THE OTHER-RACE IN DISGUISE: HOW HOODIES AND SUNGLASSES COMPLICATE FACIAL RECOGNITION

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ABSTRACT

There is limited literature on how factors like race and disguise jointly impact eyewitness identification. Both of these factors are very likely to occur simultaneously in a crime in which an eyewitness may need to identify the perpetrator. Researchers agree on the well-established existence of the other-race effect (ORE) Malpass & Kravitz, 1969; Meissner, Susa, & Ross, 2009, and the negative effects of disguises on facial recognition (Righi, Peissig, & Tarr, 2012; Fletcher, Butavicius, & Lee, 2008). The present study sought to explore the relationship between these factors. This study examined facial recognition amongst Asian, White, and Latinx participants using faces from all three races either wearing a disguise (hoodie and sunglasses) or no disguise. To investigate how quality and quantity of interactions with other races impacted facial recognition and the ORE, participants also completed an Interracial Contact Questionnaire. There was a significant main effect for disguise across all participants. Overall, all three races performed poorer on disguise trials than non-disguise regardless of the race of face. The relationship between accuracy and experience with other races was found to be nonsignificant. In the present study, we did not find evidence of the ORE, which may be the result of these disguises decreasing accuracy to below chance levels. It is also possible that an ORE might be found using more sensitive measures of performance. Future studies should consider the limitations of this study to further explore the effect of hoodies on face recognition.

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ACKNOWLEDGMENTS

I wanted to thank Dr. Jessie Peissig for all of her help throughout the thesis process. Without her, it would have been a difficult route to the finish line. I would also like to offer a very special thank you to my biggest supporters, my husband Paul and my daughter Madelynn. They are the motivation that keeps me going and without them I would be lost! Finally, I'd like to thank my mom and dad for always believing in me and not discouraging me when I was 10 years old and claiming I would have a Master's Degree some day.

CHAPTER 1

LITERATURE REVIEW

Other-Race Effect

The other-race effect (ORE) is a phenomenon in which individuals are less accurate when identifying individuals that are a different race than themselves compared to identifying individuals that are of the same race. The other-race effect (also known as the cross-race effect) has been extensively studied. These findings have been widely supported by a large number of studies (Bukach, Cottle, Ubiwa, & Miller, 2012; Malpass & Kravitz, 1969; Marcon, Meissner, Frueh, Susa, & MacLin, 2009; Meissner, Susa, & Ross, 2009; Michel, Caldara, & Rossion, 2006).

Perhaps one of the most important implications of this research is for the legal system. According to the Innocence Project, an organization that assists inmates believed to have been wrongfully convicted, 70% (of 354 cases in the United States) of the individuals who have been exonerated were wrongfully convicted due to eyewitness misidentification (Innocence Project). Furthermore, 41% of the cases involved a cross-race eyewitness misidentification and 32% involved misidentifications of the same individual by multiple eyewitnesses. Of these exonerees, an average of 14 years was served prior to their exonerations.

The criminal justice system places an emphasis on eyewitness testimony, regardless of the research showing complications with the accuracy of eyewitness

testimony (Young, Hugenberg, Bernstein, & Sacco, 2012). Jurors are particularly influenced by eyewitnesses who 1) have no obvious reason to lie about the perpetrator, and 2) appear confident in their identification (Wells, Memon, & Penrod, 2006). Meissner, Susa, and Ross (2013) found that participants rated their confidence in identification higher for other-race faces compared to same-race faces, suggesting that not only are misidentifications more likely with other-race faces, over confidence may increase believability of a misidentification. Cutler, Penrod, and Stuve (1998) found that eyewitness confidence was the single best predictor of a verdict. Looking at this research and the data from the Innocence Project, it is clear that there is an issue with how eyewitness identifications are handled in the United States legal system.

Holistic processing is an important aspect of the ORE, such that the better the holistic processing, the less prevalent the ORE (Bukach et al., 2012). Although holistic processing can reduce the ORE, it is by no means enough to eliminate the ORE in face recognition (Michel et al., 2006). Holistic processing can be better understood as the tendency to process multiple facial features at one time, in turn making it more difficult to process individual features (Maurer, Le Grand, & Mondloch, 2002). Holistic processing of faces is based on experience and, more specifically, is dependent on individuating experiences (Bukach et al., 2012). With individuating experience, the quality (more than just exposure) of the interactions is more important than the quantity of interactions. Tanaka and Simonyi (2016) suggest that exposure to other races alone is not enough to decrease the ORE; it also requires a motivation to individuate the faces and process them holistically as opposed to featurally. It has also been found that factors that are taxing on our memory processes during encoding (e.g., increased retention interval or

increased perceptual confusion) can increase the ORE (Marcon, Meissner, Frueh, Susa, & MacLin, 2009).

Individuals of the same race also have greater sensitivity to the spacing between facial features, which may be the specific mechanism for holistic processing effects (Mondloch et al., 2010). Tanaka and Simonyi (2016) define holistic processing as an individual's ability to attend to the space between facial features whereas featural processing focuses solely on the individual features. Michel, Rossion, Han, Chung, and Caldara (2006) note that an important aspect of holistic processing is an individual's ability to quickly and efficiently process information, such as the spatial relations from a face, a skill that is much more finely tuned for same-race faces. Holistic processing also involves processing the relationship between facial features and together they are processed as a unified face rather than a collection of separate features (Young et al., 2012). Additionally, adults rely on cues in faces to help them identify individuals, such as the color and shape of the features and the spacing between features (Mondloch et al., 2010). It is suggested that recognizing faces using the spacing between features is fine-tuned through experience, and experience with own-race faces is generally greater than other-race faces.

Theories of the ORE

Young, Hugenberg, Bernstein, and Sacco (2012) discussed one class of theory related to the ORE: the perceptual expertise theory. In perceptual expertise theory, an individuals' ability to pull more meaningful information from their environment improves with experience (Hehman, Mania, & Gaertner, 2009). It is suggested that due to increased experience with our own race, we gain greater expertise for faces within our

own race (Young et al., 2012). In contrast, due to a lack of experience with other races, we show a decreased ability to distinguish faces belonging to members of other racial groups. As expected based on this theory, individuals with greater childhood experience with other racial groups show an increased ability to distinguish faces within that particular group (Young et al., 2012). Furthermore, this effect has been shown in adults who gained greater exposure to another racial group; these individuals exhibited improved performance on a task assessing the other-race effect. In support of the perceptual expertise theory, Tanaka, Kiefer, and Bukach (2004) found that individuals processed faces of the same race, with which they had more experience, more holistically whereas they processed other-race faces more featurally. Zhao, Hayward, and Bülthoff (2014) also conducted a study to examine various other-race related effects and found other-race effects for holistic processing of faces. They also found evidence supporting increased holistic processing with greater experience with other-race faces, thereby reducing the other-race effect.

Individuals who gain more exposure and expertise with other-race individuals not only showed a reduction in the ORE but it was also found that they were less sensitive to manipulations that are known to disrupt holistic or configural processing (Young et al., 2012). Rhodes et al. (2009) conducted a face recognition study using White and Chinese faces and measured participants experience with these races. They found that individuals who report more contact with a specified race demonstrated better configural processing and greater recognition accuracy for other-race faces.

Young et al. (2012) also discussed a second class of theories, social-cognitive theories, that aim to help us better understand the ORE. These theories are based on the

idea that individuals perceive people of other-races as a member of a category, whereas people who are the same race are often perceived as individuals (Young et al., 2012). When individuals are processed at a categorical level, social information such as race, gender, and age are the features that are attended to, rather than individuating features (Shriver et al., 2008). Shriver et al. defines individuating features as those facial features that allow an individual to distinguish one person from another. A major aspect of this class of theories is the out-group homogeneity effect. In other words, out-group members are perceived differently than in-group members such that out-group members are perceived as more homogeneous than in-group members (Young et al., 2012). Furthermore, for in-group members, there is increased individuation and more focus on the unique features of each individual.

Hehman et al. (2009) argued that the social-cognitive theory best explains the ORE and notes that the perceptual expertise theory does not explain the results in their study. In the learning phase of their study, university affiliations were provided with images leading students to label the individual as in-group or out-group based on university, rather than race. In this study, it was found that when students were given a university affiliation with the image, the ORE was eliminated, thereby supporting the social cognitive theory. Shriver et al. (2008) also argued that the social cognitive theory better explains the ORE. Across a series of three experiments, it was found that the ORE is reduced when individuals are categorized on factors (such as university affiliation) other than race, indicating that the ORE is based on categorization, at least in part.

Young et al. (2012) discusses hybrid theories, which take both social cognitive perspectives and perceptual expertise perspectives into consideration. Based on the

existing literature for both the cognitive and perceptual theories, Young et al. (2012) argue that neither one nor the other theory can fully explain the phenomena of the other-race effect. Instead, they suggest that a hybrid theory that encompasses the strengths of both classes of theory would be a better approach to explaining the biases associated with facial processing and recognition.

Disguises and Face Recognition

In addition to the ORE, researchers have defined other factors that dramatically impact one's ability to recognize another's face. For example, it has been found that the addition or removal of a simple disguise, such as glasses or a wig, reduces an individual's ability to accurately identify the face (Righi, Peissig, & Tarr, 2012; Fletcher, Butavicius, & Lee, 2008; Terry, 1994). Furthermore, when facial features that are typically stable are altered or removed, it has a greater effect on recognition accuracy. Fletcher, Butavicius, and Lee (2008) conducted a study examining face processing with day-to-day type changes in external features (hair, chin/facial hair, and ears) by tracking participants eye movements and focus on facial features. They found that across individuals, there was great variance in eye movements and attention to specific facial features; however, within each participants' trials, eye movements and attention to specific features were very stable. They also found greater accuracy when an individual's eye movement focused more on internal (eyes, nose, and mouth) features rather than external features (hair, chin, and ears).

Researchers have also investigated disguises in eyewitness settings. Mansour et al. (2012) conducted a study looking at the effects of hats and sunglasses used as a disguise in an eyewitness identification task. It was found that sunglasses and hats reduce

accuracy of the identification with a greater effect for sunglasses. Furthermore, it was found that disguises also have an impact on confidence in identifications such that confidence decreased with the level of disguise: confidence was lower for sunglasses than hats and confidence for hats was lower than no disguise. In a follow up study, Mansour et al. (2012) also found that covering the face using a nylon stocking significantly reduced accuracy in eyewitness identifications more so than sunglasses and hats. Furthermore, between the two experiments, Mansour et al. found that participants were very willing to make an identification regardless of the amount or quality of information they received with regard to the perpetrator's identity. These findings suggest that individuals may feel obligated to identify a perpetrator using limited information, despite unbiased instructions. When the target is not present in the line up, this naturally leads to false identifications (Mansour et al., 2012).

A study by Suhrke et al. (2015) investigated both the ORE and disguises. These researchers conducted a study with children from different cultures in which one group of children was sampled from a culture where face-covering headwear (a hat) was commonly seen in every day life and the other group of children was sampled from a culture where face covering is not common in their natural environment. It was found that in these children, hats decreased childrens' ability to accurately identify an individual even in children who regularly see others wearing headgear. However, this finding was only present for own-race faces such that there was no significant difference in the accuracy for other-race faces with or without a head covering. These findings suggest that cultural factors (such as regularly seeing individuals with face-coverings) that influence

face presentation can create experience that impacts face recognition abilities (Shurke et al., 2015).

Nguyen and Pezdek (2017) also conducted a study on disguises and the ORE and found that accuracy decreased when the eye region was disguised with sunglasses, suggesting that the eye region in particular provides important information for facial recognition. Additionally, it was found that longer exposure to the face stimuli did not increase recognition accuracy for other-race faces but did increase accuracy for same-race faces. This finding is critical because it suggests that more time to encode other-race faces does not reduce the other-race effect. McKelvie (1976) conducted a face recognition study where the mouth and eye regions were covered and found that there was no difference in participant response time and participants reported equal confidence in their response accuracy; however, accuracy was significantly lower for faces in which the eye region was covered compared to faces in which the mouth region was covered. Furthermore, other research supports the finding that the eye region is very important in face recognition. Sadr, Jarudi, and Sinha (2003) found that the removal of eyebrows had a significant impact on an individuals' ability to accurately identify a face, further illustrating how a disguised eye region (such as wearing eyeglasses) could have a dramatic impact on facial recognition by obscuring the eyebrows.

A study conducted by Terry (1994) investigated the effects of disguises (eyeglasses and beards) on facial recognition. It was found that changes to both the eye and face regions of the face have a negative impact on an individual's facial recognition accuracy. The removal of eyeglasses had a greater negative effect on recognition accuracy than the addition of eyeglasses. In contrast, the addition of a beard had a greater

effect on facial recognition accuracy than the removal of a beard. Terry notes that eyewitnesses who have witnessed the commission of a crime where the perpetrator removed their eyeglasses, shaved their beard, or grew out their beard should be questioned.

There is little literature showing the impact of both other race faces and facial disguises on eyewitness identification, however both of these factors commonly occur when an eyewitness is asked to identify the perpetrator. All faces change over time and it is reasonable to expect that faces might change between the time of the crime and the line up even when no explicit disguise is used. Often there is a significant time lapse between when the crime was committed and when the eyewitness is asked to identify the perpetrator. Changes in appearance that may occur could potentially exacerbate ORE effects. Also, hoodies and eyeglasses are often worn while committing a crime, but there is no data that indicates whether a witness can accurately identify the perpetrator without the hoodie and glasses in a line up.

There are many racial/ethnic issues involved with wearing hoodies, as revealed by the extensive media attention for the killing of Trayvon Martin and the subsequent George Zimmerman trial. Journalist Geraldo Rivera was quoted saying “I think the hoodie is as much responsible for Trayvon Martin’s death as George Zimmerman was” (Fung, 2012). Rivera was also quoted defending his position by stating “Its not blaming the victim. It’s common sense-look like a gangsta & some armed schmuck will take you at your word” (Fung, 2012). Rivera was suggesting that minorities should avoid hoodies to deter racial profiling stating, “It’s those crime scene surveillance tapes. Every time you see someone sticking up a 7-11, the kid is wearing a hoodie,” and he goes on further to

explain “You have to recognize that this whole stylizing yourself as a gangster, you’re gonna be a gangster wannabe? Well, people are gonna perceive you as a menace” (Fung, 2012). Rivera’s remarks on the issue of race, attire, and profiling are particularly relevant because they suggest that these factors could unconsciously impact the amount of attention or level of memory encoding biased by the emotion of the eyewitness to a crime.

Hypotheses

The purpose of the present study is to develop further understanding regarding these issues related to eyewitness identification. Because there is limited research exploring the topic, this study seeks to help bridge the gap in the literature on both the ORE and disguises. Based on the existing literature, it has been found that disguises have a significant impact on individuals’ ability to accurately identify others. Furthermore, there is extensive research supporting the ORE. Thus we expect to find evidence for both these findings. In this study, we expect to find an interaction showing a significant decrease in accuracy when individuals are tasked with identifying an individual who is both wearing a disguise and is of another race than the participant. Additionally, we expect to see a significant interaction between other-race and disguise. We also expect to see a negative correlation between experience with other-races and participants accuracy when identifying other-race faces.

CHAPTER 2

METHODS

Participants

Participants included 90 students who are a part of the psychology department research participant pool at California State University, Fullerton. A total of 13 participants were excluded from the study because they either: self-identified as multi-racial (*n* = 7) or experienced a computer error during the experiment (*n* = 3), or had an accuracy for Old Face trials below chance using a 45% cutoff (*n* = 3) leaving 77 participants. The 45% cutoff was calculated using a binomial test to determine what was significantly below chance. One participant who identified as multi-racial also reported Epilepsy and dropped out of the experiment for medical reasons. Participants included individuals who self-identified as White (*n* = 19), Latinx (*n* = 26), or Asian (*n* = 32). Participants had a mean age of 19.5 years of age and included 50 females and 27 males. Participants education levels included a High School education (*n* = 69), an Associate's Degree (*n* = 6), and a Bachelor's Degree, (*n* = 2). Participants' sexual orientation included Straight (*n* = 64), Bi Sexual (*n* = 6), Gay (*n* = 2), Other (*n* = 1), and Declined to State (*n* = 4). Participants were Right Handed (*n* = 68), Left Handed (*n* = 6), or Ambidextrous (*n* = 3). Participants were compensated for participation through course credit. The experiment took approximately one hour from start to finish. Prior to participation in this study, each participant was asked to sign an informed consent.

Measures

Face Recognition Measure

In the study phase, participants viewed images of individuals who either had disguise or no disguise. Participants were shown photos of individuals who were either the same or one of two different races than the participant. The disguise was a hoodie and glasses. Each face image was passively displayed three times in the study phase. Each condition (race of face) of this measure included 16 faces for a total of 48 trials; 24 disguised and 24 undisguised faces. Each condition included 12 male and 12 female faces; 4 males and 4 females for each race (see Figure 1). All faces were counterbalanced across conditions: all faces that were disguised in Version 1 were undisguised in Version 2 and all faces that were undisguised in Version 1 were disguised in Version 2. To determine which faces were disguised in Version 1, a random number generator was used to select images. Participants were not told that they would need to recall the faces in a later portion of the study.

Following the first phase of the facial recognition measure, participants participated in a short distractor task where they were asked to complete a Relationship Skills Questionnaire (see Appendix A) and a simple math test (see Appendix B). The participants were required to wait at least 20 minutes before beginning the testing phase of the study. The Relationship Skills Questionnaire was administered on the computer through Qualtrics. The math task was administered using paper and pencil. Following the distractor task, participants moved on to the testing phase. Participants were shown a total of 96 faces images and were asked to indicate whether the face was seen in the study phase or if it was a new face. In this phase, the 48 faces shown in the study phase were

presented in addition to 48 new faces. In the testing phase, all of the faces were presented with no disguise.

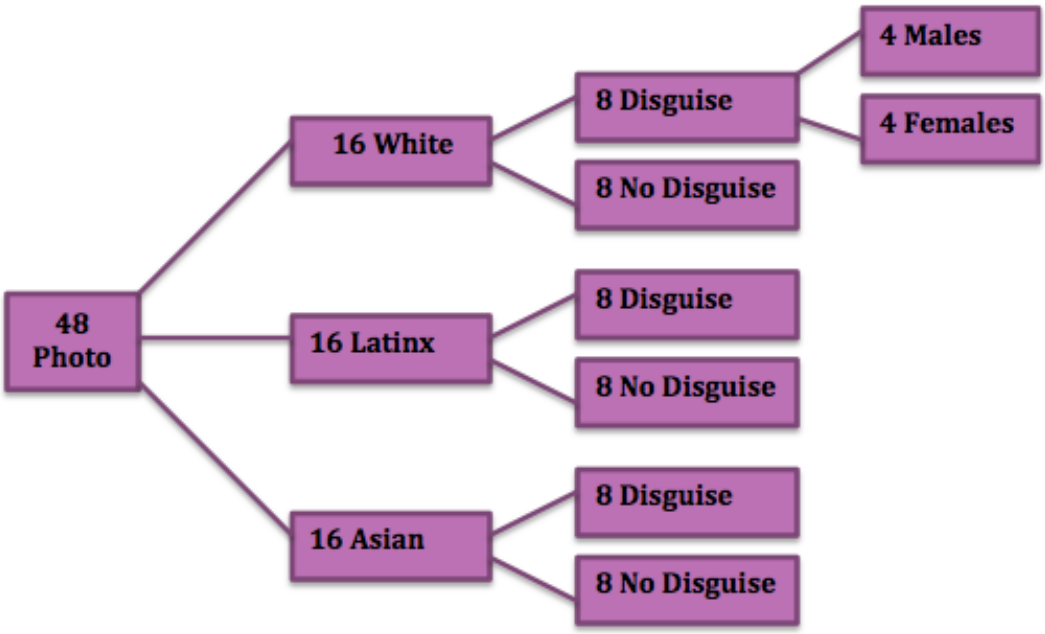

Figure 1. The breakdown of stimuli presented during the study phase of the study.

Interracial Contact Survey

Participants experience with the tested races was measured using questionnaires administered using Qualtrics. The measure included 25 questions pulled from four different questionnaires (see Appendix C). This measure was used to assess participants' exposure and experience with each race (other than their own) included in this study. Questions 1 through 8 were taken from the Social Experience Questionnaire (SEQ) and measure early life experience—elementary school to high school age—with the specified race (Asian or Latinx) (Slone, Brigham, & Meissner, 2000). Questions 9 through 13 were taken from Walker and Hewstone's (2006) Social Contact Scale (SCS) and measure the

quantity of experience with the specified race. Questions 14 through 18 were taken from Walker and Hewstone's (2006) Individuating Experience Scale (IES) to measure the quality of experience with the designated race. Finally, questions 19 through 25 were written by Bukach, Cottle, Ubiwa, and Miller (2012) to measure current quality of experience with the designated race. For each set of questions, answers were averaged to create scores for quality of experience, quantity of experience, and responses were added together to create a total experience score for each race.

Demographic Survey

Each participant was asked to complete a demographic survey as part of the study (see Appendix D). The survey included questions regarding the participants: age, self-identified race/ethnicity, gender, highest education level, sexual orientation, and handedness. The demographic survey was administered using the online survey program Qualtrics.

Procedure

This study is a 3 (race of participant as a between-subjects factor) X 3 (race of face as a within-subjects factor) X 2 (disguise or no disguise as within-subjects factor) design. Each condition included 16 stimuli: 8 disguised (4 male and 4 female) and 8 undisguised faces (4 male and 4 female). In the study phase, each face was a front angle image of the face. Each face was passively displayed three times for 1000 milliseconds each and in random order. Participants were not told that they would need to recall the face in a later phase of the study. Participants were randomly assigned to Version 1 or Version 2. In the testing phase, a total of 96 undisguised faces were used. Each face was presented one time and remained on the screen for 2000 milliseconds (two seconds) or

until the participant responded. In the testing phase, all face images were displayed at a 30-degree angle viewed from the left side of the face. This was done so that the exact same image would not be used in both the study and testing phases for the no disguise condition.

Prior to beginning the study, each participant read an informed consent and was asked to sign the document. For the study phase of the study, participants were instructed to view each face presented. All faces were displayed using Superlab 5.0. Participants viewed 48 faces; 24 disguised (see Figure 2) and 24 undisguised faces (see Figure 3). After the study phase, participants completed a short distractor task where they were asked to complete a Relationship Skills Questionnaire and a short math test. The distractor task was 20 minutes long; if participants finished early, they were instructed to sit quietly until the next phase of the study was ready. If participants were not finished after 20 minutes, they were stopped and instructed to start the testing phase of the study. For the testing phase, participants were then shown a series of 96 faces using Superlab 5.0 and were asked if the face was seen in phase one or if it is a new face. All 48 faces from the study phase were presented in the testing phase in addition to 48 new faces. In this phase of the study, all faces were presented with no disguise and were presented from a 30-degree angle of the left side of the face (see Figure 4). Using different views of the stimulus between the learning and testing phases has been shown to reduce overall familiarity when a passive view task is utilized (Peissig, Moniz, Righi, & Tarr, 2018). Upon completion of the facial recognition tasks, participants were asked to complete the interracial contact questionnaire. Finally, participants were asked to complete a short demographic survey. Participants were then thanked for their participation and debriefed.

Figure 2. Disguised faces presented during the study phase of the study.

Figure 3. Undisguised faces presented during the study phase of the study.

Figure 4. Undisguised faces presented at a 30-degree angle of the left side of the face during the testing phase of the study.

CHAPTER 3

RESULTS

Repeated Measures Analysis of Variance (ANOVA) tests were run to determine if there was a significant relationship between the participants' race, the race of the face, disguise or no disguise, and the participants' accuracy when identifying faces. The full data set was analyzed first, followed by individual analyses for each participant race category included in this study. Data for each participant race was analyzed separately to test for significant effects and interactions within each race. Only old trials were analyzed to test for face memory of those faces learned during the study phase. A 3 (race of participant as a between-subjects factor) X 3 (race of face as a within-subjects factor) X 2 (disguise or no disguise as a within-subjects factor) ANOVA was run to analyze the relationship between these. There was a significant main effect of Disguise on Accuracy for old trials $F(1, 78) = 188.77$, $p < 0.0001$ such that overall, participants were better at identifying undisguised faces compared to disguised faces (see Figure 5). The effect size for this main effect was moderate ($\eta_P^2 = 0.08$). There was a significant main effect of Race of Face on the accuracy of old trials $F(2, 156) = 19.70$, $p < 0.0001$ such that accuracy on Asian faces was higher than White or Latinx faces (see Figure 5). The effect size for this main effect was small ($\eta_P^2 = 0.02$). The main effect for Race of Participant was nonsignificant ($p > 0.05$). There was a significant interaction found between Disguise and Race of Face on Accuracy of old trials $F(2, 156 = 6.59$, $p = 0.0014$ such that

disguised Asian faces had a higher accuracy than White or Latinx faces (see Figure 5). The effect size for this interaction was small (η_P^2 = 0.004). The three-way interaction for Disguise of Face, Race of Face, and Race of Participant was nonsignificant ($p > 0.05$). Additionally, a 2 (disguise or no disguise) by 2 (own vs. other race) ANOVA was run to analyze the effects of Own versus Other race and the result was found to be nonsignificant ($p = 0.25$; see Figure 6).

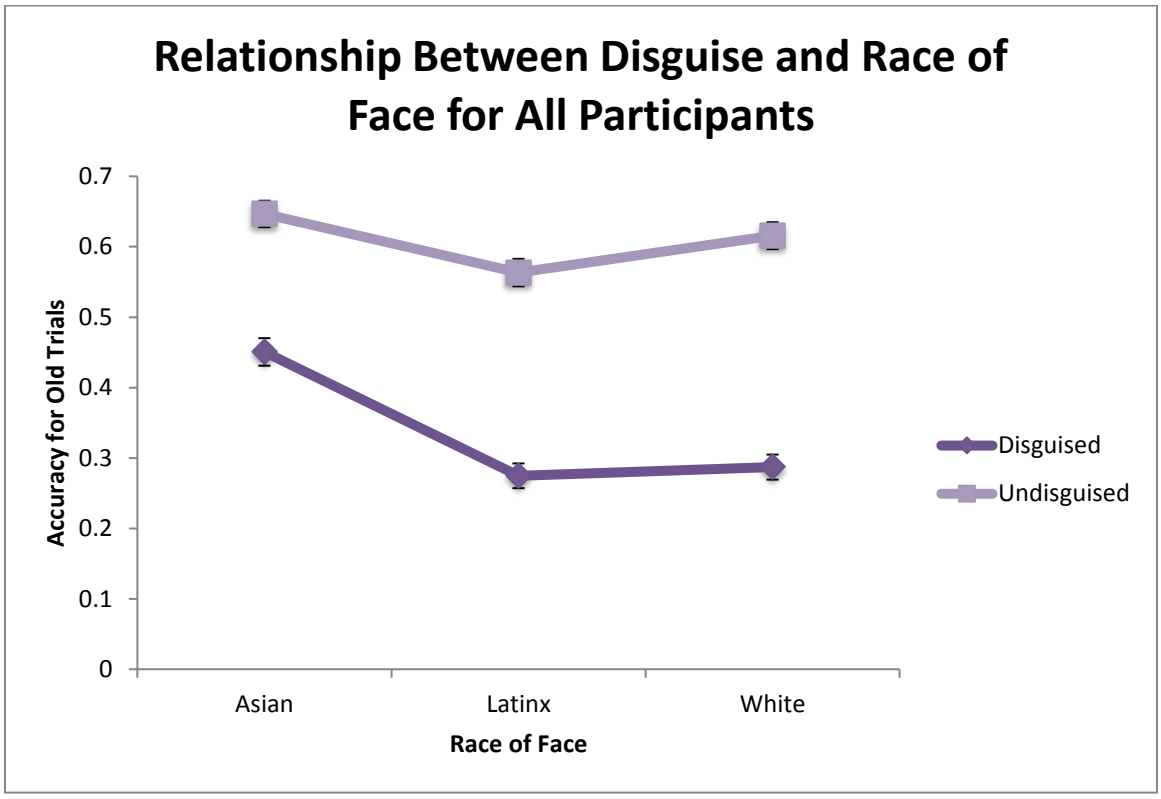

Figure 5. The interaction between Race of Face and Disguise on Accuracy on old trials for all participants. The figure also shows the main effect of Disguise on Accuracy for old trials for all participants and the main effect of Race of Face on Accuracy for old trials for all participants.

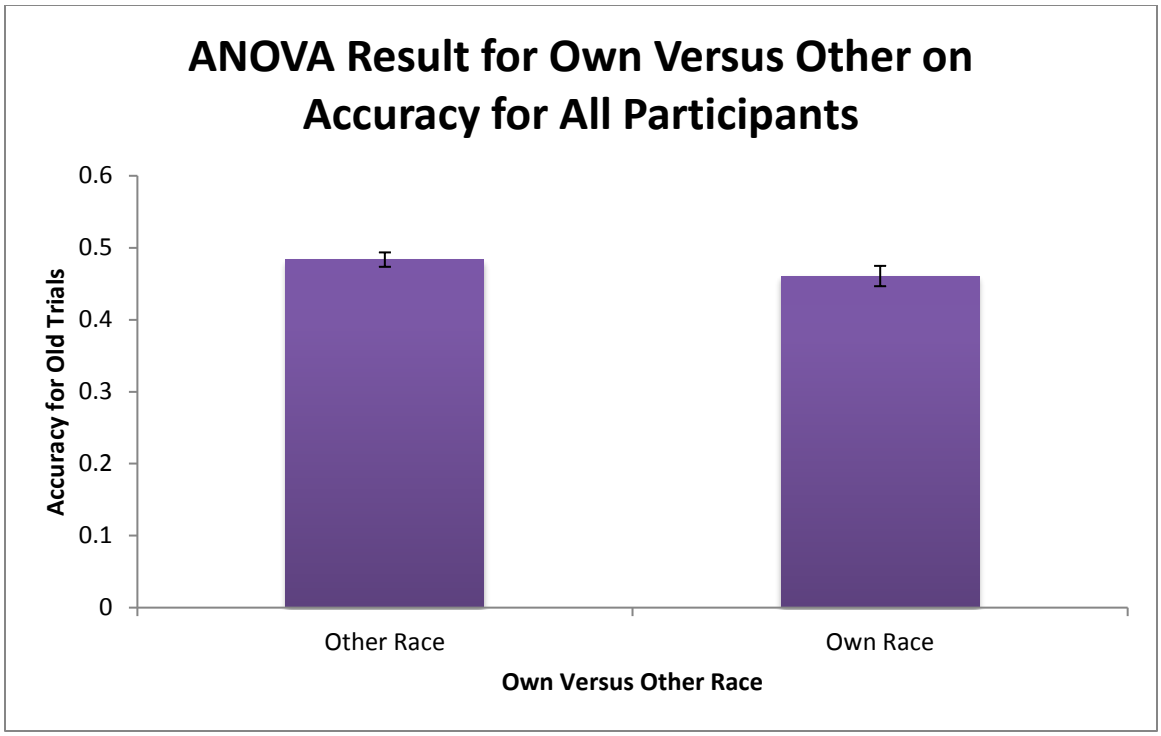

Figure 6. Nonsignificant ANOVA result for Own versus Other on Accuracy on old trials for all participants.

Asian Participants

To look for any effects that might be specific to individual racial groups, we analyzed the data for each participant racial group individually. This also allowed us to explore the effects of the sex of face as an additional factor. For Asian participants, it was found that there was a statistically significant main effect of race of face on accuracy for old trials $F(2, 62) = 4.69$, $p = 0.01$, such that accuracy for Asian faces was higher than White or Latinx faces (see Figure 7). The effect size for this main effect was small ($\eta_P^2 = 0.01$). There was also a significant main effect of disguise on accuracy of old trials $F(1, 31) = 26.83$, $p < 0.0001$, indicating that the disguise faces were harder to identify compared to undisguised faces (see Figure 8). The effect size for this main effect was large ($\eta_P^2 = 0.10$). Furthermore, there was a significant main effect of sex of face on

accuracy of old trials $F(1, 31) = 2.58$, $p = 0.0045$, which showed a better performance for female faces compared to male faces (see Figure 8). The effect size for this main effect was small ($\eta_P^2 = 0.01$). Finally, there was a signification interaction found for disguise and race of face on accuracy of old trials $F(2, 62) = 1.85$, $p = 0.0063$, such that even with the presence of a disguise, the accuracy for Asian faces was higher than the accuracy for the other races (see Figure 8). The effect size for this interaction was small ($\eta_P^2 = 0.008$). For the Interracial Contact Questionnaire, responses were totaled to create an experience score indicative of the participants experience with that race. To test the relationship between accuracy for old face trials and interracial experience, a Pearson's Correlation was calculated. It was found that the correlations between experience with White or Latinx individuals and accuracy on face recognition for those races was nonsignificant ($p > 0.05$). The correlations between accuracy and quality and quantity of experience tested separately were also nonsignificant.

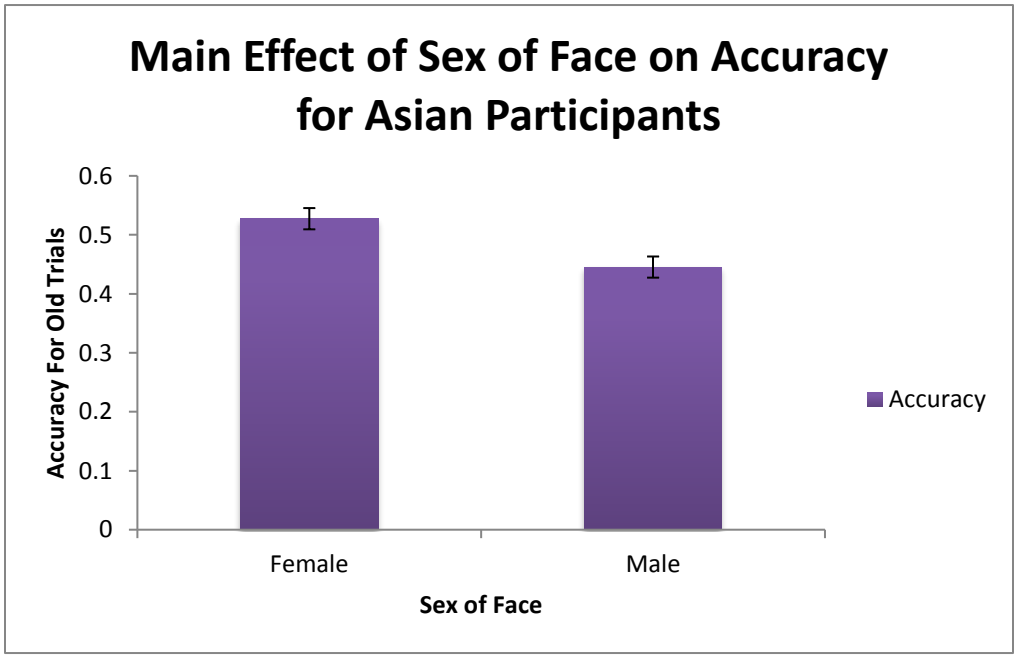

Figure 7. The main effect of Sex of Face on Accuracy for old trials for Asian participants.

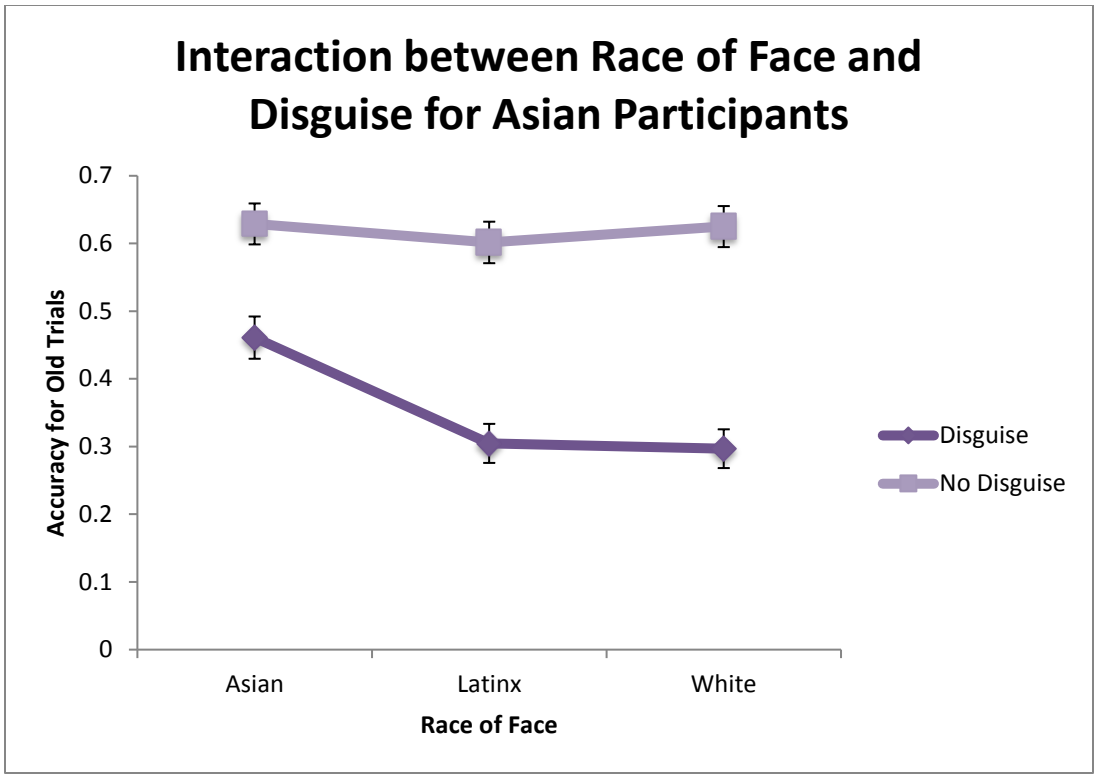

Figure 8. The interaction between Race of Face and Disguise on Accuracy for old trials for Asian participants. This figure also shows the main effects of Disguise and Race of Face on Accuracy.

Latinx Participants

For Latinx participants, it was found that there was a statistically significant main effect of race of face on accuracy for old trials $F(2, 50) = 3.92$, $p = 0.0017$ (see Figure 9). Participants performed better for Asian faces than for Latinx and White faces. The effect size for this main effect was small ($\eta_P^2 = 0.02$). There was also a significant main effect of disguise on accuracy of old trials $F(1, 25) = 31.10$, $p < 0.0001$, such that accuracy for disguised faces was significantly lower compared to accuracy for undisguised faces (see Figure 10). The effect size for this main effect was large ($\eta_P^2 = 0.15$). Furthermore, there was a significant main effect of sex of face on accuracy of old trials $F(1, 25) = 2.79$, $p = 0.0056$, showing that female faces were easier to identify than male faces (see Figure 10).

The effect size for this main effect was small (η_P^2 = 0.01). Finally, there was a significant interaction found between disguise and sex of face on accuracy for old trials $F(1, 25)$ = 0.77, p = 0.0298 (see Figure 10). The difference between disguised and undisguised was bigger for females than males. The effect size for this interaction was small (η_P^2 = 0.004). To test the relationship between accuracy for old face trials and interracial experience, a Pearson's Correlation was calculated. It was found that the correlation between experiences (total, quality, and quantity) with White or Asian individuals and accuracy on face recognition for those races was nonsignificant ($p > 0.05$).

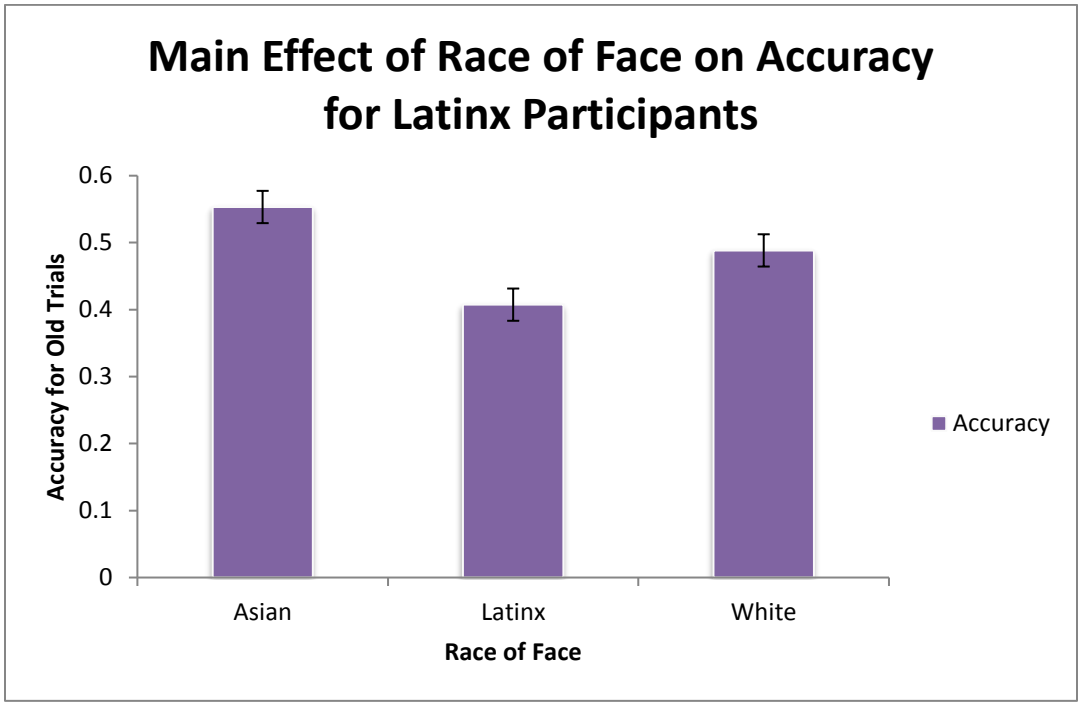

Figure 9. The main effect of Race of Face on Accuracy for old face trials for Latinx participants.

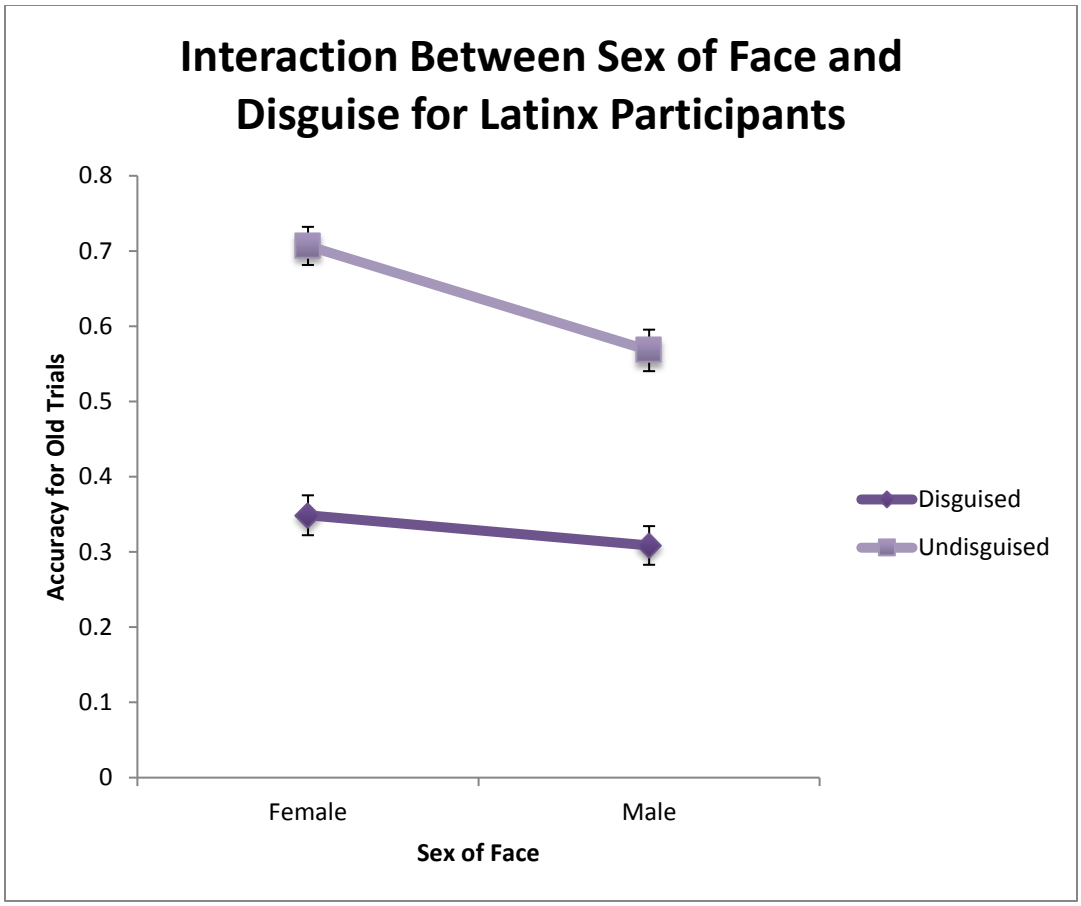

Figure 10. The interaction between Disguise and Sex of Face on Accuracy for old face trials for Latinx participants. This figure also shows the main effects of Disguise and Sex of Face on Accuracy.

White Participants

For white participants, there was a significant main effect of disguise on accuracy for old trials $F(1, 18) = 12.55$, $p = 0.0001$, such that undisguised faces had significantly higher accuracy than disguised faces (see Figure 11). The effect size for this main effect was moderate ($\eta_P^2 = 0.08$). There was also a significant main effect of race of face on accuracy of old trials $F(2, 36) = 5.94$, $p = 0.0013$, such that Asian faces were significantly easier to identify than White or Latinx faces (see Figure 12). The effect size for this main effect was small ($\eta_P^2 = 0.04$). Furthermore, there was a significant interaction of race of

face and sex of face on accuracy of old trials $F(2, 62) = 4.69$, $p = 0.01$ (see Figure 12). The effect size for this interaction was small ($\eta_P^2 = 0.01$). This effect shows that White participants performed better for female White and Asian faces but performed better for male Latinx faces. Finally, to test the relationship between accuracy for old face trials and interracial experience, a Pearson's correlation was calculated and it was found that there was a significant correlation between White participants' quality of experience with Latinx and their accuracy for Latinx faces ($r = 0.51$, $p = 0.003$; see Figure 13). The correlations between quantity of experience and total experience and accuracy were nonsignificant ($p > 0.05$).

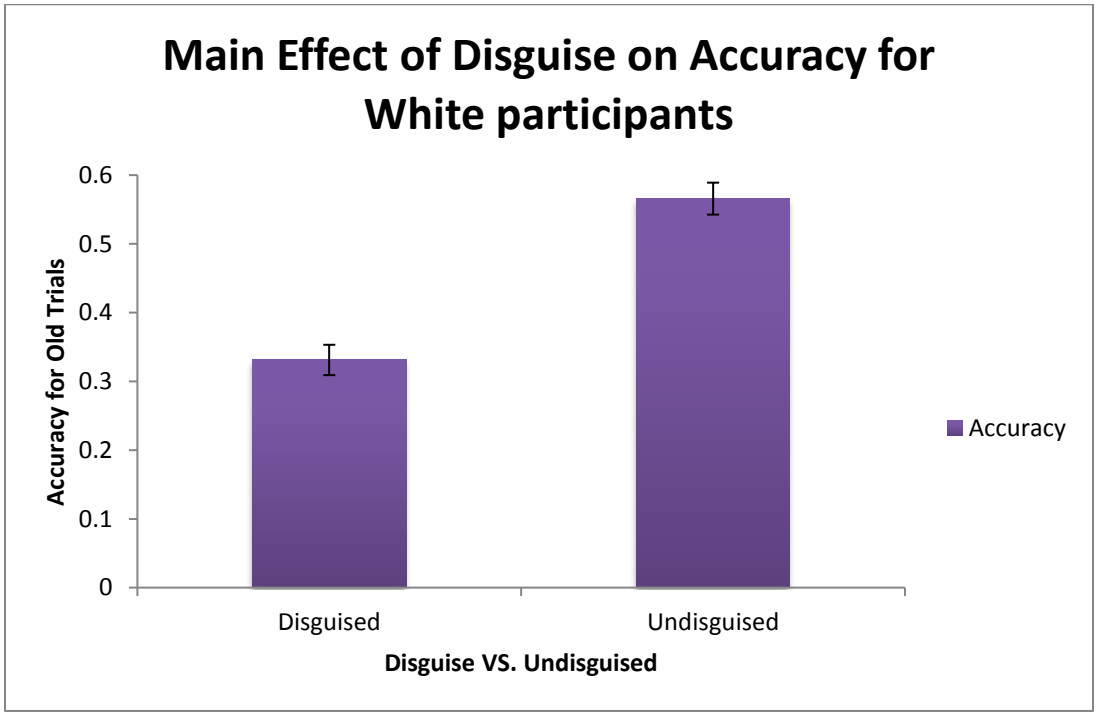

Figure 11. The main effect of Disguise on Accuracy for old trials for White participants.

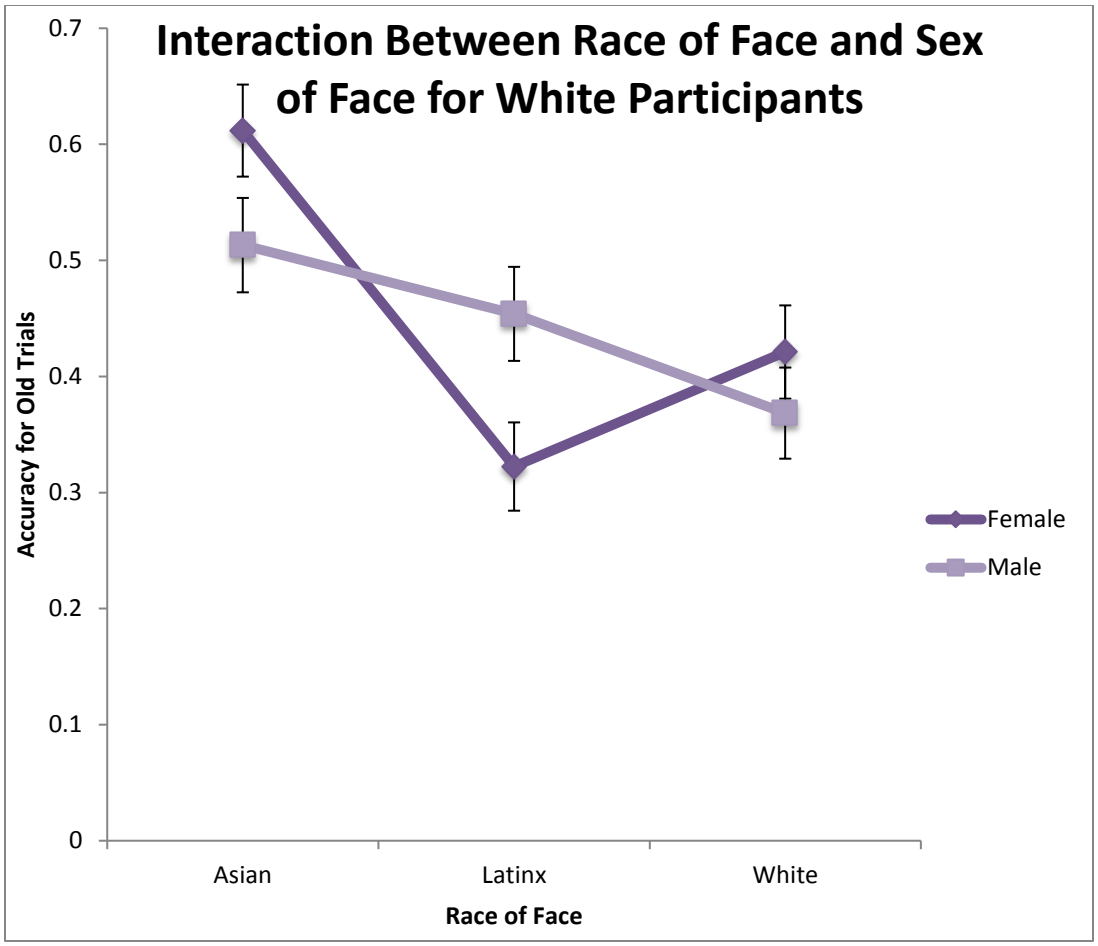

Figure 12. The interaction between Race of Face and Sex of face on Accuracy for old trials for White participants. This figure also shows the main effects of Race of Face and Sex of Face on Accuracy.

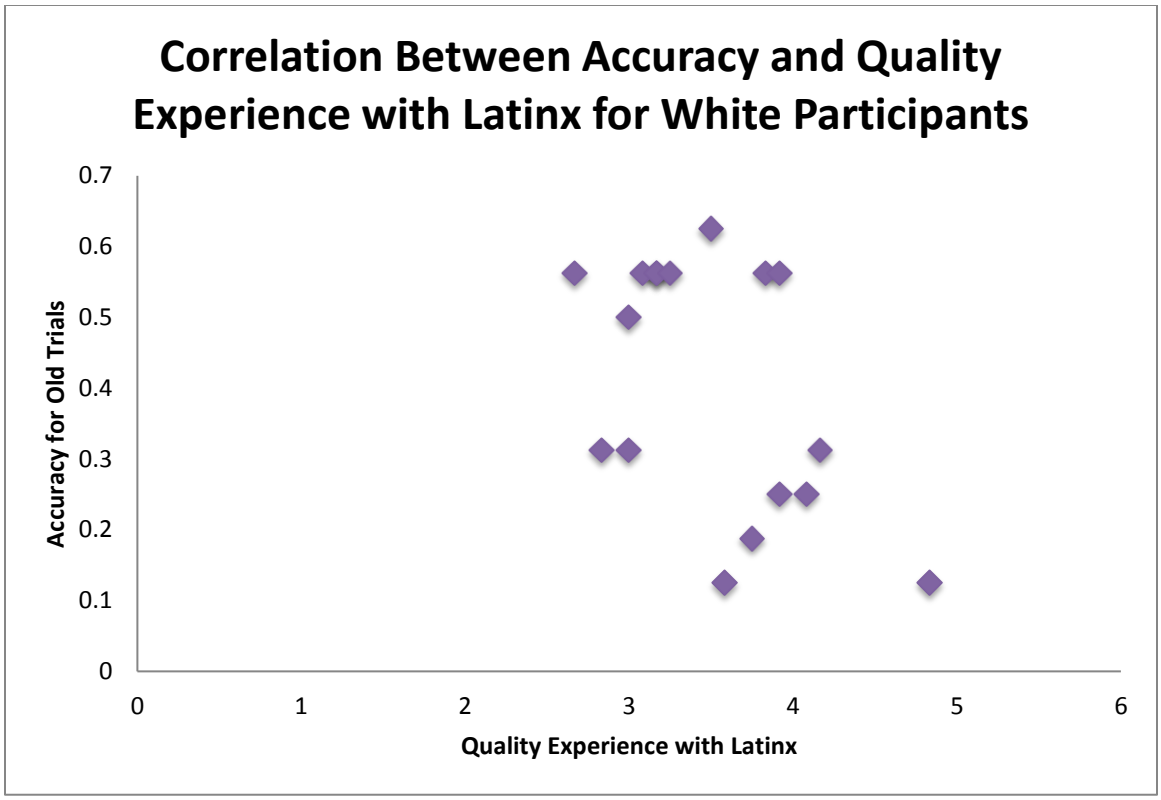

Figure 13. The correlation between Accuracy and Quality Experience with Latinx for White Participants.

CHAPTER 4

DISCUSSION

General Discussion

Results will be discussed in light of limitations present in this study. Surprisingly, we saw little evidence for a decrease in accuracy for other-race faces that would be consistent with existing literature on the ORE (Bukach et al., 2012; Malpass & Kravitz, 1969; Marcon, et al., 2009; Meissner et al., 2009; Michel et al., 2006). We also found evidence for a decrease in accuracy when a disguise was present for all three races included in this study that is consistent with existing literature on disguises (Fletcher et al., 2008; Mansour et al., 2012; Nguyen & Pezdek, 2017; Righi et al., 2012; Sadr et al., 2003; Terry, 1994). Additionally, for all three races, we found a significant effect of sex of face on accuracy such that female faces were easier to identify in all instances (except for White participants identifying Latinx faces, in which case male faces had a higher accuracy). Consistent with our findings, Tham, Bremner, and Hay (2016) conducted a study examining facial recognition with a population who had diverse exposure to individuals of other-races and found that across all races, female faces were easier to identify than male faces.

It was found that participants showed a higher accuracy for Asian faces compared to White or Latinx faces in this study that was consistent across all three races of participants. Either the Asian faces we used in this study were easier to identify or the

participants in our study were better than expected at identifying Asian faces. Future studies should examine this further by utilizing a different set of face stimuli in which the original faces yield equal accuracy. Also, we can test participants from different regions to determine if this effect is due to regional differences in experience. Orange County, CA has a diverse population made up of 3,172,532 people who are 41.1% White, 34.3% Latinx, and 20.4% Asian (Census, 2016). The racial breakdown at California State University Fullerton is also diverse with 41% Latinx students, 21% Asian, and 20% White (California State University, Fullerton Fall 2017 enrollment). It would be interesting to see how the findings might differ in a region with less diversity.

As we expected, we found evidence to support the hypothesis that the presence of a disguise would decrease the accuracy for facial recognition. For Asian participants, we found a significant interaction between the race of the stimulus face and the presence or absence of a disguise, such that other-race faces (White and Latinx) had a greater decrease in accuracy compared to same-race (Asian) faces when a disguise was present (see Figure 8). Similarly, for White participants, there was a significant difference between disguised and undisguised faces, such that undisguised faces had a higher accuracy in the facial recognition task. This finding supports the evidence in previous literature that disguises have a big impact on facial recognition accuracy. Finally, for Latinx participants, there was a significant interaction between disguise and sex of face such that disguises were more detrimental to performance on male faces compared to female faces. In this study, it was found that overall, female faces were easier to identify even in the disguise condition.

In the present study, the disguised faces (hoodie and sunglasses) brought participants' accuracy down to below chance (33.7%) and we did not find an overall interaction with race. In the present study, chance was 50% (two–alternative forced choice task - old or new); thus, participants had a 50% chance at getting a correct response if they guessed. This shows that when a face was studied with a disguise, participants were much more likely to label it as a "new" face. Future studies should test these factors on their own using the same types of disguises and the same races and compare accuracy on these factors individually to the accuracy for both factors (disguise and race) combined. This is especially important considering that there is very little data specifically exploring hoodies as a disguise and whether there is an ORE for Latinx faces. It appears that the presence of a disguise inhibited facial recognition above and beyond any other factors such as the ORE and future studies should examine this further. The presence of a disguise had a large impact on the participants' ability to accurately identify a face. This finding is consistent with the existing literature on disguises and facial recognition. Mansour et al. (2012) found that the presence of sunglasses and hats had a large effect on facial recognition accuracy. Similarly, Righi et al., (2012) found that eyeglasses had a significant impact on facial recognition accuracy. Future studies may also consider examining the effects of hoodies and race and sunglasses and race separately to determine if there is an ORE present with a solitary disguise versus the two forms of disguise combined. It is possible that both combined were too detrimental for performance, obscuring any effects of race. Race effects may also be more subtle in a diverse community.

Sadr, Jarudi, and Sinha (2003) found that removal of the eyebrows significantly impacted individuals' ability to accurately identify a face. In the present study, this finding was supported in that the disguised stimuli lacked eyebrows due to coverage by the sunglasses disguise. This finding illustrates how problematic accurate identification can be during an eyewitness identification line up when a simple disguise in the eye region (such as sunglasses) is present. Adding the hoodie appears to have driven performance even lower. In a case where a perpetrator had worn both these items, it would be nearly impossible to trust that the eyewitness is accurately able to identify the perpetrator. The present study found a significant difference in an individual's ability to accurately identify a face, such that the presence of the hoodie and glasses disguise (34% accuracy in labeling it as "old") brought the probability of an accurate identification down to below chance, meaning that the participants responded "new" significantly more than "old" for those trials. In contrast, participants' accuracy on undisguised trials was greater than chance (61% accuracy).

Overall, we found that with the interracial contact survey, greater experience with other-races included in this study did not correlate with greater accuracy for those faces in the facial recognition task. However, there was a significant correlation between quality experience for White participants, indicating that their accuracy in identifying Latinx faces was affected such that as quality of experience increased so did recognition accuracy. In our study, participants reported an overall higher quantity of experience compared to quality of experience with the exception of experience with Asian individuals (Asian quality: M = 2.71, Asian quantity: M = 2.58; White quality: M = 2.92, White quantity: M = 3.51; Latinx quality: M = 3.17, Latinx quantity: M = 3.46). The total

experience scores was highest for Latinx (M = 99.16, Range: 31-281), then White (M = 95.34, Range: 29-484), and the lowest total score for Asian (M = 73.42, Range: 25-208).

The lack of correlation between experience and accuracy in the present study is inconsistent with existing literature on the ORE and racial experience. Studies conducted by Zhao et al. (2014), Young et al. (2012), and Rhodes et. al (2009) all found that the ORE was reduced as a result of greater experience and increased holistic processing with other-race individuals. In Southern California, there is a diverse population and it could be reasonably expected that the population here would have greater experience with other-races. Tham et al. (2016) found that children who grew up in a diverse population displayed a recognition advantage of faces in which they had greater exposure (direct or indirect). These findings may be related to the present study in that it's possible that consistent exposure to the other-races (White, Asian, or Latinx) was enough to reduce the ORE regardless of the quality or quantity of experience with the other-races.

Limitations and Future Research

Overall, it was found that the disguise used in this study (hoodie and sunglasses) made it very difficult for participants to identify learned faces. The combination of both disguises (hoodie and sunglasses) may have made the task too difficult to find any interactions with race. Future studies should take the results from our study into consideration when selecting the level of disguise. Additionally, future studies should consider testing for the presence of the ORE using *d'* instead of accuracy to see if the ORE is detected. This study had a small sample size that consisted of more female participants than males. Furthermore, female faces appeared to be easier to identify than male faces in the present study, which may be a result of the hair cues that were present

in the undisguised conditions for female faces. It also possible that our results were affected by the Other Gender Effect (Loven, Herlitz, & Rehnman, 2011). In several studies female participants have been found to be better at recognizing faces of their own gender compared to male faces (Herlitz & Loven, 2013). Males do not show a similar bias. Thus, having such a large number of female participants may bias our data in favor of better performance for female faces.

Additionally, because our Asian faces appeared to be easier to identify than the other faces, future studies should more carefully select face stimuli to further investigate this result. It is possible that the diverse population at California State University, Fullerton and in Southern California impacted the results in this study. Future research on this topic should investigate regional differences related to facial recognition, race, and disguises. Furthermore, additional studies should also consider participants' attitudes towards hoodies and how that impacts facial recognition. Another related factor to consider is whether an effect similar to the "Weapon Focus" effect exists for hoodies. Kramer, Buckhout, and Eugenio (1990) describe the Weapon Focus as the effect in which an eyewitness has a decreased ability to accurately recall information from the crime scene (such as the description of the perpetrator) due to increased attention on the weapon present during the commission of the crime. It is possible that racial bias combined with negative perceptions about wearing a hoodie (related to gangs or crime) may lead to similar negative feelings towards other-race individuals wearing hoodies. This study was the first attempt at examining the ORE combined with a hoodie and sunglasses as a disguise. Future studies should address the issues discussed in this study as well as expand on other potentially related factors such as social attitudes towards hoodies.

APPENDIX A

DISTRACTOR TASK: RELATIONSHIP SKILLS QUESTIONNAIRE

RSQ

Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about <u>close relationships</u>.

		Not at all like me		Somewhat like me		Very much like me
1.	I find it difficult to depend on other people.	1	2	3	4	5
2.	It is very important to me to feel independent.	1	2	3	4	5
3.	I find it easy to get emotionally close to others.	1	2	3	4	5
4.	I want to merge completely with another person.	1	2	3	4	5
5.	I worry that I will be hurt if I allow myself to become too close to others.	1	2	3	4	5
6.	I am comfortable without close emotional relationships.	1	2	3	4	5
7.	I am not sure that I can always depend on others to be there when I need them.	1	2	3	4	5
8.	I want to be completely emotionally intimate with others.	1	2	3	4	5
9.	I worry about being alone.	1	2	3	4	5
10.	I am comfortable depending on other people.	1	2	3	4	5
11.	I often worry that romantic partners don't really love me.	1	2	3	4	5
12.	I find it difficult to trust others completely.	1	2	3	4	5
13.	I worry about others getting too close to me.	1	2	3	4	5
14.	I want emotionally close relationships.	1	2	3	4	5
15.	I am comfortable having other people depend on me.	1	2	3	4	5
16.	I worry that others don't value me as much as I value them.	1	2	3	4	5
17.	People are never there when you need them.	1	2	3	4	5
18.	My desire to merge completely sometimes scares people away.	1	2	3	4	5
19.	It is very important to me to feel self-sufficient.	1	2	3	4	5

APPENDIX B

DISTRACTOR TASK: MATH TEST

1. 12 x 10 + 20 = _____
2. a + b = c where a= 7 and c = 36 _____
3. Convert 14/3 into a proper fraction. _____
4. $7^2 + 1$ = _____
5. $\sqrt{144}$ = _____
6. What is 20% of 200? _____
7. (15 – 5) 10 = _____
8. What comes next: 12, 24, 36, 48, _____
9. Draw a factor tree for the number 81.

81

10. (20 – 15) – 5 + 3 = _____
11. Find the area of the following rectangle. _____ in.

7 in

12. a + b = c where a = 10 – 7 and c = 9 _____

13. 15 x 11 = _____

14. What comes next: 8, 16, 32, 64, _____

15. 9^2 + 11 = _____

8 in

APPENDIX C

INTERRACIAL CONTACT SURVEY

Please complete the following questionnaire. In the questionnaire, we are going to ask you about your personal experiences with Asian individuals. For each question below, please choose an appropriate answer (e.g. a number, a percentage or a frequency, etc.) that best describes your experiences. For the questions regarding your interactions with Asian individuals, we are interested in face-to-face interactions in which you have exchanged greetings, conversed, conducted business, asked for, gave, or received information or services, or in some other way responded to each other. For example, merely attending a class with a Asian individual is not an interaction unless you had a conversation, made direct eye contact, etc. Take as much time as you need to answer the questions thoroughly and accurately and get the experimenter once you are finished. Please remember too that all answers are coded and your responses will be kept confidential. Thank you again for your cooperation!

Approximately what percentage of the students in the elementary school you attended were Asian?
○ 0-9%
○ 10-19%
○ 20-29%
○ 30-39%
○ 40-49%
○ 50-59%
○ 60-69%
○ 70-79%
○ 80-89%
○ 90-100%

How many Asian friends did you have in elementary school?
○ 0
○ 1
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7
○ 8
○ 9 or more

Approximately what percentage of the students in the middle school or junior high school you attended were Asian?
○ 0-9%
○ 10-19%
○ 20-29%

○ 30-39%
○ 40-49%
○ 50-59%
○ 60-69%
○ 70-79%
○ 80-89%
○ 90-100%

How many Asian friends did you have in middle school or junior high?
○ 0
○ 1
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7
○ 8
○ 9 or more

Approximately what percentage of the students in the high school you attended were Asian?
○ 0-9%
○ 10-19%
○ 20-29%
○ 30-39%
○ 40-49%
○ 50-59%
○ 60-69%
○ 70-79%
○ 80-89%
○ 90-100%

How many Asian friends did you have in high school?
○ 0
○ 1
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7
○ 8
○ 9 or more

Approximately what percentage of the people in the neighborhood in which you grew up were Asian?
○ 0-9%
○ 10-19%
○ 20-29%
○ 30-39%
○ 40-49%
○ 50-59%
○ 60-69%

○ 70-79%
○ 80-89%
○ 90-100%

Of all the Asian individuals you know personally how many would fit into each of the following categories? Please estimate a number of individuals.

Casual Acquaintance _____
Moderately Well _____
Very Close Relationship _____

How many Asian people do you know very well?
○ 0-2
○ 3-5
○ 6-8
○ 9-11
○ 12 or more

I often spend time with Asian people.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

I spend a lot of free time doing things with Asian people.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

I often go round to the houses of Asian people.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

Asian people often come around to my house.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

I have looked after or helped a Asian friend when someone was causing them trouble or being mean to them.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

A Asian person has looked after me or helped me when someone was causing me trouble or being mean to me.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

I have comforted a Asian friend when they were feeling sad.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

A Asian person has comforted me when I have been feeling sad.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

I have asked a Asian person to be on my team or in my group during sports or activities.
○ Strongly Disagree
○ Sort of Disagree
○ Not Sure
○ Sort of Agree
○ Strongly Agree

How many times have you gone on a date with a Asian individual?
○ 0
○ 1
○ 2
○ 3
○ 4

If you have ever held a job, how many of your coworkers have been Asian?
○ 0-2
○ 3-5
○ 6-8
○ 9-11
○ 12 or more

Of your 9 closest friends at college, how many are Asian?
○ 0
○ 1
○ 2
○ 3
○ 4 or more

I often spend time in conversation with Asian individuals.
○ Never
○ Hardly Ever
○ Sometimes

○ Quite Often
○ Very Often

I share meals with a Asian individual at the same table while eating on campus.
○ Never
○ Hardly Ever
○ Sometimes
○ Quite Often
○ Very Often

I discuss my personal life with a Asian individual.
○ Never
○ Hardly Ever
○ Sometimes
○ Quite Often
○ Very Often

I discuss school work with a Asian individual.
○ Never
○ Hardly Ever
○ Sometimes
○ Quite Often
○ Very Often

That is the end of the questionnaire. Please press the finish button below and get the experimenter. Thank you for your participation!

APPENDIX D

DEMOGRAPHIC SURVEY

Highest Level of Education Completed: Postgraduate Degree (e.g., Masters or Ph.d.)____ Bachelor's Degree ____ Associate's Degree____ High School____ Primary School____

Age: _____

Gender (please circle):

Male Female

Sexual Preference: Bi Sexual ____ Straight ____ Gay ____ Other ____ Decline to State ____

If checked Other please specify _____

Ethnicity (please circle):

Hispanic/Latino(a) African/African American/Black

Asian/Pacific Islander Caucasian/European/White

Middle Eastern American Indian/Alaska Native

Other _____

Biracial/Multiracial _____

Handedness (please circle):

Right Left Ambidextrous

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