendix A), and the consent form was built into the study rather than externally provided via email. M-Turk participants were asked to enter their unique M-Turk ID so that completion could be tracked, and payment could be provided. As discussed above, M-Turk participants were awarded $0.25 for their participation once they submitted their request for payment based on completing the study. All participants were provided with a consent form (see Appendices B & C) prior to participating in the study. This consent informed participants that the study would take approximately 30 minutes to complete, and explained how they would be compensated either in credit or cash as determined by their respective recruitment source (i.e., SONA vs. Amazon M-Turk).

After consenting to participate in the study, all participants were told that they were about to watch a surveillance video of a suspect leaving a building. The surveillance video shows a moderately stereotypical Black male exiting an ambiguous building carrying nothing in his hands (see Osborne & Davies, 2012). Participants were randomly assigned to one of two experimental conditions: surveillance video of a suspect of a highly stereotypical Black crime (i.e., drive-by shooting), or highly stereotypical White crime (i.e., serial killing). It is important to note that the two surveillance videos were exactly the same, and differed only in terms of what crime the target was suspected of committing. To illustrate, participants were told: “You are about to see a short (about 15 seconds) surveillance video of a suspected drive-by shooter leaving a building”
or “You are about to see a short (about 15 seconds) surveillance video of a suspected serial killer leaving a building”. There is no other unique aspect to each video; in both videos the target is seen leaving the building carrying nothing in his hands, and participants do not actually see the target commit a crime. After watching the surveillance video, participants were told that there were three victims of the crime (see Appendices D & E). Participants were then randomly assigned to view a set of three photographs that were either all Black male adults or all White male adults. Please refer to Appendix F for the victim photographs.

After viewing the victim photographs, participants were asked to read an unrelated article on visual processing for 10 minutes (see Appendix G). This article, *How Photons Start Vision* by Denis Baylor (1996), worked as a cognitive distractor task to conservatively replicate real-world eyewitness identification circumstances (i.e., memory impairment from the duration of time between the event and recall for the event). Participants were told that this article on the visual system would help them understand how visual information is processed in the brain, and that it would increase their performance on the latter parts of the study. To avoid instilling feelings of stress or anxiety, at the end of the 10 minutes participants were informed that it was not necessary to have finished reading the whole article, as many people do not finish in the length of time provided.

After reading the article, participants were asked to identify the target that they saw in the surveillance video at the beginning of the study. Participants were shown a video, created using FantaMorph version 4.0 (Abrosoft, 2007) that transitions between faces. The morphing video goes through 100 frames in 10 seconds, and participants are asked to stop the morph at the exact moment when the face matches their memory of the target they were exposed to at the beginning of the study. The first frame represents the lowest value of perceived Black stereotypicality, and the 100th frame represents the highest level of perceived Black stereotypicality (see Figure 3). The target of this study was computer generated to be exactly at the midpoint—the 50th frame.
Previous studies determined that the direction of the stereotypicality in the video (i.e., low-high vs. high-low) was not significant. Therefore, the direction of low to high stereotypicality was arbitrarily selected. Qualtrics records the exact moment the participant chooses to stop the morph, which allows for a rating of 0 (low perceived Black stereotypicality) to 100 (high perceived Black stereotypicality) to be determined. To ensure that participants were familiar with the morphing software before having to make their judgments, a practice trial was given prior to the target identification task.

Following the identification task, participants were asked a series of questions to ascertain a level of confidence in the identification. Participants were also asked a series of questions to confirm that they were paying attention during the study, and did not experience any difficulties with the program or the study (see Appendix H). These manipulation check questions were used to identify potential sources of error in the data, and to confirm that the study was accessible across multiple domains (e.g., Mac vs. PC). Participants were also asked to provide a rating of how deserving the three individuals from the beginning of the study were to be victims of the purported crime. This rating was given on a slider scale from 0-100, with a score of “0” indicating that the victims were not at all deserving, and a score of “100” indicating that the victims were completely deserving.

Four questionnaires were then given to each participant: The Social Dominance Orientation (SDO) Scale, the Right-Wing Authoritarianism (RWA) Scale, the Modern Racism (MR) Scale, and the Need for Closure (NFC) Scale. These questionnaires were provided on a 7-point Likert scale, where participants had to express their level of disagreement or agreement with the statements (e.g., 1 = strongly disagree, 7 = strongly agree). A detailed list of the questions from the questionnaires can be found in Appendix I.

After completing the four questionnaires, participant demographics were collected. These demographic questions asked about participant characteristics such as age, gender, and
race/ethnicity, and for those participants outside of SONA, level of education, income, and location (see Appendices J & K). Lastly, questions regarding what the participant thought were the hypotheses of the study, as well as feedback for the study, were provided as a way of identifying if the participant encountered any problems, and if the study required any changes. Participants were then thanked and debriefed. Debriefing forms were included in the study, and were not emailed to the participants. These debriefing forms explained the hypotheses of the study, and the expected outcomes of the study. A copy of the debriefing form that was provided to participants can be found in Appendix L.

It is important to emphasize the strength of the simplicity of this study’s design. As discussed, this study was a 2 x 2 between-participants design with the only difference between conditions being the purported crime (i.e., drive-by shooting vs. serial killing) and the purported victims (i.e., White adult males vs. Black adult males). Participants saw the exact same surveillance video in each condition that differed only in terms of the crime the target was suspected of committing. The surveillance videos did not show the target actually committing the purported crime, just the target leaving a building. In terms of victims, participants either saw three White adult males, or three Black adult males. Participants were not told any information with respect to the relationship between the target and the victims, nor were they provided any information to justify the actions towards them (e.g., provoked the target, harmed the target etc.). The simplicity of this study’s design helps to strengthen the importance of our findings by eliminating potential confounds, and ensuring that only the relevant factors (i.e., crime type and race of victim) could influence the eyewitness recall process.
CHAPTER 3 Results

3.1 Data Analyses

The results of this study confirmed our hypothesis that crime type has a significant influence on the level of recalled perceived Black stereotypicality, $F(1, 602) = 6.94, p = .009$, partial $\eta^2 = .011$ (see Table 6 and Figure 4). Specifically, those individuals who witnessed the surveillance video of a suspect of a highly stereotypical Black crime (i.e., drive-by shooting) recalled the target to be higher on perceived Black stereotypicality ($M = 54.03$), than those participants who witnessed the surveillance video of the same suspect, but of a highly stereotypical White crime (i.e., serial killing) ($M = 50.18$) (see Table 5). It is important to acknowledge that participants were never shown a video of the target actually committing the proposed crime, and the surveillance videos only differed in terms of the crime-type description. These findings provide support for past research conducted by Osborne and Davies (2012) who also found a significant effect for crime type on eyewitness recall.

Our hypothesis that the race of the victim would influence the effect of crime type on eyewitness recall was not supported by our data. In other words, presenting information that the victims of the purported crime were either Black adult males ($M = 53.09$) or White adult males ($M = 50.74$) did not significantly impact the level of recalled perceived Black stereotypicality for the target, $F(1, 602) = 2.28, p = .132$.

It is important to note that the following covariates were included in the analyses of crime type and victim characteristics on the influence of eyewitness recall: Social Dominance Orientation (SDO), Right-Wing Authoritarianism (RWA), Modern Racism (MR), and Need For Closure (NFC). As discussed, these covariates were not included in the analyses for mediation or moderation purposes, but rather as covariates, as a way to control for individual differences in level of racism. Of the four covariates, only NFC and MR were found to be significant.
covariates, $F(1, 602) = 7.29, p = .007$, partial $\eta^2 = .012$, and $F(1, 602) = 8.79, p = .003$, partial $\eta^2 = .014$ respectively (see Table 6). Further data regarding the covariates can be found in the correlation matrix provided in Table 7.

As predicted, the effect of victim race on the perceived deservingness of the victims was significant, $F(1, 606) = 3.981, p = .046$, partial $\eta^2 = .007$ (see Table 9 and Figure 5). Specifically, it was found that Black adult males were considered more deserving as victims of crime ($M = 6.90$), than White adult males ($M = 4.53$), regardless of the purported crime type (see Table 8). The influence of crime type on the deservingness rating of the victims, however, was not significant $F(1, 606) = .152, p = .696$.

It should be noted that for the above findings regarding eyewitness recall of perceived stereotypicality and victim deservingness, gender, race/ethnicity, and age of the participants did not significantly affect the findings. In other words, there were no significant gender, race/ethnicity, or age differences amongst the participants. Further, with respect to the M-Turk participants specifically, there were no significant differences in terms of location (i.e., place of residence), education, or income. These findings would suggest that the effect of crime type on eyewitness recall of perceived stereotypicality, and race of victim on deservingness, are present irrespective of external individual factors such as race/ethnicity, gender, age, location, education or income.
CHAPTER 4 Discussion

4.1 Limitations and Future Directions

The results of this research replicated and confirmed the work of Osborne and Davies (2012) who found that crime types are influential in the eyewitness recall of perceived stereotypicality. It was expected that the race of the victim would exacerbate the established crime type effects of eyewitness recall. The race of the victims did not significantly exacerbate the effect of crime types, but it did significantly influence participants’ judgments of deservingness. Black victims were rated as more deserving than White victims irrespective of crime type. Given the discussed literature, it was expected that the participants’ memory for the target would be higher on perceived Black stereotypicality for White victims, than for Black victims. The fact that the race of the victim did not exacerbate the effect of crime type is interesting, and could provide the basis for a series of future studies.

One potential reason that the race of the victim did not exacerbate the effects of crime type on eyewitness recall may be due to the specific nature of the crimes chosen. Future research could examine other pairs of crimes that are equal in seriousness and violence, but differ in associated race, to see if there was anything unique about the chosen pair of crimes that would negate the expected influence of victim’s race. For example, it may be that serial killing and drive-by shooting are just too serious for victim characteristics to have any added impact. Further, it may be prudent to examine pairs of crimes that are associated with victims of a particular race to see if that could exacerbate the effects of crime type on eyewitness recall. In this way, future research would examine not only the seriousness and violence of the pair of crimes, but also the impact that victim race-specific crimes have on eyewitness recall.

Another potential explanation as to why the race of the victim did not exacerbate the effect of crime type stems from the work of Gordon, Bindrim, McNicholas, and Walden (1988).
Gordon et al. (1988) manipulated the type of crime committed, and the race of the defendant, and asked participants to provide sentences and bail amounts. The researchers found that Black defendants who committed a stereotypical Black crime (e.g., burglary) received longer sentences than White defendants who were accused of committing the same crime. The opposite findings were found for White defendants who committed a stereotypical White crime (e.g., embezzlement); that is, Whites received longer sentences than Blacks. In other words, the researchers found that jurors tended to show more leniencies towards defendants accused of crimes uncommon to their race. This finding may have confounded the present research. As discussed earlier, it was assumed that having Blacks targeting White victims would exacerbate the seriousness of the crimes; however, Gordon et al.’s (1988) work suggests that it may have simply made drive-by shooting a less stereotypical Black crime in the perceiver’s mind. If this were correct, having Black perpetrators of a drive-by shooting targeting White victims would only undermine the established crime type effects.

It is important to discuss the current findings with respect to the cross-race effect. As discussed earlier, the cross-race effect suggests that individuals are more accurate at remembering faces of their own race rather than those of a different race (Behrman & Davey, 2001; Brigham, Maass, Snyder & Spaulding, 1982; Kramer, Buckhout, & Eugenio, 1990; Meissner & Brigham, 2001; Pezdek, Blandon-Gitlin, & Moore, 2003; Platz & Hosch, 1988; Wright, Boyd, & Tredoux, 2001). The present research was not examining the cross-race effect because the target used in our dependent measure did not differ in race; rather, he was a single individual who differed in perceived stereotypicality. Even at the lowest point of perceived stereotypicality (i.e., 0 on our scale of 0-100) the target was universally perceived to be Black. That is to say, we were not testing whether our suspects were better at identifying various races, but rather whether the stereotypicality of the crime they were exposed to influenced the stereotypicality of their recall for the suspect.
Presenting separate individuals of varying stereotypicality provides one avenue for future research. Our study focused on the gradients of stereotypicality for one individual, which is not representative of real-world lineup procedures. Future research could focus on the inclusion of multiple suspects ranging from low perceived Black stereotypicality to high perceived Black stereotypicality. In this way, the eyewitness identification process would shift from differences within individuals to differences between individuals, and thus have far more mundane realism.

Future research in this paradigm could also involve the exploration of other victim characteristics such as gender and age. With respect to gender, male perpetrators’ sentences tend to be longer for female victims than for male victims (Curry, Lee, & Rodriguez, 2004; Franklin & Fearne, 2008). Specifically, Curry et al., (2004) studied samples of offenders convicted of various violent crimes (e.g., homicide, assault, sexual assault, robbery), and found that those male offenders who targeted against females received longer sentences than female offenders who targeted males. Further, research by Curry (2010) found that violent offenders who targeted Hispanic and/or White females, but not Black females, received 30% longer sentences.

With respect to age, surprisingly little research has been done to establish the differences in sentencing for crimes involving child victims versus adult victims. Kleinfield (2012) discussed how criminal law has perpetuated the belief that is worse to commit a crime against a child or an elderly individual, rather than commit the same crime against an adult. Furthermore, the work of Garvey (1998) examined aggravating and mitigating factors present in 41 capital murder cases in South Carolina. He interviewed the jurors involved in all of these cases, and found that the majority endorsed the death penalty in cases where the victim was a child. Admittedly, research in this specific area is limited, and the goal of future research should be to determine if differences exist in terms of eyewitness recall of perceived stereotypicality across gender, and for child victims versus adult victims.
A final avenue of exploration for the current research could involve the incorporation of Terror Management Theory (TMT). Put simply, TMT is a theory that addresses the paradox of an individual’s “biological inclination toward self-preservation” and the reality that life is finite, and we can cease to exist at any given time (Solomon, Greenberg, & Pyszczynski, 2004, p. 17). The “terror” that is created within us from this realization is managed through the development and maintenance of cultural worldviews. As Solomon et al., (2004) discuss, culture worldviews are beliefs about the world that help individuals find internal meaning and value. In terms of criminality, work by Greenberg, Solomon, and Ardnt (2008) suggest that TMT may provide a way of understanding how legal decision-making is influenced by external psychological factors. Specifically, cultural violations such as crime may threaten an individual’s worldview, and that may cause an increase in punitive attitudes. Support for this notion can be seen in the work of Bradley and Kennison (2012) who found that reminding individuals of their own death (i.e., mortality salience) caused participants to perform worse on a weapon bias task (see Payne, 2001), and that such errors were greater in conditions involving Black versus White faces. Incorporating TMT, and mortality salience specifically, will help to increase the mundane realism of our work. It is common that witnesses to a crime can feel threatened, and during violent crimes can even be concerned for their survival, so reminding our participants of their own mortality prior to witnessing a crime could help to bring our paradigm closer to real-world conditions.

4.2 Implications and Conclusion

The implications of the current research are profound for understanding perceptions of race in Canada and the United States. As discussed, there have been 310 post-conviction DNA exonerations in the United States alone, since 1989. A large majority of these exonerations were due to errors in eyewitness identification. As Carter (1988) notes, lawmakers and juries are going
to continue to bring misconceptions and stereotypes of individuals into legal settings, so long as those misconceptions and stereotypes continue to exist in society. As discussed, stereotypes are automatic (Schater, Gilbert, & Wegner, 2011), and are hard to alter even in the face of disconfirming evidence (Johnston & Macrae, 1994; Rothbart, 1981). Given this, it is important for researchers to focus on how these stereotypes develop, maintain, and influence judgments of others. This is especially true with regards to crime, and eyewitness identifications. Our research has demonstrated that crime types can influence the level of eyewitness recall of perceived stereotypicality. It is our hope, by conducting further research on these issues, judges, lawyers, and jurors, will be made aware of how certain crimes become associated with certain races, and how these associations impact witnesses’ perceptions of who commits what crimes. The goal of future research will be to identify not only when errors in judgment, especially in terms of race and crime, are likely to occur, but also who is likely to fall victim to those errors, and what safeguards need to be put in place to protect those individuals from being wrongfully accused.
References


List of Tables

Table 1

*Amazon M-Turk Participant Characteristics – Highest Level of Education Completed*

<table>
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*Amazon M-Turk Participant Characteristics – Place of Residency* 

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Amazon M-Turk Participant Characteristics – Type of Residency

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*Descriptive Statistics (Recall of Perceived Stereotypicality)*

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<td>Black Adult Male</td>
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</tr>
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<td></td>
<td>Total (Collapsed)</td>
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</tr>
<tr>
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Table 6

*Tests of Between-Subject Effects: SPSS Output (Recall of Perceived Stereotypicality)*

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<th>Sig.</th>
<th>Partial Eta Squared</th>
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*Correlation Matrix (Recall of Perceived Stereotypicality)*

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<td><strong>MRTotal</strong></td>
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<tr>
<td></td>
<td>Sig. (2-tailed)</td>
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<td>.000</td>
<td>.000</td>
<td>.000</td>
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<td>N</td>
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Table 8

*Descriptive Statistics (Victim Deservingness)*

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<td>Drive-By Shooting</td>
<td>Black Adult Male</td>
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<td>Serial Killing &amp;</td>
<td>Black Adult Male</td>
<td>6.90</td>
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*Tests of Between-Subject Effects: SPSS Output (Victim Deservingness)*

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<th>Sig</th>
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<td>320.66</td>
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Figure 1. Mean values on the given dimensions for drive-by shooting and serial killing. The dimensions of “Serious” and “Violence” are rated on a scale of -3 (Not at all) to 3 (Extremely), while the dimension of “Race” is rated on a scale of -3 (Definitely White) to 3 (Definitely Black). Drive-by shooting and serial killing differ significantly in terms of race (Black vs. White). **$p < .01$ (Osborne & Davies, 2012).
Figure 2. The Contextual Model of Eyewitness Identification as developed by Osborne and Davies (2012). This model forms the theoretical foundation for the current research. As the researchers note crime type is thought to influence eyewitness identification by way of stereotype activation.
Figure 3. Beginning and end frames of FantaMorph version 4.0 computer software. The image on the left represents the first frame of the video (lowest value of perceived Black stereotypicality), while the image on the right represents the 100th frame of the video (highest level of perceived Black stereotypicality). The arrow represents the direction of the stereotypicality in the video (low-high). The dependent variable is a continuous measure from 0-100, and is measured as the frame at which participants stop the video. As the images show, someone higher on perceived Black stereotypicality will have a darker skin tone, broader nose, and thicker lips, than someone lower on perceived Black stereotypicality.
Figure 4. Mean results of the effect of crime types on eyewitness recall. Individuals who witnessed the surveillance video of a suspect of a highly stereotypical Black crime (i.e., drive-by shooting) recalled the target to be significantly higher on perceived Black stereotypicality ($M = 54.03$), than those participants who witnessed the surveillance video of the same target but of a highly stereotypical White crime ($M = 50.18$) (i.e., serial killing), $F(1, 602) = 6.94, p = .009$, partial $\eta^2 = .011$. 
Figure 5. Mean results of the effect of race of the victim on deservingness. Black adult males were found to be more deserving as victims of the crime ($M = 6.90$), than White adult males ($M = 4.53$), $F(1,606) = 3.981, p = .046$, partial $\eta^2 = .007$. 
Appendices

Appendix A

Recruiting Form: SONA/Amazon Mechanical Turk Participants

Recruiting Form: SONA Participants

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<th>Study Information</th>
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<tr>
<td><strong>Description</strong></td>
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Recruiting Form: Amazon Mechanical Turk Participants

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<th>Requester</th>
<th>Shirley Hutchison</th>
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<td>Qualifications Required</td>
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**Eyewitness Memory**

After agreeing to participate in this study, you will be asked to watch a short video of an event. We will then ask you a few questions about the video. In addition to this, we will also ask you to fill out a few questions about yourself (e.g., age, sex, etc.). However, we will never ask you to reveal any information that could be used to connect your identity with your responses. Your participation in this study is entirely voluntary. This study will take approximately 15-30 minutes.

Survey link: [https://acssurvey.qualtrics.com/SV_5ifTa3878PovTR](https://acssurvey.qualtrics.com/SV_5ifTa3878PovTR)
Appendix B

Consent Form: SONA Participants

Consent Form
Eyewitness Recall

Principal Investigator: Paul Davies, Ph.D., Psychology Department, UBC Okanagan, tel: (250) 807-8727, email: paul.g.davies@ubc.ca

Co-Investigator(s): Shirley Hutchinson, M.A. Student, Psychology Department, UBC Okanagan, email: shutchin@interchange.ubc.ca

Sponsor: This study is funded by a UBC Okanagan Office of the Provost Award, held by Dr. Paul Davies.

Purpose: The purpose of this study is to assess the accuracy of eyewitness memory.

Study Procedures: After agreeing to participate in this study, you will be asked to watch a short video of an event. We will then ask you a few questions about the video. In addition to this, we will also ask you to fill out a few questions about yourself (e.g., age, sex, etc.). However, we will never ask you to reveal any information that could be used to connect your identity with your responses.

By clicking the provided link to begin this experiment, you are indicating that you have read the consent form, that you are free to withdraw without consequence at any time, and hereby consent to voluntarily participate in this study.

Potential Risks: There are no known physical or psychological risks associated with this study. You may withdraw from this study at any time if you no longer wish to participate.

Potential Benefits: Participation in this study will increase your knowledge about the accuracy of eyewitness memory and will introduce you to the research experience. At the end of the study you will be provided with a debriefing form including the researchers’ contact information so that you can find the results of this study in the future, if you are interested.

Confidentiality: This online survey company is hosted by Qualtrics, a web survey company located in the USA and as such, is subject to U.S. laws. In particular, the US Patriot Act, which allows authorities access to the records of Internet service providers. Qualtrics has SAS (Statistical Analysis Systems) 70 Certification. It also has met privacy standards for the storage of health care records, as outlined by the Health Insurance Portability and Accountability Act (HIPAA). This survey or questionnaire does not ask for personal identifiers or any information that may be used to identify you. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and accessed in the USA. The security and privacy policy for the
web survey company can be found at the following link: http://www.qualtrics.com/security-statement/

All information collected from this study will be kept confidential. All data will be identified only by code number and kept on password-protected computers for at least five years, as required by the University, before being destroyed. You will not be identified by name in any reports of the completed study.

**Remuneration/Compensation:**
Upon completion of this study, you will be awarded 0.5 credit points toward an eligible course in the Psychology Department. If you can earn credit points in more than one class, you can specify which class you would like to add points to online at http://ubco.sona-systems.com.

**Contact for information about the study:**
If you have any questions or desire further information with respect to this study, you may contact Dr. Paul Davies (by email: paul.g.davies@ubc.ca or phone: 250-807-8727) or Shirley Hutchinson (by email: shutchin@interchange.ubc.ca).

**Contact for concerns about the rights of research subjects:**
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832.

**Consent:**
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time without jeopardy to your class standing. If you would like to withdraw your data from analysis after completion of the online questionnaire, please contact one of the researchers with your participant ID number (for identification purposes) via email to do so.

You will be prompted to provide consent before starting the experiment online, which indicates that you have received a copy of this consent form and that you consent to participate in this study. If you consent to participate in this study, please proceed to the web-link indicated in the email sent to you by the researchers.
Appendix C

Consent Form: Amazon Mechanical Turk Participants

Consent Form
Eyewitness Recall

Principal Investigator: Paul Davies, Ph.D., Psychology Department, UBC Okanagan, email: paul.g.davies@ubc.ca

Co-Investigator(s): Shirley Hutchinson, M.A. Student, Psychology Department, UBC Okanagan, email: shirley.hutchinson@alumni.ubc.ca

Sponsor: This study is funded by a UBC Okanagan Office of the Provost Award, held by Dr. Paul Davies.

Purpose: The purpose of this study is to assess the accuracy of eyewitness memory.

Who may participate: Anyone, 18 years of age or older, is eligible to participate. Participants must reside in Canada or the United States, must be fluent in English, and read at the Grade 12 level. Participants must also have an Amazon Mechanical Turks account in order to receive compensation for their participation.

Study Procedures: After agreeing to participate in this study, you will be asked to watch a short video of an event. We will then ask you a few questions about the video. In addition to this, we will also ask you to fill out a few questions about yourself (e.g., age, sex, etc.). However, we will never ask you to reveal any information that could be used to connect your identity with your responses. This study is expected to take approximately 15-30 minutes to complete.

Potential Risks: There are no known physical or psychological risks associated with this study. You may withdraw from this study at any time if you no longer wish to participate.

Potential Benefits: Participation in this study will increase your knowledge about the accuracy of eyewitness memory and will introduce you to the research experience. At the end of the study you will be provided with a debriefing form including the researchers’ contact information so that you can find the results of this study in the future, if you are interested. Participants will also be offered $0.25 for their participation.

Confidentiality: This online survey company is hosted by Qualtrics, a web survey company located in the USA and as such, is subject to U.S. laws. In particular, the US Patriot Act, which allows authorities access to the records of Internet service providers. Qualtrics has SAS (Statistical Analysis Systems) 70 Certification. It also has met privacy standards for the storage of health care records, as outlined by the Health Insurance Portability and Accountability Act (HIPAA). A unique User ID will be assigned to each participant in order to identify participants’ data which enables us to keep the data you supply us completely confidential; that is there is no way to link your data with a specific individual. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and accessed in the USA. The security and privacy policy for the web survey company can be found at the
following link: http://www.qualtrics.com/security-statement/
All information collected from this study will be kept confidential. All data will be identified only by code number and kept on password-protected computers for at least five years, as required by the University, before being destroyed. You will not be identified by name in any reports of the completed study.

**Remuneration/Compensation:** Upon completion of this study, participants will be offered $0.25 for their participation in this study. Participants will be reimbursed through the online payment system presently established through Amazon Mechanical Turk. In order to be properly reimbursed, these participants will need to have an Amazon Mechanical Turk account. The hotlink below indicates how people can collect money for the task they complete.
(http://aws.amazon.com/mturk/faqs/#How_do_people_collect_money_for_the_tasks_they_complete)

**Contact for information about the study:** If you have any questions or desire further information with respect to this study, you may contact Dr. Paul Davies (by email: paul.g.davies@ubc.ca) or Shirley Hutchinson (by email: shirley.hutchinson@alumni.ubc.ca).

**Contact for concerns about the rights of research subjects:** If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832.

**Consent:** Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time. If you would like to withdraw your data from analysis after completion of the online questionnaire, please contact one of the researchers with your IP address (for identification purposes) via email to do so.
Appendix D

Black Crime/Victim Instructions: SONA/Mechanical Turk Participants

You are about to see a short (about 15 seconds) surveillance video of a suspected drive-by shooter leaving a building.

Pay close attention to the visuals presented in the surveillance video of the suspected drive-by shooter, as you will be asked information about what you saw later in the study.

Please be patient, and allow the video to load. There will be a few extra seconds in the beginning, but the video will play automatically. There will be a few extra seconds at the end, but the page will automatically advance. Please ensure that you keep your mouse cursor off the video in order for the video to play properly.

Click the "Next" button at the bottom of the page when you are ready to see the video.

There were three separate victims of this suspected drive-by shooter. A photo of each victim will be presented. Please pay close attention as the photos will only appear for a short time. Click the "Next" button at the bottom of the page to continue.

When you are ready to see the three separate victims of this suspected drive-by shooter, please click the "Next" button at the bottom of the page. The three victims will appear on the page for 5 seconds, and then the page will auto advance.
Appendix E

White Crime/Victim Instructions: SONA/Mechanical Turk Participants

You are about to see a short (about 15 seconds) surveillance video of a suspected serial killer leaving a building.

Pay close attention to the visuals presented in the surveillance video of the suspected serial killer, as you will be asked information about what you saw later in the study.

Please be patient, and allow the video to load. There will be a few extra seconds in the beginning, but the video will play automatically. There will be a few extra seconds at the end, but the page will automatically advance. Please ensure that you keep your mouse cursor off the video in order for the video to play properly.

Click the "Next" button at the bottom of the page when you are ready to see the video.

There were three separate victims of this suspected serial killer. A photo of each victim will be presented. Please pay close attention as the photos will only appear for a short time.
Click the "Next" button at the bottom of the page to continue.

When you are ready to see the three separate victims of this suspected serial killer, please click the "Next" button at the bottom of the page. The three victims will appear on the page for 5 seconds, and then the page will auto advance.
Appendix F

Victim Photographs: SONA/Amazon Mechanical Turk Participants

Participants were presented with one of the following two conditions.

White Adult Male Victims

THE THREE VICTIMS

Black Adult Male Victims

THE THREE VICTIMS
Appendix G

Cognitive Distractor Task: SONA/Amazon Mechanical Turk Participants

How Photons Start Vision, Denis Baylor
This paper was presented at a colloquium entitled “Vision: From Photon to Perception,” organized by John Dowling, Lubert Stryer (chair), and Torsten Wiesl, held May 20-22, 1995, at the National Academy of Science in Irvine, CA.

How Photons Start Vision  DENIS BAYLOR Department of Neurobiology, Sherman Fairchild Science Building, Stanford University School of Medicine, Stanford, CA 94305

ABSTRACT  Recent studies have elucidated how the absorption of a photon in a rod or cone cell leads to the generation of the amplified neural signal that is transmitted to higher-order visual neurons. Photoexcited visual pigment activates the GTP-binding protein transducin, which in turn stimulates cGMP phosphodiesterase. This enzyme hydrolyzes cGMP, allowing cGMP-gated cationic channels in the surface membrane to close, hyperpolarize the cell, and modulate transmitter release at the synaptic terminal. The kinetics of reactions in the cGMP cascade limit the temporal resolution of the visual system as a whole, while statistical fluctuations in the reactions limit the reliability of detection of dim light. Much interest now focuses on the processes that terminate the light response and dynamically regulate amplification in the cascade, causing the single photon response to be reproducible and allowing the cell to adapt in background light. A light-induced fall in the internal free Ca\(^{2+}\) concentration coordinates negative feedback control of amplification. The fall in Ca\(^{2+}\) stimulates resynthesis of cGMP, antagonizes rhodopsin’s catalytic activity, and increases the affinity of the light regulated cationic channel for cGMP. We are using physiological methods to study the molecular mechanisms that terminate the flash response and mediate adaption. One approach is to observe transduction in truncated, dialyzed photoreceptor cells whose internal Ca\(^{2+}\) and nucleotide concentrations are under experimental control and to which exogenous proteins can be added. Another approach is to observe transduction in transgenic mouse rods in which specific proteins within the cascade are altered or deleted.

Introduction  Vision begins with the conversion of light from the outside world into electrical signals, which can be processed within the retina and sent to the brain. When the conversion fails, as it does in hereditary retinal degenerations, a willing brain is left unable to see. The workings of the first step fix the absolute sensitivity, spectral sensitivity, and temporal resolution of the visual system as a whole. Our understanding of the molecular basis of visual transduction has deepened rapidly in recent years as physiology, biochemistry, and molecular biology have been brought to bear. Insights gained from the study of transduction in photoreceptor cells have helped to elucidate signaling in a wide variety of other cell types that use G-protein-coupled receptors and cyclic nucleotide cascades. My aim in this article is to review some of the accomplishments and gaps in our understanding of visual signal generation.

Electrical and Chemical Signaling in Rods and Cones  Rods and cones have the following structure diagramed in Fig. 1A. The outer segment, containing the visual pigment, is connected to the inner segment, which bears a synaptic terminal
contacting bipolar and horizontal cells. Light absorbed in the pigment acts to close cationic channels in the outer segment, causing the surface membrane of the entire cell to hyperpolarize. The hyperpolarization relays visual information to the synaptic terminal, where it slows ongoing transmitter release. The cationic channels in the outer segment are controlled by the diffusible cytoplasmic ligand cGMP, which binds to channels in darkness to hold them open. Light closes channels by lowering the cytoplasmic concentration of cGMP. The steps that link light absorption to chanel closure in a rod are illustrated schematically in Fig. 1B.

When rhodopsin (R) absorbs a photon its 11-cis-retinal chromophore rapidly isomerizes, causing the cytoplasmic surface of the protein to become catalytically active. In this state, rhodopsin activates the GTP-binding protein transducin (T). Within a fraction of a second a single active R causes hundreds of transducins to exchange bound GDP for GTP, forming active TGTP complexes. A greatly amplified signal now passes to a third protein, cGMP PDE, which is activated by TGTP. Activated PDE hydrolyzes cGMP to 5'-GMP, which cannot open the channel. With cGMP removed, channels close, interrupting a steady inward current of Na+ and Ca2+, thus hyperpolarizing the cell. These activation steps in transduction are now well established (see ref. 1 for review) and their behaviour has been described quantitatively (2).

The events that terminate the response to light are not so well understood. Catalytically active rhodopsin is thought to be shut off by phosphorylation followed by binding of the soluble protein arrestin. The time course of shutoff in vivo as well as the relative importance of phosphorylation and arrestin binding in reducing rhodopsin’s catalytic activity are not yet known however. Active transducin is thought to be shut off by hydrolysis of the GTP bound to it. Although this process proceeds slowly in the test tube, heat measurements on outer segment preparations indicate that it occurs on the subsecond time scale expected from the time course of the electrical response to light (3). In the intact outer segment the GTPase activity of transducin may be accelerated by a specific protein. A candidate for the accelerator is the γ subunit of phosphodiesterase (PDE) (4), which may act in concert with another membrane-bound protein (5). PDE shuts off when its inhibitory subunit, freed by deactivation of TGTP, recombines with the catalytic subunits. Finally, the cGMP concentration is restored to the dark level by cGMP synthesis, which is mediated by guanylate cyclase.

Single Photon Effect
Pioneering psychophysical experiments half a century ago indicated that a retinal rod registers the absorption of a single photon, the smallest unit of light energy (6). Electrical recordings confirm this behaviour and reveal that the elementary response is highly amplified. In a mammalian rode, for example, the quantal response has a peak amplitude of about 1pA and over the entire response the entry of about one million elementary charges into the cell is blocked (7). This amplification is explained by the cascaded reactions that link rhodopsin and the cGMP-activated channels in the surface membrane. Thus, the intense cGMP sink created by the activation of PDE is sufficient to close a few hundred of the 7000 or so channels that are open at any instant in darkness. Further amplification results from the sizeable rate of ion flow through the channels themselves. The single photon response of cones is typically 10-100 times smaller than that of a rod and also considerably briefer. Given these functional differences it is perhaps not surprising that many of the transduction proteins are encoded by different genes in rods and cones (see ref. 1).

Because it involves enzymatic mechanisms, visual transduction proceeds relatively slowly. In a monkey rod, for instance, the single photon response resembles the impulse response of a
multistage low-pass filter with an integration time of about 0.2 s (7). This interval is comparable to the integration time of rod vision measured psychophysically (8), so that transduction itself, rather than subsequent processing in the eye or brain, apparently causes the poor temporal resolution of human rod vision. Although the single photon response of cones is too small to resolve, its average form can be inferred from the shape of the response to a dim flash. In primate cones it resembles the impulse response of a bandpass filter, with a delayed s-shaped rise to a peak and a prominent undershoot on the falling phase (9). The amplitude spectrum of the cone flash response has a peak at a frequency of 5-10 Hz, and the form of the amplitude spectrum resembles the psychophysically determined flicker sensitivity of human cone vision measured under light-adapted conditions (10).

**Dark Noise in Rods and Cones**

Dark noise sets the ultimate limit on the performance of many devices that count photons, and retinal rods are no exception. The electrical noise of rods contains two dominant components that may be confused with photo responses: (a) occasional events resembling responses to single photons (the “discrete” component) and (b) a sustained fluctuation of small amplitude (the “continuous” component) (11). In a monkey rod the discrete noise events occur about once every 2.5 min (7). Psychophysical experiments indicate a similar magnitude for the rod “dark light,” the apparent rate of photon-like spontaneous excitations in dark-adapted rods (12, 13). The temperature dependence of the rate of occurrence of discrete events gives the apparent activation energy of the process producing them as about 22 kcal mol⁻¹ (1 kcal = 4.18 kJ) (11). This is close to the activation energy for thermal isomerization of the 11-cis-retinal (14), suggesting that discrete events arise from thermal isomerization of rhodopsin’s 11-cis-retinal chromophore. Additional evidence for the functional importance of thermal events is provided by behavioural experiments and recordings from retinal ganglion cells which show that the threshold for scotopic vision in toads is limited by a noise source with a very similar rate per rhodopsin molecule and temperature dependence (15). Although thermal activation occurs, it is infrequent: one calculates a 420-year average wait for a rhodopsin molecule at 37°C (7). Cones are electrically noisier than rods, consistent with psychophysical evidence for a larger dark light in cones. In a monkey cone one component of the dark noise has a power spectrum like that of the cell’s dim flash response (9). The photoisomerization rate that would produce an equivalent amount of noise is estimated as roughly 10⁴ s⁻¹. Bleaching a cone’s pigment lowers the photon-like dark noise, suggesting that the noise may arise from thermal isomerization of pigment (9). Perhaps the red-shift in the absorption spectra of the pigments in red- and green-sensitive cones is inevitably accompanied by greater thermal instability (16).

The continuous noise of rods arises within the outer segment at a site in the transduction cascade downstream from rhodopsin (11), but the molecular mechanism has yet to be identified. The noise seems to result from shot effects of very small amplitude occurring at high frequency. The power spectrum of the continuous noise suggests that the shot effect is shaped by two of the four low-pass filter stages in an empirical quantitative model of the shape of the single photon response (11). Although the continuous component contributes more to the dark noise variance of rods than the discrete component (7), the discrete component apparently dominates the behaviour measured psychophysically. It is not yet clear how this comes about, but evidence has been presented that synaptic transfer of rod signals to bipolar cells is accompanied by a temporal filtering that will help to separate the single photon response from the continuous noise (17).

A rod’s electrical noise is elevated after exposure to bright light, and it has been suggested that increased noise may contribute to the elevated threshold of rod vision measured
psychophysically (18). In amphibian rods the noise has a magnitude and power spectrum consistent with a superposition of shot effects like those generated by absorption of photons, and it has been proposed that the noise arises from photoexcited rhodopsin which, during the shutoff process, escapes quenching and returns to the active state (19, 20). In primate rods noise after bright light results partly from anomalous photon responses, which have a rectangular waveform (see below). In psychophysical studies the briefest component of the threshold elevation following bright light decays with a time constant of 5 s (21), which matches the mean duration of the anomalous single photon responses. Perhaps anomalous events, triggered by rhodopsin, which fail to be quenched properly in the first place, are responsible for the rapidly decaying threshold elevation.

**Rhodopsin Quenching in Transgenic Mouse Rods**

The termination of rhodopsin’s catalytic activity is a key event in transduction, for as long as rhodopsin is active an amplified signal will continue to be generated by the cascade. Termination is thought to involve binding of rhodopsin kinase to the active rhodopsin, phosphorylation of the rhodopsin at one or a few sites, dissociation of the kinase, and binding of the soluble protein arrestin. Although these steps have been studied *in vitro* by biochemical techniques, it is not yet clear how they operate *in vivo*. It is not known, for instance, how rhodopsin’s catalytic activity changes as each step occurs, nor whether the reactions are controlled by feedback arising from subsequent stages in the cascade. In one approach to the mechanism of control of rhodopsin’s activity, Clint Makino and I studied visual transduction in transgenic mouse rods (22). In addition to normal rhodopsin, these cells expressed a 15-amino acid truncation mutant lacking the three phosphorylation sites that biochemical experiments had previously implicated in the shutoff process (see Fig. 2). The transgenic mice were produced in Melvin Simon’s laboratory by Jeannie Chen. Western blots revealed that rods of the mice utilized for the studies contained the usual amount of total rhodopsin, of which 10% was the truncated form. A similar fraction of the single photon responses recorded from the transgenic rods failed to terminate normally, suggesting that the anomalous responses were generated by truncated rhodopsin molecules (see Fig. 3A). The anomalous responses consisted of a rounded rise to a maintained plateau, which lasted, on average about 20 times longer than the normal response. This behaviour supports the notion that phosphorylation at one or more of the three sites within the C terminus indeed initiates rhodopsin shutoff under normal conditions. The fact that the majority of the rod’s single photon responses were normal shows that the anomalous responses do not reflect a nonspecific disturbance of function in the transgenic rods. Comparison of normal and anomalous responses indicates that normal rhodopsin already begins to be quenched during the rising phase of the photon response. The functional significance of the multiple phosphorylation sites on rhodopsin remains to be determined. Can phosphorylation at a single trigger normal shutoff? Are the three sites functionally equivalent? Rods expressing rhodopsin in which the phosphorylation sites at serines 334, 338, and 343 are removed one by one should help to answer these questions.

Truncated rhodopsin may also be present at low concentration in normal rods. About 0.1% of single photon responses in a monkey rod are grossly prolonged and closely resemble the anomalous responses of the transgenic mouse rods (7). Perhaps protein synthesis occasionally fails to reach the C terminus, producing a truncated molecule. Alternatively, proteolysis within the outer segment might occasionally remove the C terminus, producing a defective molecule, which could be eliminated by outer segment renewal (23).

**Feedback Control by Ca**

Exposure of a photoreceptor cell to progressively higher ambient light levels causes absorbed
photons to take progressively smaller bites out of the light-regulated conductance. This change, light adaptation, prevents moderate background light from closing all the cGMP-gated channels, which would defeat the cell’s ability to register changes in light intensity. A light-induced fall in the cytoplasmic concentration of Ca\(^{2+}\) mediates light adaptation and speeds the recovery of the response to a flash presented darkness. The fall in Ca\(^{2+}\) results from the mechanism diagramed in the lower part of Fig 1B (reviewed in ref. 1). In darkness, Ca\(^{2+}\) enters the cell through the cGMP-activated channel and is extruded by a Na/Ca-K exchanger. In light, the Ca\(^{2+}\) concentration falls because closure of the channel blocks Ca\(^{2+}\) influx while extrusion by the exchanger continues. Although the Ca\(^{2+}\) concentration in rod outer segments has proved difficult to measure, the free level in darkness is thought to be roughly 0.5 µM (24-26); the exchanger is thermodynamically capable of reducing the level in bright light by three orders of magnitude (27). Evidence for the key functional role of the light-induced fall in Ca\(^{2+}\) is that blocking the fall prevents adaptation and increases the size and duration of the flash response (28, 29).

The fall in Ca\(^{2+}\) antagonizes the light-induced closure of channels by actions at several sites in the cascade (Fig. 4A). For instance, the channel’s affinity for cGMP is lowered at high Ca\(^{2+}\) by a calmodulin-like protein (31). A fall in Ca\(^{2+}\) will increase the channel’s affinity for cGMP and antagonize channel closure. The enzyme that synthesizes cGMP, guanylate cyclase, is also Ca\(^{2+}\) sensitive. A Ca\(^{2+}\)-binding protein, GCAP (32, 33) and/or GCAP2 (34), stimulates cyclase activity at low Ca\(^{2+}\) but not at high Ca\(^{2+}\). A drop in Ca\(^{2+}\) will thus increase the rate of cGMP synthesis, tending to reopen channels. Ca\(^{2+}\) also appears to control light-triggered PDE activity. Shutoff of rhodopsin by phosphorylation is inhibited at high Ca\(^{2+}\) by the Ca\(^{2+}\)-binding protein recoverin, and removal of this effect at low Ca\(^{2+}\) may antagonize the activation of PDE by light (35). In truncated rods, Leon Lagnado and I found yet another effect of Ca\(^{2+}\) on light-triggered PDE activity (30). Under conditions in which cyclase activity was negligible and shutoff of the flash response was limited by rhodopsin phosphorylation, lowering Ca\(^{2+}\) reduced the fall of transduction without affecting the time course of response termination. Several pieces of evidence indicated that the effect was exerted at rhodopsin itself, one being that sensitivity to low Ca\(^{2+}\) was only present around the time of the flash (Fig. 4B). Lowering Ca\(^{2+}\) slightly around the flash, at a time when intense transducin and PDE activation were still present, had no effect. Recent evidence suggests that Ca\(^{2+}\)'s effect on light-evoked PDE activation is most important in producing adaptation, while the Ca\(^{2+}\) effect on the cyclase mainly fixes the dark-adapted fall of the transduction mechanism (36).

Currently we are testing the role of the Ca\(^{2+}\)-binding protein recoverin by two kinds of experiments. In one, the recombinant protein, kindly provided by Lubert Stryrer, is being dialyzed into salamander rod outer segments. Leon Lagnado, Martha Erickson, and I have found that myristoylated bovine recoverin slows the recovery of the flash response at high Ca\(^{2+}\) but has no effect at low Ca\(^{2+}\). A slowing of flash responses has previously been reported to result from addition of purified recoverin to Gecko rods through a patch pipette (37). The slowing effect in our experiments can be shown to depend on inhibition of rhodopsin shutoff, the mechanism indicated by biochemical studies (35). The Ca\(^{2+}\) dependence of the effect on the flash response is puzzling, however, as it occurs at unphysiologically high concentrations. In a second approach, Robert Dodd and I are studying transduction in transgenic mouse rods that do not express recoverin. These mice were made by Jeannie Chen and Melvin Simon. “Recoverin knockout” rods transduce, but their light-triggered PDE activity fails to light adapt normally. Furthermore, their Na\(^{+}\)/Ca\(^{2+}\)-K\(^{+}\) exchange current, a measure of intracellular Ca\(^{2+}\) kinetics, is faster than that of control rods, consistent with the absence of a buffer that binds roughly 25% of a normal rod’s total intracellular Ca\(^{2+}\). The flash responses of knockout rods were also faster than those of
control rods, perhaps because of their faster Ca\(^{2+}\) kinetics. Although it is not yet clear how to reconcile the results of the two kinds of experiments, one possibility is that different heterogeneously acylated forms of recoverin perform different physiological functions. Perhaps one form is active at physiological Ca\(^{2+}\) and mediates adaptation of light-triggered PDE activity, while another, turned on at high Ca\(^{2+}\), prevents rhodopsin shutoff and thus protects the cell from abnormal Ca\(^{2+}\) loads which might otherwise trigger cell death.

**Reproducibility of the Single Photo Response**

An intriguing property of the visual transduction mechanism is its ability to generate a reproducible elementary response (38), which should aid accurate photon counting. The reproducibility is illustrated in Fig. 5A, which presents results from a recent experiment by Fred Rieke. The stepped curve in the histogram is the distribution of the amplitudes of responses evoked by repeated dim flashes of fixed applied strength. From left to right, the peaks represent 0, 1, or 2 effective photon absorptions-fluctuations expected from Poisson statistics. This distribution can be analyzed on the assumption that there is a fixed, Gaussian baseline noise variance and a similar independent variance in the elementary response itself. Reconstructing the observed distribution on this assumption (smooth curve), one finds that the peak representing single photon absorptions has a standard deviation only about one-fourth the mean, indicating good reproducibility. Little would be gained if the reproducibility were better because the standard deviation of the continuous dark noise is comparable to the intrinsic fluctuation in the photon response. The shape as well as the size of the single photon response is remarkably constant from trial to trial.

How does a single rhodopsin molecule trigger a constant response? Typically active lifetimes of single molecules are highly variable because of stochastic fluctuations in the process that terminates activity. For example, the open time of single ion channels is often exponentially distributed because the open state is terminated by a memoryless, first-order transition to the close state. Indeed, the single photo responses that arise in truncated rhodopsin molecules shut off after exponentially distributed delays with a mean of 5 s (Fig. 3B). Now if normal rhodopsin were shut off by a similar stochastic reaction that simply operated on a shorter time scale, and if it drove a chain of linear gain stages, the amplitude or time integral of the single photon response ought to fit the exponential distribution shown in Fig. 5B. Only two parts of the exponential distribution fail to fit: the right and left halves!

The absence of very small values in the experimental amplitude distribution is a strong constraint on the mechanism of reproducibility. It indicates that a single activated rhodopsin is not quenched by a first-order memoryless transition but instead shuts off along a fairly stereotypic time course. One mechanism for achieving this would be feedback control. For instance, shutoff might be disabled at the high Ca\(^{2+}\) level present in darkness but allowed to occur when Ca\(^{2+}\) falls during the flash response. By acting as a time, this mechanism would prevent brief rhodopsin shutoff in bright flash responses. It might still be argued, however, that different rules apply to small responses, which were not investigated.

Alternatively, multiple steps might be required for rhodopsin’s catalytic activity in the average activity over these steps, and reproducibility would be maximal if the events were independent and had comparable mean waiting times. A series of identical independent steps could give the exponential time course of rhodopsin shutoff derived from analysis of responses to bright flashes (40, 41). What might these steps be? Perhaps kinase binding itself lowers catalytic activity
somewhat, and one or two phosphorylations of rhodopsin lower it still more. Autophosphorylation of rhodopsin kinase may then occur, allowing it to dissociate from rhodopsin so that the final shutoff mediated by arrestin binding can take place.

Either feedback or multiple steps in the shutoff process might produce a distribution of photon response sizes in which small responses are absent, as in the experimental distribution of Fig. 5A. An additional mechanism is probably required to eliminate large responses form the distribution, and feedback activation of cGMP synthesis, driven by the eight-induced fall in intracellular Ca$^{2+}$, might accomplish this. The possibility that amplitude saturation might eliminate large responses seems unlikely because the size and duration of the single Ca$^{2+}$ is buffered or the response is triggered by a truncated rhodopsin. We are currently performing experiments to test whether Ca$^{2+}$ or other feedback signals may contribute to reproducibility.

**Transfer of Signals at the First Synapse**

Generation of an amplified single photon response that exceeds electrical dark noise in the rod is an impressive feat, but it is only the first step in the chain of events leading to perception. The next step, transfer of a single photon signal across the rod’s output synapse, poses novel problems because the presynaptic voltage change is very small—roughly three orders of magnitude less than the amplitude of an action potential. Such a small voltage change can produce only a small reduction in the rate of exocytosis of synaptic vesicles. This in turn requires a very high rate of resting release if the photon-induced change is to exceed statistical fluctuations. Synaptic ribbons, specialized structures found within rod and cone terminals (42), may help to support a high resting rate of a release by providing a large pool from which releasable vesicles may be drawn. The presynaptic terminals of auditory hair cells, which also generate small presynaptic voltage signals, contain dense bodies reminiscent of ribbons. If the drop in the rate of release is to be successfully detected and amplified, the elements that generate the postsynaptic response must be nicely matched to those at the presynaptic side of the junction. Remarkably, recent evidence suggests that rod bipolar cells utilize for this task a glutamate receptor coupled to a cGMP cascade—an amplifying strategy reminiscent to that of the rods themselves (43, 44). A glutamate receptor activated by the rod transmitter released in darkness appears to continually activate a G protein and in turn a cGMP PDE which holds the level of cGMP low in darkness. A light-triggered reduction in the activity of the glutamate receptor allows cGMP levels to rise, opening cationic channels in the surface membrane and producing a depolarization which carries the message onward. It will undoubtedly be satisfying to learn more about how synaptic transmission is “designed” to work in concert with the visual transduction mechanism. Already it appears that synaptic transmission has borrowed a successful molecular strategy from visual transduction itself.
Appendix H

Study Questions: SONA/Amazon Mechanical Turk Participants

How confident are you in your identification?

- Very Confident
- Confident
- Slightly Confident
- Neither Confident nor Uncertain
- Slightly Uncertain
- Uncertain
- Very Uncertain

Was the suspect you saw leaving the building at the start of the study, in the identification morph you just watched?

- Yes
- No

Prior to participating in this study, have you seen the person shown in the video before?

- Yes
- No

What was the color of the suspect’s shirt shown in the video you watched at the beginning of the study?

- Red
- Yellow
- Green
- Grey

Was the person in the video we showed you suspected of committing a crime?

- Yes
- No

What crime was the person suspected of committing?

- Serial Killing
- Drive-by Shooting
Were there any victims of this crime?

Yes  No

You will recall that you were presented with three separate victims. Which of the following options best represents the victims you were presented with?

- Black Adult Males
- White Adult Males
- Black Adult Females
- White Adult Females
- Black Teenage Males
- White Teenage Males
- Black Teenage Females
- White Teenage Females

Using the slider bar below, please indicate how deserving those three victims were to be the targets of the reported crime. A score of "0" indicates the victims were not at all deserving, while a score of "100" indicates the victims were completely deserving.

<table>
<thead>
<tr>
<th>Not At All Deserving (0) to Completely Deserving (100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
</tr>
</tbody>
</table>

How deserving were the victims?
Appendix I

Questionnaires: SONA/Amazon Mechanical Turk Participants

Social Dominance Orientation (SDO) Scale

Please rate your agreement or disagreement with each of the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1 (strongly disagree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (strongly agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Some groups of people are simply inferior to other groups.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. In getting what you want, it is sometimes necessary to use force against other groups.</td>
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<tr>
<td>3. It's OK if some groups have more of a chance in life than others.</td>
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<tr>
<td>4. To get ahead in life, it is sometimes necessary to step on other groups.</td>
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</tr>
<tr>
<td>5. If certain groups stayed in their place, we would have fewer problems.</td>
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<tr>
<td>6. It's probably a good thing that certain groups are at the top and other groups are at the bottom.</td>
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<tr>
<td>7. Inferior groups should stay in their place.</td>
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<tr>
<td>8. Sometimes other groups must be kept in their place.</td>
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<tr>
<td>9. It would be good if groups could be equal.</td>
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</tr>
<tr>
<td>10. Group equality should be our ideal.</td>
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</tr>
<tr>
<td>11. All groups should be given an equal chance in life.</td>
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<td></td>
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</tr>
<tr>
<td>12. We should do what we can to equalize conditions for different groups.</td>
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<td></td>
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<tr>
<td>13. Increased social equality is beneficial to society.</td>
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</tr>
<tr>
<td>14. We would have fewer problems if we treated people more equally.</td>
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<tr>
<td>15. We should strive to make incomes as equal as possible.</td>
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<tr>
<td>16. No group should dominate in society.</td>
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<td></td>
</tr>
</tbody>
</table>
Right-Wing Authoritarianism (RWA) Scale

Please rate your agreement or disagreement with each of the following statements.

<table>
<thead>
<tr>
<th>1 (strongly disagree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (strongly agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Our country needs a powerful leader, in order to destroy the radical and immoral currents prevailing in society today.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2. Our country needs free thinkers, who will have the courage to stand up against traditional ways, even if this upsets many people.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3. The &quot;old-fashioned ways&quot; and &quot;basic moral values&quot; still show the best way to live.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4. Our society would be better off if we showed tolerance and understanding for untraditional values and opinions.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5. God's laws about abortion, pornography and marriage must be strictly followed before it is too late, violations must be punished.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6. The society needs to show openness towards people thinking differently, rather than a strong leader, the world is not particularly evil or dangerous.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7. It would be best if newspapers were censored so that people would not be able to get hold of destructive and disgusting material.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8. Many good people challenge the state, criticize the church and ignore &quot;the normal way of living&quot;.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9. Our forefathers ought to be honoured more for the way they have built our society, at the same time we ought to put an end to those forces destroying it.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>10. People ought to put less attention to the Bible and religion, instead they ought to develop their own moral standards.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11. There are many radical, immoral people trying to ruin things, the society ought to stop them.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12. It is better to accept bad literature than to censor it.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>13. Facts show that we have to be harder against crime and sexual immorality, in order to uphold law and order.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>14. The situation in the society of today would be improved if troublemakers were treated with reason and humanity.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>15. If the society so wants, it is the duty of every true citizen to help eliminate the evil that poisons our country from within.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Modern Racism (MR) Scale (Canadian Version)

Please choose the response that most accurately represents your views.

<table>
<thead>
<tr>
<th></th>
<th>1 (strongly disagree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (strongly agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Over the past few years, minorities have gotten more economically than they deserve.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Over the past few years, the government and news media have shown more respect for minorities than they deserve.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. It is easy to understand the anger of minority people in Canada.</td>
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<tr>
<td>4. Discrimination against minorities is no longer a problem in Canada.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. Minorities are getting too demanding in their push for equal rights.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6. Minorities should not push themselves where they are not wanted.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
**Need for Closure (NFC) Scale**

Please choose the response that most accurately represents your views.

<table>
<thead>
<tr>
<th></th>
<th>1 (strongly disagree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (strongly agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I don't like situations that are uncertain.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I dislike questions which could be answered in many different ways.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>3</td>
<td>I find that a well ordered life with regular hours suits my temperament.</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>I feel uncomfortable when I don't understand the reasons why an event occurred in my life.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>I feel irritated when one person disagrees with what everyone else in the group believes.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I don't like to go into a situation without knowing what to expect from it.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>When I have made a decision, I feel relieved.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>8</td>
<td>When I am confronted with a problem, I'm dying to reach a solution very quickly.</td>
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</tr>
<tr>
<td>9</td>
<td>I would quickly become impatient and irritated if I would not find a solution to a problem immediately.</td>
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</tr>
<tr>
<td>10</td>
<td>I don't like to be with people who are capable of unexpected actions.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I dislike it when a person's statement could mean many different things.</td>
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</tr>
<tr>
<td>12</td>
<td>I find that establishing a consistent routine enables me to enjoy life more.</td>
<td></td>
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<tr>
<td>13</td>
<td>I enjoy having a clear and structured mode of life.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14</td>
<td>I do not usually consult many different opinions before forming my own view.</td>
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</tr>
<tr>
<td>15</td>
<td>I dislike unpredictable situations.</td>
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</tbody>
</table>
Appendix J

Demographic Questions: SONA Participants

Please indicate your gender.

Male ☐ Female ☐

Please enter your age.

Age: __________

Please indicate your race/ethnicity.

Black ☐ Latino/Latina ☐ Asian ☐ White ☐ Other (if "other", please indicate below): __________

Please indicate your major.

Major: __________

Please indicate your current year in your university education.

First Year ☐ Second Year ☐ Third Year ☐ Fourth Year ☐ Other (please specify): __________
Please indicate which course (e.g., PSYO 111, PSYO 121 etc.) you are participating in this study for.

Course:

Please indicate which psychology courses you have taken prior to participating in this study.

<table>
<thead>
<tr>
<th>Course</th>
<th>Yes</th>
<th>No</th>
<th>In Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYO 111</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PSYO 121</td>
<td></td>
<td></td>
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<tr>
<td>PSYO 252</td>
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<tr>
<td>PSYO 270</td>
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<td>PSYO 271</td>
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<tr>
<td>PSYO 372</td>
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<td></td>
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</tr>
<tr>
<td>PSYO 373</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Appendix K

Demographic Questions: Amazon Mechanical Turk Participants

Please indicate your gender.

Male  Female

Please enter your age.

Age:

Please indicate your race/ethnicity.

Black  Latino/Latina  Asian  White  Other (if "other", please indicate below)

In which Canadian province/territory or American state do you currently reside? If you do not reside in either a Canadian province/territory or an American state, please select "Other" below and type in the box the location of your residence.

Alberta

Place of residence that is not in Canada or the United States of America:

Other

Would you describe your place of residence as city or rural?

City  Rural
What is the highest level of education you have completed?

- Some High School
- High School / GED
- College Diploma / Degree
- Bachelors Degree
- Masters Degree
- Doctoral Degree
- Professional Degree (JD, MD)

What is your combined annual household income?

under $20,000
Appendix L

Debriefing Form: SONA/Mechanical Turk Participants

Debriefing Form

You have just participated in a study looking at the factors that influence one’s accuracy when attempting to identify a crime suspect (i.e., eyewitness identification). While we were generally interested in the accuracy of eyewitness memory, we had additional interests that we were unable to tell you about until now. Specifically, we wanted to know if your memory of the person shown in the video (i.e., the target) differed based on a variety of factors. Some of these factors included the reason the target was leaving the building, type of crime he was suspected of, etc. The reason we withheld this information from you is twofold. First of all, one of the factors we are interested in investigating is whether expectations influence one’s accuracy in eyewitness identification. Secondly, there is a tendency for participants to try to confirm the experimenters’ hypotheses. In order to ensure that you were not unconsciously influenced to do this, we withheld the hypotheses of this study.

You may be curious about our hypotheses. Previous research has shown that individuals are often susceptible to an own-race bias when deciding if they have seen someone before (Meissner & Bringham, 2001). That is, individuals are likely to identify someone of the opposite race as familiar, even though they have never seen the person. Surprisingly, no one to date has looked to see if individuals misidentify more typical members of the opposite race more often than less typical members of the opposite race. Thus, we were interested in seeing if individuals who are mistakenly identified are judged as more stereotypically Black than those not identified as familiar. Furthermore, we wanted to see if various other factors (e.g., type of crime) influenced participants’ responses.

Though this study was looking at the factors that influence eyewitness identification, we would like to point out that none of the responses you provided can be considered “right” or “wrong”. We purposely created the slideshow so that the person and events would appear ambiguous. As such, the photos you identified are very subjective and can be interpreted by each participant differently. We should also point out that none of the pictures you saw were of anyone suspected of any crime. In fact, we used picture-editing software to manipulate the appearance of the individuals shown in the photographs.

At this point, we would like to thank you very much for participating in the present study. Should you wish to find the results of this study, or have additional questions concerning your participation in this study, feel free to contact:

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E-mail: paul.g.davies@ubc.ca

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