The Cross-Race Effect in Lineup Identifications by White, East Asian, and Hispanic Individuals

by

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Abstract

The cross-race effect refers to poorer recognition of faces of another race compared to faces of one's own race. This research investigates this phenomenon in White, East Asian, and Hispanic participants, using a repeated measures lineup procedure. Each lineup was pilot tested using 223 undergraduate student participants. Study 1 on Amazon Mechanical Turk (*n* = 431) showed no significant own-race advantage, with all groups performing worst on Asian faces. Study 2 (*n* = 150) in Metro Vancouver involved community members where participants completed a survey measuring intergroup contact and social motivation to individuate faces. No group performed the best on own-race faces, and performance was not significantly associated with self-report of intergroup contact or social motivation. However, when White and Hispanic participants were combined into one “Non-Asian” group, an own-group advantage was found. The current study explores the cross-race effect and urges additional research using diverse groups and lineup paradigms.

Keywords: cross-race effect; lineup identification; diverse groups

Dedication

This thesis is dedicated to my partner, Ethan, my parents, Angel and Ken, and my brother, James.

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Chapter 1.

Introduction

1.1. The Cross-Race Effect

The cross-race effect is poorer recognition of faces of another race compared to faces of one's own race (Malpass & Kravitz, 1969). This phenomenon, otherwise known as the own-race bias, is often linked to mistaken eyewitness identification, especially in the case of identifying visible minorities (Brigham et al., 2007). In a review of the 72% of wrongful conviction cases that involved eyewitness misidentification in an Innocence Project study done in 2014, 41% were cross-race identifications (West & Meterko, 2016). Eyewitness testimony is a powerful piece of evidence, making mistaken eyewitness identification a contributing factor of 44% of wrongful conviction cases in Canada (Campbell, 2017). The serious real-life implications of the cross-race effect reinforces the importance of understanding the mechanisms behind the phenomenon.

Existing literature on the cross-race effect has replicated the phenomenon in many studies, as shown across multiple meta-analyses (Anthony et al., 1992; Bothwell et al., 1989; Lee & Penrod, 2022; Meissner & Brigham, 2001). When recognizing cross-race faces, a "mirror effect" may occur, in which people are less likely to make hits (correctly identifying a target) and more likely to make false alarms (incorrectly identifying another face as the target) (Lee & Penrod, 2022; Meissner & Brigham, 2001). While many studies have replicated this effect, a significant area of contention in the cross-race effect literature are competing theories that attempt to explain the phenomenon – mainly the perceptual expertise hypothesis and socio-cognitive models.

1.2. The Perceptual Expertise Hypothesis

The perceptual expertise hypothesis, or contact theories, attribute the cross-race effect to greater exposure with own-race faces, leading to expertise and improved recognition (Chiroro & Valentine, 1995; Hancock & Rhodes, 2008). Since people are most likely to associate primarily with people of their own race (e.g., family members), this allows people to hone their facial recognition skills for same-race faces. A model that

is often used to support the perceptual expertise hypothesis is the multi-dimensional space framework (Valentine, 1991). This framework states that people store faces in a multi-dimensional face space, and each dimension is categorized by a specific facial feature, like eye colour, skin colour, or hair length. Each face is thought to be encoded as a unique point in this space, in relation to the specific dimensions that make up the face. The similarity of faces in this space can be represented by the distance between them: faces that are close to each other represent similar-looking faces and faces that are far from each other represent dissimilar-looking faces. As each additional face is encoded, the framework becomes increasingly better trained to detect small differences between faces. If the encoded faces are mostly own-race faces, then those types of faces will be the easiest to discriminate. Since faces of different races tend to have different characteristics, the face space will be less attuned to subtle differences in other-race faces, making these faces more densely clustered in the face space and harder to discriminate from each other (Byatt & Rhodes, 2004; Chiroro & Valentine, 1995).

The perceptual expertise hypothesis has been studied empirically. In one study, Black and White participants were recruited in Zimbabwe and the United Kingdom: Black and White participants from a diverse school in Zimbabwe were recruited as participants with high intergroup contact, and Black participants from a rural school in Zimbabwe and White participants from a small village in England were recruited as participants with low levels of intergroup contact (Chiroro & Valentine, 1995). As predicted, both Black and White participants showed the cross-race effect. However, high levels of contact only mitigated the cross-race effect in Black participants. In another study performed in South Africa and England, the cross-race effect was less pronounced for Black participants with high cross-racial contact, while intergroup contact was a weaker mitigator of the cross-race effect for White participants, which the authors attributed to less variability in intergroup contact within White participants (Wright et al., 2003). White and Asian participants have also been investigated within the context of the contact hypothesis. Hancock and Rhodes (2008) recruited White and Chinese participants from Australia with varying levels of cross-racial contact and found that higher levels of contact were associated with a reduced cross-race effect for both racial groups. This empirical work suggests that interracial contact can be effective in mitigating the cross-race effect, but it may not have the same impact on all racial/ethnic groups.

Children of minority groups that were adopted into White households from a young age provide a valuable opportunity for studying the perceptual expertise hypothesis. In one study, Korean adults adopted into White households in France from age 3-9 years-old demonstrated a reversal of the cross-race effect, meaning that they performed better for White faces compared to Korean faces (Sangrigoli et al., 2005). This finding was interpreted as evidence for the perceptual expertise hypothesis since extensive cross-race contact during the periods for the development of face-processing systems led the Korean adoptees to develop expertise for White faces over own-race faces. In another study, East Asian children adopted into White households in Belgium from young childhood to adolescence performed equally well for own-race and cross-race faces, while White non-adopted children in Belgium showed the typical cross-race effect (De Heering et al., 2010). In Canada, the elimination of the cross-race effect was also found in adults that were born in Canada or immigrated to Canada from infancy, whereas East Asians that immigrated to Canada during adulthood still demonstrated the typical cross-race effect (Zhou et al., 2019). Intergroup contact may not have reversed the cross-race effect in all these studies, but the elimination of the effect alone suggests that the cross-race effect is malleable and mitigable. These studies provide some evidence that intergroup contact can be effective in reducing the cross-race effect, especially when exposure occurs at an early age of development that is often described as a sensitive period for learning faces (Kelly et al., 2007; McKone et al., 2021).

Studies have also shown that different levels of contact for multiple outgroups are associated with differing magnitudes of the cross-race effect. For example, Stelter et al. (2021) tested the contact hypothesis by looking at proximal and distal groups, where outgroup proximity is defined as level of contact. The authors looked at White Germans, who would mostly encounter Middle Eastern individuals (proximal group) compared to Black or Asian individuals (distal groups). The study showed the typical own-race bias for the White participants, but they had higher accuracy rates for faces in the proximity group compared to distal groups, suggesting that higher levels of intergroup contact are more effective in mitigating the cross-race effect.

However, the perceptual expertise hypothesis was not supported in a study done in Canada and Singapore with White and Asian participants, where participants from both countries performed worse on cross-race faces than on same-race faces, despite drastic differences in intergroup contact (Ng & Lindsay, 1994). Other studies have

indicated no association between intergroup contact and cross-race effects, such as research with White young adults residing in the Midwestern United States (Wylie et al., 2015) and with White and First Nations students in Saskatchewan, Canada (Jackiw et al., 2008). In a recent meta-analysis of 207 experiments (which mostly sampled Black and White participants), intergroup contact was found to reduce the cross-race effect, but its effect was small (Singh et al., 2022). Between this meta-analysis and the one conducted by Meissner and Brigham (2001), intergroup contact only accounts for approximately 2% of the variance in the size of the cross-race effect (Stelter et al., 2023).

In more recent research, Stelter et al. (2023) used novel methods to measure intergroup contact by using the participants' residential location, GPS tracking, in addition to self-report measures. Black and White participants from the United States and White participants from Germany completed face-recognition tasks and provided their levels of intergroup contact. White participants were shown to generally exhibit the cross-race effect, but Black participants showed no difference in their performance on White or Black faces. Performance was not found to be correlated with intergroup contact determined through residential location or GPS tracking, but the authors did find some small effects of contact when looking at particular self-report measures. Specifically, intergroup contact with Black people during adulthood, negative contact with Black people during adulthood, and intergroup contact (positive or negative) with Black people during childhood were all associated with a reduced cross-race effect. Stelter et al. found that intergroup contact accounted for less than 1% of the variance across all measures of intergroup exposure. Based on mixed results drawn from research on the perceptual expertise hypothesis, some researchers turn to socio-cognitive theories to explain the cross-race effect.

1.3. Socio-Cognitive Models

At the core of socio-cognitive explanations of the cross-race effect is the idea that people are more likely to focus on categorical information (i.e., race) when viewing cross-race faces, and less likely to focus on individuating information (i.e., features that make them unique) when viewing same-race faces (Hugenberg et al., 2007; Sporer, 2001; Young et al., 2012). A focus on categorical features makes it more difficult to differentiate between outgroup faces. For example, if someone is only focusing on a

stranger's race, they may fail to take note of the person's eye colour, which could impede their ability to differentiate this person from another person of the same race. While the contact hypothesis states that perceptual expertise is driven by unconscious processes, some socio-cognitive theorists argue that there is an element of motivation that leads people to favour categorization over individuation for cross-race faces (Cruz et al., 2023). As people see faces every day, they have a limited capacity to fully process every face that they see, so they may reserve the costly process of individuation, which usually requires both motivation and cognitive resources, to same-race faces, and settle for the efficient process of categorization for other-race faces (Wilson et al., 2014).

There are multiple reasons why people would be motivated to individuate strangers that are part of their in-group. Humans are social beings that are constantly seeking out relationships, and research has shown that people are more attracted to people that they view as similar to themselves (Byrne, 1971). Ingroup membership is an indicator of similarity, so people may see value in individuating them in case they are potential candidates for a future relationship (Ng et al., 2020). In a few studies, researchers have found that participants who anticipate they would have a high chance of interacting with a member of a particular cross-race group demonstrated a mitigated cross-race effect (Van Bavel & Cunningham, 2012; Wilson et al., 2014). Ingroup members are also typically more relevant to someone's relationship, belonging, or self-esteem, which gives people more incentive to pay careful attention to them to fulfill psychological needs (Simon et al., 2023; Van Bavel & Cunningham, 2012).

Some studies have demonstrated that by assigning a race label to racially ambiguous faces, participants will perform better if the face is labeled with their own race than if it was labeled with an outgroup race (Hourihan et al., 2013; Pauker et al., 2009). MacLin and Malpass (2001) studied recognition of racially ambiguous faces with Hispanic participants. Half of the faces were paired with a typical Hispanic hairstyle and half were paired with a typical Black hairstyle. A recognition benefit occurred for faces with the Hispanic hairstyle, suggesting that inducing racial categorization could manipulate which faces are perceived as same-race or cross-race. However, Rhodes et al. (2010) did not replicate this effect when they morphed White and Asian faces to create racially ambiguous stimuli, and found no difference in performance when they manipulated the context to be same-race or other-race.

Race is not the only determinate of group membership, and factors such as social status can diminish the cross-race effect, resulting in superior recognition of high-status faces even if the faces are of outgroup status (Dunham et al., 2014; Hinzman et al., 2022). Across multiple studies, Simon et al. (2023) recruited Black, White, Asian, and Hispanic participants in the United States and found that all participants generally performed best on White faces relative to own-race faces and other cross-race faces, thereby overriding the own-race bias and supporting the claim that there is better memory for faces from higher status groups. Vingilis-Jaremko et al. (2020) came to similar conclusions when studying White, East Asian, South Asian, and Black participants in Canada and found a small trend towards better recognition of majority out-group faces (White) amongst members of the minority groups. Differences in status between the non-White groups were also present, as White participants recognized Asian faces better than the Black faces, which may be a result of Asian people being perceived as having a higher social status than Black people in North America (Frey, 2018). On the other hand, Shriver et al. (2008) did not eliminate the cross-race effect completely by manipulating social status, but they did find that American participants performed better on high status outgroup faces compared to low status outgroup faces.

Interestingly, arbitrary labels denoting group membership can lead individuals to have better recognition for in-group members, even if a member of the fabricated in-group is of cross-race (Hehman et al., 2010; Van Bavel & Cunningham, 2012). Recognition for same-race and other-race faces was also enhanced when participants were led to believe that certain targets were more similar to them, denoted by arbitrary labels of colour that indicated similarity in bogus personality survey responses (Kawakami et al., 2021, 2022). The results of these studies are consistent with the Common Ingroup Identity Model (Gaertner et al., 1993), which suggests that the malleability of an individual's identity and perception of other individuals' membership can lead them to recategorize a member of their outgroup as a member of their ingroup. In-group membership then comes with benefits such as better memory for detailed information about the member (Gaertner et al., 1993, Hehmen et al., 2010).

Individuating as motivated by group membership would be an example of internal motivation, but the source of motivation can be external as well (Simon et al., 2023). An example of external motivation would be a financial incentive to put more effort in recognizing outgroup faces. This was tested by Susa et al. (2019), who found that

financial incentives were effective in mitigating the cross-race effect in Hispanic participants' recognition of Black faces. Similarly, by inducing negative consequences of poor performance on outgroup faces (Baldwin et al., 2013), or assigning high value points to outgroup faces (DeLozier & Rhodes, 2015), participants were motivated externally to pay more attention to other-race faces and exhibited a reduced cross-race effect.

Hugenberg et al. (2007) found that the cross-race effect could be eliminated by simply warning participants about the cross-race effect and instructing them to attend to unique facial features, which was interpreted as evidence of the influence of motivation on the cross-race effect. A direct replication of the Hugenberg et al. (2007) study, conducted in the United States and Portugal with White participants, failed to produce any effect of individuating instructions (Cruz et al., 2023). Additional attempts to replicate this finding have produced mixed results – only two studies have managed to replicate the elimination of the cross-race effect through individuating instructions while eight other studies did not replicate (Cruz et al., 2023). Pica et al. (2015) found that the instructions managed to reduce but not eliminate the cross-race effect for White participants, whereas in another study the same set of instructions had no effect on White and Asian participants (Wan et al., 2015). In another study, pairing individuating instructions with a small reward for correctly recognizing Black faces did reduce the cross-race effect for White participants (Kawakami et al., 2014). Empirically, support for socio-cognitive models have also been mixed.

1.4. Hybrid Models

Although socio-cognitive theories alone may not be sufficient either to explain the cross-race effect, combining it with the contact hypothesis may offer a more holistic understanding of the phenomenon. The integrative categorization-individuation model (Hugenberg et al., 2010) states that exposure to a cross-race face directs attention to categorical information, and interracial experience is only effective in reducing the cross-race effect if there is motivation to individuate. This relationship is bidirectional, meaning that the ability to effectively individuate hinges on having enough interracial contact. In this model, interracial contact must be of high quality, such that people have experience discriminating between cross-race faces, rather than just being exposed to them (Yovel et al., 2009). Empirical research indicates that plenty of cross-racial contact does

mitigate the cross-race effect, but only in the condition in which participants were prescribed the individuating instruction (Young & Hugenberg, 2010). From this perspective, cross-racial contact and socio-cognitive processes work hand-in-hand in producing the cross-race effect.

Wan et al. (2015) proposes a different model that includes both perceptual expertise and social motivation as factors of the cross-race effect. In this model, the route to the cross-race effect and the magnitude of the effect can vary across cultural settings. Participants can experience the cross-race effect because they have limited intergroup contact, low social motivation, or a combination of both, which would amplify the effect. In a recent study from Tracy et al. (2023), the authors compared both perceptual expertise and socio-cognitive theories by using the Contact Survey by Hancock and Rhodes (2008) and the Anticipated Interaction Survey by Wilson et al. (2014). Tracey et al. found a bigger association between socio-cognitive factors measured in the Anticipated Interaction Survey compared to the Contact Survey. They also found a mediating effect of anticipated interaction, such that contact was only effective in reducing the cross-race effect if there was motivation to properly individuate these faces. Historically, perceptual expertise and social cognitive theories have been studied in separate camps, with perceptual expertise theories rooted in neurocognitive psychology and social cognitive theories rooted in experimental social psychology (Stelter & Schweinberger, 2023). Evidently, neither theory can be completely ruled out as an explanation for the cross-race effect, so both theories should be considered in tandem.

1.5. Experimental Paradigms

The cross-race effect can be explored in two ways: one-way designs, where a single group of participants are tested on both same-race and cross-race faces or two-way designs, which involve multiple groups of varying races or ethnicities, each identifying both own-race and cross-race faces (Lee & Penrod, 2022). Both designs are commonly used in the literature as just under 50% of the studies in the latest meta-analysis by Lee and Penrod (2022) involved two-way designs. However, one-way designs have a limitation when testing the cross-race effect because they cannot rule out the possibility that the specific cross-race faces in the study might simply be more challenging to recognize, leading to lower performance in those groups (Wells & Olson,

2001). In a two-way design, differences due to stimulus sampling can be ruled out if an interaction effect between participate race and stimulus race is found (Wells & Olson, 2001). This limitation of the one-way design highlights the importance of having a complete crossover between participant and stimulus race when studying the cross-race effect.

The predominant method of testing the cross-race effect has been the “old-new” paradigm. In an old-new study, participants study faces and then complete a recognition test that includes studied (old) and unstudied (new) faces. In this paradigm, the cross-race effect is found if participants are more likely to mistake a new face for an old face or vice versa for cross-race faces compared to same-race faces. This procedure may not be the most relevant for police lineup procedures, but is the predominant paradigm found in meta-analytic reviews of the cross-race effect literature (Meissner & Brigham, 2001; Singh et al., 2022), making up 76.9% of studies in the most recent meta-analysis by Lee and Penrod (2022). Stimulus sampling is also automatically implemented within the old-new paradigm due to its use of many different faces, which could explain its common use in the literature. An addition 15.7% of the studies in the meta-analysis are n-Alternative Forced Choice tasks, where participants are also asked to select previously-seen faces out of a series of *n* faces, but they are not given the option to say they have not seen any of the faces presented in that round.

Conversely, lineup identification tasks involve presenting a culprit to the participant (i.e., through a photo, video, or a live lineup) and asking participants to identify who they believe is the culprit from a lineup that either contains or does not contain the culprit. For example, a lineup study in Florida with White and Black convenience store clerks found that White clerks were better at identifying same-race customers compared to other-race customers, but Black clerks showed no difference in performance (Brigham et al., 1982). In another lineup study in which participants were only exposed to one target, Black and White participants in both South Africa and England both recognized people of their own race more accurately than people of another race (Wright et al., 2001).

There are different paradigms for studying eyewitness identification from lineups. The typical paradigm for lineup studies is to for participants to view a crime with one culprit and then to complete one lineup. However, Meissner et al. (2005) introduced a

repeated lineup recognition paradigm: rather than using just one culprit and one lineup, participants view numerous faces, complete a distractor task, and then complete a series of target-present and target-absent lineups. Jackiw et al. (2008) used this paradigm with White and Indigenous participants and found the cross-race effect in both groups.

Meissner and Brigham (2001) found that the effect size of the cross-race effect was slightly larger in lineup identifications tasks compared with old-new recognition paradigms. This finding is at odds, however, with data from 314 lineups administered by the Metropolitan Police in London, which provided no evidence of the cross race effect in White and Black witnesses (Valentine et al., 2003). Despite the high practical value of studying lineups due to its use in police investigations, lineup paradigms are very understudied as it only accounts for 7.4% of cross-race studies (Lee & Penrod, 2022). The cross-race effect has been treated and discussed as a robust phenomenon (Brigham et al., 2007; Kassin et al., 2001), but considering that most of the empirical work supporting this claim used the old-new paradigm, it is important to add to the dearth of research on cross-race effects in lineup decisions.

1.6. Racial Groups

Compared to studies with White and Black samples, the cross-race effect has been less consistent in studies with other racial groups. In the meta-analysis of cross-race effect studies by Singh et al. (2022), most studies included White participants (108 samples), followed by Asian participants (40 samples) and Black participants (23 samples). Only 20 samples contained participants of multi-racial, Latin American, or Turkish origin. The majority of cross-race studies are with White participants, while a lesser number of studies recruit non-White participants or look at multiple non-White groups in tandem.

1.6.1. Asian Participants

White and Asian participants are a common pairing of participant groups in cross-race effect studies (Singh et al., 2022), but the cross-race effect is not found as consistently as it is found in White-Black participant pairings. For East Asian participants residing in North America, cross-race effects have been detected in some studies

(Gross, 2009; Walker & Tanaka, 2003), but other studies have shown equal performance for own-race and White faces (Marsh, 2021; Ng et al., 2016; O'Bryant & McCaffrey, 2006). Chinese participants who reside in China have also demonstrated the cross-race effect when looking at Asian and White faces (Ge et al., 2009; Schwartz et al., 2023). When comparing first and second-generation East Asian Canadians, only second-generation participants (who were born in Canada) showed a cross-race effect (Ng et al., 2020). There are still some inconsistent findings even in the studies that detected a cross-race effect in Asian participants, as intergroup contact was found to be beneficial for cross-race face recognition in some studies (Hancock & Rhodes, 2008; Tuttenberg & Wiese, 2019; Zhou et al, 2019), but this association was not found in other studies (Ng & Lindsay, 1994; Walker & Tanaka, 2003).

1.6.2. Hispanic Participants

There are limited studies that include Hispanic participants and/or use Hispanic faces in their stimuli (Rennels, 2022), which is a weakness of the cross-race literature due to the unique characteristics of Hispanic people. To clarify, the term "Hispanic" refers to someone from a Spanish speaking country; the term "Latino" or "Latina" refers to someone from Mexico, Central/South America, or the Caribbean (Lopez et al., 2022). As such, Hispanic is not a term descriptive of race, it is a description of ethnicity. Hispanic people can be White, Black, or be from any race/mix of races. Therefore, some may find it more ambiguous to categorize Hispanic faces as in-group or out-group during facial recognition. For example, a White individual could categorize a racially ambiguous Hispanic person as part of their in-group but would be less likely to do the same for an Asian person.

The unique features of the Hispanic ethnicity have been used to study differences in proximity to in-group. Marsh (2021) demonstrated through their study that inducing a prime about the American identity led White and Hispanic participants to only exhibit a cross-race effect towards Asian faces, where White participants had already exhibited a cross-race effect for both Hispanic and Asian faces before the cultural prime. This study also showed White participants identifying many Hispanic faces as White after they were primed with their racial identity. The author suggested that the Hispanic group may be more readily incorporated into the American identity compared to the Asian group, which may be more saliently perceived as foreigners.

Visually, there may also be important differences in how consistently people perceive racial identity across these three groups. In the Chicago Face Database, which contains almost 600 faces of people of different racial backgrounds, White and Black faces had the highest agreement in how they were racially perceived by others and how they racially identify themselves, followed by Asian faces, and Hispanic faces (Abascal, 2020; Ma et al., 2015). When Hispanic faces are not identified as Hispanic, they are often identified as White (Abascal, 2020; Herman, 2010). This ambiguity could stem from the difficulty in determining prototypical features of a Hispanic face, compared to other faces, like White or Asian (Ma et al., 2018), which can disrupt the process of categorizing a face as cross-race or same-race (Rennels, 2022). The meta-analysis by Lee and Penrod (2022) showed that White participants had a smaller cross-race effect for Hispanic targets relative to Black and Asian targets, and Hispanic and Asian participants both had a larger cross-race effect to Black targets relative to White targets.

In the few studies that involve Hispanic participants, the results are as inconsistent as that of East Asian participants; for example, Platz & Hosch (1988) found the cross-race effect for Mexican, Black, and White participants in a field lineup study and Evans et al. (2009) replicated the cross-race effect in Hispanic and Black participants, but O'Bryant and McCaffrey (2006) only found the effect in White participants and failed to find the effect in Hispanic, Asian, or Black participants. Gross (2009) also conducted a study on Hispanic, Asian, Black, and White participants: he found that Hispanic participants performed better on own-race and White faces relative to Asian and Black faces, Asian participants recognized own-race faces better than Black faces but were only marginally better at recognizing own-race faces relative to White and Hispanic faces, and White participants demonstrated the typical own-race advantage. The same study was conducted on a younger sample of individuals aged 5-17 years, and Gross (2014) found that White children demonstrated an own-race bias and also recognized Hispanic faces better than Black and Asian faces, Hispanic children showed an own-race bias and recognized White and Asian faces better than Black faces, and Asian and Black children did not show any differences in their recognition of different faces.

1.6.3. White Participants

Some studies that utilize diverse samples have found that White participants are often the most consistent and/or the most apparent in showing the cross-race effect compared to other groups (Katzman & Kovera, 2023; Lee & Penrod, 2022; Marsh, 2021; Meissner & Brigham, 2001; Schwartz et al., 2023). This disparity could stem from power differences within a Western society, where White people are the majority. From this perspective, members of minority groups are motivated to individuate members of the majority group in addition to members of their own in-group as they recognize that members of the majority group have the power to influence their life outcomes. However, members of the majority group hold enough power that they feel no need to do that, so they can rely on surface-level processes like categorization and stereotypes (Fiske, 1993; Simon et al., 2023; Wright & Taylor, 2007). These findings underscore the significance of understanding not only how individuals exhibit an own-race bias in face recognition but also how they fare when evaluating faces from multiple out-groups (Vingilis-Jaremko et al., 2020). It is important not to anticipate uniformity in how the cross-race effect manifests across various cross-race groups.

1.7. The Current Study

In this thesis, I investigated the cross-race effect in White, East Asian, and Hispanic participants using a repeated-measures lineup paradigm. With this lineup paradigm, this study investigated the cross-race effect using an understudied method. This study also took advantage of Metro Vancouver's diversity to investigate the cross-race effect using understudied racial/ethnic groups and the opportunity to compare performance on two cross-race groups. Metro Vancouver is predominantly populated by White residents (43.1%), followed by East Asian (comprised of people from China, Japan, Korea, Taiwan, and Mongolia) residents (23.3%) (Government of Canada, 2022). Latin American residents are less represented relative to White and Asian residents as they comprise only 1.98% of the population (Government of Canada, 2022). Thus, I predicted that White and East Asian participants will have higher levels of cross-racial contact with East Asian and White individuals, respectively, compared to contact with Hispanic individuals. Hispanic individuals are predicted to have high levels of cross-

racial contact with both East Asian and White individuals. High levels of contact are expected to mitigate the cross-race effect.

There are four main hypotheses, as follows.

1. Participants will perform better for same-race faces compared to cross-race faces, meaning that they will have a higher *d'*.
2. White participants will perform better with East Asian faces compared to Hispanic faces.
3. East Asian participants will perform better with White faces compared to Hispanic faces.
4. Hispanic participants will perform equally with White and East Asian faces.

These hypotheses were pre-registered at https://aspredicted.org/BZM_BR5.

These hypotheses are also consistent with socio-cognitive theories. White people have the highest social power amongst these three groups, which could motivate East Asian participants to better individuate White outgroup members compared to Hispanic outgroup members. Past studies have also shown that there appears to be a perceived status difference between Asian and Hispanic populations, which may give White participants more incentive to individuate Asian faces relative to Hispanic faces (Kahn et al., 2009). White individuals possess greater social power compared to Asian individuals but given the significant presence of both communities in the city, increased intergroup interaction might offset reduced motivation to individuate Asian faces. Consequently, Hispanic participants may exhibit similar levels of motivation to individuate between these groups, resulting in comparable performance. This study will thus contribute to the budding literature that investigates both theories in tandem.

Chapter 2.

General Procedure

I conducted a pilot study, followed by two studies: the pilot study was conducted using the SFU Research Participant Pool, Study 1 was conducted with Amazon Mechanical Turk participants, and Study 2 was conducted with community members in Metro Vancouver. The general procedure is the same for all three studies; changes made along the way are documented below.

2.1. Participants

In the cross-race face recognition literature, effect sizes have tended to be small (Meissner & Brigham, 2001). Power analysis using G*Power indicates that to achieve power of .80 to detect a small effect size of d = 0.20, an estimate of 156 participants (52 participants per group) are needed to test for main effects and interactions in a mixed-subjects design, with one between-subjects variable with three levels and one within-subjects variable with three levels. For each study, we aimed to recruit 52 participants for each racial/ethnic group.

2.2. Materials

Photos for encoding and lineup stimuli were compiled through internet search of publicly accessible photos to find 12 targets for each racial group. Having repeated trials with different targets was important for stimulus sampling and ensuring construct validity (Wells & Windschitl, 1999). In order to reduce the chances that these targets would be familiar to the participants, I searched for targets that were from outside of North America, such as minor celebrities, athletes, voice actors, and news anchors. Biographical information was used to confirm that the targets identified as the intended race/ethnicity (and did not identify as Mixed). This method also enabled different photos for the same person to be available for encoding and retrieval so that participants were not simply matching pictures (Kawakami et al., 2022; Kramer & Gous, 2020; Marsh et al., 2016). The two photos for each target were free to differ in some characteristics like facial expression and hairstyle, but faces were required to be clearly visible in each

photo, whether it was facing forward or slightly turned away. Ages of the targets ranged from 20-50 years old, and approximately an equal number of male and female targets were included. People with any distinctive features like a birthmark or scars were excluded from the stimuli.

A similar procedure was used to obtain images of lineup fillers. I established a description for each target consisting of each person's sex, race, approximate age, hair length and hair colour. My research assistant and I used this description to find five fillers matched in appearance to the target, plus one designated innocent target to be used as the target image at encoding for target-absent trials. These fillers came from the same source as the targets. After lineups were created, I revised the lineups to ensure no lineup member or any aspect of their picture made them stand out (e.g. pictures were cropped so that the face took up approximately the same amount of space in each photo). Lineup member order was randomized for each participant.

2.3. Procedure

The main portion of each study is the lineup identification trials, which generally remain the same throughout each study. Following the paradigm by Meissner et al. (2005), participants learned several faces, completed a brief distractor task before completing a series of lineups that were either be target-present or target-absent. The single-lineup paradigm (Oriet & Fitzgerald, 2018) was employed to allow for the same lineups to be used in both target-present and target-absent trials. In this method, the same lineup is either target-present or target-absent depending on whether participants saw the suspect in the lineup (target-present) or they saw the designated innocent target (target-absent).

At the lineup test, participants were instructed that the lineups may or may not contain the target, then asked if they could identify a lineup member or report that the target is absent from the lineup by selecting the "Not Present" answer. Participants rated their confidence from 0% to 100% immediately after their decision. Lineups were also presented in the same order as the faces during encoding. At the end of each survey, participants were asked to fill out a demographic survey that asked about their gender, age, and ethnicity, debriefed, and given the opportunity to express any opinions or concerns about the study.

Chapter 3.

Pilot Study: SFU Student Sample

3.1. Participants

I recruited 275 students from the SFU Research Participant Pool to complete the study for partial course credit, but data from 13 students were excluded for non-completion, resulting in *N* = 262. Two pilot studies were conducted: data from 39 participants were reviewed to assess the difficulty of the study in Pilot Study 1, and Pilot Study 2 had a final sample of 223 participants, consisting of 57 White participants, 45 East Asian participants (38 Chinese, 6 Korean, and 1 Japanese), and 4 Hispanic participants. The rest were South Asian (*N* = 48), mixed-race (*N* = 30), or other ethnicities. Only the data from White and Asian participants will be analysed and reported here, but the data from the entire sample was used for pilot testing purposes (see Appendix A for data from the South Asian participants). There were 147 women, 69 men, 2 non-binary participants, and 4 participants who preferred not to disclose. The mean age was 18.85 (*SD* = 1.45).

3.2. Materials

This stimulus set included 12 targets x 3 racial categories = 36 targets total, with 6 lineup members per target, resulting in 72 lineup members per racial category x 3 racial categories = 216 lineup members total. The total of 36 targets was split into nine blocks, where four targets were presented sequentially in each block. Targets were always presented in the same order within each block. Counterbalancing the order of target presentation across blocks was done to decrease the likelihood that ordering effects would impact participant performance. For the blocks that contain two targets of the same race/ethnicity, the two targets were always of different genders to avoid confusing participants.

3.3. Procedure

The study was a 2 (participant race – White, East Asian) x 3 (stimulus race – White, East Asian, Hispanic) x 2 (target presence – target-present lineups, target-absent lineups) mixed subjects design, where the participant race was the between-subjects factor, and the target race and target presence were the within-subjects factors. Students taking first year psychology courses at SFU were recruited through the SONA system to complete this online study in exchange for partial course credit. The study was advertised as an investigation of face memory, without mentioning the component of the cross-race effect.

3.3.1. Pilot Study 1

For each block, participants saw four faces sequentially each for 3 seconds, which were randomly chosen to be either a target of the block or the designated innocent target. After a brief distractor task of 10 simple math questions for 25 seconds, participants were presented with four simultaneous lineups that each contain a different photo of the respective target than the one used at encoding. The data from Pilot Study 1 showed that performance was lower than expected; for some targets, participants were performing only slightly above chance (1/6 = 0.167%).

3.3.2. Pilot Study 2

To make the task easier after assessing the results of Pilot Study 1, the encoding time was extended from 3 second exposure per target image to 5 second exposure. In addition, the filler task was reduced from 10 math questions to 6 math questions, and the duration of the filler task was reduced from 25 seconds to 15 seconds. After completing the identification tasks of the block, participants were presented with three sliding scales to measure their confidence in categorizing the target as White, East Asian, or Hispanic. Each scale had three options: “confident that the target *is* White/East Asian/Hispanic,” “not confident that the targets are White/East Asian/Hispanic,” or “confident that the target is *not* White/East Asian/Hispanic.” Scales were used instead of a multiple-choice question because we anticipated that for any ambiguous Hispanic targets, participants may lean more towards choosing White, and the data will appear as though many Hispanic targets are being constantly identified as White when they may just be

ambiguous to most participants. After, participants were also asked whether they recognized any of these people from outside of the context of the study. The order of the nine blocks was presented randomly. The end of the survey follows the same steps as described in the General Procedure.

This pilot study was used to achieve three purposes before launching the main study: strive to maintain that (1) difficulty of target recognition was similar across racial groups, (2) targets were being perceived as their actual race/ethnicity, (3) targets were not familiar to most participants, and (4) no fillers were standing out from the lineup. We planned to include 24 targets in the main study and had 36 targets in the pilot, which allowed for the removal of some targets while still maintaining stimuli sampling. These pilot studies were meant to identify any ill-suited targets for elimination as a way to decrease the cognitive load, as it has been found that excessive cognitive load can drastically decrease overall performance and may result in a floor effect that may hide any indications of the cross-race effect (Shapiro & Penrod, 1986).

3.4. Results

Since there was a sizable sample of White and Asian participants in this pilot, it was an opportunity to observe whether there was an emergence of the cross-race effect. *d'* was computed to observe recognition performance, which can be interpreted as the participants' ability to discriminate between targets and non-targets. This measure is computed by calculating the difference between the standardized means of the hit and false alarm rates. Hit rates were the proportion of correct identifications of the target and false alarm rates were the proportion of mistaken identifications in target absent lineups (which includes both the identification of the designated innocent target and fillers). The formula is as follows: $d' = z(\text{H}) - z(\text{FA})$, where the *z*-transformation of the FA (false alarm) rate is subtracted from the z-transformation of H (hit) rate (Stanislaw & Todorov, 1999). I then performed a modified log linear correction on the hits and false alarm rates by adding .05 to the numerator and .1 to the denominator to correct any rates that were zero or one. I chose this adjusted correction method instead of the conventional approach, which involves adding 0.5 to the numerator and 1 to the denominator. This modification aims to prevent significant alterations in the numerical value, especially given its limited range. Lastly, I computed three *d'* measures for each participant to account for their performance for each racial/ethnic group and took the average to

account for the overall performance of each racial/ethnic group for each of the racial/ethnic stimuli groups of faces.

Positive values of *d'* indicate that these participants looking at this certain group of stimuli are more likely to make a hit rather than a false alarm; negative values of *d'* indicate the opposite. A *d'* value of 0 indicates that participants are equally likely to identify the target or identify a non-target. In addition, *c* was calculated using the following formula: -0.5*(*z*(H) + *z*(FA) to assess suspect bias (Fitzgerald & Price, 2015). Positive values of *c* suggest a tendency towards not identifying the suspect; a negative value of *c* suggests the opposite. Suspect bias is a more conservative measure of the tendency to choose as it does not consider filler identifications, so I also calculated choosing rates to get a more precise measure of response bias. To do this, I computed a weighted average of hits and filler selection rates from target present lineups, and false alarm rates (including both filler and designated innocent target selections) from target absent lineups.

Table 1 reports the eyewitness outcomes for White and Asian participants being tested on White and Asian faces. To test for any significant differences, a series of Linear Mixed Models (LMMs) were run using the lmer function in the package *lme4* in R (Bates et al., 2015), where the predictors are two categorical variables of participant group and stimulus group, and the response variable is a continuous variable of *d'*. First, there was an overall main effect of stimulus group, where participants were performing better on White faces compared to Asian faces (β = 0.42, *SE* = 0.15, 95% CI [0.12, 0.72], *t*(101) = 2.78 *p* = .006, *d* = 0.39). An overall omnibus test of the interaction model did not suggest an interaction effect between participant group and stimulus group (F(1, 100) = 2.34, *p* = .13), but simple effect analyses showed that White participants performed significantly worse on Asian faces compared to White faces (*t*(100) = -3.11, *p* = .002, *SE* = 0.20, *d* = -0.58, 95% CI [-1.03, -0.23]). There were no differences observed for *c,* but choosing rates were also lower for White lineups (β = -0.04, *SE* = 0.02, 95% CI [-0.07, -0.005], *t*(101) = -2.24, *p* = .03, *d* = -0.31).

Table 1. Lineup Outcomes for White and Asian Participants in SFU Sample

Participant		Target Present				Target Absent				*d′*	c	Cho
	Stimulus	**N**	**Hits**	**Filler**	**NoID**	**N**	**IT[a]**	**Filler**	**NoID**			
White	White	344	.47	.14	.39	340	.07	.26	.67	0.54	0.33	.48
	Asian	344	.39	.24	.37	340	.06	.37	.57	-0.09	0.36	.52
Asian	White	253	.41	.17	.42	287	.09	.33	.58	0.05	0.27	.49
	Asian	273	.42	.16	.42	267	.05	.40	.56	-0.11	0.28	.52

Note. All outcomes are denoted as average rates; the "NoID" rate can be inverted to get the overall false alarm rate; "Cho" denotes choosing rates.
[a]"IT" refers to identification of the designated innocent target in target absent trials

3.5. Discussion

Evidently, White participants did better on same-race faces, but no interaction effect was present since Asian participants did not also do better on same-race faces. This result is consistent with previous literature where White participants are more prone to experiencing the cross-race effect relative to other minority groups. Though the difference is insignificant, it is interesting to note that Asian participants actually did worse on Asian faces than White participants, which is the opposite of what the cross-race effect would predict.

Chapter 4.

Study 1: Amazon Mechanical Turk Sample

4.1. Participants

After adjusting the stimuli, I recruited East Asian, Hispanic, and White participants from Amazon Mechanical Turk to continue pilot testing and to investigate the cross-race effect with all three racial/ethnic groups. Since this platform requires studies to have a duration of 25 minutes or less, I reduced the number of blocks so that participants would complete 12 trials, rather than the 36 trials in the pilot study. Given that the number of trials were reduced to 1/3 of that used in the pilot, I divided the pilot study stimuli into three surveys and tripled the sample size to obtain approximately 50 participants per group for each lineup.

The final sample included 431 participants (139 East Asian participants, 141 Hispanic participants, 151 White participants). The total sample of participants that passed the ethnicity screening was 490, and data from 59 participants were excluded because the participant failed the attention check (*n* = 3), did not complete the whole study (*n* = 19), have completed the same survey once already (*n* = *3)* or they reported they were of mixed heritage (*n* = 34). Note that there were 40 participants that identified as both White and Hispanic in the Hispanic sample – they were not excluded as many Hispanic people do still identify as White and may have indicated such on the demographic survey if asked directly about their race (Noe-Bustamante et al., 2021).

The White sample had an average age of 42.83 (*SD* = 12.37) and included 74 women, 75 men, 1 non-binary participant, and 1 participant who preferred not to disclose their gender. The Asian sample had an average age of 36.91 (*SD* = 11.14) and included 60 women, 77 men, 1 non-binary participant, and 1 participant who preferred not to disclose their gender. The Hispanic sample had an average of 35.09 (*SD* = 10.13) and included 71 women, 68 men, and 2 non-binary participants. All participants were located in the United States, with the exception of one White participant who completed the study in Bangladesh and another White participant who completed the study in India. To be eligible for the study, participants were required to have completed at least 100 hits (survey tasks) and have received at least a 95% approval rating. Each survey took

approximately 15 minutes. Initially, participants were compensated $1. Eventually, the compensation was increased to $4 per participant as an attempt to recruit more East Asian participants.

4.2. Materials

Hit rates from the pilot study were used to identify targets that could be replaced to balance performance across trials. As a result, one White target was replaced for having a hit rate at the ceiling, one Asian target was replaced for having a very low hit rate, and two Asian and two Hispanic targets had their encoding picture replaced for having low hit rates. One Hispanic filler was replaced because it was drawing a disproportionate number of mistaken identifications when the lineup was target absent. Lineup effective size was also calculated using lineup choice distribution data from all participants that viewed that target on target-absent trials to assess lineup fairness (Tredoux, 1998; see Appendix B). Two Hispanic targets were also replaced for being confidently categorized as White over 50% of the time. There were 36 targets still remaining after revisions.

4.3. Procedure

Order of the blocks was randomized within each survey. There was a screening question at the beginning of the survey to ensure that the participant belonged to the racial/ethnic groups I was recruiting for the study. In addition, an attention screening question was placed at the beginning, and the survey would end for any participant who failed to read the instructions and answered the question correctly. During encoding, an interaction break was added between each target appearance during the encoding stage, so that after 5s, the target image would disappear, and participants would be prompted to click an arrow on the screen to see the next face. This revision was done to improve performance by ensuring participants were able to actively pay attention to each face and preventing people from missing a few faces if they stopped paying attention for a few moments. The same procedure as the pilot study was followed outside of these modifications.

4.4. Results

Study 1 offers another opportunity to observe how each group performs on each group of faces (see Table 2 for all eyewitness outcomes). Using the glmer function in the lme4 package (Bates et al., 2015), a series of Generalized Linear Mixed Models (GLMMs) were run to test for significant differences. Since each participant was only exposed to approximately four targets per stimulus group, there were some participants that saw all target present or target absent trials. Thus, GLMMs were used instead of LMMs to accommodate missing cases. The response variable in these models was a binary variable depicting suspect identification accuracy (hits = 1, false alarms = 0), and the probit link function was used in the model to account for the binary variable. Each GLMM was run twice, using two different reference groups each time to observe all the contrasts. *d'*, c, and choosing rates were then calculated using the hit and false alarm rates in Table 2. There was a main effect of stimulus group again, where participants are generally underperforming on Asian faces relative to both White faces (β = -0.40, *SE* = 0.07, 95% CI [-0.54, -0.26], *z* = -5.67, *p* = <.001) and Hispanic faces (β = -0.45, *SE* = 0.07, 95% CI [-0.58, -0.31], *z* = -6.43, *SE* = 0.07, *p* = <.001). Interestingly, there was also a main effect of participant group, where both Asian participants (β = 0.19, *SE* = 0.09, 95% CI [0.02, 0.36], *z* = 2.25, *p* = 0.025) and Hispanic participants (β = 0.19, *SE* = 0.08, 95% CI [0.02, 0.35], *z* = 2.21, *p* = 0.027) had a greater *d'* than White participants.

The omnibus test for the interaction model suggested that an interaction effect was present (χ^2 (4) = 11.68, *p* = .020). However, the only significant effects in the simple effects analyses (which used the Tukey method to adjust for Type I error) did not point towards a typical own-race advantage as participants did not significantly perform the best on own-race faces, as the cross-race effect would predict. The only significant effects suggest that White and Hispanic participants did worse on Asian faces but performed at a comparable level for White and Hispanic faces. White participants did significantly better on White faces than Asian faces (β = 0.27, *SE* = 0.12, 95% CI [0.002, 0.54], *z* = 2.36, *p* = 0.048), and better on Hispanic faces than Asian faces (β = 0.32, *SE* = 0.12, 95% CI [0.05, 0.59], *z* = 2.82, *p* = .014). For Asian participants, they performed significantly better on White faces compared to Asian faces (β = 0.36, *SE* = 0.13, 95% CI [0.05, 0.67], *z* = 2.72, *p* = .018). Hispanic participants performed significantly better on White faces compared to Asian faces (β = 0.58, *SE* = 0.12, 95% CI [0.29, 0.87], z =

4.70, p = <.001), and significantly better on Hispanic faces compared to Asian faces (β = 0.77, SE = 0.12, 95% CI [0.48, 1.05], z = 6.33, p = <.001). For Hispanic faces, White participants performed worse than Hispanic participants (β = -0.39, SE = 0.13, 95% CI [-0.69, -0.08], z = -2.95, p = .009).

4.4.1. Exploratory Analysis – Asian vs Non-Asian Participants

Since the simple effects analyses suggested that performance on White and Hispanic faces was fairly equal, and Asian faces were generally harder, exploratory analysis was performed by recoding White and Hispanic participants and faces as non-Asian to see whether a non-Asian and Asian interaction effect could be found. The interaction model was not significant (χ^2 (1) = 1.90, p = .168), but simple effects analyses show that both Non-Asian (β = 0.48, SE = 0.07, 95% CI [0.34, 0.62], z = 6.61, p = <.001) and Asian participants (β = 0.30, SE = 0.12, 95% CI [0.08, 0.51], z = 2.64, p = .008) were better at Non-Asian faces compared to Asian faces.

Table 2. Lineup Outcomes for White, Asian, and Hispanic Participants in MTurk Sample

Participant	Stimulus	Target Present				Target Absent				d'	c	Cho
		N	**Hits**	**Filler**	**NoID**	**N**	**IT[a]**	**Filler**	**NoID**			
White	White	307	0.47	0.15	0.38	307	0.12	0.32	0.56	0.08	0.12	.53
	Asian	306	0.38	0.26	0.36	304	0.06	0.47	0.48	-0.37	0.13	.58
	Hispanic	301	0.48	0.21	0.31	311	0.13	0.27	0.60	0.22	0.16	.54
Asian	White	278	0.47	0.12	0.41	279	0.06	0.22	0.72	0.52	0.33	.43
	Asian	283	0.36	0.16	0.48	280	0.06	0.31	0.63	-0.04	0.34	.45
	Hispanic	286	0.49	0.15	0.35	274	0.11	0.25	0.63	0.33	0.18	.51
Hispanic	White	296	0.46	0.13	0.40	276	0.07	0.23	0.69	0.42	0.30	.46
	Asian	273	0.38	0.23	0.38	283	0.10	0.45	0.45	-0.42	0.08	.58
	Hispanic	289	0.60	0.12	0.28	275	0.08	0.23	0.69	0.75	0.12	.52

Note. All outcomes are denoted as proportions

[a]"IT" refers to identification of the designated innocent target in target absent trials

4.5. Discussion

White participants showed an own-race advantage with Asian faces, replicating the effect from pilot studies. However, they did not significantly outperform Hispanic faces in terms of own-race faces. Asian participants did not exhibit the typical cross-race effect, performing better on White faces than own-race faces, but they did outperform White or Hispanic participants on Asian faces, even if the difference was insignificant. This suggests a degree of an own-race advantage for Asian participants. Hispanic participants mirrored White participants' performance, performing notably worse on Asian faces compared to White and Hispanic faces. While the interaction between Asian and Non-Asian groups was insignificant, it provides a useful framework for evaluating the data in Study 2.

Chapter 5.

Study 2: Metro Vancouver Sample

5.1. Participants

Study 2 was conducted with a sample based in Metro Vancouver, allowing a test of intergroup contact effects. The study had a sample of 163 participants, excluding 13 participants: 1 participant had already done the study once before, 12 participants did not meet the exclusion criteria as they were mixed-race (*n* = 8), or South Asian (*n* = 1), or Southeast Asian (*n* = *3)*. Out of the final sample of 150 participants, 51 participants identified as White, 51 participants identified as East Asian (Chinese = 39, Korean = 5, Japanese = 3, Taiwanese = 3, Chinese and Japanese = 1), and 48 participants identified as Hispanic (out of which four participants identified as White and Hispanic). The following analyses were also done excluding the data from these four participants and the results were unaffected.

The average age of the sample was 27.88 (*SD* = 10.19), and the average ages for the three racial/ethnic groups were all similar (White participants = 28.16, *SD* = 10.15; East Asian participants = 28.81, *SD* = 12.59; Hispanic participants = 26.67, *SD* = 7.23). The sample included 91 women, 51 men, 7 non-binary participants, and 1 participant who preferred not to disclose their gender. Participants were asked to report their place of birth, with 41.6% (*n* = 61) reporting that they were born in Vancouver and 59.3% (*n* = 89) reporting they had moved to Vancouver. The average length of time spent living in Vancouver for those that had moved to the city was 9.28 years (*SD* = 10.69; White = 8.78 years, *SD* = 10.85; East Asian = 14.14 years, *SD* = 11.86; Hispanic = 5.99 years, *SD* = 8.34).

Participants were recruited from a variety of sources. The largest group of participants (36.5%) were friends, acquaintances, or family members recruited directly by me or my two Research Assistants that helped collect data for the study. A further 29.1% of the participants found the study through various social media platforms (i.e. posts in Facebook groups, Instagram advertisements, posts on SFU-specific Reddit threads, advertisement in the SFU Psychology E-Newsletter). Another 22.3% of the participants were recruited through word-of-mouth from previous participants. The

remaining participants were recruited from posters on SFU campus (4.1%), posters off campus (5.4%), and from Latincouver (3%), which is a Vancouver-based Latin American cultural organization. Two participants did not disclose how they found out about the study.

5.2. Materials

Using the data from Study 1, the survey was shortened by eliminating targets that had ceiling or floor performance were eliminated. Four of the lowest performing White and Asian targets were removed. Three Hispanic targets that were categorized as White over 50% of the time and one Hispanic target that had outstanding performance was removed. No lineup fillers needed to be replaced (see Appendix B for average lineup effective sizes from Study 1). After eliminations, eight targets per race/ethnicity remained. Subsequently, the remaining 24 lineups trials were split into 6 blocks.

After completing the lineup tasks, participants completed several questionnaires that were intended to inform on the different theories of the cross-race effect. In order to measure cross-racial contact, this study adopted the contact questionnaire from Hancock and Rhodes (2008; see Appendix D), which is a commonly used questionnaire to measure intergroup contact in the cross-race effect literature (Singh et al., 2022). Participants rated their contact with their own race and the other two racial groups. There were six questions assessing contact with each race, including their own racial group, equating to 18 questions per survey. Each question was answered on a 5-point Likert scale (ranging from strongly disagree to strongly agree). Question order was randomized so participants were not answering the questions blocked by racial group.

There have been a few surveys used in the literature to address socio-cognitive theories: Walker and Hewstone (2006) devised an “individuating experience” survey, where they asked participants how much experience they had engaging in activities like helping a friend from a cross-race group during times of trouble, or how many times they comforted a friend from a cross-race group when they were sad. In addition, motivation to individuate was measured by asking questions about anticipated contact with a member of the cross-race group (Wilson et al., 2014). Contrary to Walker and Hewstone’s (2006) scale, which focuses on intergroup experience that has already happened, the scale by Wilson et al. (2014) measures motivation based on anticipated

contact, which could be too closely tied to intergroup contact that they have already experienced. I wanted to use a survey that was more distinct from the contact survey to specifically investigate how participants' may differ in their perception and sense of belonging in relation to each cross-race group, so I opted for an exploratory survey made up of two surveys from literature adjacent to the cross-race effect.

Four questions were pulled from the Allophilia scale (Pittinsky et al., 2011) that aim to measure positive attitudes toward outgroups and one question was pulled from the Outgroup Interactions and Closeness Index (Welker et al., 2014) that aims to measure how close an individual feels towards an outgroup (see Appendix E). These questions in this makeshift survey were aimed at measuring whether participants have differing levels of perceived value and in-group status assignment across outgroups and whether that influences the levels of individuation motivation (Simon et al., 2023; Marsh, 2021). This survey is used to operationalize the motivation to individuate faces. Each question is also answered on a 5-point Likert scale (ranging from strongly disagree to strongly agree). There are 5 questions about each racial group, and questions were in random order for each participant.

5.3. Procedure

Since the participants recruited for the main study were not anticipated to be familiar with psychology studies like students at SFU or workers on MTurk, steps were taken to ensure that participants were well equipped to complete the study properly. RAs were tasked to schedule a time to meet with the participant through Zoom to guide and supervise their completion of the study. First, the RA explained their role in supervising the participant as they go through the study and that they would be there to answer any questions the participant may have if any instructions were unclear. The RA then explained how the participant could access and complete the survey online. The RA's presence was also meant to encourage the participant to stay focused on the study until they were finished. After the participant completed the study, a $10 compensation was distributed using *Interac* E-transfer. The emails collected for E-transfer were then deleted after the transaction was complete.

The main study procedure for the lineup portion was the same as the procedure in Study 1. Contrary to Study 1, participants were not asked to categorize targets by

race/ethnicity after each block. After the lineup identification tasks were completed, the participants were asked to fill out the intergroup contact questionnaire, the socio-cognitive questionnaire (presented in counterbalanced order), followed by the demographic questionnaire and the debrief. Participants were also asked whether they have always lived in Vancouver, and if they had moved to Vancouver, they were asked to indicate how many years they have resided in Vancouver.

5.4. Results

In Study 2, no participant group performed the best on own-race faces (Table 3). LMMs were used again to assess for significant differences in d', and each LMM was run twice to get all the contrasts. Main effects show that Asian participants had lower performance relative to only White participants (β = -0.49, *SE* = 0.25, 95% CI [-0.97, -0.01], *t*(147) = -2.00, *p* = .048, *d* = -0.36). Participants were also underperforming on Asian faces relative to both White (β = 0.40, *SE* = 0.16, 95% CI[0.09, 0.71], *t*(298) = 2.52, *p* = .012, *d* = 0.29) and Hispanic faces (β = 0.53, *SE* = 0.16, 95% CI [0.22, 0.84], *t*(298) = 3.34, *p* = .001, *d* = 0.39). To assess the overall significance of the interaction model, I first ran an omnibus *F* test, which revealed a significant effect (F(4, 294) = 3.07, *p* = .017). Simple effects analysis further show that Hispanic participants are significantly better at White faces compared to Asian faces (β = 1.02, *SE* = 0.28, 95% CI [0.38, 1.68], *t*(294) = 3.71, *p* = .001, *d* = 0.76) and better at own-race faces relative to Asian faces (β = 0.74, *SE* = 0.28, 95% CI [0.09, 1.39], *t*(294) = 2.66, *p* = .022, *d* = 0.54). In addition, White participants are better at White faces than Asian participants (β = 0.95, *SE* = 0.33, 95% CI [0.17, 1.72], *t*(361) = 2.87, *p* = .012, *d* = 0.70). Again, no significant difference in *c* was found. There was also a main effect of stimulus on choosing, where participants were more likely to make an identification from both Asian (β = 0.07, *SE* = 0.02, 95% CI [0.03, 0.10], t(298) = 3.60, *p* = .0004, *d* = 0.42) and Hispanic lineups (β = 0.04, *SE* = 0.02, 95% CI [0.0005, 0.07], t(298) = 1.99, *p* = .048, *d* = 0.23) relative to White lineups.

Table 3. Lineup Outcomes for White, Asian, and Hispanic Participants in the Vancouver Sample

Participant		Target Present				Target Absent				d'	c	Cho
	Stimulus	N	**Hits**	**Filler**	**NoID**	**N**	**IT[a]**	**Filler**	**NoID**			
White	White	196	.56	.10	.34	212	.07	.24	.68	0.90	0.26	.50
	Asian	207	.54	.22	.24	201	.08	.36	.56	0.42	0.03	.59
	Hispanic	208	.60	.11	.29	200	.08	.28	.64	0.93	0.07	.57
Asian	White	213	.46	.15	.38	195	.15	.34	.52	-0.04	0.10	.54
	Asian	194	.55	.21	.24	214	.10	.39	.52	0.23	-0.13	.59
	Hispanic	208	.57	.21	.23	200	.05	.36	.59	0.59	0.04	.60
Hispanic	White	202	.61	.17	.23	182	.12	.30	.58	0.73	-0.07	.61
	Asian	189	.51	.25	.24	195	.10	.47	.43	-0.30	-0.11	.66
	Hispanic	194	.55	.20	.24	190	.09	.34	.57	0.44	0.02	.59

Note. All outcomes are denoted as average rates, "Cho" denotes choosing rates.
[a]"IT" refers to identification of the designated innocent suspect in target absent trials

5.4.1. Intergroup Contact

Intergroup contact was measured through a survey (Hancock & Rhodes, 2008) of 18 questions, and the average was taken from each set of six questions to get a measure of the level of contact the participant has reported having with members of that particular group. Their answers could range from 1-5, 1 representing low contact and 5 representing high contact. As a result, each participant has three contact scores, one for each racial/ethnic group. Cronbach's alpha (α) was used to assess the reliability of the scale, where $\alpha > 0.7$ is considered acceptable. Cronbach's alpha was calculated for each set of six questions and each set had good reliability: contact with White people ($\alpha = .83$, 95% CI [.78, .87]), contact with East Asian people ($\alpha = .85$, 95% CI [.81, .89]), and contact with Hispanic people ($\alpha = .90$, 95% CI [.87, .92]).

As seen in Table 4 and in a LMM, all groups reported highest contact with people of their own racial/ethnic group ($\beta = 1.03$, $SE = 0.08$, 95% CI [0.87, 1.18], $t(448) = 12.87$, $p = <.001$, $d = 0.75$); see Appendix F for more detailed inferential statistics. Some important patterns to note are: for East Asian and Hispanic participants, contact with White people was always second, not last, and contact with Asian people was the second highest for White participants but last for Hispanic participants. In order to observe whether contact had any effect on performance for specific face groups, three LMM models (one model per participant group) were run, where the categorical variable

of face group and a continuous variable of contact are predictors on *d'*. No significant interaction effects for White participants ($F(2, 131) = 1.00$, $p = .370$), Asian participants ($F(2, 135) = 0.36$, $p = .697$), or Hispanic participants ($F(2, 117) = 0.22$, $p = .803$) were found. Origin (whether the participant was born in Vancouver or not) was also taken into account but did not offer any additional helpful information to explain the results (see Appendix C).

5.4.2. Social Motivation

Social motivation was measured through a 15-question survey (Pittinsky et al., 2011; Welker et al., 2014) and the average of each set of 5 questions was taken as a measure of each participant's motivation to individuate members of each racial/ethnic group to compile three measures of motivation per participant. Their answers could range from 1-5, 1 representing low motivation and 5 representing high motivation. Cronbach's alpha was used again to assess reliability of these scales, and like the contact survey, each set of questions was reliable in measuring motivation to individuate White people ($\alpha = .80$, 95% CI [.74, .85]), East Asian people ($\alpha = .81$, 95% CI [.76, .86]), and Hispanic people ($\alpha = .88$, 95% CI [.85, .91]).

Similar to contact, participants overall reported more social motivation for own-race members compared to other-race members ($\beta = 0.92$, $SE = 0.07$, 95% CI [0.79, 1.04], $t(299) = 13.98$, $p = <.001$, $d = 0.75$); please see Appendix F for more detailed inferential tests. Interestingly, White participants deviated from this overall pattern as there was no difference between their motivation to individuate any of the groups. Asian and Hispanic participants were significantly more motivated to individuate their own-race groups compared to cross-race groups, whereas they did not show a difference in motivation to individuate between both cross-race groups. Again, three LMMs were used to investigate the effect of social motivation on performance and no significant interaction effects were found for White participants ($F(2, 123) = 0.33$, $p = .718$), Asian participants ($F(2, 124) = 0.73$, $p = .482$), or Hispanic participants ($F(2, 115) = 0.63$, $p = .534$).

5.4.3. Hybrid Models

To assess whether the contact and motivation scores had an interaction effect on performance for each of the participant groups, three LMMs were run where contact scores, motivation scores, and face group formed an interaction term as a predictor on performance. No significant effects were found for White participants ($F(2, 123) = 0.85$, $p = .432$), Asian participants ($F(2, 130) = 2.01$, $p = .138$), or Hispanic participants ($F(2, 113) = 2.07$, $p = .131$).

Table 4. Average Contact and Motivation Scores amongst Vancouver Participants

Participant	Stimulus	Motivation	Contact
White	White	3.38 (0.73)	4.00 (0.59)
	Asian	3.55 (0.64)	3.55 (0.77)
	Hispanic	3.18 (0.76)	2.73 (0.79)
Asian	White	2.65 (0.61)	3.10 (0.68)
	Asian	3.99 (0.56)	3.99 (0.57)
	Hispanic	2.71 (0.68)	2.11 (0.71)
Hispanic	White	2.94 (0.63)	3.40 (0.70)
	Asian	3.02 (0.76)	2.91 (0.78)
	Hispanic	4.38 (0.54)	3.97 (0.69)

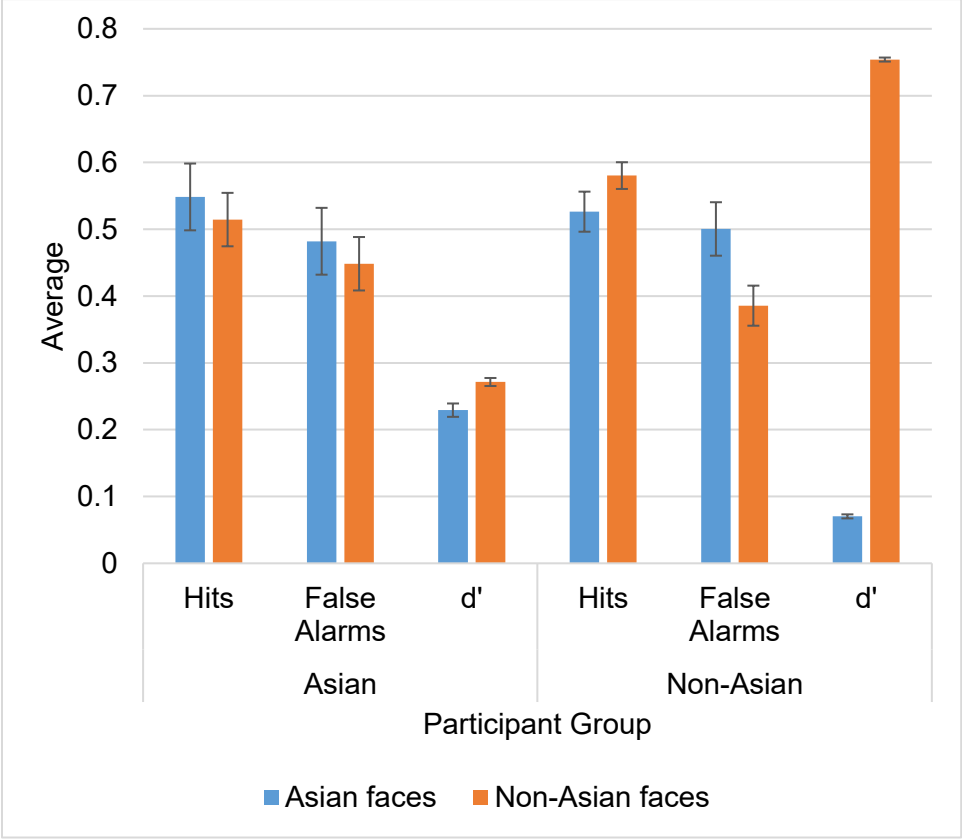
Note. Standard deviation is denoted in brackets

5.4.4. Exploratory Analysis – Asian vs Non-Asian Participants

Exploratory analysis was performed again by recoding White and Hispanic participants and faces as non-Asian to see whether a non-Asian and Asian interaction effect could be found (Figure 1). Again, a main effect of face group was found in the LMM analysis, where participants generally had a higher d' for non-Asian faces ($\beta = 0.47$, $SE = 0.14$, 95% CI [0.20, 0.74], $t(299) = 3.38$, $p = .001$, $d = 0.34$). The omnibus F test showed that the interaction effect was significant overall ($F(1, 298) = 4.94$, $p = .027$). Simple effects analyses show that non-Asian participants were worse at Asian faces relative to non-Asian faces, i.e., a cross-race deficit ($\beta = -0.68$, $SE = 0.17$, 95% CI [-1.02, -0.35], $t(298) = -4.06$, $p = <.001$, $d = -0.50$). Asian participants were also worse at non-Asian faces compared to non-Asian participants ($\beta = -0.48$, $SE = 0.24$, 95% CI [-0.95, -

0.02], $t(209) = -2.05$, $p = .042$, $d = -0.35$). Asian participants do outperform non-Asian participants on Asian faces, exhibiting an own-group advantage, but the difference is not significant. This configuration of data shows a significant own-group advantage for non-Asians and hints of an own-group advantage for Asian participants.

Figure 1. Lineup Outcomes for Asian vs Non-Asian Participants in Vancouver



Note. Error bars denote standard error

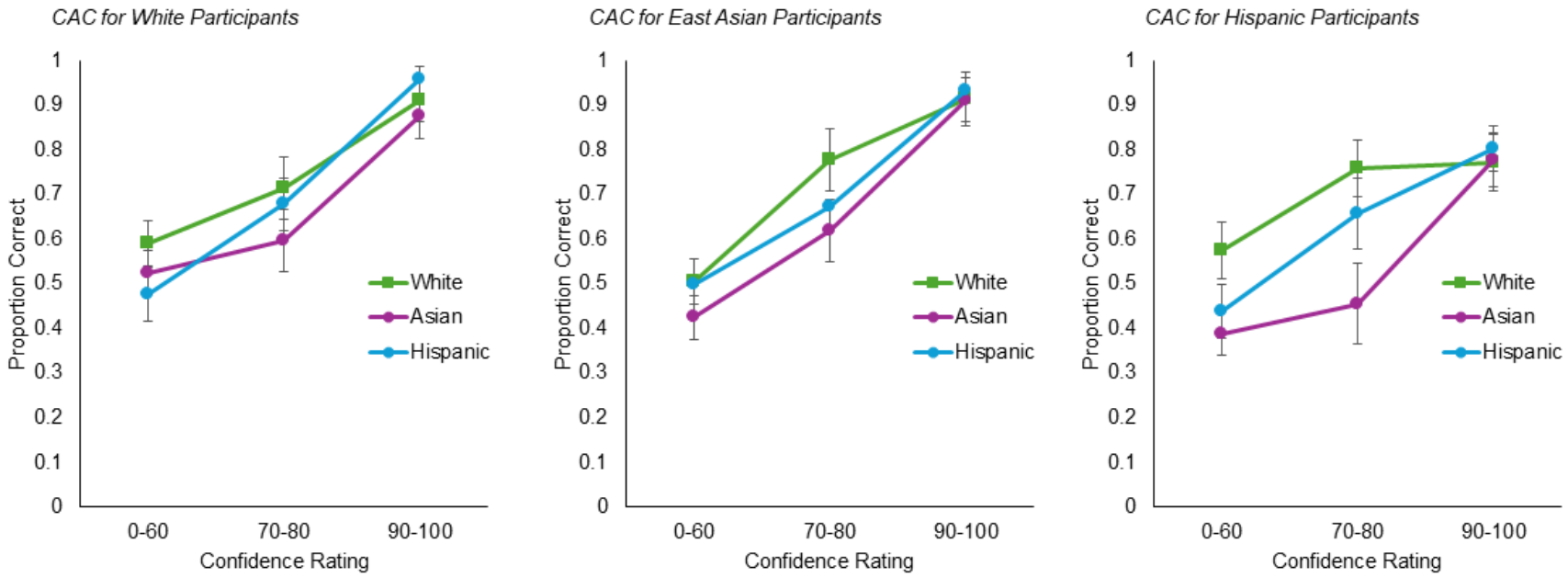
5.4.5. Confidence-Accuracy Relationship

Three confidence-accuracy-characteristics (CAC) were made for each participant group to depict the proportion of correct suspect identifications at each level of confidence, where suspect identifications include hits in target present lineups and filler selections in target absent lineups. As the cross-race effect is a general impairment variable rather than a suspect specific variable (Wells & Olson, 2001), no correction was applied on the false alarm rates in target absent lineups. Participants reported confidence on a 0-100 scale, at intervals of 10, but for the CACs, the levels of confidence were collapsed into three bins: low confidence consists of 0-60% confidence

ratings, medium confidence consists of 70-80% confidence ratings, and high confidence consists of 90-100% confidence ratings.

Figure 2 depicts the CACs for White, East Asian, and Hispanic participants, respectively. All participant groups appear to show the confidence-accuracy relationship for all three face groups since there is a higher proportion of correct identifications at higher confidence levels. The cross-race effect did not appear to disrupt this relationship. One thing to note is that the proportion of correct high confidence identifications of all face groups appear to be lower for Hispanic participants, and medium confidence identifications of Asian faces were considerably lower than the other two face groups for Hispanic participants.

Figure 2. Confidence Accuracy Characteristics for Study 2



Note. Error bars denote standard error

Chapter 6.

General Discussion

The purpose of this thesis was to investigate the cross-race effect in White, East Asian, and Hispanic individuals by using a repeated lineup identification paradigm. All four of the pre-registered hypotheses were not supported in Study 2. The first hypothesis was that all participant groups would perform the best on own-race faces, which was not observed in any of the participant groups. The second hypothesis was that White participants would be better at Asian faces compared to Hispanic faces: the opposite pattern was found but the difference was nonsignificant. The third hypothesis was that Asian participants would be better at White faces compared to Hispanic faces: the opposite pattern was also found here but the difference was nonsignificant. The last hypothesis was that Hispanic participants would have equal performance on White and Asian faces: we found significant differences in performance on these face groups. This significant difference was an indication that treating the three participant groups as entirely separate may not be the most effective in explaining the results; hence the reason to again recode the data into two groups, where White and Hispanic participants were grouped together into one Non-Asian group. This model proved to be fitting for Study 2.

Previous literature has found a similar pattern in which White and Hispanic participants show a smaller cross-race effect for each other compared to other groups like Asian and Black (Gross, 2009; Lee & Penrod, 2022; Rennels, 2022; Teitelbaum & Geiselman, 1997). Due to the racial ambiguity often seen in Hispanic faces, they may be recognized as White (Ma et al., 2015), which may lead a White individual to view them as an ingroup member, thereby lending them that own-race advantage (Marsh, 2021). From a perceptual expertise perspective, intergroup contact with either White or Hispanic individuals may improve recognition for either group due to the similarities between a prototypical White and prototypical Hispanic face. White and Hispanic individuals may be able to use the expertise they developed for own-race faces to accurately differentiate Hispanic and White faces, respectively, even if they may view each other as outgroups. This explanation is also in line with the multi-dimensional face space framework (Valentine, 1991), if White and Hispanic participants are able to use

their framework that is trained on White and Hispanic faces to also accurately differentiate between Hispanic and White faces, respectively, due to the similarities in facial features between the two groups.

According to Sporer (2001), the term “race” refers to “differences in physiognomy,” meaning that the cross-race effect operates on the basis that different groups of people have prototypical facial features that characterize that group, and these groups do not necessarily have to be categorized by race. In the example of Hispanic people, they may not differ from White people from the perspective of race, but socially, they are often considered as a separate group. This line of thought alludes to the uncertainty in determining how much of the cross-race effect is a perceptual phenomenon or a social phenomenon (Wells & Olson, 2001), which may explain why in some studies White and Hispanic participants demonstrate the cross-race effect for each other, and in other studies like this one, White and Hispanic participants could be treated as one group. It is important to note that participants were generally underperforming on Asian faces for all three studies, which may be an indication that the Asian faces in this study were inherently harder to recognize, even after pilot testing. The average lineup effective size for Asian lineups in Study 2 seemed to be smaller when contrasted with White and Hispanic lineups (Appendix B), possibly contributing to increased false alarm rates and poorer performance. Additional research is needed to determine whether Hispanic and White groups could be viewed as one group within the context of facial recognition.

In this model of Asian vs non-Asian participants, Asian participants did not demonstrate an own-race advantage, but performed at the same level for non-Asian faces. They do outperform Non-Asian participants on Asian faces, thereby showing hints of the cross-race effect, but the difference was nonsignificant. Some previous studies are in line with this finding where Asian participants do not show a significant difference in their performance between ingroup and outgroup faces (Marsh, 2021; O’Bryant & McCaffrey, 2006). Some authors suggest that cultural differences could offer an explanation to why Asian participants may not exhibit an own-race advantage. For example, perceived relational mobility is defined as the ease in which a person feels they can start new relationships and end old ones (Sato et al., 2014). Perceived relational mobility tends to be high in a Western societal context such as North America, but low for people in East Asia (Schug et al., 2009). Research from this perspective

suggests that high perceived relational mobility is associated with increased motivation to individuate strangers of one's in-group because they see a chance in forming new relationships (Ng et al., 2016). For people with low perceived relational mobility, they tend to focus on maintaining existing relationships, so there is low motivation to individuate strangers, leading to equal performance for in-group and out-group faces. In addition, there has been research suggesting that East Asian cultures define their ingroup by personal relationships, whereas North American cultures are more liberal and would perceive someone as an ingroup member if they share a social category with them, such as race (Brewer & Yuki, 2007). East Asian participants may see no reason to view East Asian faces of strangers during a face recognition study as part of their ingroup as they have no pre-established relationship with these people, and thus not exhibit any advantage associated with ingroup faces.

The current study was also aimed at addressing the two main competing theories of the cross-race effect phenomenon. Ultimately, no association of self-reported intergroup contact or social motivation to individuate with performance was found in the analyses, which further contributes to the mixed findings in support of either theory. Despite reporting the highest level of contact with members of their own group, all three participant groups did not achieve their best performance on own-race faces. In addition, low levels of contact with Hispanic people did not predict lower levels of performance on Hispanic faces for White participants. These self-reports do show that participants are reporting levels of contact consistent with the demographic breakdown of Metro Vancouver, but do not effectively explain the pattern of their performance when they are viewed as three separate groups.

Intergroup contact may offer a better explanation when applied to the Asian vs Non-Asian model than when viewing the three groups independently, even if there was no statistically significant association. White participants, despite reporting minimal contact with Hispanic individuals, exhibited equal performance on Hispanic faces compared to own-race faces. This could potentially be attributed to the transferability of expertise in recognizing White faces to recognizing Hispanic faces. In addition, Hispanic participants, who reported the least interaction with Asian individuals, demonstrated lower proficiency in recognizing Asian faces within this model. When categorized as the non-Asian group, White and Hispanic participants report a medium to high level of intergroup contact with both White and Hispanic groups, potentially contributing to their

expertise with non-Asian faces compared to Asian faces. Perhaps the medium to high level of contact with White people across all participant groups explains why Asian participants showed no disparity in their ability to recognize Asian faces versus non-Asian faces, despite having notably more contact with Asian people. Their high levels of contact with Asian people may have also helped them perform better on Asian faces than the non-Asian group.

Similarly, motivation to individuate does not explain the results well when looking at the three participant groups separately. White participants do not show a difference in motivation across groups, and East Asian and Hispanic participants only reported higher motivation to individuate faces of their own group relative to the two cross-race groups. These higher levels of motivation would predict higher performance for own group faces, but that was not found in the current study. Looking at motivation within the context of the Asian vs Non-Asian model may offer some more clarity on the role of social motivation. White participants reported slightly higher motivation to distinguish own-race faces compared to Asian or Hispanic faces, although this difference was not statistically significant. This aligns with their superior performance on non-Asian faces. Asian participants reported the highest motivation for own-race faces, which contrasts their equal performance on Asian and non-Asian faces. However, they did report equal levels of motivation for White and Hispanic people, which could indicate that the Asian participants were not differentiating between those groups. Conversely, Hispanic participants reported highest motivation for own-race faces, potentially indicating high motivation for individuating White faces as well.

One facet of socio-cognitive models involves the notion that individuals might be more inclined to individuate people of higher social status. While this concept was not explicitly captured in the self-report survey, it could provide insight into the findings. If White groups are perceived as the majority, and Hispanic faces are categorized in the same group due to visual similarities, the motivation to individuate high-status individuals may extend to Hispanic individuals, despite not typically being considered part of the majority. The consistent poorer performance on Asian faces may also result from status effects. Participants may have greater motivation to differentiate White (and consequently Hispanic) faces, leaving less motivation to differentiate Asian faces. Likewise, the lack of difference in the Asian participants' performance in the Asian

versus non-Asian model could be attributed to their motivation to also individuate White faces due to their perceived higher status.

A strength of this study is that it studies both competing theories of the cross-race effect in tandem. Hybrid theories of the phenomenon suggest that intergroup contact and social motivation to individuate work hand-in-hand to produce the effect. High intergroup contact with White people, coupled with motivation to individuate high status faces may be a plausible explanation for why the Asian vs non-Asian model works. Given the visual similarity between Hispanic and White faces, they may be perceived to be in the same group, so high intergroup contact with White people and motivation to individuate high status White faces could improve recognition of Hispanic faces as well. Asian participants may be doing equally well on non-Asian faces compared to own-race faces for the same reason. While this study does not conclusively point to whether the cross-race effect is caused by contact or social motivation (or both), particularly as measured through self-report, these factors may still provide plausible explanations for the observed results.

The use of lineups in this study is somewhat atypical in the cross-race effect literature, but it is unclear on whether that is part of the reason why the typical cross-race effect does not appear for all groups. The meta-analysis by Meissner and Brigham (2001) show that the magnitude of the cross-race effect is actually *greater* in lineup studies compared to old-new studies, but other research did not find the cross-race effect in field lineups (Valentine et al., 2003). There is no suggestion that the lineup task would be easier or harder than the old-new task as indicated by the moderate to high performance across participants in Study 2. In comparison to the old-new task, there may be more variability across lineup tasks due to factors such as lineup size or lineup type (e.g. simultaneous or sequential), which may change the difficulty of the task that affects how the cross-race effect manifests in the study. The variability in the lineup paradigm further calls for additional research using this paradigm to study the cross-race effect.

6.1. Limitations

The use of naturalistic photos as stimuli has both advantages and disadvantages. One advantage is that using photos with “natural” facial expressions and

varying hairstyles could lend external validity and test the cross-race effect on faces that are more similar to faces one would encounter in real life rather than neutral, standardized photos often used in cross-race studies (Lee & Penrod, 2022). The images could also be a disadvantage however, because naturalistic photos are not standardized like those found in face databases. Even after pilot testing, differences in facial expression, photo quality, or camera angle may interfere with how participants are processing the faces and have implications for the cross-race effect. The difficulty in recognizing Asian faces across studies may have obscured any own-race advantage demonstrated by Asian participants. Had different faces been used for the Asian stimuli, Asian participants might have significantly outperformed Non-Asian participants on Asian faces instead of the observed nonsignificant difference. In addition, these faces were only found by myself (I am Chinese) and another Research Assistant (she is White) without consulting with a Hispanic person. The effect of the cross-race effect in lineup construction has been documented in research (Brigham & Ready, 1985), so it may be that we were susceptible to our own biases and inadvertently made lineups that were easier or chose more distinctive looking targets for the Hispanic targets. In addition, we may not be the most well-versed in what a protypical Hispanic person looks like, so we may have chosen targets and fillers that look more White than if a Hispanic person were to select faces.

Another limitation may be the presence of RAs during the administration of the study. While having the RA on Zoom served as a strength to make sure participants had a clear understanding of the task, their presence may have made participants feel “watched,” which could have imposed pressure that may have had an effect on performance (Bond & Titus, 1983), and/or induced social desirability bias (Nederhof, 1985) while they filled out the two surveys. Having the RA turn off their camera while the participant completed the study was intended to lessen that effect, but some participants may not be able to ignore the fact that they are doing the study in the company of another person.

I aimed to test both the contact hypothesis and socio-cognitive models, but using self-report measures may have introduced additional noise into the study. Stelter et al. (2023) suggest that participants may be considering mere contact or negative intergroup contact while answering self-report questions, which are not as helpful in reducing the cross-race effect compared to interactive, positive contact. Self-report measures may

also be ineffective in accurately capturing the frequency of mundane behaviours that would translate into positive intergroup contact. In addition, media consumption could also contribute to effective intergroup contact, but that was not captured using these self-report surveys. There can be various ways in which participants interpret the questions, and also various ways in which participants answer questionnaires in general (some people may lean away from answering questions on either extreme end, etc.) (Paulhus, 1991). The survey I used to measure motivation to individuate was also exploratory, so there should be more research on tailoring a survey specifically to test socio-cognitive models. The survey currently only measures group closeness and positive attitudes and uses that as proxy to encapsulate motivation to individuate, but it could also incorporate questions about perceived status, which has been shown to play a role in face recognition as described above.

Singh et al. (2022) found that intergroup contact was more impactful if the contact was experimentally manipulated through cross-race face recognition training during the study rather than operationalized through self-report measures. Thus, a future direction may be to use experimental manipulation to test out the two theories; intergroup contact may be manipulated by having participants undergo a training session viewing cross-race faces and motivation to individuate may be manipulated by inducing a cultural identity prime (e.g., Marsh, 2021). Another future direction may be to continue investigating the link between White and Hispanic faces within the context of the cross-race effect. One way to do so may be to induce racial categorization, like how Maclin and Malpass (2001) did with prototypical hairstyles, to see whether White and Hispanic participants still exhibit this own-group advantage for each other.

6.2. Implications

This study has theoretical implications in the cross-race effect literature and potential implications for the justice system. The cross-race effect is often discussed as a robust effect, but as demonstrated in this study and others, the typical manifestation of the phenomenon is not replicated, especially for diverse groups. Psychology research has a history of studying predominantly White participants and making claims based on this limited sample (Santoro, 2023), so non-typical results such as those from this study are a reminder to challenge established phenomenon from the perspective of diverse populations. Future studies should continue to investigate diverse populations and use

the lineup paradigm to gain a deeper understanding of contexts where the cross-race effect does not show up as expected.

In addition, studying the cross-race effect within the forensic context of lineups can inform how this phenomenon ties into cross-race identifications and wrongful convictions that are based on cross-race identifications. The current literature seems to suggest that the cross-race effect may play a big part in the overrepresentation of mistaken cross-race identifications, but these conclusions are drawn from a field that underutilizes the more forensically relevant paradigm of the lineup. Katzman and Kovera (2023) found in their meta-analysis of fully-crossed lineup studies that racial disparities in evidence-based suspicion may be a stronger explanation for the overrepresentation of mistaken cross-race identifications. Researchers should explore systemic causes of these issues alongside addressing gaps in the cross-race effect literature as the current study highlights some uncertainty regarding how these issues manifest across different groups.

6.3. Conclusion

In conclusion, an own-group advantage was found when White and Hispanic individuals were grouped together into a Non-Asian group, suggesting that White and Hispanic may be better categorized as one group within the context of facial recognition. When the participant groups were treated as three separate groups, they did not display the typical cross-race effect by performing the best on own-race faces. Asian participants showed similar performance levels for both Asian and non-Asian faces. However, they were outperforming non-Asian participants on Asian faces by a margin approaching statistical significance, suggesting an own-race advantage that could have been obscured by the greater difficulty of the Asian faces. Contact and social motivation did not appear to influence performance based on self-report scores, but could offer some explanations, nonetheless. Further research should be done to determine the similarities and differences between White and Hispanic participants in the context of the cross-race effect. This study adds nuance to the conclusions made based on previous literature, and more research should be focused on determining the full extent of the effect.

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Appendix A.

Lineup Outcomes for South Asian Participants in Pilot Study

Participant		Target Present				Target Absent				*d'*	c
	Stimulus	**N**	**Hits**	**Filler**	**NoID**	**N**	**IT[a]**	**Filler**	**NoID**		
South Asian	White	305	.39	.14	.47	271	.04	.25	.70	0.27	0.42
	Asian	293	.28	.24	.47	283	.06	.35	.59	-0.36	0.41

Note. All outcomes are denoted as proportions.
[a]"IT" refers to identification of the designated innocent target in target absent trials

Appendix B.

Average Lineup Effective Sizes for each Stimulus Group

	Pilot Study 2	Study 1	Study 2
White lineups	3.46 (1.10)	2.93 (1.08)	3.59 (0.98)
Asian lineups	4.16 (1.02)	3.83 (0.83)	2.90 (0.59)
Hispanic lineups	4.02 (0.51)	3.42 (0.81)	3.96 (1.04)

Note. Tredoux's (1998) method was used to calculate effective sizes for each lineup by using the choice distribution data from target absent trials. The average effective size of lineups for each racial/ethnic stimulus group is denoted in the table. Standard deviation is denoted in brackets.

Appendix C.

Average *d'* of Participants based on Origin Status

	Born in Vancouver	Moved to Vancouver
White Participants	0.46 (1.50)	1.05 (1.53)
White Faces	0.48 (1.52)	1.34 (1.52)
Asian Faces	0.22 (1.61)	0.63 (1.38)
Hispanic Faces	0.69 (1.40)	1.17 (1.64)
Asian Participants	0.35 (1.76)	0.17 (1.54)
White Faces	-0.01 (1.73)	-0.08 (1.53)
Asian Faces	0.24 (1.77)	0.22 (1.61)
Hispanic Faces	0.83 (1.76)	0.37 (1.32)
Hispanic Participants	-0.78 (1.97)	0.61 (1.71)
White Faces	-0.64 (2.05)	1.14 (1.90)
Asian Faces	-1.39 (1.57)	0.03 (1.48)
Hispanic Faces	-0.31 (2.24)	0.66 (1.76)
Average	0.19 (1.75)	0.60 (1.64)

Note. Standard deviation is denoted in brackets

Appendix D.

Intergroup Contact Questionnaire

Questionnaire adapted from Hancock & Rhodes (2008)
Questions are answered on a Likert scale from 1-5: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

1. I know lots of (White, East Asian, or Hispanic/Latino/Latina) people.
2. I interact with (White, East Asian, or Hispanic/Latino/Latina) people during recreational periods.
3. I live in an area where I interact with (White, East Asian, or Hispanic/Latino/Latina) people.
4. I interact with (White, East Asian, or Hispanic/Latino/Latina) people on a daily basis.
5. I socialize a lot with (White, East Asian, or Hispanic/Latino/Latina) people.
6. I generally only interact with (White, East Asian, or Hispanic/Latino/Latina) people.

Appendix E.

Motivation to Individuate Questionnaire

The first question is adapted from the Outgroup Interactions and Closeness Index by Welker et al. (2014) and the rest of the questions are adapted from the Allophilia scale by Pittinsky et al. (2011).

Questions are answered on a Likert scale from 1-5: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

1. I feel close to (White, East Asian, or Hispanic/Latino/Latina) people as a group.
2. I feel a sense of belonging with (White, East Asian, or Hispanic/Latino/Latina) people.
3. I feel a kinship with (White, East Asian, or Hispanic/Latino/Latina) people.
4. I am motivated to get to know (White, East Asian, or Hispanic/Latino/Latina) people.
5. I would try and make more friends that are (White, East Asian, or Hispanic/Latino/Latina) people.

Appendix F.

Pairwise Comparisons of Contact and Motivation Scores

	Contact				Motivation			
	Estimate	SE	*df*	*p*	Estimate	SE	*df*	*p*
White Participants								
Asian vs White	-0.47	0.14	98	.001*	-0.21	0.12	98	.08
Hispanic vs White	-1.29	0.14	98	<.001*	-0.21	0.12	98	.08
Asian vs Hispanic	0.82	0.14	98	<.001*	0.005	0.12	98	.96
Asian Participants								
White vs Asian	-0.90	0.13	150	<.001*	-1.22	0.11	100	<.001*
Hispanic vs Asian	-1.88	0.13	150	<.001*	-1.15	0.11	100	<.001*
Hispanic vs White	-0.98	0.13	150	<.001*	0.06	0.11	100	.57
Hispanic Participants								
White vs Hispanic	-0.57	0.15	141	<.001*	-1.43	0.12	94	<.001*
Asian vs Hispanic	-1.06	0.15	141	<.001*	-1.36	0.12	94	<.001*
White vs Asian	0.49	0.15	141	.001*	-0.08	0.12	94	.55

Note. Linear Mixed Models were run to compare how each participant group was reporting their levels of intergroup contact and motivation to individuate each racial/ethnic group. “Estimate” refers to the estimated difference for each comparison, a negative sign indicates that the participant group had a lower average score for the first group compared to the second group; SE denotes standard error, *df* denotes degrees of freedom

*denotes significant differences, with alpha level <.05