# Investigating the role of motivation in cross-race facial recognition using a social exclusion paradigm

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**COMPULSORY DECLARATION**

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

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**Abstract**

The cross-race effect (CRE) refers to the finding that participants in face recognition tasks show better memory for same-race faces than cross-race faces. The social cognitive perspective suggests that motivation to encode and remember different faces can affect the CRE. Social exclusion presents one way to explore the role of motivation through its influence on the processing social information. The primary aim of the present research was to examine the influence of social exclusion on the CRE. Social exclusion was simulated by using *Cyberball,* a game where participants are excluded by virtual players. The *Cyberball* games also formed the encoding phase of a face recognition task, where different race faces were used as the avatars of the virtual players. The final sample included 754 black, coloured and white participants assigned to one of five conditions where they were included or excluded by same-race or cross-race members. The analyses showed that black participants did not show any significant CRE, white participants showed a CRE for both black and coloured targets and coloured participants showed a CRE for black targets only. The effects of exclusion were not consistent and, generally, predictions about the role of motivation were not supported. These results point to a need to explore inconsistencies in producing the CRE, such as why participants demonstrate a CRE for certain cross-race groups but not others. Considering the lack of support for a motivational account, the present research suggest that a combination of perceptual, social and contextual factors should be considered in future research on the CRE.

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## List of Abbreviations

| | | |
|---|---|---|
| ANOVA | - | Analysis of Variance |
| AP | - | Affective Prejudice |
| CA | - | Contact Avoidance |
| CR | - | Cross-race |
| CRE | - | Cross-race Effect |
| FA | - | False Alarms |
| ID | - | Identification |
| OGB | - | Own-group Bias |
| ORE | - | Other-race Effect |
| SDT | - | Signal Detection Theory |
| SMS | - | Social Monitoring System |
| SR | - | Same-race |
| SRPP | - | Student Research Participant Program |
| UCT | - | University of Cape Town |
| US | - | United States |

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# CHAPTER ONE:

# INTRODUCTION

There is a long history and wide range of research in psychology that has explored and investigated the ability to encode and remember faces. The recognition of different faces is essential to many daily social interactions and, as such, humans possess a natural proficiency for remembering and distinguishing between faces of different individuals. However, this ability is not always equal for all faces and there are numerous recognition biases that impact memory for different faces (Young, Hugenberg, Bernstein & Sacco, 2012). One of these biases, the cross-race effect (CRE) or other-race effect (ORE) refers to differences in participants' memory for faces in face recognition tasks or line-up identifications where they are better at recognising and remembering faces belonging to the same racial group as themselves when compared to memory for faces of other racial groups. The CRE is well established in psychology and has been reliably found in studies conducted in many different countries (Meissner & Brigham, 2001; Sporer, 2001; Young et al., 2012). While the CRE is consistently demonstrated, there is still no consensus on the underlying causes or mechanisms of the effect, with conflicting findings illustrating that the CRE is a complex phenomenon involving various perceptual, social and motivational factors.

One theoretical perspective of the CRE, the social cognitive perspective, emphasises perceivers' motivations and the importance of inter-group dynamics in producing or diminishing the CRE (Sporer, 2001, Young et al., 2012). However, relatively little of this research has looked specifically at how motivation can influence memory for racial groups, instead looking at experimentally induced or more contextually-defined group memberships (Young et al., 2012). Of this research, even less has included cross-over designs with participants belonging to more than one racial group. As a result, there is relatively little evidence in the CRE literature for how motivation influences memory for multiple different racial groups. A wide range of manipulations have been used throughout this literature to

change perceivers motivations to process different group members as either in-group or out-group members. Social exclusion or rejection can have important effects on the way different group members are processed and, in some cases, can bias the processing of in-group members over out-group members. Socially excluded individuals are more motivated to search for possible sources of acceptance and inclusion and usually this is offered by in-group members (Xu et al., 2015). In this way, social exclusion presents one possible way to explore the relationship between motivation and the CRE.

The aim of the present research was to further investigate the role of motivation in an inter-racial inter-group context using a cross-over design that included participants of different racial groups encoding same-race and cross-race faces. By doing so, the influence of motivation specifically on memory for racial group members could be explored for different racial groups at the same time. Continued research into the causes of the CRE is especially important given the significant role mistaken eyewitness identifications play in false prison incarcerations. The Innocence Project reports that false eyewitness identifications make up over a third of false imprisonments in the United States (US) and has been the single largest cause of false imprisonments in the US (Colloff et al., 2021; Young et al., 2012). Additionally, the CRE suggests that because of this weaker memory for cross-race faces, cross-race misidentifications may further contribute to a large number of false convictions globally. In the US, cross-race misidentifications make up just over 40% of all mistaken eyewitness identifications (Colloff et al., 2021). As one example of this issue, 63% of Innocent Project exonerations in 2012 were mistaken identifications of black Americans even though they make up only about 12% of the US population (Innocence Project, 2012). These findings illustrate the importance of understanding the causes of the CRE and factors that contribute to biases in face memory (Ratcliff et al., 2011).

In Chapter 2 of this thesis I will review the CRE literature and the effects that exclusion can have on social information processing. Chapter 3 provides the specific aims and hypotheses for the study presented in this thesis. Chapter 4 provides the methods for the study, and Chapter 5 outlines the results. Finally, Chapter 6 is a discussion of the results in terms of my specific hypotheses and the general CRE literature.

**Discussion on racial terms used throughout the dissertation**

Although some research has found more general group-based biases in face recognition it should not be ignored that race is often the primary and most salient dimension for group-based categorisation and various group-based biases in daily life (Cassidy, Quinn and Humphreys, 2011). Racial categories, while socially constructed, still have implications for people belonging to those categories making them very real in the impact they have in various contexts (Alexander, 2006). Racial group belonging is also a key aspect of many people's social identities which means that race and the perception of racial groups can potentially influence many social, behavioural and cognitive processes (Renn, 2012). This is clearly demonstrated in the case of the CRE where cross-race recognition biases are often difficult to overcome.

In South Africa especially there is a long history of racism that has created a situation where inequality is still clearly defined by race. The apartheid government introduced the racial classification terms that are still used today in South Africa and the creation of these terms was motivated by racism and segregation (Petrus & Isaacs-Martin, 2012). The long-standing use of these terms has also meant that people's identities, specifically their racial identities, are in many ways tied to these terms, with potential social and psychological implications. For example, the racial category "coloured" was used by the apartheid government as a term to refer to a population mixed-race and multi-ethnic descent (Petrus & Isaacs-Martin, 2012). This term introduced as an official racial category by the Population

Registration Act No. 30 of 1950, but even though the creation of this racial category was rooted in racism, it still has meaning for many who identify as a member of this category (Alexander, 2006; Petrus & Isaacs-Martin, 2012). This identity, therefore, can shape the perception of the self as group belonging is an essential part of many social and psychological processes, which in turn has implications for the way in-group and out-group members are perceived (Tajfel, 1979).

Throughout my research, I use the racial categories used by the South African Government for census and bureaucratic purposes (except when talking about research conducted in other countries). Broadly, the category or term 'black' refers to black South Africans, 'white' refers to white South Africans and 'coloured' refers to coloured South Africans and these classifications generally include and group multiple different ethnic and cultural groups. All participants in my research self-selected their race according to these categories and I did not classify or categorise any participant as a member of a particular racial group. All participants were also provided with the option of entering their own self-identified racial category or identity if they did not identify with any of the ones provided. Although I only analysed the data of black, coloured and white participants, no one was denied the chance to participate based on their racial identity. Additionally, all photos used as target images in the study were of people who self-identified as a member of that racial group.

# CHAPTER TWO:

# LITERATURE REVIEW

The CRE is a research area that has been the focus of studies conducted around the world using many different population groups. For example, many studies on the CRE have been conducted in the US, the United Kingdom, South Africa, China, Canada and different parts of Europe looking at a number of different racial and ethnic groups (Meissner & Brigham; Sporer, 2001; Wittwer, 2020; Wright, Boyd & Tredoux, 2003; Young et al., 2012). This large body of research has produced various theories and explanations of the CRE grounded in different theoretical perspectives. As a result, the CRE has been linked to various neural, social, cognitive, perceptual and behavioural factors and causes making it an effect that has received interest from many different areas within psychology. In this review, I focus on the most influential theories and explanations of the CRE and draw from social psychology and other areas to review the influence of different social and contextual factors on the CRE.

The present research focuses on the role of social motivation or social cognitive factors in producing the CRE. Social cognitive theories emphasise how changing perceivers' motivations to process faces can influence how in-group and out-group (or same-race and cross-race) faces are encoded and later remembered (Bernstein, Sacco, Young & Hugenberg, 2014; Hugenberg & Sacco, 2008; Young et al., 2012). Taking a social cognitive perspective, I used a manipulation of social exclusion to investigate the role of motivation in producing the CRE in an intergroup context. While there is a wide range of research on the CRE, very little of it has been conducted in a context where participants view cross-race and same-race faces at the same time. Social exclusion is also hypothesised to have an important influence on the way perceivers attend to and encode faces, with different implications for the perception of in-group and out-group faces. These effects suggests exclusion could have

important potential implications for the CRE. In this review, I will first briefly outline different theoretical explanations of the CRE, followed by a specific focus on theories of the way social exclusion can influence face perception and memory for in-group and out-group members (specifically for racial in-groups and out-groups). Lastly, I will outline the specific aims and hypotheses of the present study in light of these theoretical accounts and the reviewed evidence.

**Theoretical Accounts of the CRE**

There are two main broad theoretical perspectives that have are most frequently used as explanations of the CRE. Each of these perspectives include different models or theories of the specific mechanisms involved in producing the bias. Broadly, perceptual expertise accounts focus on a lack of experience or contact with cross-race faces which results in poorer processing, encoding and recognition for these faces (Meissner & Brigham, 2001; Young et al., 2012). Social cognitive perspectives, however, focus on a perceiver's motivations to process different faces. Specifically, social cognitive accounts focus on the suggestion that in-group faces are processed in an individuating manner, with a focus on individual facial features, while out-group faces are categorised and processed along broader or more general group membership lines (Young et al., 2012). Mixed or hybrid accounts combine aspects of both these perspectives and view the CRE as resulting from a mixture of perceptual factors and social cognitive and motivational factors to produce the bias (Young et al., 2012).

According to perceptual expertise perspectives, the CRE can be understood as resulting from differences in perceptual learning mechanisms and processes that lead to biases in recognition for same- and cross-race faces. A core belief, or assumption, of this perspective is that racial segregation present in many countries and social contexts has led to differences in face processing abilities across racial groups due to a lack of contact with faces

of a different race (Meissner & Brigham, 2001; Young et al., 2012). This has resulted in an expertise with same-race faces that is not seen for other-race faces, thereby producing the CRE.

There are two main types of models proposed to explain differences in perceptual learning mechanisms: models focusing on the use of different processing styles or methods, and models exploring differences in the stored mental representations of faces (Cassidy, Quinn & Humphreys, 2011; Valentine, 1991; Young et al., 2012). Models of differential processing styles, in general, suggest that differential experience with faces leads to different processing styles being used for same-race faces versus cross-race faces. For same-race faces, increased experience means these faces are processed configurally through a focus on the configuration of facial features within a face. In contrast, cross-race faces are processed featurally, which means they are processed on feature-by-feature basis (Cassidy, Quinn & Humphreys, 2011; Sporer, 2001; Young et al., 2012). The use of configural encoding instead of featural encoding for same-race faces results in stronger ability to encode and later remember these faces. Representational models focus instead on the way mental representations of different faces are stored in memory (Sporer, 2001; Valentine, 1991; Young et al., 2012).

Broadly, these models suggest that increased experience with same-race faces results in more varied representations of these faces. When a same-race face is seen, the face can be linked to the representation that most closely resembles that face. Conversely, for cross-race faces, there are fewer, more similar, and less varied stored mental representations so when a cross-race face is seen, it activates many different representations, making an accurate identification more difficult (Sporer, 2001; Valentine, 1991; Young et al., 2012).

In support of perceptual expertise models, a number of studies have shown that both lifetime or long-term expertise and experience and short-term experimentally induced contact

with cross-race faces can result in improved cross-race recognition and reduce the bias (Wan et al., 2015; Xiao et al., 2015; Young et al., 2012; Zhou, Elshiekh & Moulson, 2019). Some of these studies have shown that infants and young children raised in foreign countries (and adult immigrants in some cases) show no CRE and sometimes even show a cross-race recognition advantage due to increased cross-race contact (Tham, Woo & Bremner, 2019; Young et al., 2012; Zhou, Elshiekh & Moulson, 2019). For example, Zhou, Elshiekh and Moulson (2019) found that East Asian adults who were born and had lived in Canada their whole lives showed no CRE compared to white Canadians and East Asians who immigrated in adulthood. Both white Canadians and adult immigrants demonstrated a CRE. Results such as these suggest that early, long-term expertise and experience with cross-race faces arising from growing up in a majority cross-race context eliminated the CRE. Short-term, lab-based perceptual training studies that train participants to learn and remember cross-race faces have also found that this training can reduce the CRE. Effects of short-term training have been found for studies involving both infant and adult samples (Lebrecht et al., 2009; Qian et al., 2017; Xiao et al., 2015). Generally, these studies train participants to individuate cross-race faces or to encode cross-race faces and facial features in ways that facilitates better memory for these faces (Wittwer, Tredoux, Py & Paubel, 2019).

As indicated by these findings, the perceptual expertise perspective emphasises that interracial contact is key to explaining the CRE. However, there is still mixed, and sometimes contradictory, evidence for the role of contact, and contact alone does not always improve cross-race recognition (Wittwer et al., 2019; Wong, Stephen & Keeble, 2020). Some findings suggest that the quality of contact with cross-race faces may be more important than amount of contact in producing the CRE, with many studies showing little correlation between contact quantity and the CRE (Meissner & Brigham, 2001; Young et al., 2012). There may also be a developmental component to the role of contact where age of cross-race contact is

particularly important. Consistent with this, McKone et al. (2019) suggest that there is a critical period for the development of cross-race recognition that ends at age 12, after which contact does not produce any improvements in cross-race recognition ability. A critical period may also help to explain the inconsistent results in many training studies, as low childhood cross-race contact may be difficult to overcome.

The lack of consistent and lasting results for perceptual training experiments presents another challenge to perceptual expertise theories. Some training studies have led to a reduced CRE but this is not always the case and often the effects are relatively short-lived (Young et al., 2012; Wittwer et al., 2019). Wittwer et al. (2019), for example, trained white participants to focus on facial features that would be more useful for discriminating between individual black target faces in an attempt to improve recognition of black faces. However, the training had the opposite effect and instead resulted in an increased CRE. Increased interracial contact outside of the lab also does not always eliminate the CRE. In a study of a Malaysian sample that had grown up in a highly multiracial context, Wong, Stephen and Keeble (2020) still found a CRE across four racial groups. These participants' self-reported quantity of contact with different racial groups was also not correlated to their recognition performance. This finding also contradicts earlier evidence that growing up in a context with high interracial or cross-race contact reduces or eliminates the CRE. Overall, the inconsistent findings for the perceptual expertise perspective suggest that the CRE cannot solely be explained by a lack of contact or expertise with cross-race faces compared to same-race faces.

The second main theoretical perspective, the social cognitive perspective, emphasises the role of motivation and in-group versus out-group categorisation in producing the CRE. According to social cognitive theories, the CRE is a result of perceivers categorising out-group members (thus failing to individuate them) while individuating in-group members

(Young et al., 2012). Categorisation involves a reliance or focus on broad social category membership information of a face, such as race or gender. This means that cross-race faces are quickly categorised as out-group members based on race-specifying information, like skin colour (Gonzalez & Schnyer, 2018). In contrast, in-group members are individuated, meaning perceivers use individual facial features to tell in-group members apart. Through this individuation, same-race members are better encoded and later remembered because the unique facial features and characteristics of each face are processed (Gonzalez & Schnyer, 2018; Van Bavel & Cunningham, 2012; Young et al., 2012). As a result, categorisation can have homogenising effects for out-group or cross-race members where they are processed as "interchangeable representatives of a social category" (Van Bavel & Cunningham, 2012, p. 1567).

One potentially important implication of the social cognitive perspective is that group based recognition biases, or more specifically the CRE, are not necessarily about race, meaning a recognition bias could theoretically occur for any in-group and out-group comparison where perceivers are motivated to process different individuals as in-group or out-group members (Hugenberg & Sacco, 2008; Young et al., 2012; Van Bavel & Cunningham, 2012). Perceivers' motivations to individuate group members are central to many social cognitive theories, which suggest that if individuals are motivated to think of cross-race targets as in-group members, they will individuate them and the CRE will be diminished (Baldwin, Keefer, Gravelin & Biernat, 2013; Bernstein et al., 2014). In support of this, some studies using minimal group paradigms have showed that perceivers can be motivated in various ways to view cross-race targets as in-group members, leading to improved cross-race recognition performance (Baldwin et al., 2013; Cassidy, Quinn & Humphreys, 2011; Ratcliff et al., 2011; Van Bavel & Cunningham, 2012). Minimal group paradigms are used to explore the minimum conditions for participants to show biases as a

result of simply being a member of that group (Tajfel, 1979). They are usually groups that are formed along some experimentally created dimension. Others have also shown that when perceivers are motivated to view same-race targets as out-group members, their memory for those targets can worsen (Cassidy, Quinn & Humphreys, 2011; Hugenberg & Sacco, 2008; Ratcliff et al., 2011). These findings illustrate the importance of perceivers' goals and motivations in influencing how group members are categorised and processed, and how this can affect face memory (Ratcliff et al., 2011).

The two most influential social cognitive models proposed to explain the CRE are the feature-selection model and the cognitive disregard model (Gonzalez & Schnyer, 2018; Hugenberg & Sacco, 2008; Levin, 1996; Rodin, 1987; Young et al., 2012). Levin's (1996) feature-selection model hypothesises that categorising cross-race faces and individuating same-race faces results in differences in the way facial features are encoded in same-race and cross-race faces. For individuated faces, perceivers will look for unique, identity-specifying facial features. For out-group faces, perceivers will only encode category-specifying facial features that members of that category share instead of individual characteristics (Hugenberg & Sacco, 2008; Levin, 1996; Young et al., 2012). The model suggests that it is not necessarily that individuals pay less attention to cross-race faces but that attention is allocated differently to facial features and characteristics for same-race faces compared to cross-race faces (Hugenberg & Sacco, 2008). Alternatively, Rodin's (1987) cognitive disregard model presents a more motivational account where "low-value" or irrelevant targets are disregarded in that perceivers do not want to devote processing resources to these targets. Therefore, perceivers use social category information is to determine whether or not a face belongs to a socially relevant category. Once this decision is made, an irrelevant target will not be processed beyond category-specifying information and will be poorly encoded and remembered (Hugenberg & Sacco, 2008; Rodin, 1987; Young et al., 2012). As a result, the

cognitive disregard model especially emphasises the role of perceiver motivations in dictating which targets are relevant in a given context. These two models each propose potential mechanisms through which social categorisation and social motivational processes can influence the CRE, and a number of studies have tested the assumptions and predictions of these models and the cognitive perspective.

Much of the literature on the social cognitive account views the CRE as a group-based effect or an own-group bias (OGB) and not necessarily a race-based effect. According to this view, an OGB could occur for any in-group versus out-group distinction. As a result, many studies have used minimal groups paradigms to demonstrate how different recognition targets can be categorised as either in-group or out-group members depending on the goals and motivations of the perceiver. For example, in a series of studies Bernstein, Young and Hugenberg (2007) manipulated in-group and out-group categorisations by changing the background faces were presented on, thereby changing participants' motivation to process these faces. When faces were presented on backgrounds indicating that they were the same personality type or university affiliation as that assigned to the participant, recognition for these faces was improved. However, when faces were presented on backgrounds signalling a different university or personality type, participants demonstrated worse memory for these faces. These changes in accuracy resulted in a significant OGB in favour of faces perceived to be in-group members (Baldwin et al., 2013; Bernstein, Young & Hugenberg, 2007; Hugenberg & Sacco, 2008).

A similar finding in support of a motivational account of the CRE is the finding that high-status targets or targets with greater subjective importance to the perceiver are better remembered than low-status targets, or those with less social power (Baldwin et al., 2013; Bernstein et al., 2014; Ratcliff et al., 2011; Shriver & Hugenberg, 2010). For example, Ratcliff et al. (2011) found that when faces were presented with backgrounds implying their

occupation, faces presented with high status occupations were better remembered than those paired with low-status occupations. Similarly, when faces were presented on wealth-implying backgrounds, faces paired with wealthier backgrounds were better remembered than those presented on poverty-implying backgrounds (Ratcliff et al., 2011; Shriver & Hugenberg, 2010).

Subjective importance may also be determined by a participant's self-identification with an in-group and their role within that group. Van Bavel and Cunningham (2012) found that participants' social roles and their self-identification with an assigned in-group influenced their memory for own-group members versus other-group members, depending on the role they were assigned. When their role required them to focus on other-group faces, participants were motivated to better remember these faces and they demonstrated a reduced own-group bias. In another study, Shriver and Hugenberg (2010) paired same-race and cross-race faces with occupations either high in social power (e.g. lawyer or doctor) or low in social power (e.g. plumber). They found that high-power cross-race targets and same-race targets were better remembered than low-power cross-race faces, which elicited a CRE (Shriver & Hugenberg, 2010). Findings such as these indicate that the perceived social status and subjective relevance of target faces may serve as motivators that can influence how processing resources are allocated, with increased cognitive resources directed to targets perceived to control perceivers' outcomes or viewed as more important for social goals (Hugenberg & Sacco, 2008; Ratcliff et al., 2011). Taken together, these experiments demonstrate that manipulating the perceived group membership of different faces and group members' importance to social goals and outcomes can motivate the processing of faces as either in-group or out-group members. In turn, this can influence memory for these faces and either increase or reduce the CRE, or OGB (Hugenberg & Sacco, 2008; Ratcliff et al., 2011).

Although there is evidence in support of a general OGB, race is an inherent and stable social category and in many situations it is the most salient social category that individuals use to categorise different group members. As such, it is often difficult to overcome racial categorisation in inter-group contexts. Additionally, the effects of in-group and out-group categorisations often affect memory for same-race faces re-categorised as out-group members more than memory for cross-race faces categorised as in-group members (Cassidy, Quinn & Humphreys, 2011; Gonzalez & Schnyer, 2018; Hehman, Mania & Gaertner, 2010; Hugenberg & Sacco, 2008).

One significant limitation of much of the literature on social cognitive accounts or social categorisation effects is that many influential studies have used only white participants or white face recognition targets (Bernstein, Young & Hugenberg, 2007; Hugenberg & Sacco, 2008). So, while there is evidence for recognition biases using in-group and out-group distinctions across dimensions other than race, it is not always clear if these group manipulations would have led participants to overcome a CRE by improving their recognition for cross-race faces that have been categorised as in-group members (Bernstein, Young & Hugenberg, 2007; Hugenberg & Sacco, 2008). Another important limitation is that many of these studies did not vary the face stimuli from the encoding phase to the recognition phase, meaning that they used the same photos at encoding and at test. As a result, these studies were likely testing photo recognition rather than face recognition. Additionally, a prediction of social cognitive models is that increasing the salience and perceived in- or out-group membership of an out-group category will affect the CRE, but not all manipulations intended to influence the perception of the in-group/out-group status of faces result in differences in the CRE. For example, experimental manipulations intended to have perceivers categorise ambiguous faces as same-race or cross-race do not always lead to changes in memory for these faces (Young et al., 2012).

In spite of the challenges overcoming the salience of race in the categorisation of group members, there has been some evidence that perceivers can be sufficiently motivated to categorise cross-race faces as in-group members. In some cases, this has reduced or even eliminated the CRE. For example, some studies have attempted to manipulate the most salient dimension for categorisation by grouping faces by either race or some other category. In their manipulation, Hehman, Mania and Gaertner (2010) kept race and university affiliation equally salient by grouping same- and cross-race faces by either race or university. They found that for targets grouped by race, participants recognised more same-race faces than cross-race faces even if the university status suggested the targets were in-group members. However, when targets were grouped according to university, participants recognised more in-group faces regardless of race. Using a similar procedure, Cassidy, Quinn and Humphreys (2011) found that when faces were presented in an interracial context, race was the most salient and default dimension for categorising faces according to group membership. When same-race and cross-race faces were presented separately, the perception of target faces as belonging to a same or different university became the most salient dimension for categorisation.

These studies suggest that the inherent salience of race could potentially be reduced using strong enough manipulations of in-group and out-group status so that perceivers use some dimension other than race to categorise group members. In turn, this motivation should improve the individuation of cross-race faces and improve memory for these faces (Cassidy, Quinn & Humphreys, 2011; Hehman, Mania & Gaertner, 2010). Overall, social cognitive research suggests that a range of social, contextual and motivational factors could potentially affect the observed CRE and existing evidence suggests that if sufficiently motivated, perceivers can overcome a CRE.

**Social Exclusion and the CRE**

Social exclusion, or ostracism, presents a possible way to explore the influence of motivation on processing group members in inter-group settings, including inter-racial settings (Bernstein et al., 2014; Syrjämäki & Hietanen, 2018; Van Bavel, Swencionis, O'Connor & Cunningham, 2012; Xu et al., 2015). In addition to its negative emotional effects, social exclusion has been found to influence many different cognitive processes in excluded individuals. These processes include perception, attention, and memory for socially relevant stimuli (Buelow, Okdie, Brunell, & Trost, 2015; Claypool & Bernstein, 2019; DeWall, Maner, & Rouby, 2009; Kawamoto, Nittono, & Ura, 2013; Xu et al., 2015).

Theoretical accounts of social exclusion suggest that it has a significant influence on the way excluded individuals process social information. These effects often extend to the processing of faces and information conveyed by faces. Broadly, social exclusion is thought to motivate excluded individuals to search for and prioritise the processing of social information that present the best opportunities to fulfil basic needs threatened by exclusion (Bernstein et al., 2014; DeWall, Maner & Rouby, 2009; Gaither, Pauker, Slepian & Sommers, 2016; Sacco, Wirth, Hugenberg, Chen & Williams, 2011; Van Bavel et al., 2012; Xu et al., 2015). Usually, these opportunities are sources of re-inclusion or future social affiliation. If social exclusion biases the processing of social information, it may have important practical implications for understanding the relationship between motivation and the CRE. In inter-racial settings, racial in-groups represent important sources of belonging and inclusion, meaning that excluded individuals would be more motivated to prioritise processing of in-group members.

It has been reliably demonstrated that social exclusion threatens a number of fundamental or basic needs, including the need to belong, which can have important cognitive, affective, and behavioural outcomes (Buelow et al., 2015; Van Bavel et al., 2012). Participants in ostracism research usually report reduced feelings of belonging following

exclusion and score lower on measures of self-esteem and meaningful existence (the belief that their life has meaning or purpose) (Buelow et al., 2015; Van Bavel et al., 2012). These effects of exclusion on fundamental needs have been demonstrated when participants were excluded by real people, by a computer and when there was only a threat of future exclusion,. On average, these effects persisted up to 55 minutes after the exclusion incident (Buelow et al., 2015; Kawamoto, Nittono, & Ura, 2013; Williams, 2007). The threat to belonging needs has the most relevant impact on the processing of social information as it promotes a search for cues in the social environment that present an opportunity to restore belonging needs or prevent further threats to the need to belong (DeWall, Maner & Rouby, 2009; Williams, 2007).

The main theoretical explanation of responses to exclusion is the social monitoring system (SMS) framework (Xu et al., 2015). According to the SMS hypothesis, humans have an internal or built-in regulatory system that monitors the environment, regulates responses to exclusion and attempts to maintain an acceptable or optimal level of social inclusion by promoting or prioritising a search for social cues when belonging is threatened (Claypool & Bernstein, 2019). As a result, when an individual experiences threats to their feelings of belonging or when trait need to belong is high, they will compensate by looking for signs of re-affiliation in their social environment that could help fulfil this need. Being more attuned to these cues allows individuals to behave in ways that will promote acceptance by others and facilitate re-inclusion through positive social interactions and social connection (Claypool & Bernstein, 2019; Van Bavel et al., 2012; Xu et al., 2015).

Many studies examining the predictions of the SMS theory have found that this search for social cues influences the processing of faces, specifically affecting attentional and perceptual processes. Researchers investigating the effects of social exclusion have frequently used smiling and angry faces to represent positive and negative social cues

respectively (Claypool & Bernstein, 2019; DeWall, Maner & Rouby, 2009; Xu et al., 2015). Smiling faces represent important signs of acceptance and affiliation whereas angry faces represent threat or aggression. In line with the predictions of the SMS hypothesis, a number of studies have shown that participants display a preference for smiling faces over angry faces (Claypool & Bernstein, 2019; DeWall, Maner & Rouby, 2009; Xu et al., 2015). Across three experiments, Xu et al. (2015) looked at participants attention for smiling and angry faces following exclusion. They found that participants showed an attentional bias and greater sensitivity for smiling faces over angry faces. Consistent with the SMS theory, this finding suggests that participants showed a preference for positive social cues or potential signs of affiliation following exclusion.

In a similar set of experiments, DeWall, Maner & Rouby (2009) also found a preference for smiling faces over angry, sad and disgusted faces. They found that participants were faster at finding smiling faces in an array (or grouped presentation), showed preferential attention for smiling faces in an eye tracking task, and were slower to look away or draw their attention away from smiling faces. They also showed that these effects were present only for positive social stimuli and not for positive non-social stimuli, providing further evidence that exclusion promotes a search for potential sources of social acceptance or sources that can fulfil belonging needs (DeWall, Maner & Rouby, 2009). Overall, these findings suggest that following exclusion, participants became more sensitive to smiling faces as they searched for positive social cues that would provide possibilities for renewed social connection (Claypool & Bernstein, 2019; Xu et al., 2015).

Race is another potentially important social cue that can represent renewed affiliation and inclusion and there is evidence that exclusion also affects the way individuals pay attention to, categorise, and remember same-race and other-race group members (Bernstein et al., 2014; Claypool & Bernstein, 2019; Gaither et al., 2016; Sacco et al., 2011; Sacco,

Bernstein, Young & Hugenberg, 2014; Van Bavel et al., 2012). People tend to affiliate more with their own racial group than other racial groups and racial in-groups provide chronic sources of affiliation and belonging (Sacco et al., 2011). Therefore, if exclusion improves the ability to distinguish between signs of inclusion and exclusion, or increases sensitivity signs of social acceptance, then it should also influence the processing of social group members, including racial in-group and out-group members (Sacco et al., 2011). In addition to the previously mentioned effects of exclusion on attention to positive and negative social cues, social exclusion also influences the perception, categorisation and memory of racial in-group and out-group members (Bernstein et al., 2014; Claypool & Bernstein, 2019; Gaither et al., 2016; Sacco et al., 2011; Sacco et al., 2014; Van Bavel et al., 2012).

According to Sacco et al. (2011), exclusion leads to an increased tendency to perceive social stimuli in a more categorical manner. Excluded individuals are more likely process inclusion and exclusion cues categorically, meaning that they draw a greater distinction between inclusion and exclusion signals (Claypool & Bernstein, 2019; Sacco et al., 2011). This enhanced categorical perception not only influences the perception of targets categorised as in-group or out-group but also affects the way group members are categorised and decisions about which targets are included as in-group members. Motivation also plays a role in this relationship as the desire to fulfil belonging needs following exclusion acts as a motivator to guide the categorisation of different group members and influences the inclusion of ambiguous racial targets as in-group members (Gaither et al., 2016). When their need to belong is threatened, perceivers would be less likely to accept ambiguous targets as in-group members to maintain the boundary between stronger and weaker sources of affiliation and belonging. In the case of racial groups, same-race members would provide the best possible sources of re-inclusion (Gaither et al., 2016).

Across two experiments, Gaither et al. (2016) demonstrated that white American participants who scored higher on measures of need to belong and racial in-group identification were more likely to categorise ambiguous targets as black (out-group members). This was also the case when participants were excluded using a social exclusion manipulation where their need to belong was threatened. These findings suggest that social exclusion increases sensitivity or bias toward social affiliation cues and that this sensitivity is biased toward targets that provide the greatest opportunity for affiliation or inclusion. This bias leads to stricter boundaries being drawn between out-group members and in-group members because in-group targets represent the best opportunity to belonging needs (Gaither et al., 2016; Sacco et al., 2011). Their results go further to suggest that an individual's level of identification with their in-group can also influence their response to exclusion as people who more strongly identify with their in-group are more likely to categorise ambiguous targets as part of the out-group (Gaither et al., 2016; Sacco et al., 2011).

In another experiment Gaither et al. (2016) demonstrated that exclusion again affected the categorisation of ambiguous targets, but that this effect depended on the social status or social power of the perceiver and of target faces. Whereas white participants categorised ambiguous targets as out-group members, black participants were more likely to include ambiguous targets as part of their in-group by categorising them as black (Gaither et al., 2016). The finding that both white and black participants categorised racially ambiguous faces as black is consistent with optimal distinctiveness theory which proposes that "majority and minority group members respond differently to belonging threats" (Gaither et al., 2016; Leonardelli, Pickett & Brewer, 2010). In the US, white people are considered a majority group with higher social status, social power and socioeconomic status when compared to black people (Wan et al., 2015). Majority groups are thought to already meet inclusion needs for its members, which means they are more likely to exclude ambiguous targets from their

in-group in an effort to maintain the group's status, keep group membership selective and draw strong boundaries between group members. In contrast, minority groups are thought to potentially gain value or status by relaxing inclusion boundaries (Gaither et al., 2016; Leonardelli, Pickett & Brewer, 2010). Therefore, white participants were more motivated to protect their group identity and draw stronger group boundaries, which was reflected in more biased categorisations of unclear or ambiguous targets as black (Gaither et al., 2016). Altogether, these findings illustrate that social exclusion and consequent threatened belonging results in the motivation to selectively affiliate with group members that offer the best possible source of inclusion and fulfilment of belonging needs. Importantly, these motives can also be influenced by social and contextual factors, such as social status and power (Gaither et al., 2016; Sacco et al., 2011).

The influence that exclusion and threatened belonging needs can have on the perception of race and racial groups is also particularly relevant in its potential implications for the CRE, as racial in-groups represent important signs of inclusion and belonging. The desire to restore belonging needs and seek opportunities for affiliation and inclusion could also have an effect on memory for in-group and out-group faces in addition to its influence on attention and perception of social information (Bernstein et al., 2014; Van Bavel et al., 2012; Syrjämäki & Hietanen, 2018). If so, in inter-racial contexts, memory for same-race faces would be biased, or prioritised, over memory for cross-race faces (Van Bavel et al., 2012). In terms of the social cognitive perspective, social exclusion would motivate the processing and encoding of racial in-group faces over out-group members and in turn result in a memory bias for these faces (Bernstein et al., 2014). The influence of exclusion on the categorisation of same- and cross-race faces as members of an individual's in-group or out-group is also relevant for the CRE because of the tendency to individuate in-group members, which is associated with better memory for these faces (Van Bavel et al., 2012).

In two experiments examining the relationship between need to belong and the OGB, Van Bavel et al. (2012) found that participants who scored higher in trait need to belong and those who had been experimentally socially excluded demonstrated a larger OGB. Using a minimal group task, the authors showed that excluded participants were better at recognising same-university (in-group) faces over other-university faces. This result suggests that enhanced or biased categorical perception of social cues may also translate to better memory for these cues (Van Bavel et al., 2012). Importantly, this effect was found at the encoding stage suggesting that this improved memory for in-group faces resulted from better encoding of faces once they were categorised as members of the participant's in-group or out-group. Participants who were excluded also scored higher on a measure of need to belong which provides further evidence in support of the SMS theory that the desire to restore belonging needs motivates the preferential processing of in-group members who provide the best opportunity to fulfil this need (Van Bavel et al., 2012).

In a similar study, Bernstein et al. (2014) specifically explored the effect of exclusion on the recognition of same-race and cross-race faces. They also looked at the role of the source of exclusion and inclusion using *Cyberball*, an online ball-toss game, to manipulate the source of exclusion or inclusion. In *Cyberball,* human participants are either passed or not passed a ball by virtual, computer players. By programming whether or not participants receive the ball, researchers are able to manipulate whether or not they are included (receive the ball) or excluded (don't receive the ball) during the game (Williams et al., 2000). The authors found that when participants played the game with same-race players and were excluded by these players they showed a normal CRE. They also showed a normal CRE when they were included by same-race and cross-race players. However, when they were excluded by cross-race players they showed no significant CRE. They explain this lack of a CRE for participants excluded by cross-race players as resulting from the increased power

associated with the act of exclusion. This finding is consistent with social cognitive accounts because increased social power or social status has been suggested to influence the CRE where high power or high-status targets are typically better remembered (Bernstein et al., 2014; Claypool & Bernstein, 2019; Shriver & Hugenberg, 2010; Ratcliff et al., 2011). This finding again points to the importance of social and contextual factors in producing the CRE and suggests that the relationship between social exclusion and the processing of social information could be moderated by who does the excluding or including.

In a deviation from the predictions of the SMS and those of Van Bavel et al. (2012), participants who were excluded by same-race members did not show significantly better same-race recognition performance as would be expected if threatened need to belong led to better processing of sources of inclusion (Bernstein et al., 2014). However, while not significant, the pattern of results was qualitatively similar to Van Bavel et al. (2012) with better same-race recognition following exclusion, providing some support for the SMS theory.

In summary, exclusion appears to have important implications for the processing of social information. In many inter-group settings, race is the most relevant source of social information and most salient dimension for in-group and out-group distinctions (Gonzalez & Schnyer, 2018). This has further implications for investigating the causes or factors contributing to the CRE, with some evidence suggesting that exclusion could present a potential way to explore a motivational, social cognitive account of the CRE through its influence on individuals' search for re-affiliation cues. While the effects of exclusion on attention paid to social cues conveyed by faces and the enhanced categorical perception of different-race faces have been more widely researched, there are very few studies that have looked at the relationship between exclusion and memory, and more specifically the CRE (Bernstein et al., 2014; Claypool & Bernstein, 2019; Van Bavel et al., 2012; Syrjämäki &

Hietanen, 2018). The predictions of social cognitive accounts and of the SMS hypothesis taken together with existing evidence of attentional and perceptual effects of exclusion on processing social information suggest, however, that exclusion could impact the way the faces of in-group and out-group members are encoded and remembered (Syrjämäki & Hietanen, 2018). Faces are often the most relevant sources of social information. In inter-racial inter-group settings, the faces of same-race members would offer the best source of in-group affiliation and processing resources would likely be directed toward these faces following exclusion. If the processing of social information at early stages is biased toward targets that offer the best possibility for inclusion and affiliation, it seems likely that memory for these targets would also be improved at the expense of memory for out-group targets (Syrjämäki & Hietanen, 2018).

Another important consideration is the way that social context can influence both the social cognitive predictions of the CRE and the effects of social exclusion. The broader socio-economic context of the racial groups involved in an experiment and the consequent social power these groups possess have been shown to influence the relationship between motivational factors and the CRE. Additionally, the previously discussed effects of exclusion appear to be moderated by whether individuals are excluded by in-group or out-group members, which could in turn effect an observed CRE (Sacco et al., 2014). For example, exclusion threatens basic needs regardless of whether it is done by in-group or out-group members but exclusion by in-group members threatens basic needs more and results in more social pain. In contrast, inclusion by in-group members leads to greater basic needs satisfaction (Sacco et al., 2014). It is therefore important to take these social and contextual factors into account given that they could influence the relationship between the motivational effects of social exclusion and the observed CRE.

# CHAPTER THREE:

# AIMS AND HYPOTHESES

Considering the reviewed literature, the present research used the *Cyberball* paradigm to experimentally manipulate social inclusion and exclusion in an inter-racial intergroup setting. As mentioned, *Cyberball* is a virtual, online ball-tossing game where participants are either included or excluded by computer players. Exclusion is simulated by whether or not participants are passed a ball by other computer players. To simulate an inclusion or exclusion incident at the time of encoding faces to memory, the target faces for a face recognition task were included as avatars in the *Cyberball* games. This made it possible to vary the perceived race of an includer or excluder. In this context, the salience of race and racial groups was also increased by presenting faces of different races together which would also help to ensure that race was the most relevant source of social information (Gonzalez & Schnyer, 2018). Using *Cyberball*, participants were included and excluded by same-race or cross-race players across four different inclusion and exclusion conditions. The fifth condition was a control group where all computer players and the participant received the ball.

I also used social exclusion as a way to explore the influence of motivational factors on increasing or attenuating the CRE based on the predictions of the SMS hypothesis and social cognitive theories. In this way, I wanted to explore preferential encoding of social acceptance cues as a potential motivator that could increase the CRE through improved encoding and memory for same-race group members. Additionally, social exclusion acted as a manipulation of the perceived power of group members, which also provided a test of the role of motivation and the predictions of social cognitive models. Another important aim was also to investigate the CRE for different racial groups simultaneously using a full cross-over

design where I could also explore if the effect varied by participant race or by race of out-group faces that they saw.

The following were the specific predictions or hypotheses I made based on social cognitive models of the CRE and the predictions of the SMS hypothesis:

1. Exclusion by same-race players will increase the CRE because, consistent with the SMS model, participants will attend to same-race or in-group members as they seek signs of re-affiliation.
2. Exclusion by cross-race players will reduce the CRE through the increased power associated with exclusion, motivating participants to attend to and remember cross-race targets.
3. Following a social cognitive perspective, inclusion by same-race players will lead to an increase in the CRE, as participants will identify with their racial in-group and will categorise players of a different race as out-group members.
4. Inclusion by cross-race players will not affect the observed CRE as inclusion by cross-race members may not be strong enough to affect participants' feeling of belonging with their racial in-group.

# CHAPTER FOUR

# METHODS

## Design and Setting

The study was conducted online with a sample of students studying at the University of Cape Town (UCT). The study was created, administered and distributed using the online survey platform Qualtrics (https://www.qualtrics.com/uk/) and all tasks were completed within Qualtrics. I used a 5 (Condition: same-race exclusion vs. cross-race exclusion vs. same-race inclusion vs cross-race inclusion vs. control) X 3 (participant race: black vs. coloured vs. white) X 3 (out-group race: black vs. coloured vs. white) X 2 mixed design with recognition performance (same-race recognition performance vs. cross-race recognition performance) as the within-subjects factor. The levels of the within-subjects factor were each participant's recognition performance on same-race faces compared to their recognition performance on the cross-race faces that they saw. The levels of the inclusion/exclusion condition independent factor were: same-race inclusion, cross-race inclusion, same-race exclusion, cross-race exclusion and an include-all control condition (all players received the ball). For the out-group/target race and participant race factors the levels were black, coloured and white racial groups.

## Participants

### *Recruitment*

I used convenience sampling to recruit participants through the UCT Psychology department's Student Research Participant Program (SRPP), in which students are awarded points for their participation in research studies as part of their course requirements. There were no exclusion criteria and all South African students aged 18 and above were able to participate, but I only included the data of participants who self-identified as black, white and coloured in my final analyses. Participants were made aware of these eligibility criteria via an

advertisement posted on the SRPP recruitment site (Appendix A).

A total of 847 students were recruited via SRPP and participated in the study. Of this sample, 73 respondents identified as either the 'Indian/Asian' or 'Other' racial categories leaving 774 participants who identified as 'Black', 'Coloured', or 'White'. I deleted a further 20 responses of participants who completed the study twice, retaining only their first response. Therefore, the final sample that I analysed data for consisted of 754 participants (312 black, 208 coloured, and 234 white participants). Participants were also asked to write in their own self-identified gender and of the sample of 754 participants, 539 stated that they were women, 181 men, and 34 wrote in a different gender identity.

**Power analysis.** I conducted a power analysis using G*Power version 3.1. I used effect sizes reported by Bernstein et al. (2014) and Van Bavel et al. (2012) whose experimental designs were closest to the one I used. Both studies reported main effect sizes of $\eta_p^2 = 0.04$. I set the statistical test as a repeated measures ANOVA with a within-between subjects interaction, $\alpha = .05$, power $(1- \beta) = 0.8$, number of groups = 30, number of measurements = 2. This analysis suggested I needed to recruit a sample of $N = 330$ participants.

In a first round of data collection I recruited 337 participants. When I started analysing the data, I found that because of the large number of interactions involved between factor levels, many of the group sizes were too small to provide adequate power. After this initial data analysis I decided to run a second round of data collection so that all group sizes would be large enough to allow for meaningful comparisons between groups. The final sample of $N = 754$ was more than double the calculated sample size suggesting there would be adequate power.

## Measures

### *Sociodemographic questions*

Participants were asked to select their self-described race according to the racial categories used in South Africa and to write in their self-defined gender. I did not ask for any other sociodemographic information or identifying information.

***Social exclusion manipulation***

I used the *Cyberball* paradigm to experimentally manipulate social exclusion (Williams & Jarvis, 2006; Williams et al., 2000). *Cyberball* is a computer game in which participants throw a virtual ball around with up to 8 other virtual computer players. The computer players are programmed by the researcher but participants are led to believe they are real people. The researcher is able to manipulate social exclusion by programming how often the virtual players throw the ball to the participant (Williams, Yeager, Cheung, & Choi, 2012). To distinguish between the participant and computer players, I will refer to the computer players as avatars for the remainder of the description of the *Cyberball* manipulation. In a typical inclusion condition, the participant is included in the game by the other avatars who consistently throw the ball to the participant. In an exclusion condition, the participant is thrown the ball once or twice initially but is then ignored for the rest of the game while the avatars pass the ball to each other (Bernstein, et al., 2014).

To manipulate race-based exclusion or inclusion, the in-game avatars consisted of faces of different races so participants believed they were playing with other human same-race and cross-race players (Figure 1 shows an example of the faces displayed in-game). There were eight avatars in each game, four same-race avatars and four cross-race avatars. The ninth player was the participant who was the only human player. Participants were randomly assigned to one of five *Cyberball* conditions and each participant played three different *Cyberball* games. The five *Cyberball* conditions were same-race inclusion, cross-race inclusion, same-race exclusion, cross-race exclusion, and an include-all control condition:

- In the same-race inclusion condition, participants were included by avatars of the same racial group as themselves (same-race members) but same-race avatars did not throw the ball to avatars of a different racial group (cross-race avatars).
- In the same-race exclusion condition, same-race avatars excluded both the participant and cross-race avatars, only passing the ball between the four same-race avatars.
- In the cross-race inclusion condition, the participant was included by cross-race avatars but the same-race avatars were ignored so only cross-race avatars and the participant received the ball.
- In the cross-race exclusion condition the participant and other same-race avatars were ignored by the cross-race avatars.
- In the control condition, participants played *Cyberball* games where all avatars, including the participant, received the ball.

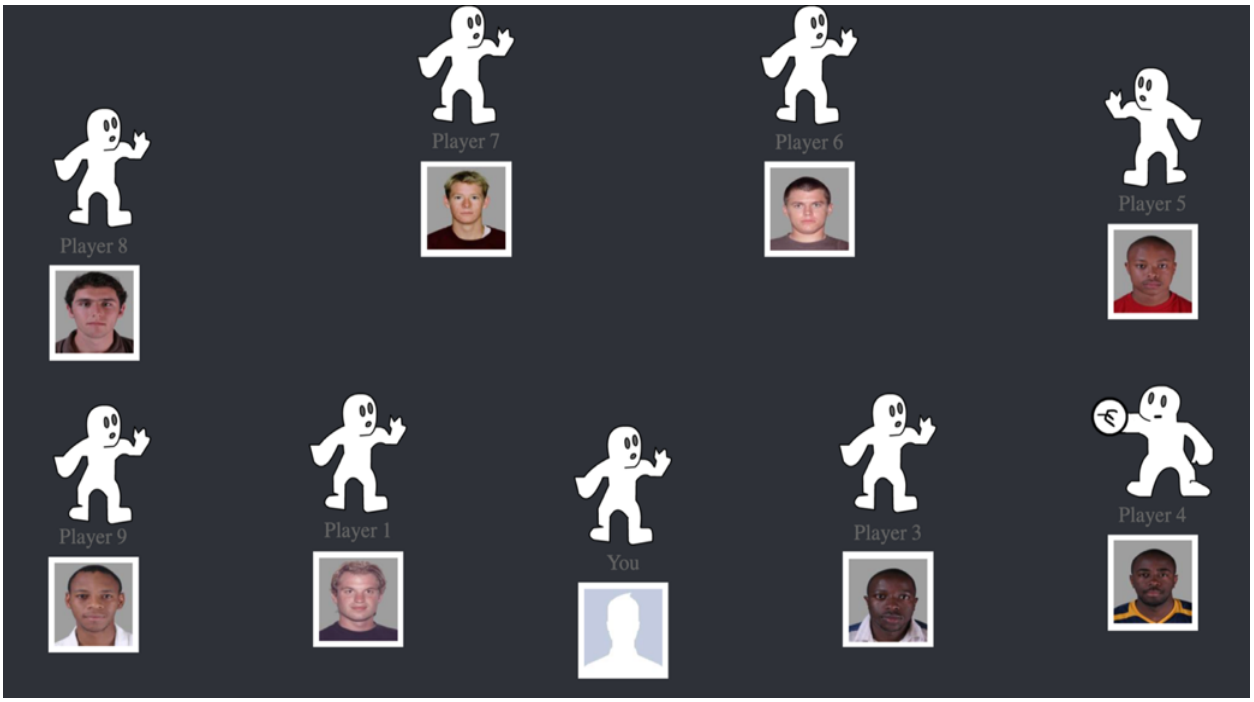
I used the *Cyberball* desktop configuration app version 5.6.1.0 to configure all the *Cyberball* games (downloaded at https://www.empirisoft.com/cyberball.aspx). I programmed the *Cyberball* games to determine which avatars received the ball and whether or not the participant received the ball, the number of throws, the length of time between throws and the overall length of the games to ensure these settings were consistent across all the games and conditions. Each game lasted about three minutes and every avatar that was involved in a particular game received the ball the same number of times. In games where the participant received the ball, they also received it the same number of times as the avatars that were included. The configuration app also allows for adding avatar faces for each of the players in the games. For my games, faces presented as avatars during the games were the target faces for a later recognition task. All participants played three games of *Cyberball* so each participant

viewed 24 target faces in total (12 same-race and 12 cross-race faces), with eight avatar (or target) faces presented per game (four same-race and four cross-race). Once all games were programmed, I produced URLs using the configuration app for online hosting of the games on the *Cyberball* server. Each URL corresponded to a specific game. I used these URLs to integrate the *Cyberball* games into Qualtrics survey questions so I could run the entire experiment within Qualtrics. In this way, the *Cyberball* software is easily integrated into Qualtrics and is able to run in a survey without the need to leave the Qualtrics page. All other randomisation processes for the *Cyberball* games and experiment procedures were run in Qualtrics.

The order of presentation of the three *Cyberball* games was randomised to vary the order of presentation of target faces. Participants were randomly assigned to play with one of the two possible racial out-groups. For example, a participant who self-identified as black was randomly assigned to either play *Cyberball* with white or coloured avatars, and therefore viewed that race as the cross-race target group in the following facial recognition task. The cross-race faces they saw as avatars during *Cyberball* also determined the versions of the rest of the tasks they completed so that the relevant racial out-group was kept consistent across tasks and participants completed questionnaire items relevant to the cross-race faces they saw.

**Figure 1**

*Example of faces displayed during the Cyberball games*




**Manipulation check.** I included two items as a manipulation check for participants to complete directly following the games of *Cyberball* (Bernstein et al., 2014). The items were "I felt excluded" (item 1) and "I felt ignored" (item 2), which participants responded to on a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). Higher responses following the exclusion condition and lower responses following the inclusion condition were taken to indicate that the manipulation was successful.

***Face recognition task and photos***

I used a forced choice *yes/no* recognition task in the study. As mentioned, the 24 target faces (8 per *Cyberball* game) were presented during the *Cyberball* games as the avatars of the computerised players. For the recognition phase, these target faces were presented amongst 24 foils, or distractor faces (12 same-race and 12 cross-race). During the recognition phase, the 48 (24 targets and 24 foils) faces were presented one at a time. Participants responded by selecting that "yes" they had seen a face previously or "no" they had not seen it previously. There was

no time limit for selecting a response so participants were able to take as long as they needed to make a decision. The order of presentation of faces during the recognition phase was also randomised, and the recognition task was the same for all groups or conditions. Participants viewed the same out-group or cross-race faces for the recognition task that they encountered during the *Cyberball* games. For example, if a white participant saw black target faces they completed a recognition task with black and white faces, but if they saw coloured target faces they completed a recognition task with white and coloured faces.

I selected an initial set of 108 faces from a larger face database provided by my supervisor. All of these initial photos were taken in a frontal pose and had neutral expressions. To select the final set of faces used for each racial group I first recruited participants for a face rating task. I used the rating task to try to more fairly select the final face set instead of simply choosing the faces myself. In the rating task, participants rated the faces along two dimensions, distinctiveness and attractiveness, and I used the ratings to match the faces' scores on these dimensions to select a final face set. I included these two dimensions in rating task based on previous research that both distinctiveness and attractiveness can influence how well a face is remembered (Sarno & Alley, 1997; Wiese, Altmann & Schweinberger, 2014). The faces were rated by 14 participants (9 women, 5 men). Of these 14 participants, 10 were white and 4 were coloured. Participants rated 36 faces for each of the three racial groups (black, coloured, and white) for a total of 108 faces. They responded to two items on a 7-point Likert scale. The first item measured how distinctive they thought the face was ("How easy would it be to spot this person in a crowd?") and the second item measured how attractive participants' considered the face ("To what extent do you think people would consider this person attractive?").

Using these ratings, I selected 24 faces of each race, 12 that were used as targets and 12 used as foils, to create recognition tasks for each possible in-group and out-group combination. To calculate the ratings and select the final face set I calculated the mean, median,

range and interquartile range for each face set. I then selected faces that scored within the lower and upper quartiles, or toward the middle of the scales, and excluded any faces that scored on the extreme high or low end of the scale to select faces that were neither extremely attractive nor distinctive and neither extremely unattractive nor unique. Therefore, I selected 72 faces in total from the initial set of 108 faces to be used in the recognition tasks.

All the images were varied from presentation at encoding during the *Cyberball* games to presentation at recognition. At encoding, all the face images were presented in the frontal pose, had a neutral facial expression and were displayed in colour. At recognition all images were presented with a three-quarter pose, had a neutral expression and were changed from colour to greyscale. This was done to ensure that participants' memory for the face is being tested and not their memory for an image. All faces were presented with their hair and clothing visible because, while participants may have been able to rely on these as memory cues, it made the *Cyberball* deception that these were other human players more realistic or believable than if hair and clothing was obscured. The size of images at recognition was 366 pixels x 500 pixels. I could not find the size of presentation of the *Cyberball* avatars as these are set by the software but the size of the *Cyberball* frame within the Qualtrics survey was set at 1350 pixels x 1050 pixels.

***Group identification***

One of the measures I included was a group identification scale (Obst & White, 2005) (Appendix B). The scale provided an estimate of participants' identification with their racial in-group. Group identification is closely linked to ostracism and some evidence suggests that group identification can be affected by exclusion and inclusion, and is also associated with evaluations of group members (Dahl, Niedbala, & Hohman, 2019). Exclusion has been shown to threaten basic needs and affect perception and other processes regardless of who does the excluding, but evidence indicates that exclusion by in-group members threatens basic needs

more and results in greater social pain, and inclusion by in-group members leads to greater basic needs satisfaction. These effects are also mediated by individuals' perceived similarity with their in-group, suggesting that group identification may be closely related to social exclusion and its effects (Sacco et al., 2014; Wirth & Williams, 2009).

The scale consisted of 12 items measuring strength of identification with racial in-group members scored on a 7-point Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). The items assessed three distinct but related aspects of social identity and group identification: cognitive centrality of the in-group, in-group affect, and ties to the in-group (Obst & White, 2005). The scale demonstrated good reliability in the original study it was tested, with alpha ranging from .83 to .91 (Obst & White, 2005). Cronbach's alpha reliability for this study ranged from $\alpha$ =.64 to $\alpha$ = .82 (see Table 5 in Results section).

***Affective prejudice***

I included an affective prejudice scale as a measure of explicit prejudice (Finchilescu, 2010; Zanna, 1994) (Appendix C). I included this measure of prejudice because exclusion is often an emotional event involving strong negative affective responses (Kawamoto, Nittono & Ura, 2013; Williams, 2007). Both implicit and explicit prejudice, or racial bias, have also been found to influence group identification and categorisation processes, as well as the CRE (Chen, Moons, Gaither, Hamilton & Sherman, 2014; Phills, Kawakami, Krusemark & Nguyen, 2019; Scroggins, Mackie, Allen & Sherman, 2016; Walker & Hewstone, 2008). The scale consists of six items scored from 1 to 7. Participants expressed their affective responses toward racial out-group members by responding to 6 pairs of bipolar adjectives on the 7-point scale, with higher scores indicating stronger negative affective responses toward racial out-group members (Tredoux & Finchilescu, 2010). The out-group they responded to corresponded with the out-group seen during *Cyberball.*

This scale has been used previously in South Africa, and demonstrated high internal consistency, α = .87 for black participants and .90 for white participants included in that study (Tredoux & Finchilescu, 2010). In this study, alpha ranged from α = .93 to α = .95 (see Table 5 in Results section). I included two versions of the affective prejudice scale, one that measured affective prejudice toward outgroup members generally and one that measured participants' feelings specifically during the *Cyberball* games to measure changes in their responses as a consequence of exclusion. Participants were randomly assigned to one of these two versions.

***Contact avoidance***

To measure contact avoidance, I adapted items created by Hajji, Tredoux and Py (unpublished) to fit a South African population (Brunet, Py, Tredoux, Becker & Brunel, unpublished) (Appendix D). I included a contact avoidance scale because negative contact, such as an exclusion event, is associated with increased avoidance of out-group members or increased motivation to avoid an out-group, and is also associated with increased prejudice (Meleady & Forder, 2019). The contact avoidance scale provides a measure of contact quality to explore the relationship between contact and the CRE. Participants responded to six items scored on a 5-point Likert scale from 1 (Strongly Agree) to 5 (Strongly Disagree). For this study, Cronbach's alpha for the contact avoidance scale ranged from .85 to .88 (see Table 5 in results section)

**Procedure**

An outline of the entire procedure is shown in Figure 2 below. The link to the study was posted on the SRPP Vula site at the bottom of the study advertisement. When participants clicked on the link they were automatically randomly assigned to one of the five study conditions (same-race exclusion, cross-race exclusion, same-race inclusion, cross-race exclusion, and include-all control). On the first page of the experiment, participants viewed the informed consent form outlining the study procedures, risks and benefits, and their rights as

participants (Appendix E). To continue to the next section, they had to sign that they had read and understood, and by signing they agreed to participate in the study. Next, they completed the demographic questions where their self-identified racial identity informed the in-group and out-group faces and questions they saw for the rest of the tasks.

After the demographic questions, participants were provided instructions for the first task that participants completed, which was to play the three consecutive *Cyberball* games where they encoded same-race and cross-race target faces that were presented to them during the games. Participants were not informed that they would be required to remember these target faces and were not aware that these *Cyberball* games were part of a face recognition task. These three games lasted approximately ten minutes altogether and they were only able to move on from each game once the game was finished. They completed the manipulation check directly after playing all three games. Before the face recognition task participants performed a 5-minute, unrelated filler task. This filler task was included to ensure participants were prevented from rehearsing the target photos they had encoded during the *Cyberball* games. After five minutes, they were automatically directed to the instructions for the face recognition task where they saw all 48 faces (the 24 previously encoded targets and the 24 new, distractor faces) presented one at a time.

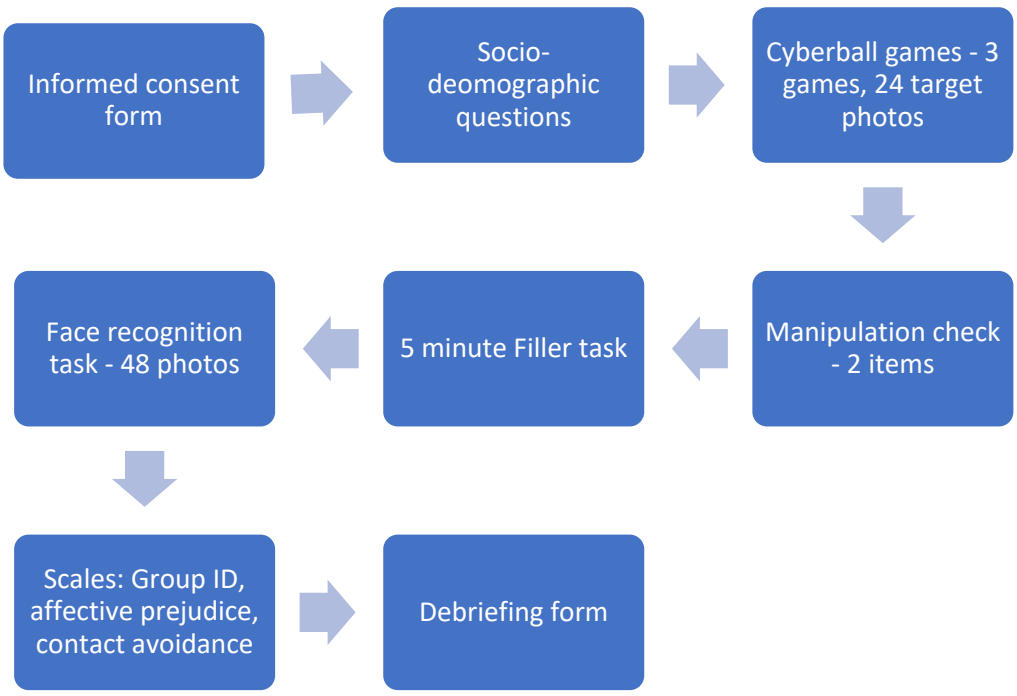
The last set of tasks they completed was to answer each of the three brief scales (the group identification, contact avoidance and affective prejudice scales). They first saw the group identification scale, followed by the contact avoidance scale, and lastly they completed the affective prejudice scale. This order of tasks was the same for all four experimental groups and the control group. However, because of the negative emotional effects associated with exclusion, participants assigned to the same-race and cross-race exclusion conditions played another two *Cyberball* games where all players were included (similar to the games played by control participants). I included these games as an ethical consideration because race-based

exclusion is a potentially harmful and emotional experience for many people and I did not want any participant to have only experienced these negative effects during the study. The decision to use inclusion games to counter the negative experience of exclusion was based on evidence that individuals who were experimentally excluded and later experienced inclusion demonstrated a recovery in their basic or fundamental needs (Dahl, Niedbala, & Hohman, 2019).

On the last page of the survey, participants were required to read and sign a detailed debriefing form (Appendix F) that explained all the tasks and procedures used in the study. I also explained the use of deception in the *Cyberball* games where they were led to believe they were playing with real players and provided my contact details if they required any further information or support. The study typically took 25 to 35 minutes to complete. I was also available to answer any questions they had via email during or after their participation in the study.

**Figure 2**

*Diagram outlining the experiment procedure*



## Data Management and Statistical Analyses

I conducted all statistical analyses in Microsoft Excel and R (version 4.1.3). I downloaded all the survey data from Qualtrics as Excel spreadsheets and scored the face recognition data and questionnaire data within Excel. I also organised the data by condition, participant race and out-group race in Excel to make it easier to import and analyse in R. For the face recognition data, I scored it using a Signal Detection Theory (SDT) framework and guidelines (Stanislaw & Todorov, 1999). For the questionnaire data (group identification, contact avoidance and affective prejudice scales) I recoded participants' responses as numerical because the data downloaded from Qualtrics included the response text (e.g. "Strongly disagree" was changed to "1"). After coding and scoring the data, I created an Excel spreadsheet of participants' raw face recognition scores and scale response scores organised by group, participant race and out-group race and imported it into R. All further statistical analyses were conducted in R beginning with descriptive analyses and followed by inferential analyses where applicable.

### *Calculating SDT measures for face recognition scores*

I scored face recognition responses using SDT guidelines. SDT provides an estimate of participants' recognition accuracy (*d'*) (Stanislaw & Todorov, 1999). According to SDT, *d'* provides an estimate of a participant's ability to discriminate between "old", previously seen target faces and "new", foil or distractor faces. I first scored participants' "hits" and "false alarms". Hits are correct identifications of a previously seen target face and false alarms are incorrect identifications of new faces as old or previously seen. I then calculated hit rates and false alarm rates by dividing the number of hits and false alarms a participant made by the total number of old and new faces respectively (Stanislaw & Todorov, 1999). Finally, I calculated *d'* by converting hit rates (H) and false alarm rates (FA) to z-scores, and subtracting the z-score for FA from the z-score for H ($d' = z(H)-z(FA)$) (Stanislaw & Todorov, 1999).

In order to analyse whether participants demonstrated a CRE, I calculated *d'* separately for same-race and cross-race faces for each participant. Therefore, because each participant saw 12 cross-race and same-race targets and 12 cross-race and same-race foils, I divided the number of hits and false alarms they made by 12 for both same-race and cross-race faces separately to get two *d'* scores (*d'* same-race, and *d'* cross-race). Because the calculation of z-scores in the *d'* calculation is sensitive to hit or false alarm rates of 0 and 1 respectively, when calculating *d'* scores, I adjusted hit and false alarm rates of 0 by replacing them with 0.5/*n* and rates of 1 with (*n*-0.5)/*n* where *n* is the number of targets or foils (Stanislaw & Todorov, 1999). A higher *d'* score indicates that a participant was better at correctly recognising target faces as previously seen (responding "yes" they had seen the face before) and distractor faces as new faces (responding "no" they had not seen the face before), demonstrating higher recognition accuracy. A CRE is present when a participant demonstrates significantly higher recognition accuracy for same-race faces than cross-race faces as indicated by a larger *d'* score.

I also calculated decision criterion (*c*) as a measure of response bias. *C* was calculated with the formula $c = -[z(H) + z(FA)] / 2$ where H refers to the number of hits, FA refers to the number of false alarms and z refers to the z-score for these values. Neutral responses are reflected by a score of 0, with positive responses indicating a tendency to adopt a stricter or more conservative criterion (toward "no" responses). Negative values reflect a more liberal criterion (a tendency to respond "yes") in the face recognition task (Stanislaw & Todorov). I calculated *c* separately for same-race and cross-race faces for each participant to look at how response bias varies for these faces.

***Main analyses of face recognition accuracy data***

All further statistical analyses were conducted in R (version 4.1.3). The significance level for rejecting null hypotheses in all statistical analyses was set at $\alpha = .05$. To test Hypotheses 1 to 4 (all concerning the effect of social exclusion and inclusion manipulations on

the CRE) I fitted linear mixed-effects models on the face recognition accuracy data. Before fitting the model, I produced and examined detailed descriptive statistics to look for outliers and for any interesting patterns or relationships between variables. I ran linear mixed-effects models as they are more robust for unbalanced or unequal groups than a mixed or repeated measures ANOVA (see Table 1 below for a breakdown of sample size by condition for my sample) (Hesselmann, 2018; Schielzeth et al., 2020). The response variable for all models and comparisons was raw *d'* scores. Exclusion/inclusion condition, participant race, and race of out-group faces were between-subjects fixed effects and in-group or out-group status of the target faces (accuracy scores for same-race vs. cross-race faces) was the within-subjects fixed effect. After fitting the models I inspected plots of residuals versus fitted values and Q-Q plots of the residuals to ensure that the assumptions of homogeneity of variance (homoscedasticity) and normality of the models were met. The results of Shapiro-Wilk's tests for normality and Levene's tests for homogeneity of variance of residuals were also both not significant (all *p*'s > .05). I then conducted planned contrasts of the estimated marginal means to directly test the study hypotheses that 1) a CRE was present for participants and 2) there were differences in the observed CRE across inclusion and exclusion conditions.

***Analysis of response bias data***

I also fitted a linear mixed-effects model on the response bias data. The response variable for the model was *c* scores, with exclusion condition, participant race, and out-group race as between-subjects fixed effects and *c* same-race faces versus *c* cross-race faces as the within-subjects fixed effect. I checked all assumptions for this data were met as well and report any transformations in the relevant parts of Results section. After fitting the model I conducted comparisons of the estimated marginal means to further explore main and interaction effects.

***Correlation analysis***

I had no specific hypotheses or predictions for the relationship between the questionnaire response data and face recognition data but I looked at descriptive statistics for each scale by participant race. I also calculated mean composite scores for each scale and looked at the correlations between these composite scores and face recognition scores.

***Data sharing and open access***

In line with UCT policies, this dissertation will be publicly available on the OpenUCT website (https://open.uct.ac.za). I will also make the data, my R code, and stimulus and other experimental materials available on the Open Science Framework (OSF) website. After writing and attempting to publish an article based on the findings presented in this dissertation, I will share all these materials on the OSF website (https://osf.io).

# CHAPTER FIVE

# RESULTS

## Sample Characteristics

A breakdown of the number of participants assigned to the exclusion, inclusion and control groups by participant race is shown in Table 1 below. Participants were randomly assigned to one of the five conditions after selecting their self-described racial group. Looking at each racial group individually, there were similar numbers of participants assigned to each condition. However, there were more black participants involved in the study so there more black participants assigned to each condition compared to coloured and white participants. Almost three times as many women (539, 71.49%) as men (181, 24.01%) participated in the study. This may be a result of sampling bias resulting from recruiting through the Psychology department using the SRPP platform, as there are more women enrolled in Psychology courses at UCT. Most of the participants were first- and second-year psychology students at UCT. I did not collect any other sociodemographic information from my participants.

**Table 1**

***Breakdown of number of participants in each condition by participant race***

| | Condition | | | | |
|---|---|---|---|---|---|
| | SR exclusion | CR exclusion | SR inclusion | CR inclusion | Control |
| Participant race | *n* | *n* | *n* | *n* | *n* |
| Black | 59 | 66 | 62 | 68 | 57 |
| Coloured | 42 | 44 | 34 | 45 | 43 |
| White | 51 | 44 | 51 | 39 | 49 |
| Full sample | 152 | 154 | 147 | 152 | 149 |

*Note.* N = 754. SR refers to same-race group members and CR refers to cross-race group members.

**Manipulation Check**

Table 2 outlines mean responses and standard deviations for each manipulation check item across the different experiment conditions. The two items were included as a manipulation check following the *Cyberball* games. The items were "I felt excluded" (item 1) and "I felt ignored" (item 2) and were scored on a 7-point Likert scale. Higher response scores for the exclusion conditions and lower scores for the inclusion conditions indicate that the manipulation was successful.

**Table 2**

***Means and standard deviations of responses for manipulation check items by condition***

| | I felt excluded | | I felt ignored | |
|---|---|---|---|---|
| Condition | *M* | *SD* | *M* | *SD* |
| SR exclusion | 5.57 | 1.37 | 5.51 | 1.40 |
| CR exclusion | 5.81 | 1.24 | 5.54 | 1.47 |
| SR inclusion | 2.76 | 1.50 | 2.58 | 1.35 |
| CR inclusion | 2.68 | 1.57 | 2.53 | 1.53 |
| Control | 3.93 | 1.69 | 3.83 | 1.73 |

*Note.* N = 754. SR refers to same-race group members and CR refers to cross-race group members.

I created composite scores for each participant by calculating a mean score of the two items, which I then used for statistical analyses. I ran a one-way between-subjects ANOVA to compare the mean composite scores across the different groups. There was a significant main effect of group on the mean item scores, $F$ (4, 749) = 167, $p < .001$. I used pairwise t-tests to compare the mean composite scores across all groups. The pairwise t-tests indicated that responses in the same-race and cross-race exclusion conditions were significantly higher than the same-race and cross-race inclusion conditions, $p < .001$ for all comparisons. Scores in the control condition were also significantly higher than the inclusion conditions, $p < .001$, and lower than the exclusion conditions, $p < .001$. The results of the pairwise t-tests indicate that the exclusion manipulations were successful with participants feeling more excluded and ignored in the exclusion conditions than in the inclusion conditions. Participants responses for the control condition were more neutral, suggesting they felt neither overly excluded nor overly included during the *Cyberball* games.

## Primary Analyses

### *Recognition accuracy*

My main analyses concerned the effect of social exclusion on face recognition scores, specifically on the CRE (Hypotheses 1 to 4 predicted different effects of exclusion on the CRE depending on the condition). The outcome variable for all inferential analyses was *d'* scores and a CRE was indicated by significantly better recognition of same-race faces versus cross-race faces. Therefore, the CRE was present if there was a significant difference between *d'* for same-races faces and *d'* for cross-race faces (CRE = *d'* SR - *d'* CR). Participants were randomly assigned to view one of two possible out-group or cross-race face sets. I excluded the scores of nine participants from all descriptive and inferential analyses because they responded either "yes" or "no" to all 24 target and foil faces (when asked if a face was previously seen during the recognition phase). This left a final sample of 745 participants included in the recognition data analyses. Descriptive statistics of face recognition scores by participant race, out-group race, and group are outlined in Table 3 below. For all three racial groups, standard deviations were higher than mean scores indicating there was a large amount of variability in the data. Descriptive data of hits and false alarms are shown in Figure 3 (Appendix G).

Looking briefly at the descriptive data presented in Table 3, there seems to be mixed support for the study hypotheses. Overall, the existence of a CRE also seemed to vary depending on the race of participant and the race of cross-race faces they viewed. There is also no clear pattern suggesting that the exclusion and inclusion manipulations influenced the CRE. White participants viewing black targets showed stronger same-race recognition in all conditions. In contrast, black participants viewing white faces displayed very similar recognition for same-race and cross-race faces in all conditions, even performing better on cross-race faces in the SR exclusion, CR exclusion, and control groups. Black participants performance on coloured cross-race faces followed a similar trend except in the SR exclusion

group where they had better recognition of same-race faces. This result, if significant, would be in line with the predictions of Hypothesis 1. However, looking at all comparisons, only white participants viewing black faces also showed a large difference between same-race and cross-race *d'* scores suggesting the pattern of results does not support this hypothesis. Coloured participants viewing black targets showed no consistent trend across the five conditions, only displaying stronger same-race recognition in the SR and CR inclusion groups and the control group. This lack of a consistent same-race recognition bias was also the case for coloured participants viewing white faces, as they only performed better on same-race faces in the CR exclusion and control conditions. Lastly, white participants viewing coloured cross-race targets performed better on same-race faces in all conditions, with the largest differences between same-race and cross-race *d'* scores in the CR inclusion and control conditions.

In terms of my specific hypotheses, the pattern of descriptive results shown in Table 3 does not suggest there is a clear trend across the four inclusion and exclusion conditions. Additionally, while I would have expected to see a CRE in the control condition, black participants did not show better same-race recognition for either cross-race group they viewed. I also expected to see no CRE in the CR exclusion conditions (Hypothesis 2), but coloured participants viewing white faces and white participants viewing both out-groups did seem to show a same-race recognition advantage. There are also no clear trends or patterns for the two inclusion conditions and they vary by race of participant and race of cross-race faces (Hypothesis 3 and 4).

**Table 3**

***Means and effect sizes of d' scores for same-race faces compared to cross-race faces by exclusion/inclusion condition, participant race, and out-group race***

| | Condition | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SR exclusion | | | CR exclusion | | | SR inclusion | | | CR inclusion | | | Control | | | All conditions | |
| | *M* | | | *M* | | | *M* | | | *M* | | | *M* | | | Pooled *SD* | |
| Compare | d' SR | d' CR | *d* | d' SR | d' CR | *d* | d' SR | d' CR | *d* | d' SR | d' CR | *d* | d' SR | d' CR | *d* | d' SR | d' CR |
| White - Black | 0.70 | 0.16 | 0.93 | 0.53 | 0.21 | 0.55 | 0.72 | 0.36 | 0.63 | 0.60 | 0.22 | 0.66 | 0.55 | 0.23 | 0.55 | 0.65 | 0.6 |
| Black - White | 0.01 | 0.06 | 0.08 | 0.13 | 0.18 | 0.1 | 0.30 | 0.24 | 0.1 | 0.15 | 0.14 | 0.02 | 0.19 | 0.29 | 0.17 | 0.57 | 0.63 |
| Black - Coloured | 0.24 | -0.00 | 0.43 | 0.16 | 0.19 | 0.04 | 0.29 | 0.19 | 0.18 | 0.16 | 0.29 | 0.22 | 0.30 | 0.33 | 0.04 | 0.65 | 0.59 |
| Coloured - Black | 0.31 | 0.38 | 0.12 | 0.52 | 0.53 | 0.01 | 0.78 | 0.29 | 0.85 | 0.34 | 0.15 | 0.33 | 0.59 | 0.13 | 0.79 | 0.65 | 0.62 |
| Coloured - White | 0.23 | 0.47 | 0.41 | 0.32 | 0.16 | 0.28 | 0.38 | 0.38 | 0.00 | 0.45 | 0.48 | 0.04 | 0.21 | 0.08 | 0.23 | 0.59 | 0.54 |
| White - Coloured | 0.47 | 0.36 | 0.2 | 0.27 | 0.16 | 0.2 | 0.39 | 0.22 | 0.3 | 0.56 | 0.02 | 0.93 | 0.41 | 0.11 | 0.52 | 0.74 | 0.53 |

*Note.* $N = 745$. *d'* SR and *d'* CR refer to accuracy scores for same-race and cross-race faces respectively. Compare refers to same-race versus cross-race comparison where participant race is listed first and race of cross-race faces viewed is listed second (participant race – out-group race). SR exclusion refers to the same-race exclusion condition, CR exclusion to the cross-race exclusion, SR inclusion to the same-race inclusion, and CR inclusion to the cross-race inclusion. *d* is Cohen's *d* for the comparison between mean *d'* SR and mean *d'* CR. *n* by condition, participant race and race of out-group ranges from $n = 17$ to $n = 39$ ($M = 25$, $SD = 5.41$).

For the first part of my analyses, I focused on determining if a CRE was present for all participants and, if so, exploring the nature of the CRE because all my hypotheses relied on a CRE being present. To test if participants displayed an overall significant CRE I ran a 3 (Race of participant: black vs. coloured vs. white) X 3 (Race of out-group faces viewed: black vs. coloured vs. white) X 2 (in-group/out-group status of recognition faces: same-race vs. cross-race) linear mixed-effects model with continuous *d'* score as the outcome variable.[1] Participant race and race of out-group faces were between-subjects fixed effects. The in-group/out-group status of the face was the within-subjects fixed effect. The race of participant variable was defined by participants' self-identified race. The race of out-group faces factor refers to the race of out-group or cross-race targets participants were randomly assigned to view during the experiment. The in-group/out-group status within-subjects factor refers to which target a *d'* score corresponds to, same-race or cross-race faces (all participants had two *d'* scores). This factor was used to compare same-race and cross-race recognition accuracy within-subjects to determine if a CRE was present (a significant difference between same-race and cross-race recognition accuracy). For a CRE to be present, there would need to be a significant effect of in-group/out-group status suggesting that accuracy (*d'*) for same-race faces differed from accuracy for cross-race faces. I included a random effect for participant ID (participant number or participant identifier).

There was a significant main effect of race of participant, $F$ (2, 739) = 4.05, $p$ = .018, $\eta_p^2$ = .006. There was also a significant main effect of race of out-group faces viewed, $F$ (2,

[1] An examiner has questioned the inclusion of the race of participant and race of out-group faces variables as factors in my models and suggested their inclusion rather as covariates. However, based on previous research on the CRE, including one study conducted at UCT, I expected that both the race of the perceiver and the race of the out-group faces they see would affect the observed CRE. Previous research has shown that it is possible that participants display a CRE for one racial out-group but not for another (Seutloali, 2014; Wittwer, 2020; Wong, Stephen & Keeble, 2020). Therefore, I believe that the inclusion of these variables as factors in the model was justified and that if they were included as covariates, I would have potentially missed important effects. For example, by not including these variables as factors I would have missed the finding that coloured participants displayed a CRE only when they viewed black faces and not for white faces. Differences in the CRE by participant race and race of out-group faces such as these are important for a complete understanding of the CRE and its contributing factors.

739) = 3.05, $p$ = .048, $\eta_p^2$ = .005. Lastly, there was a significant main effect of in-group/out-group status of the faces (accuracy for same-race vs. cross-race faces), $F$ (1, 739) = 21.84, $p$ < .001, $\eta_p^2$= .016 suggesting that there was a significant difference between *d'* for same-race and *d'* for cross-race faces (a CRE). There was also a significant interaction between participant race and in-group/out-group status, $F$ (2, 739) = 3.15, $p$ = .044, $\eta_p^2$ = .005 indicating that this CRE was dependent on the race of participants. No other main or interaction effects were significant. The main effects of participant race, out-group race participants viewed and in-group/out-group status of faces, and the interaction between participant race and in-group/out-group status suggest that a significant CRE was present in the study when looking at results averaged across all five conditions (SR exclusion, CR exclusion, SR inclusion, CR inclusion and Control). It also suggests that the CRE was influenced by the race of cross-race faces participants saw and the race of the participant. I continued with planned contrasts to further explore the nature of these effects.

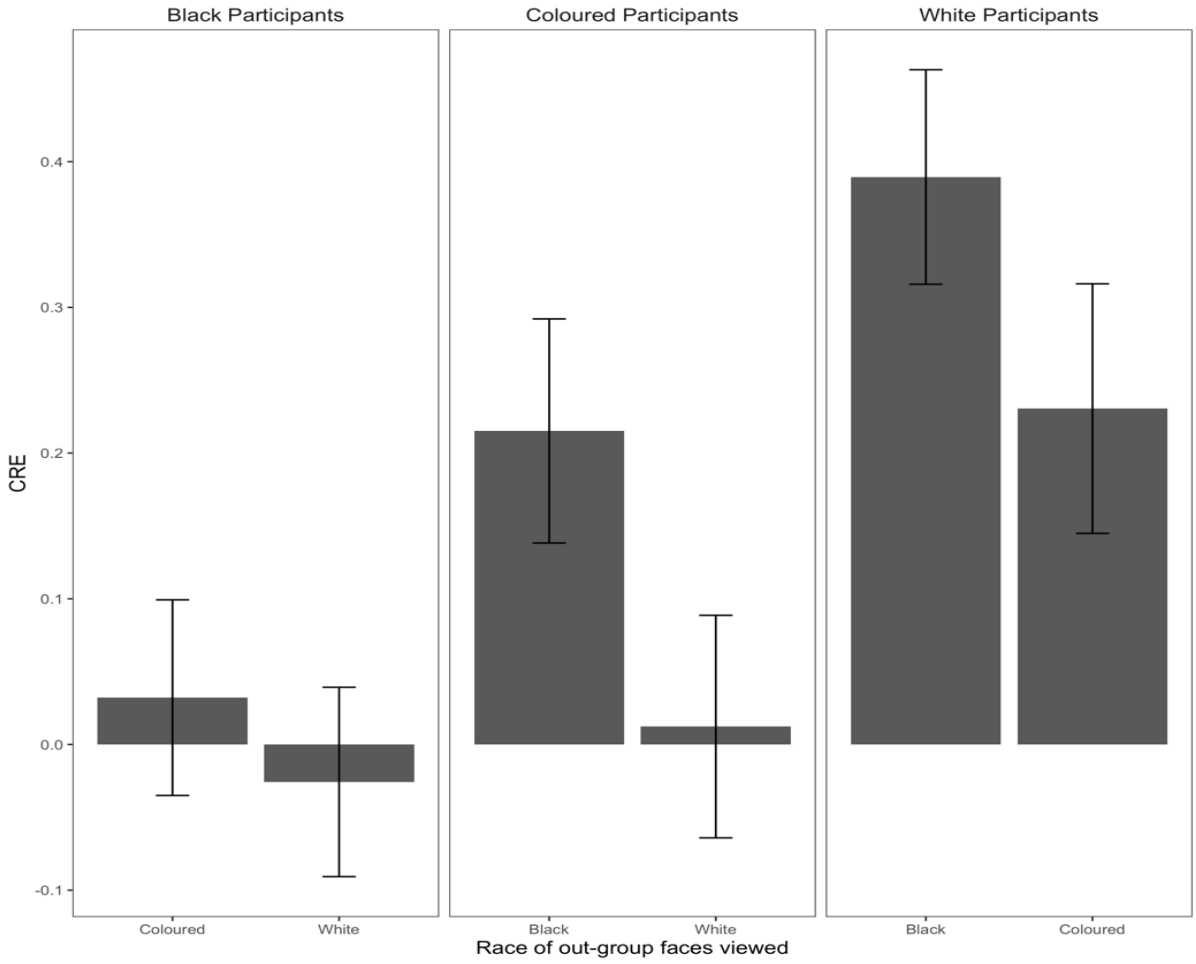
The first of my planned contrasts focused on the effects of participant race and race of out-group faces on recognition accuracy for same-race faces compared to cross-race faces. For these contrasts, I looked at the estimated marginal means differences of *d'* scores for same-race faces versus *d'* for cross-race faces (the within-subjects factor) for each combination of participant race and out-group race averaged across all five exclusion/inclusion conditions (including the control condition). All $p$-values were Tukey HSD adjusted for multiple comparisons. These contrasts showed that black participants did not demonstrate a significant CRE for either coloured (same-race: $M$ = 0.23, $SD$ = .65; cross-race: $M$ = 0.2, $SD$ = .59; $p$ = .637, $d$ = 0.06) or white faces (same-race: $M$ = 0.15, $SD$ = .57; cross-race: $M$ = 0.18, $SD$ = .63; $p$ = .691, $d$ = 0.04). Coloured participants demonstrated a CRE when viewing black faces (same-race: $M$ = 0.5, $SD$ = .65; cross-race: $M$ = 0.29, $SD$ = .62; $p$ = .009, $d$ = 0.37) but not for white faces (same-race: $M$ = 0.32, $SD$ = 0.59; cross-race: $M$ = 0.31, $SD$ = 0.54; $p$ = .876, $d$ =

0.02). White participants showed a significant CRE for both black (same-race: $M = 0.63$, $SD = 0.65$; cross-race: $M = 0.24$, $SD = 0.6$; $p < .001$, $d = 0.67$) and coloured faces (same-race: $M = 0.41$, $SD = 0.74$; cross-race: $M = 0.18$, $SD = 0.53$; $p = .003$, $d = 0.4$).

In summary, these results indicate that black participants did not display an CRE for either white or coloured faces when comparisons were averaged across all exclusion/inclusion conditions. In contrast, white participants showed an overall CRE regardless of the cross-race faces they viewed. Coloured participants showed CRE only when viewing black faces.

**Figure 4**

*Mean difference in accuracy between same-race and cross-race faces by participant race and out-group race*




*Note.* Error bars represent standard error. *CRE* is the mean difference between *d' for* same-race faces and *d'* for cross-race faces to provide an indication of the size of the CRE.

My main hypotheses all stated that exclusion and inclusion would influence the observed CRE and that source of exclusion and inclusion also affect this relationship. To explore the interaction between exclusion/inclusion and source of exclusion/inclusion, I split the exclusion group/condition variable into two separate factors: source of exclusion/inclusion (Same-race group members vs. cross-race group members) and condition (Exclusion vs. inclusion). I ran a 2 (Source of exclusion/inclusion: same-race vs. cross-race group members) X 2 (Condition: exclusion vs. inclusion) X 3 (Race of participant: black vs. coloured vs. white) X 3 (Race of out-group faces viewed: black vs. coloured vs. white) X 2 in-group/out-group status of recognition faces (accuracy for same-race vs. cross-race faces) linear mixed-effects model with continuous *d'* score as the outcome variable. Source of exclusion/inclusion, condition, participant race and race of out-group faces were between-subjects fixed effects and in-group/out-group status of faces was the within-subjects fixed effect. I also included a random effect for participant ID. There was a significant main effect of participant race, $F$ (2, 573) = 6.31, $p$ = .002, $\eta_p^2$ = .012. There was a significant in-group/out-group status of recognition faces (accuracy for same race faces vs. cross-race faces), $F$ (1, 573) = 15.19, $p <$ .001, $\eta_p^2$ = .014. There was a significant interaction between participant race and in-group/out-group status of the faces, $F$ (2, 573) = 3.22, $p$ = .041, $\eta_p^2$ = .006. There was also a significant four-way interaction between exclusion/inclusion condition, participant race, race of out-group faces and in-group/out-group status, $F$ = (1, 573) = 4.35, $p$ = .037, $\eta_p^2$ = .004.

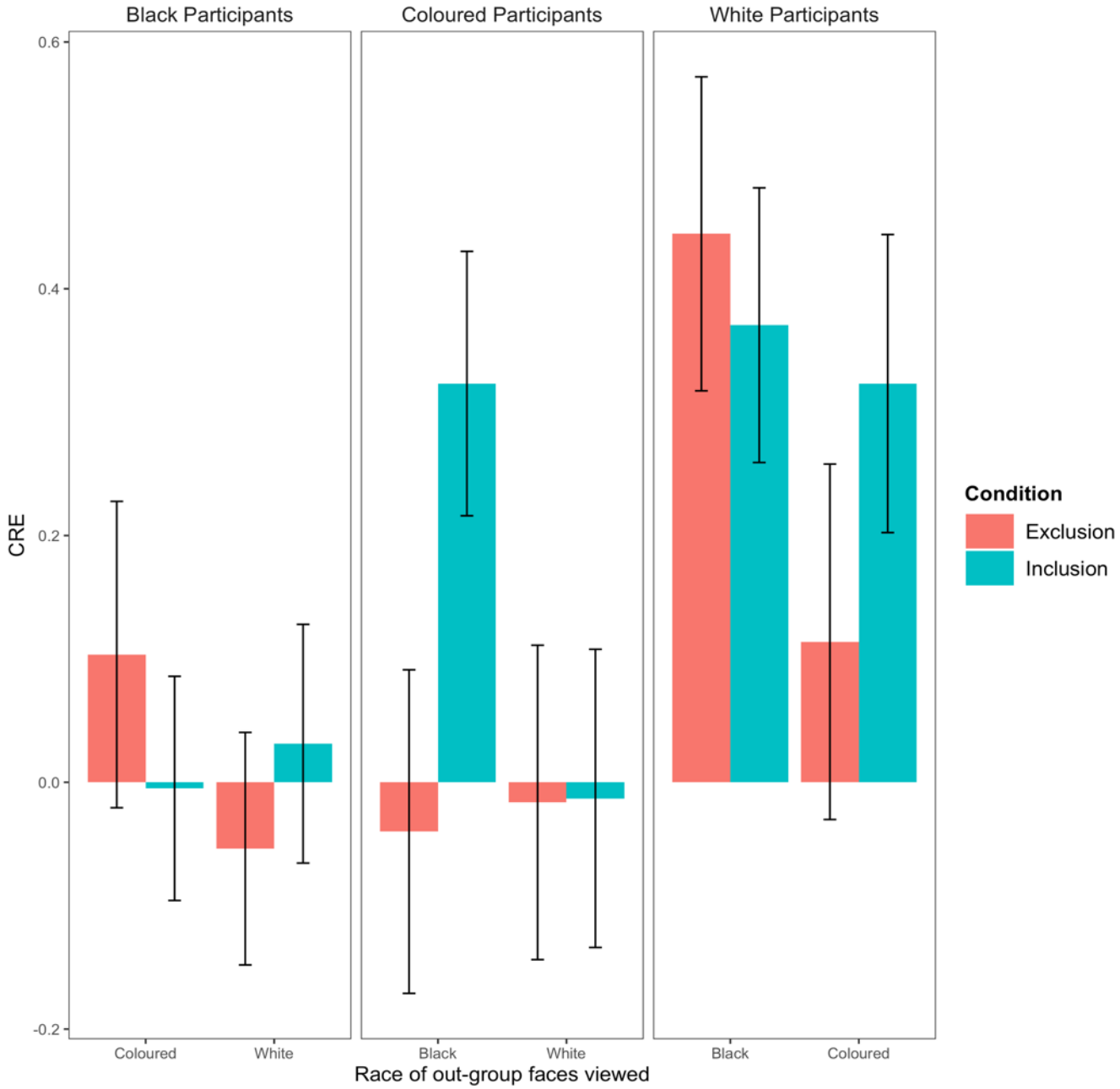
There were no other significant main or interaction effects. Especially relevant for the study hypotheses is that there was no interaction between source of exclusion/inclusion and whether participants were excluded or included. However, the main effects of participant race and in-group/out-group status of recognition faces and the significant interaction between the two indicate that a CRE was still observed for some participants. The four-way interaction between exclusion/inclusion condition, race of participant, race of cross-race faces viewed and

the in-group/out-group status of the faces suggests that 1) there was a significant difference in accuracy for same-race faces compared to cross-race faces (a CRE), 2) this difference was influenced by the experience of exclusion or inclusion but that the source of exclusion/inclusion had no effect and 3) the CRE was also dependent on the race of participants and the race of out-group faces that participants viewed.

To further explore these effects, I looked at estimated marginal means contrasts of *d'* scores for same-race faces compared to *d'* scores for cross-race faces grouped by exclusion/inclusion condition, participant race, and race of out-group face participants saw. All *p*-values were Tukey HSD adjusted for multiple comparisons. Looking only at condition and not the source of exclusion/inclusion, coloured participants viewing black cross-race faces showed a CRE in the inclusion conditions (same-race: $M = 0.54$, $SD = 0.66$; cross-race: $M = 0.21$, $SD = 0.54$; p = .011 $d = 0.59$) but not in the exclusion conditions. White participants viewing coloured cross-race targets also only showed a CRE in the inclusion conditions (same-race: $M = 0.46$, $SD = 0.62$; cross-race: $M = 0.13$, $SD = 0.58$; $p = .006$; $d = 0.61$). White participants viewing black cross-race faces showed a significant CRE in both the exclusion (same-race: $M = 0.63$, $SD = 0.64$; cross-race: $M = 0.18$, $SD = 0.54$; $p = < .001$; $d = 0.74$) and inclusion (same-race: $M = 0.67$, $SD = 0.72$; cross-race: $M = 0.3$, $SD = 0.67$; $p = .002$; $d = 0.64$) conditions. These contrasts indicate that overall participants showed a more consistent CRE in the inclusion conditions.

**Figure 5**

*Mean difference in accuracy between same-race and cross-race faces by exclusion/inclusion condition, participant race and race of out-group faces*




*Note.* Error bars represent standard error**.** *CRE* is the mean difference between *d' for* same-race faces and *d'* for cross-race faces to provide an indication of the size of the CRE. Condition refers to the exclusion or inclusion condition participants experienced.

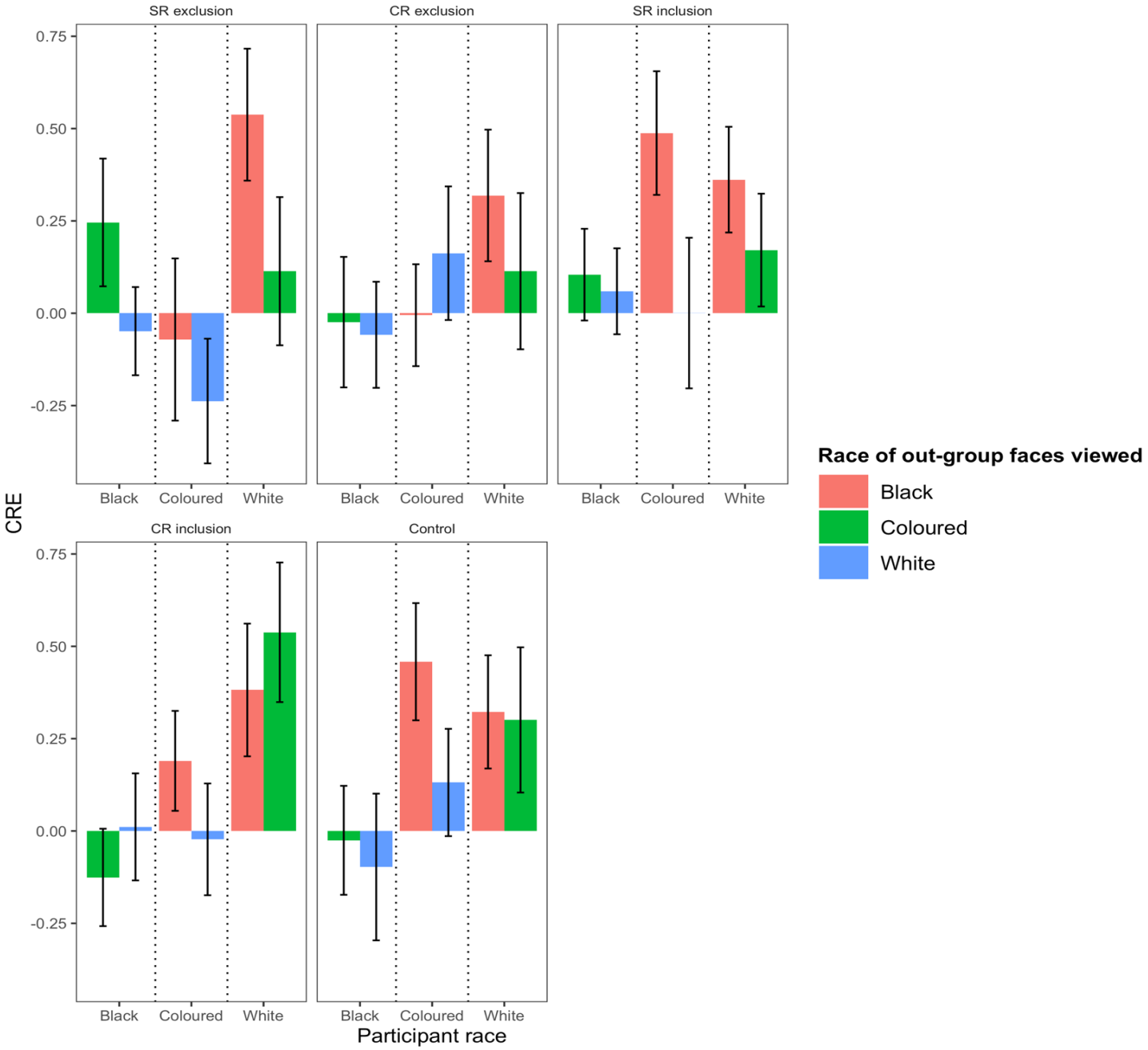
Next, I looked at planned contrasts of estimated marginal means differences to see how these effects differed by source of exclusion and inclusion. Five of these comparisons were statistically significant and all contrasts are displayed in Table 4 (Appendix H). Means for all comparisons are reported in Table 3 and mean differences and standard errors are reported in Table 4. All *p*-values were Tukey HSD adjusted for multiple comparisons. Coloured participants only demonstrated a significant CRE when viewing black out-group faces in the same-race inclusion condition (same-race: $M = 0.78$, $SD = 0.66$; cross-race: $M = 0.29$, $SD = 0.6$; $p = .014$; $d = 0.85$) but did not show any significant CRE when viewing white faces in any group. White participants demonstrated a significant CRE when viewing coloured faces only in the cross-race inclusion condition (same-race: $M = 0.56$, $SD = 0.48$; cross-race: $M = 0.02$, $SD = 0.58$; $p = .007$, $d = 0.93$). White participants demonstrated a significant CRE for black faces in the same-race exclusion (same-race: $M = 0.7$, $SD = 0.68$; cross-race: $M = 0.16$, $SD = 0.59$; $p = .001$; $d = 0.93$), same-race inclusion (same-race: $M = 0.72$, $SD = 0.66$; cross-race: $M = 0.36$, $SD = 0.62$; $p = .022$, $d = 0.63$) and cross-race inclusion (same-race: $M = 0.6$, $SD = 0.79$; cross-race: $M = 0.22$, $SD = 0.72$, $p = .032$, $d = 0.66$) conditions.

To compare the experimental conditions with the control condition, I also looked at repeated measures t-tests comparing same-race and cross-race recognition performance in the control condition. Only coloured participants viewing black cross-race faces showed a significant CRE in the control group, $t\ (715) = 2.68$, $p = .008$. The only other result that approaching significance was for white participants viewing black target faces, $t\ (715) = 1.96$, $p = .05$. Lastly, to examine if there was a difference in the CRE between the four experimental conditions and the control condition I looked at Bonferroni adjusted pairwise t-tests comparing the CRE for each of the experimental conditions with the control condition for every combination of participant race and out-group race. None of these t-tests was significant (all $p$'s $< .05$).

Taken together the results of these planned contrasts indicate that a CRE was not present for all levels of participant race. Black participants did not demonstrate a significant same-race recognition bias for either coloured or white faces across all exclusion/inclusion conditions. For white and coloured participants the CRE depended on the race of out-group faces they encountered during the experiment and this effect was also not present across all exclusion and inclusion conditions. White participants viewing black out-group faces displayed a CRE in all exclusion and inclusion conditions except for the cross-race exclusion condition. However, white participants who saw coloured cross-race faces only displayed a CRE in the cross-race inclusion condition. The observed CRE for coloured participants was also dependent on the race of out-group face they saw as they did not show any CRE when viewing white faces, demonstrating almost equal recognition for same-race and cross-race faces when viewing white targets. Additionally, while coloured participants showed a significant CRE for black faces when results were averaged across all exclusion/inclusion conditions (including the control condition), comparisons taking exclusion/inclusion condition into account showed that this CRE was only present for the same-race inclusion and control conditions.

**Figure 6**

*Mean difference in accuracy for same-race and cross-race faces by source of exclusion/inclusion, participant race and race of out-group faces*




*Note*. Error bars represent standard error. *CRE* is the mean difference between *d' for* same-race faces and *d'* for cross-race faces to provide an indication of the size of the CRE. The labels above each plot refer to the different inclusion and exclusion conditions. SR refers to same-race group members and CR refers to cross-race group members.

***Response bias***

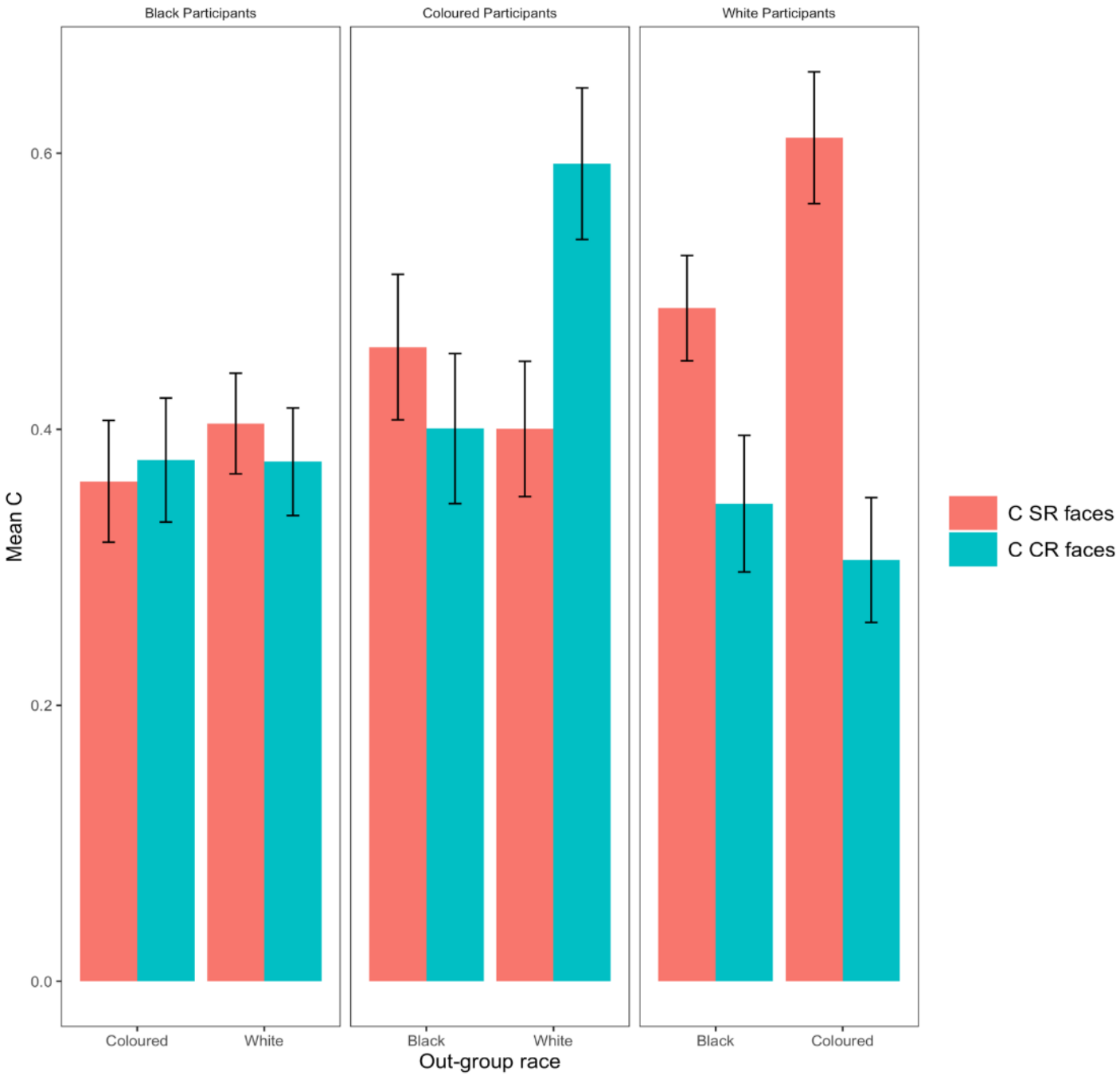
The outcome variable for all inferential tests of the response bias data was decision criterion *c*. I ran a 5 (Condition: same-race exclusion vs. cross-race exclusion vs. same-race inclusion vs. cross race inclusion vs. control) X 3 (Participant race: black vs. coloured vs. white) X 3 (race of out-group face: black vs. coloured vs. white) X 2 (in-group/out-group status of target faces: same-race vs. cross-race) linear mixed-effects model with continuous *c* score as the outcome variable. Exclusion/inclusion condition, participant race and race of out-group face were between-subjects fixed effects and in-group/out-group status of the faces was the within-subjects fixed effect (*c* for same-race versus *c* for cross-race faces). There was a main effect of in-group/out-group status, $F$ (1, 715) = 7.43, $p$ = .007, $\eta_p^2$ = .008 suggesting that *c* for same-race faces was significantly different to *c* for cross-race faces. There was a significant interaction between participant race and in-group/out-group status, $F$ (2, 715) = 10.74, $p$ < .001, $\eta_p^2$ = .023. There was also a significant interaction between out-group race and in-group/out-group status, $F$ (2, 715) = 3.29, $p$ = .038, $\eta_p^2$ = .007. Lastly, there was a significant three-way interaction between participant race, out-group race and in-group/out-group status (*c* for same-race versus *c* for cross-race faces), $F$ (1, 715) = 16.58, $p$ < .001, $\eta_p^2$ = .018. No other main or interaction effects were significant. The significant three-way interaction effect suggests that decision criterion was significantly different for same-race faces versus cross-race faces and this difference depended on the race of participants and the race of target faces they viewed. There was no effect of exclusion/inclusion condition suggesting that exclusion and inclusion manipulation did not affect response bias.

Next I looked at estimated marginal means contrasts for the three-way interaction between participant race, out-group race and *c* for same-race versus *c* for cross-race faces. All *p*-values were Tukey HSD adjusted for multiple comparisons. These comparisons showed that white participants adopted a significantly stricter criterion for same-race faces when viewing

black cross-race faces (Same-race: $M = 0.48$, $SD = 0.42$; cross-race: $M = 0.35$, $SD = 0.54$, $p = .002$, $d = 0.4$). White participants also showed a stronger bias toward "no" responses (stricter criterion) for same-race faces when viewing coloured cross-race faces (Same-race: $M = 0.61$, $SD = 0.51$; cross-race: $M = 0.31$, $SD = 0.48$; $p < .001$, $d = 0.89$). Lastly, coloured participants demonstrated a stronger tendency toward a more liberal criterion for white cross-race faces ($M = 0.4$, $SD = 0.51$; $M = 0.59$, $SD = 0.57$; $p < .001$, $d = 0.57$). These comparisons show that white participants, while showing better accuracy for same-race faces over both black and white cross-race faces, showed a stronger tendency toward responding "no" for same-race faces than cross-race faces for both these out-groups. This meant they adopted a stricter criterion for making a decision for same-race faces over cross-race faces. In contrast, coloured participants' accuracy for same-race faces and white cross-race faces was almost equal but they adopted a significantly more liberal criterion for white faces.

**Figure 7**

*Response bias (c) for same-race and cross-race faces by participant race and race of out-group face*




*Note.* Mean *c* refers to the mean criterion score. *c* SR and *c* SR responds to criterion for same-race and cross-race faces respectively for each participant race and out-group race combination.

**Secondary Analysis**

I also included three Likert scales of group identification, contact avoidance, and affective prejudice (AP) and additional analyses focused on correlations between these scales and face recognition scores. Stacked bar charts illustrating participants' responses to individual items for each scale are shown in Appendices I to K (Figures 8 to 10). I first calculated internal consistency reliability for each scale which are displayed in Table 5. The scales demonstrated high reliability overall. Not all participants who completed the face recognition part of the study also completed the scales as some participants only partially completed the study. In total, 747 participants completed the group identification scale (309 black, 205 coloured and 233 white) and 743 completed the contact avoidance scale (306 black, 206 coloured and 231 white). Participants were also randomly assigned to either the general affective prejudice scale ($n$ = 376; 156 black, 109 coloured, 111 white) or the *Cyberball* specific scale ($n$ = 367; 150 black, 97 coloured, 120 white).

**Table 5**

***Cronbach's alpha reliability for each scale by participant race***

| | Scale | | | |
|---|---|---|---|---|
| Participant race | Group identification | Contact avoidance | Affective prejudice general | Affective prejudice *Cyberball* specific |
| Black | .73 | .85 | .93 | .95 |
| Coloured | .82 | .88 | .92 | .94 |
| White | .64 | .88 | .94 | .95 |
| Full sample | .8 | .87 | .93 | .95 |

After assessing reliability of the scales, I calculated mean composite scores for each scale separately for each participant and used these mean composite scores for all further

analyses. Group identification scores by participant race and condition are shown in Figure 11. When looking at each racial group individually, there was not much difference in group identification scores across the different exclusion and inclusion conditions. However, there did seem to be a difference in scores between the racial groups overall. To further analyse these results, I ran a two-way ANOVA to explore the effect of participant race and condition on mean group identification scores. There was only a significant main effect of participant race, $F$ (2, 732) = 164.56, $p < .05$, $\eta_p^2 = .309$. There were no other significant effects. Tukey HSD post-hoc comparisons showed that white participants mean group identification ($M$ = 4.25, $SD$ = 0.64) was significantly lower than black ($M$ = 5.45, $SD$ = 0.76) participants, $p < .05$, $d$ = 1.57. White participants also scored significantly lower than coloured ($M$ = 4.81, $SD$ = 0.89) participants, $p < .05$, $d$ = 0.72. Coloured participants group identification scores were also significantly lower than black participants' scores, $p <.05$, $d$ = 0.84.

Contact avoidance scores were also consistent across all groups and tended to be on the lower end of the scale. Contact avoidance scores by participant race, out-group race and group are displayed in Figure 12. I also ran a two-way ANOVA looking at the effect of participant race and condition on contact avoidance scores. There was a significant main effect of participant race, $F$ (2, 728) = 3.17, $p$ = .043, $\eta_p^2$ = .009. No other effects were significant. Tukey HSD post-hoc comparisons showed that white participants ($M$ = 2.16, $SD$ = 0.92) scored significantly higher on the contact avoidance scale than black participants ($M$ = 1.97, $SD$ = 0.9), $p$ = .037, $d$ = 0.21.

Affective prejudice scores for each scale by participant race, out-group race and group are shown in Figures 13 and 14. While mean affective prejudice did not change much across the exclusion and inclusion groups for participants who responded to the general scale with mean scores ranging from 2.52 to 2.88 (average $SD$ = 1.21), scores for the *Cyberball* specific scale were highest in the cross-race exclusion condition ($M$ =3.9, $SD$ = 1.64) and lowest in the

same-race inclusion condition ($M$ = 2.91, $SD$ = 1.22; $p < .001$, $d$ = 0.7). Mean responses to the *Cyberball* specific scale were also significantly higher in the cross-race exclusion condition than all other conditions: Same-race exclusion ($M$ = 3.13, $SD$ = 1.21, $p$ = .002, $d$ = 0.55), cross-race inclusion ($M$ = 3.02, $SD$ = 1.19, $p < .001$, $d$ = 0.63), and control ($M$ = 3.02, $SD$ = 1.2, $p < .001$, $d$ = 0.63). This suggests that exclusion by cross-race, or out-group members, significantly increased participants' feelings of explicit or affective prejudice during the *Cyberball* games.

Table 6 (Appendix L) shows Pearson correlations of the face recognition scores and each of the scales for the full sample and by participant race. Correlations in general were low for all comparisons when looked at for the whole sample and for each racial group separately. There was a significant negative correlation between group identification and *d'* for same-race faces when looking at the full sample, $r$ = -.11, $p < .001$. There was also a significant negative correlation between the general affective prejudice scale and *d'* for same-race faces across the full sample ($r$ = -.18, $p < .001$). Looking specifically at participant race, coloured participants' accuracy for same-race faces was significantly negatively correlated with their responses to the general affective prejudice scale ($r$ = -.21, $p$ = .03). White participants' contact avoidance scores were significantly positively correlated with group identification, $r$ = .31, $p < .001$. For the full sample, there was also a significant positive correlation between both affective prejudice measures and group identification ($r$ = .14, $p$ = .01 for AP general; $r$ =.17, $p < .001$ for AP *Cyberball*). Overall, these results indicate that there was little relationship between measures of group identification, prejudice and the CRE as correlations between these items were low overall.

I also produced correlations between mean response scores for each scale and the CRE where the CRE is the difference between *d'* for same-race faces and *d'* for cross-race faces (accuracy for same-race faces compared to cross-race faces) (Table 7). These correlations were for scores averaged across all other factors. There were only significant negative correlations

between group identification scores ($r$ = -.10, $p$ = .01) and the affective prejudice general scale ($r$ = -.12, $p$ = .02) with the CRE. Therefore, an increase in the CRE was associated with lower responses to both the group identification and the affective prejudice scales.

**Table 7**

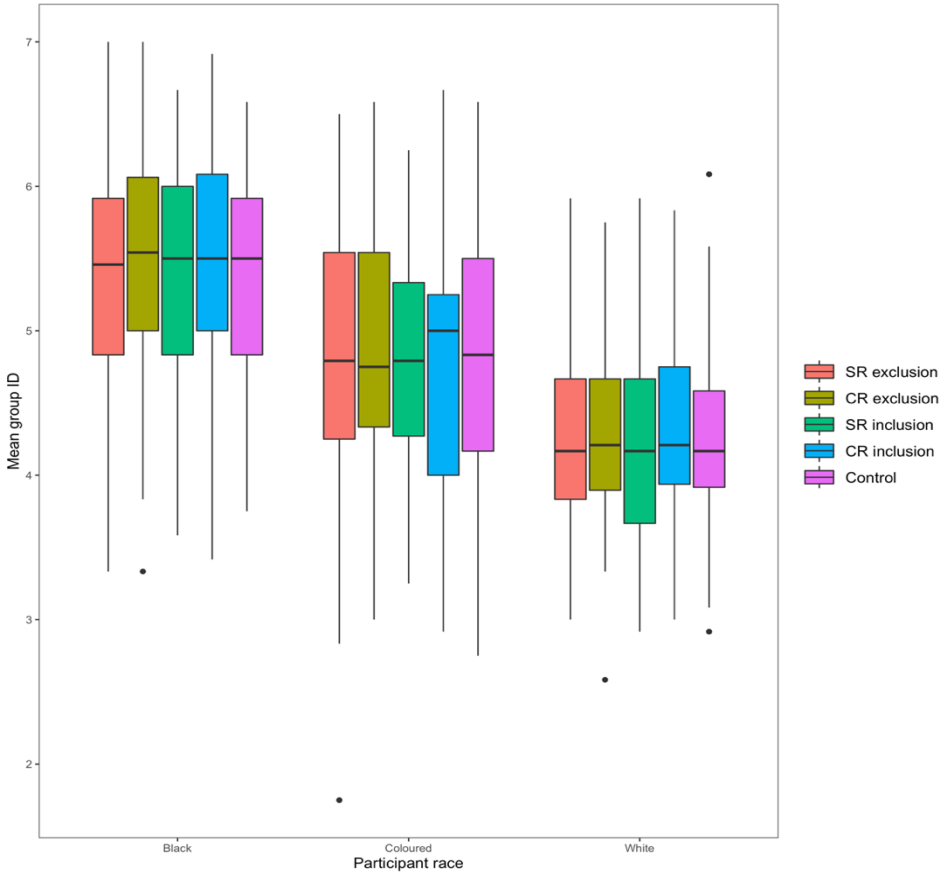
***Pearson correlations of the CRE with group identification, contact avoidance and affective prejudice scales***

| Measure | CRE | Group identification | Contact Avoidance |
|---|---|---|---|
| CRE | - | | |
| Group identification | -0.10* | - | |
| Contact Avoidance | 0.02 | 0.02 | - |
| Affective Prejudice general | -0.12* | 0.14* | 0.30* |
| Affective Prejudice specific | -0.11 | 0.17* | 0.18* |

*Note.* *$p$ < .05

**Figure 11**

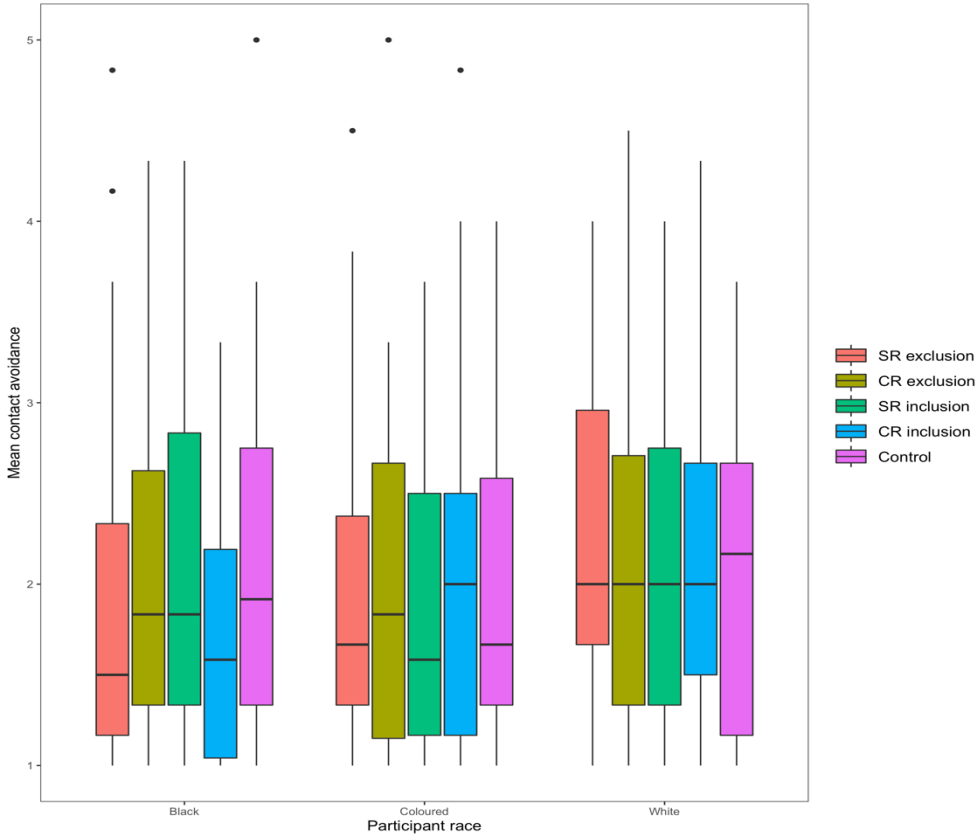
*Box plots of mean group identification scores by participant race*




*Note.* SR refers to same-race group members and CR refers to cross-race group members

**Figure 12**

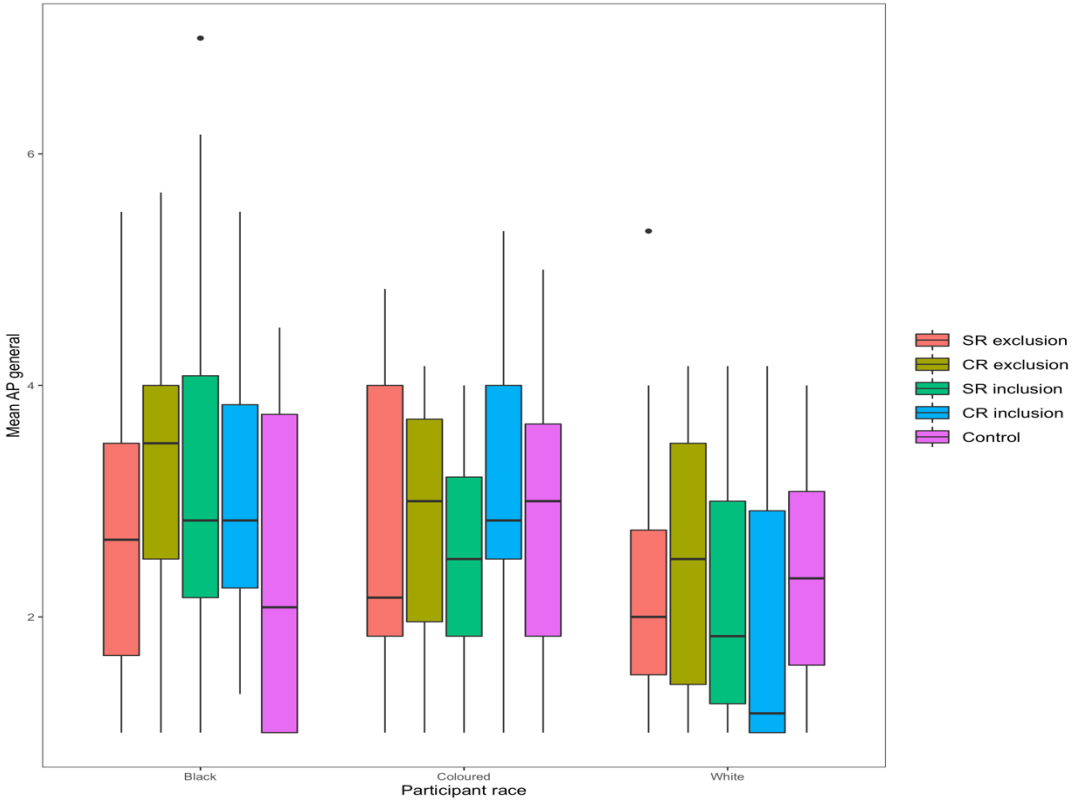
*Box plots of mean contact avoidance scores by participant race and condition*




*Note.* SR refers to same-race group members and CR refers to cross-race group members

**Figure 13**

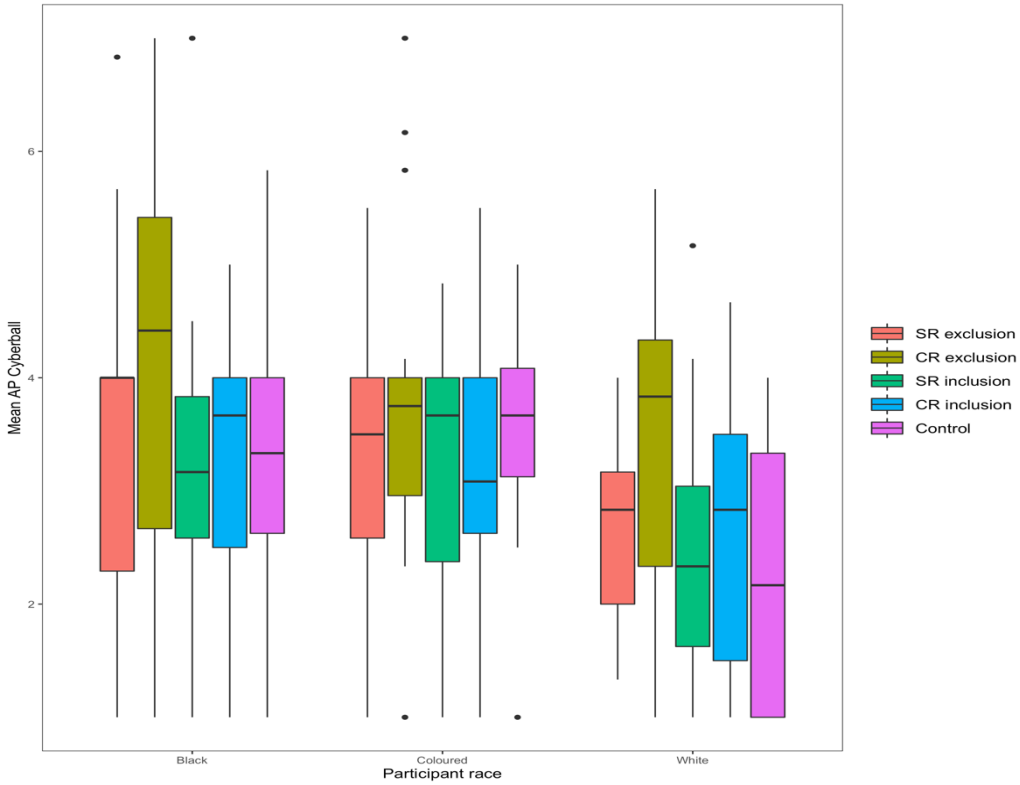
*Box plots of mean composite scores for the affective prejudice general scale*




*Note.* SR refers to same-race group members and CR refers to cross-race group members

**Figure 14**

*Box plots of mean composite scores for the affective prejudice Cyberball specific scale*




*Note.* SR refers to same-race group members and CR refers to cross-race group members

# CHAPTER SIX

# DISCUSSION

The CRE is well established and has been reliably demonstrated in the face recognition and eye-witness literature but there is still much debate around the underlying causes of the effect. Most research on the CRE focuses on the social cognitive perspective and perceptual expertise theories, each of which make specific predictions and hypotheses about the causes and factors influencing the CRE. Broadly, the perceptual expertise perspective emphasizes the role of inter-racial contact and experience with cross-race faces in producing the CRE. Social cognitive theories focus on the role of different social and cognitive factors, such as motivation and the influence of in-group and out-group distinctions on face recognition for same-race and cross-race faces (Meissner & Brigham, 2001; Young et al., 2012).

The present research followed a social cognitive perspective and attempted to influence perceivers' motivation to encode and remember same-race and cross-race faces using a social exclusion paradigm. According to the Social Monitoring System (SMS) hypothesis, social exclusion is thought to influence individuals' processing of social information through a bias for positive social cues that represent signs of acceptance or re-inclusion following an exclusion incident (Claypool & Bernstein, 2019; Van Bavel et al., 2012; Xu et al., 2015). In inter-racial intergroup contexts, racial in-groups or same-race faces are often the most salient source of re-inclusion, meaning that, following the predictions of the SMS theory, excluded individuals' processing resources would be directed toward same-race faces (Van Bavel et al., 2012). In the present research, I made specific predictions based on the theories of social cognitive models of the CRE and the SMS theory and attempted to manipulate participants' motivation to attend to, encode and remember in-group and out-group faces and investigate what effect, if any, these changes in motivation would have on an observed CRE.

I will discuss the results of this study in relation to each of the hypotheses, each of which relate to the expected effects of exclusion and inclusion when carried out by same-race or cross-race group members based on social cognitive accounts and the SMS theory. I will then discuss the findings in light of previous research and the existing CRE literature and end with a discussion of the limitations of the current research and some future considerations.

**The Effects of Social Exclusion and Inclusion on the CRE**

The predictions I made relied on finding 1) a significant overall CRE for participants across all groups and 2) a significant interaction between source of inclusion and exclusion and whether participants experienced exclusion or inclusion. Importantly for my specific hypotheses, there was no significant interaction between source and condition, suggesting that, overall, none of these hypotheses was fully supported. In spite of this, I will discuss each hypothesis in terms of the pattern seen for participants across participant race, out-group and exclusion/inclusion condition.

Hypothesis 1 stated that exclusion by same-race group members would lead to an increased CRE because exclusion by same-race members motivates the processing of signs of acceptance or re-inclusion (based on the SMS theory) (Bernstein et al., 2014; Buelow et al., 2015; Van Bavel et al., 2012. Only white participants demonstrated a significant CRE in the same-race exclusion group which indicates that, overall, this hypothesis was not supported. Although not a statistically significant finding, black participants viewing coloured participants showed their highest mean difference in recognition scores for the same-race exclusion condition which is more consistent with the predictions of the SMS theory. This was also the case for white participants viewing black cross-race faces (mean difference = 0.54, $p < .001$, $d = 0.93$). For white participants viewing black targets, this mean difference was higher than for any other exclusion/inclusion condition. In contrast, coloured participants instead showed overall better memory for cross-race faces than for same-race faces in same-race exclusion

condition, a result that is in opposition to the predictions of the SMS theory. These results show that there was not a consistent CRE in same-race exclusion condition indicating this hypothesis was not supported.

Hypothesis 2 predicted that cross-race exclusion would reduce or diminish the CRE as the act of exclusion is associated with increased social power of cross-race targets which, following a social cognitive perspective, should increase the motivation to remember these targets (Baldwin et al., 2013; Bernstein et al., 2014; Shriver & Hugenberg, 2010; Ratcliff et al., 2011). Averaged over all exclusion/inclusion conditions there was no CRE present in the cross-race exclusion group which is consistent with the predictions I made. Therefore, this hypothesis was supported for all participants but conclusions drawn from this are complicated by the fact that black participants did not demonstrate a CRE for either out-group in any condition and that the CRE for white and coloured participants was dependent on the race of out-group faces. Direct support was only provided by white participants viewing black cross-race faces as this was the only group where white participants did not demonstrate a significant CRE.

I predicted that participants should experience increased feelings of in-group identification or belonging when included by same-race targets, which in turn should lead to an improved when racial groups are made salient (Hypothesis 3) (Van Bavel & Cunningham, 2012). In support of this, participants' mean recognition scores for same-race faces and the difference between same-race and cross-race accuracy were both highest in this condition. The increased *d'* for same-race recognition in this group also indicates that this effect was driven by improved same-race recognition. Looking at comparisons across participant race and target race, there was only a significant CRE for white participants viewing black cross-race faces (mean difference = 0.36, $p = .02$, $d = 0.63$) and coloured participants viewing black target faces (mean difference = 0.49, $p = .01$, $d = 0.85$). For both these comparisons their mean same-race

recognition score in this condition was higher than for any other condition. In the case of coloured participants the size of the sample was relatively small ($n$ = 17) meaning this finding should be interpreted with caution. Therefore, while results for the same-race inclusion condition provide support for this hypothesis, comparisons taking participant and target race into account suggest that this hypothesis was not confirmed. Additionally, these findings don't seem to be due to increased in-group identification as group identification was negatively correlated with the CRE. It is possible that in this group, the fact that participants were more involved in the games may have meant they paid more attention during the games. This combined with same-race players being the ones to include participants may have resulted in participants paying more attention to same-race members during games where they were more actively engaged.

I did not expect cross-race inclusion to have any specific effects on the CRE (Hypothesis 4). Only white participants showed a significant CRE for both black and coloured targets. Again, though, the sample size for white participants viewing coloured targets was relatively small ($n$ = 17). Overall, only white participants' recognition for black cross-race faces followed a similar pattern to their results for the rest of the study with them showing a strong CRE.

Lastly, there was an overall CRE in the include-all control condition averaged over participant race and out-group race. For this group, coloured participants viewing black target faces showed a significant CRE (mean difference = 0.46, $p$ = .01, $d$ = 0.79). White participants viewing black cross-race faces also showed a marginally significant CRE ($p$ = .05, $d$ = 0.55). While not significant, white participants also showed a better memory for same-race targets when viewing coloured faces ($p$ = .07, $d$ = 0.52). In both the cross-race inclusion and control conditions I made no specific predictions about the effect these manipulations would have on the CRE. While a CRE was present in some cases, this again was only true for certain

combinations of participant and out-group race. In the control condition, I expected to see a CRE for all participants which was only the case when results were collapsed over participant and target race. Additionally, the general pattern of the CRE in the control group was consistent for all combinations of in-group and out-group race that had showed a CRE in the any of the other groups.

When I looked at the effect of condition without the source of exclusion/inclusion, the strongest effects were found in the same-race inclusion, control and cross-race inclusion conditions. This may be the case because in these conditions participants were more actively engaged in the task and as a result had better overall memory. In the same-race inclusion and control conditions especially, increased attention and better same-race recognition ability might explain why the largest overall effects were found because same-race members were involved in the games. Additionally, in the same-race inclusion condition the largest differences in same- and cross-race recognition were seen for combinations of participant race and out-group race where strong biases were seen in other conditions. It is possible, therefore, that greater attention during the games benefitted their memory for same-race faces because of their existing proficiency with in-group faces. Even though cross-race players were including participants in the cross-race inclusion condition, participants' increased overall attention during the games might have still led to better same-race recognition performance. In this case, inclusion by cross-race players was not sufficient to overcome generally superior memory for same-race faces. The overall larger CRE in the inclusion conditions was also driven mostly by better recognition in the same-race inclusion condition where participants increased attention was more likely to translate to better memory because same-race players were the focus of the games.

The exclusion and inclusion manipulations did not seem to have much impact on participants' memory for same-race and cross-race faces and findings were not consistent with

the predictions I made. There was only an overall significant overall CRE present in the control and same-race inclusion conditions and these effects were not consistent across all participant and out-group pairings. The only consistent finding was a CRE for white participants viewing black cross-race targets. While there was a significant CRE for white participants viewing coloured targets and coloured participants viewing black targets, these results were driven by significant effects in some groups but not others. Black participants did not show any significant recognition bias for same-race faces. This overall inconsistency in findings suggests there is a need to explore alternative possible explanations of the CRE that take into account participants' experience with different cross-race faces as well as broader social and contextual factors.

**Social Cognitive Theories and the Role of Motivation**

Considering the general lack of support for these hypotheses, the attempted manipulation of perceivers' motivations through social exclusion by same-race and cross-race members did not appear to have a consistent influence on the size of the CRE. According to the SMS theory, participants who were excluded by same-race group members should have shown an increased CRE driven by improved same-race recognition ability (Claypool & Bernstein, 2019; Van Bavel et al., 2012; Xu et al., 2015). Specifically, following a social cognitive approach, exclusion and the threatened need to belong should motivate excluded participants to search for sources of inclusion (Claypool & Bernstein, 2019; Van Bavel et al., 2012; Xu et al., 2015). Consequently, participants should have been motivated to encode and remember same-race targets who present the best source of inclusion, leading to better memory for these targets at the expense of cross-race targets (Sacco et al., 2011).

For the prediction of improved same-race recognition following threatened need to belong to have been supported, an increased CRE was expected when participants were excluded by same-race group members for all combinations of participant and target race that

had demonstrated any CRE throughout the experiment. The present results suggest that this was only the case for white participants responding to black cross-race targets. This finding deviates somewhat from previous research. For example, Van Bavel et al. (2012) found an own-group bias (OGB) for white participants following experimentally induced exclusion and threatened belonging needs. In their study, participants were assigned a minimal group identity (same-versus-other university) and an OGB was determined by better in-group recognition for targets assigned to their own-group. However, Van Bavel et al. (2012) only included white participants in their study and although they used mixed-race target faces, they did not look at how memory for cross-race targets categorised as in-group members differed from memory for same-race targets categorised as in-group members. As a result, the impact of exclusion on stable or permanent group identities, such as race, was not investigated. Because only white participants were included it is also unclear if their results would have been true for any other racial groups. The results of my research suggest that if exclusion and the threat to belonging needs does increase the CRE, that was only true for white participants viewing black CR targets and black participants viewing coloured target faces (although this result was not significant).

The only other study that directly investigated the effect of exclusion on the CRE found no increased CRE for black and white participants following exclusion by same-race members (Bernstein et al., 2014). The authors of that study included both white and black participants and targets but did not report recognition scores separately. Instead, they reported recognition scores averaged over race of participant meaning that it is not certain if exclusion differently affected the CRE for white and black participants in that study. As is illustrated by the current research, the effect of same-race exclusion on the CRE seems to be moderated by both race of participant and race of target faces participants viewed. The lack of a consistent effect of same-race exclusion on the CRE is also more generally suggestive of a small role of motivation in moderating the CRE. If exclusion increases the motivation to restore belonging needs through

a search for signs of inclusion, this motivation should have been sufficient to direct participants encoding resources toward same-race group members who represent the best sources of re-inclusion (Van Bavel et al., 2012). It is possible that this motivation was insufficient to direct attention to same-race group members or that participants need to belong was not sufficiently threatened by the exclusion manipulation. Although I did not directly measure need to belong in this study, the results of the manipulation check indicated that the *Cyberball* manipulation was successful in inducing feelings of exclusion. In the exclusion groups, participants responded that they felt excluded and ignored during the *Cyberball* games, so it is likely that they experienced threatened belonging needs following the exclusion incident (Buelow et al., 2015; Williams, 2007).

Much of the previous research on the influence of exclusion on social information processing has only focused on perception and attention but relatively little has looked at memory for social information (Buelow et al., 2015; Claypool & Bernstein, 2019; DeWall, Maner, & Rouby, 2009; Kawamoto, Nittono, & Ura, 2013; Xu et al., 2015). For example, previous research examining the effect of exclusion on the categorisation of ambiguous targets as in-group or out-group members focused only on whether or not targets were included as part of a participants' in-group and not on memory for these targets (Gaither et al., 2016; Sacco et al., 2011). Considering this, it is also possible that the effects of exclusion on the perception of social information do not extend to memory for social information. Taking the present results into account, there is little support for the predictions of the SMS hypothesis with regard to the CRE as exclusion did not appear to improve participants memory for same-race faces.

Exclusion was expected to have an opposite effect when carried out by cross-race group members. A number of previous studies have shown that increasing the threat, power or social status associated with cross-race targets can lead to better memory for those targets (Bernstein et al., 2014; Hugenberg & Sacco, 2008; Ratcliff et al., 2011; Shriver & Hugenberg, 2010).

Exclusion is an act that is associated with increased social power, greater control over others and is often perceived as a threatening act (Bernstein et al., 2014). The power to exclude individuals from a group also increases the perceived importance of the excluder (Baldwin et al., 2013; Ratcliff et al., 2011). Consequently, exclusion by cross-race members should increase the perceived importance of those targets, in turn resulting in improved cross-race memory and eliminating the CRE. As a result, the effect of social power also acts as motivation to attend to and encode these targets. The present results are somewhat consistent with this previous research, including the results of Bernstein et al. (2014) who found that the CRE was eliminated when participants were excluded by cross-race group members. As mentioned previously, Bernstein et al. (2014) did not report recognition performance separately for white and black participants, rather reporting an overall accuracy (*d'*) for same-race versus cross-race faces averaged over race of participant. In the present research, only white participants viewing black target faces showed a clear effect of a lack of a CRE in the cross-race exclusion condition.

Conclusions drawn for the role of perceived power as a motivating factor are further complicated by the fact that, in many of the studies conducted so far, only white participants were included as participants (Baldwin et al., 2013; Gaither et al., 2016; Hugenberg & Sacco, 2008; Ratcliff et al., 2011; Shriver & Hugenberg, 2010; Van Bavel et al., 2012). Additionally, all of the referenced studies were conducted in the US where white people represent a social majority and maintain a higher socio-economic status (Van Bavel & Cunningham, 2012; Wan et al., 2015). Higher socio-economic status is associated with more control over social and economic resources, providing increased social power, as well as with higher status within society (Lynch & Kaplan, 2000; Wingen, Englich, Estal-Muñoz, Mareva & Kassianos, 2020). Therefore, these studies provide evidence for a reduced CRE when a group that already possesses higher social power experiences a threat to that power or perceives an increase in another group's power or status. This idea would be more consistent with the cognitive

disregard theory where group members seen as unimportant for social goals are disregarded and not individuated, but it would apply more to an interaction of the broader social context with an experimental manipulation of power (Rodin, 1987). In the present study, only white participants viewing black cross-race targets clearly demonstrated the same effect. In South Africa, white people also generally have a higher socio-economic status meaning that if this social context influences the relationship between motivation and the CRE, this would help explain why the use of exclusion to manipulate participants' motivation was only clearly successful for white participants (Gradín, 2012; Mabuza, 2020; Taylor & Yu, 2009).

The findings presented here also show that there was no CRE for all race of participant and race of out-group comparisons in the cross-race exclusion group, which is consistent with predictions of the role social power. However, interpretation of this result is complicated by the fact that black participants did not demonstrate any CRE for either out-group, coloured participants did not show a CRE for white targets, and the inconsistent CRE for white participants viewing coloured targets and for coloured participants viewing black targets. The mean difference in recognition between same-race and cross-race targets in the cross-race exclusion condition was smaller than for all other conditions but this was a result of decreased same-race recognition accuracy rather than improved cross-race accuracy, which would have been expected from previous research (Bernstein et al., 2014). It is possible that in this case, participants perceived cross-race targets as more powerful but that this increased motivation to encode these targets was not enough to overcome lower expertise with cross-race faces. Instead, this resulted in weaker memory for same-race targets who were not encoded. In support of this theory, same-race recognition performance in this condition was lowest overall but cross-race performance was the equivalent to other conditions. Considering this, these results point to an explanation of the CRE that emphasises both social cognitive and perceptual expertise factors.

The overall pattern of results indicates that manipulating exclusion, inclusion, and the source of exclusion and inclusion did not have the intended outcomes. The present findings showed that manipulating participants motivation to attend to same-race and cross-race members did not have an equal effect on the size of the CRE for all participants suggesting that other social and contextual factors, and other potential theoretical explanations may better account for the present results. As such, it seems more likely that an approach that considers social context, perceptual expertise and social factors, and the interaction between these factors, may better explain the CRE (Wan et al., 2015). In the present research the impact of motivational factors on the CRE is further complicated by the complete lack of CRE for black participants viewing any cross-race targets and for coloured participants viewing white faces, suggesting that a social cognitive motivational approach cannot fully account for these results. In the next section, I will discuss the overall observed recognition biases in terms of broader social factors and explore whether the results are better explained by alternative theoretical perspectives, such as perceptual expertise and the role of inter-racial contact.

**Alternate Explanations**

The finding of a consistently strong CRE for white participants viewing black cross-race faces is consistent with previous research on the CRE in South Africa where a CRE for white participants is consistently found (Chiroro, Tredoux, Radaelli & Meissner, 2008; Seutloali, 2014; Wittwer, 2020; Wright, Boyd & Tredoux, 2003). Historically, black participants viewing white cross-race faces have demonstrated a less consistent CRE with some studies finding stronger same-race recognition (Chiroro et al., 2008; Wright et al., 2001) but others finding no bias (Sadozai, Kempen, Tredoux & Robbins, 2019). For example, Wittwer (2020) found a CRE for black participants in only one out of six pre-test studies. Some previous research has even found better recognition of white cross-race faces for black participants (Seutloali, 2014; Wright et al., 2003). Only one other study has looked at the CRE for coloured

participants using coloured face stimuli (Seutloali, 2014). In that study, coloured participants showed similar recognition for white and coloured faces but were much worse at recognising black faces. Similarly, white participants showed better recognition for coloured targets than for black targets (Seutloali, 2014).

I found a similar pattern of results but I also found an overall significant same-race bias for white participants recognising coloured faces, although white participants' recognition accuracy for coloured faces was better than for black faces overall. Taken together, it appears that the occurrence of a CRE for South African participants is relatively inconsistent and dependent on the race of cross-race targets. The overall pattern of results in South Africa (or more specifically for Cape Town) also points to a general weakness for both white and coloured participants recognising black cross-race faces (Seutloali, 2014). It seems likely that a full explanation of the CRE in South Africa has to take an approach that considers broader social factors, such as socio-economic status and the relative social power different groups hold in addition to the role of expertise and inter-racial contact, as well as potential motivational processes (Seutloali, 2014; Wittwer, 2020).

South Africa is still a largely unequal society and there is still spatial and racial segregation resulting from a history of colonial and apartheid-era policies (Strauss, 2019; Turok, Visagie & Scheba, 2021; Van Rooyen & Lemanski, 2020). This complicates the relationship between contact and cross-race experience and the CRE in the South African context. In 2019, black South Africans were estimated to make up about 81% of the population, while white and coloured South Africans made up about 8% and 8,8% of the total population respectively (https://www.gcis.gov.za/official-guide-south-africa-201819). Looking specifically at Cape Town, in 2016, black South Africans made up 42,6% of the population, coloured people made up 39,9% and white people made up 16,5% of the Cape Town population (2016 Community Survey Cape Town; Small, 2017). Finally, at UCT in 2018, 22% of students

were white South Africans and 25% were black South Africans (UCT Transformation Report 2018). UCT did not report the number of coloured students separately for that year but in previous years coloured students made up about 10 to 12% of the population.

Based on these statistics, it would be expected that there is a large degree of inter-racial contact with black people for coloured and white people, which in turn should improve cross-race recognition. Taking only their numerical majority status into account, black participants should show a strong CRE. The population distribution of students at UCT is also relatively more equal suggesting that UCT students should have more experience with cross-race faces compared to the wider population. However, due to the spatial and racial segregation still evident in many parts of South Africa, actual contact between different racial groups is likely still low (Gibson & Claassen, 2010; Seutloali, 2014; Strauss, 2019: Turok, Visagie & Scheba, 2021; Van Rooyen & Lemanski, 2020).

Coloured participants, while showing a CRE for black cross-race faces, had almost equal recognition of same-race faces and white cross-race faces. In terms of the geographical and socioeconomic status of coloured and black people, coloured people are typically closer, both geographically and in terms of socio-economic status, to white people than black people, especially in Cape Town (Mabuza, 2020; Maluleke, 2019; Oosthuizen, 2019; Seutloali, 2014; Turok, Visagie & Scheba, 2021). For example, looking specifically at spatial segregation in Cape Town, historically majority-coloured communities are situated closer to majority-white communities, while majority-black communities are further away geographically (Turok, Visagie & Scheba, 2021). This geographic and socio-economic context could also explain the finding that coloured participants' recognition is better for white targets than black targets and that white participants show better recognition for coloured targets than black targets because contact between coloured and white people is potentially higher. Considering student demographics alone, UCT students should have more cross-race contact and in turn show

recognition biases more reflective of this contact. For example, coloured students at UCT should show almost equal recognition for black and white South African faces considering their almost equal population distribution. Since this is not the case, a longer-term pattern inter-racial contact, such as that suggested by spatial and socio-economic differences, may be more difficult to overcome (Wan et al., 2015).

Socio-economic status and its relation to social power is another potentially important factor. As mentioned, socio-economic status is associated with control over resources which suggests that groups with higher social status or increased social power are generally more able to avoid contact with other groups that are less important for social goals and interactions (Baldwin et al., 2013; Lynch & Kaplan, 2000; Ratcliff et al., 2011; Wingen et al., 2020). In South Africa, white people have a disproportionate amount of social power and have increased socio-economic status when compared to black and coloured people. For example, the annual income per capita for white South Africans was 6.6 times higher than for black South Africans in 2018. (Mabuza, 2020; Oosthuizen, 2019; Taylor & Yu, 2009). White people are also often over-represented in many higher status positions, such as academic spaces. In 2018, 52% of professionally qualified academic positions at UCT were held by white staff members (UCT Transformation Report 2018; Wittwer, 2020). As a result, the individuation of white faces may be more important for social goals, such as academic performance (Baldwin et al., 2013; Ratcliff et al., 2011; Wittwer, 2020). Therefore, it is possible that in daily life, black and coloured people are more motivated to process and individuate white faces out of a more general need to do so for various social goals and social interactions (Ratcliff et al., 2011; Wittwer, 2020). Coloured South Africans may occupy a socio-economic position that is slightly closer to white people than black people, which may also help to explain their CRE for black targets but not for white targets, as their relative social position between black and white South Africans may increase their motivation to individuate white faces but not faces of black

people (Maluleke, 2019; Ratcliff et al., 2011; Wan et al., 2015; Wittwer, 2020; Young & Hugenberg, 2012).

Taking a combined approach, social motivation and perceptual expertise jointly cause the CRE in that motivation and effortful processing can improve recognition ability to a point, but is limited by long-term perceptual experience. Therefore, if a social context means motivation is already high for a given population, participants are already relying on long-term perceptual expertise and are less impacted by experimental manipulations of motivation (Wan et al., 2015). As a result, in this case (similar to other contexts where they are either a social or numerical majority) white participants may have been more affected by acute or experimentally induced manipulations that increase the social power of racial out-groups as their baseline motivation to attend to these out-groups is lower so their recognition performance was improved by more effortful processing (Wan et al., 2015; Wittwer, 2020; Young & Hugenberg, 2012). This would explain why white participants failed to show a CRE for black CR targets in the cross-race exclusion condition where they were more motivated to remember powerful social targets. In contrast, black and coloured participants recognition ability for white out-group faces may have been unaffected by short-term manipulations of motivation because they are already motivated to individuate white faces meaning that experimental manipulations had no effect (Wan et al., 2015). These explanations, however, fail to fully explain why black participants did not show a CRE when viewing coloured CR faces but coloured participants dis show one for black cross-race faces. It is possible that, looking specifically at Cape Town, a mixture of socio-economic factors and similar population sizes of coloured and black people in Cape Town mean that contact between black and coloured people is higher but motivation for coloured people to individuate black people is lower (due to factors mentioned previously, such as importance to social goals).

Further support for this suggestion comes from a study conducted in the US that manipulated the motivation individuate same-race and cross-race targets for black and white participants (Ho & Pezdek, 2016). In their study, Ho and Pezdek (2016) used red and green backgrounds to manipulate in-group and out-group status for white and black participants viewing same-race and cross-race faces. They hypothesised that participants would be more motivated to remember faces categorised as in-group members. While they found that white participants' memory for same-race faces categorised as in-group members was better than for out-group same-race faces, black participants did not show any significant recognition differences for faces categorised as in-group or out-group. White participants' memory for cross-race faces was not influenced by the group status manipulation (Ho & Pezdek, 2016). Also relevant is that black participants did not show any significant CRE in their study. These results provide further support for the suggestion that the influence of motivation in experimental conditions is dependent on other social factors.

Overall, these findings point to an explanation of the CRE that considers the influence of social, contextual and social-motivational factors that influence amount and quality of inter-racial contact and, in turn, perceptual experience with different cross-race faces (Wan et al., 2015). Unfortunately, I did not measure participants' contact with different races or any socio-economic indicators in this study so I was unable to directly explore this relationship. Previous findings and the pattern of results in the present research suggest that the use of exclusion to manipulate participants' motivation to encode and remember cross-race faces was generally unsuccessful and inconsistent across race of participant, and did not follow predictions made by social cognitive theories and the SMS model (Bernstein et al., 2014; Van Bavel et al., 2012). The importance of broader social factors is also clear in the relationship between contact, perceptual experience and the CRE, as looking at both self-reported contact and population statistics, an increased quantity of contact with cross-race groups does not eliminate the CRE

and contact accounts for very little of the variation in the CRE (Meissner & Brigham, 2001; Singh, Mellinger, Earls, Tran, Bardsley & Correll, 2021). This relationship may be further moderated by the long-term interaction of these factors in a broader social context where long-term motivation and increased need for cross-race for social goals influences perceptual experience with cross-race faces. Because this relationship may not be equal for all racial groups in a given context, simply looking at contact or motivation, or their interaction, in an experimental manipulation without considering this wider social context may not fully explain the CRE (Wan et al., 2015). For example, even in a multi-racial society (based on population demographics) participants still displayed a CRE even though inter-racial contact was supposedly high (Wong, Stephen & Keeble, 2020).

Another important consideration for social cognitive models is that many experimental manipulations of motivation in previous studies have used minimal group paradigms or, where cross-race performance was investigated, only included white participants with no cross-over design (Bernstein, Young & Hugenberg, 2007; Bernstein, Young & Hugenberg, 2007; Hehman et al., 2010; Hugenberg & Sacco, 2008; Ratcliff et al., 2011; Shriver et al., 2011; Wan et al., 2015; Young & Hugenberg, 2012). So, while motivation may influence participants' recognition of minimal groups members, it is less clear that motivation manipulations influence recognition for racial group members (Wan et al., 2015). It is also less clear this effect would be seen equally for different racial groups, such as for groups of unequal or relatively equal socio-economic status. As mentioned, motivation may be more relevant in a wider societal context than in short-term experimental manipulations. Taking all these factors into consideration, it seems unlikely that the CRE will be fully explained by inter-racial contact or motivation to individuate faces in a given experiment and that any attempt to understand the causes of CRE will need to also carefully consider the specific social context for where a study is conducted and for the racial groups involved in the study.

**Limitations and Future Directions**

One limitation for the present research was that the face rating task used to select images for the face recognition task did not include any black participants, only white and coloured participants. Similar to the CRE, ratings of distinctiveness and attractiveness are influenced by both the race of the perceiver and the race of the faces being rated (Meissner, Brigham & Butz, 2005; Potter & Corneille, 2008). Therefore, future studies should attempt to ensure that face ratings are provided by perceivers of the same racial groups as those included in the photo sets. This could explain why black participants did so poorly in the recognition task, scoring lowest on same-race recognition overall, as it is possible that these faces were poorly chosen and the task was too difficult. However, black participants' overall recognition performance for cross-race faces was also lowest of all three racial groups pointing more to generally poor recognition performance of all faces by black participants.

Overall, white and coloured participants demonstrated similar recognition ability to black participants for black face stimuli, which suggests that black participants' poor same-race performance was not simply due to factors specific to that face set. The poor recognition performance displayed by black participants for both same-race and cross-race faces may suggest other factors specific to this participant group has influenced their performance. It is possible that factors specific to black participants in South Africa, such as the social and contextual factors discussed previously, have led to these results. For example, black participants could have paid more attention or spent more time encoding cross-race faces at the expense of same-race faces but this greater effort was not enough to improve cross-race recognition performance and worsened their memory for same-race faces. However, this finding of poor overall performance for black participants was not consistent with previous research conducted in South Africa pointing, again, to factors specific to the stimuli used here (Seutloali, 2014; Wittwer, 2020). Future research should further explore possible variables,

such as the stimuli used or attentional processes, that could impair performance on same-race faces without affecting cross-race performance.

An additional limitation surrounding the face stimuli is the inclusion of hair and clothing, as hair and clothing may have been used as cues for face recognition. For example, some research has found that a CRE was not present when hair and clothing was displayed but found a significant CRE when cropped faces were shown (Wong, Stephen & Keeble, 2020). I made the decision to include hair and clothing because of the *Cyberball* manipulation where displaying cropped photos to participants would make it clearer that no real people were involved in the game. Future research should further explore the use of photos without hair and clothing versus cropped photos and its effect on the CRE. The use of rating tasks may aid in stimulus selection but future research should also explore the fairest way to select face photos.

Another important limitation was the lack of a direct measure need to belong following the exclusion manipulation. While the manipulation check showed that participants did feel excluded following *Cyberball*, not measuring belonging needs meant I was unable to explore if the deviation of results from previous findings was due to participants need to belong not being threatened. Previous research and the SMS theory have found that the influence of social exclusion on social information processing was due to threatened belonging needs. For example, Van Bavel et al. (2012) included a measure of belonging needs and found that increased need to belong was associated with an increased OGB. Including a measure of need to belong in the present research would have strengthened any conclusions drawn about the relationship between exclusion and the CRE and would have allowed me to determine if threatened need to belong was the involved in this relationship.

The online administration of the study, while making it possible to collect more data, also gave me less control over the administration of the study. The COVID-19 pandemic made this online administration necessary but future research would benefit from a more controlled

data collection process, especially for experiments testing short-term memory effects. Finally, while the final sample size was large, the random assignment and uneven racial distribution of participants meant that some of the cell sizes were relatively small ($n < 20$) compared to others ($n > 30$) making it harder to draw conclusions about the interactions between some of the factors.

Future research should further explore the role of social motivation processes specifically for racial group members (rather than for experimentally created groups) and include cross-over designs where multiple participant groups view same-race and cross-race faces. Additionally, future research in South Africa should explore the CRE in coloured participants who have been largely ignored in research on the CRE in South Africa. The role of social and contextual factors, such as socio-economic status, should also be explored further as moderating factors for the relationship between either perceptual expertise (contact), social cognitive processes and the CRE as any research on race related processes should not ignore the relative position of those racial groups within broader society.

The use of eye-tracking and screen recording software in future similar research on the effect of exclusion and inclusion on the CRE that uses the *Cyberball* paradigm would also help to further explore group dynamics and behaviour following the exclusion manipulation. An eye tracker or screen recorder would provide potentially useful information on participants behaviour toward group members following exclusion or inclusion by providing data about which group members participants themselves ignored, who they pass the ball to, and where their attention is focused during the games. Eye tracking data would also provide an indication of whether participants pay less attention in general during games when they are excluded compared to inclusion conditions.

**Summary and Conclusion**

Given the importance of face memory in everyday social interactions and in many legal and forensic applications, it is especially important to understand the underlying factors that lead to or cause the CRE. The present research adds to the large body of existing research on the CRE and its existence in different populations in varied global contexts. With a specific focus on social cognitive models of the CRE, I investigated the role of motivation in a South African context looking at the cross-race recognition performance for the three largest racial groups in South Africa. I used a social exclusion paradigm to manipulate participants' motivation to remember same-race and cross-race faces and predicted different effects of exclusion and inclusion on the CRE depending on whether the exclusion and inclusion was carried out by in-group or out-group members. Specifically, I expected that exclusion and inclusion by same-race members would increase the CRE and exclusion by cross-race members would decrease the CRE.

The results of the *Cyberball* manipulation were not consistent across participant race and there was no significant effect of exclusion/inclusion group on the CRE. Similarly, a CRE was also not consistently seen across participant race and target race, with black participants showing no CRE for either target race, white participants showed a CRE for both target groups, and coloured participants showing a CRE for black targets but not for white cross-race targets. These results were also not significantly related to measures of group identification or prejudice. Overall, these findings indicate that attempting to manipulate participants' motivation had no effect on the observed CRE. It seems more likely that an explanation of the CRE will depend on the specific social context in which a study takes place and for participants included in the study, as well as a consideration of both short- and long-term social cognitive (motivational) and perceptual expertise factors (Wan et al., 2015). Unless all these factors are investigated adequately, it seems unlikely that the results of a given study will apply beyond

the specific context in which it takes place and there will be continued uncertainty on the underlying causes of the CRE. Research using different populations and in different settings is especially important for a complete understanding of the causes and ways to reduce the bias, which has important implications in the criminal justice and legal systems where there is a significant reliance on eye-witness testimony.

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**Appendix A**

**SRPP advert**

**Subject:** EARN 1 SRPP POINT – INVESTIGATING THE EFFECTS OF AN ONLINE GAME

**Researcher:** Daniel Derbyshire

Hi Everyone,

I am a Psychology Masters student conducting a research study in the Psychology department. I am investigating the effect of playing an online game on performance on a few short tasks. In the experiment, you will play a simple online game with some other players for a short amount of time. Afterwards you will complete a task related to the game, followed by a few short questionnaires. The experiment may cause some discomfort or negative feelings associated with the game, so it is important to consider this before participating. The study will take approximately 30 to 45 minutes to complete and you will earn 1 SRPP point for your participation in the study. It will take place online through Qualtrics.

To participate you must:

1. Be 18 years or older.

2. Be a South African citizen

3. Have not participated in my Honours study conducted in 2018.

**If you meet these criteria and are interested in participating in the study, please click the link below which will direct you to the consent form and begin the study:**

https://toulousepsychology.eu.qualtrics.com/jfe/form/SV_41RqYOccQgpQ9x4

If you have any questions, please email me at **drbdan001@myuct.ac.za**.

Thank you,

Daniel Derbyshire

**Appendix B**

**Group identification scale**

**Please select the number that best reflects your agreement with each of the following statements from 1 (Strongly Disagree) to 7 (Strongly Agree):**

1. I often think about being an (in-group member).

2. Being an (in-group member) has little to do with how I feel about myself in general.

3. Being an (in-group member) is an important part of my self-image

4. The fact that I am an (in-group member) rarely enters my mind.

5. In general I am glad to be an (in-group member).

6. I often regret being an (in-group member).

7. Generally I feel good about myself when I think about being an (in-group member).

8. I don't feel good about being an (in-group member).

9. I have a lot in common with other (in-group members).

10. I feel strong ties to other (in-group members).

11. I find it difficult to form a bond with other (in-group members).

12. I don't feel a strong sense of being connected to (in-group members).

**Appendix C**

**Affective prejudice scales**

Please circle the number that best reflects your response to the following statement for each of the adjectives below (1 reflects greater agreement with the adjective on the left, while 7 reflects greater agreement with the adjective on the right):

**I feel the following emotions toward (racial outgroup) people in general / during the games of *Cyberball* .**

| **Warm** | | | | | | **Cold** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| **Positive** | | | | | | **Negative** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| **Friendly** | | | | | | **Hostile** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| **Trusting** | | | | | | **Suspicious** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| **Respect** | | | | | | **Contempt** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| **Admiration** | | | | | | **Disgust** |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |

**Appendix D**

**Contact avoidance scale**

Please indicate your level of agreement with each of the following statements on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Choose the answer that seems closest to what you believe. Read each statement carefully, there are no right or wrong answers. Please be as honest as possible.

1. When travelling by car, I prefer to avoid neighbourhoods with a strong presence of (out-group members).

2. I sometimes change my route to avoid contact with (out-group members).

3. In general, I try to avoid neighbourhoods with a strong presence of (out-group members).

4. When choosing my accommodation (flat, room, house etc.), I avoided neighbourhoods with a strong presence of (out-group members).

5. When I walk around the city, I prefer passing through neighbourhoods with a strong presence of people from the same racial group as my own.

6. When choosing a restaurant, bar or club, I avoid places with a strong presence of (out-group members).

## Appendix E

## Informed consent form

### Overview

I am a Psychology Masters student at the University of Cape Town investigating the effects of an online computer game on participants' performance in a few short tasks. In the experiment, participants will play a simple online computer game with other players. In the game, you will throw a virtual ball around with the other players for a few minutes. Following this, you will complete a brief task and answer a few short questionnaires.

### Procedure

If you decide to participate, you will be randomly assigned to one of three conditions. All procedures will be completed in this survey. The study will take about 30 to 45 minutes to complete.

### Risks

If you are assigned to one of the experimental groups, there are potential negative emotional effects related to the procedures in the study. You are free to withdraw at any point that you feel uncomfortable or unable to continue. You can also refuse participation at any point in the study.

### Benefits

There are no direct benefits to you as a participant in the study. However, this research has a number of important practical implications and can be used to further our understanding of different psychological processes. You will receive 1 SRPP point for your participation in the study.

### Voluntary Participation and Right to Withdraw

Participation in the study is completely voluntary and you will face no penalties at all for not participating in the study. If you decide to participate, you are free to withdraw from the study at any point without fear of any negative consequences. You will not have to provide any reasons for your decision to withdraw from the study.

### Confidentiality

All information gathered about you in the study will be completely confidential, and your name will not appear anywhere in the study. All data will be kept on a password-protected computer. Reports made about the study will not identify any of the participants in the study.

**Exclusion Criteria**

There are no exclusion criteria for participation in this study.

**Questions**

If you have any further questions about the study or would like any additional information, please contact me:

Daniel Derbyshire
Email: DRBDAN001@myuct.ac.za

Please contact Rosalind Adams (rosalind.adams@uct.ac.za or 021 650 3417) if you have any complaints or comments about the study or me as a researcher.

I have read and understand the above information and am aware of my rights as a participant. I acknowledge my right to withdraw at any time from the study without penalty:

**_____(signature)**

## Appendix F

## Debriefing form

Dear participant,

Thank you for your participation in the study! This form will provide an outline of the study and explain the procedures involved in the study.

### 1. Purpose of the study

The aim of the study was to investigate racial differences in the perception and memory of faces and whether or not this is related to ostracism or social exclusion. The cross-race effect refers to people's ability to better remember faces that are part of their own racial group (same-race faces) compared to faces of a different race (cross-race faces). This effect has been found to reliably occur in many different contexts and countries around the world. There are a number of different theories about the causes of the cross-race effect. Social exclusion may influence people's feelings of belonging with different social groups, which could in turn influence their memory for faces. Usually, facial recognition tasks are done in laboratory environments and involve passive viewing of faces of different races. Therefore, a further aim of the experiment was to study the cross-race effect when participants were made actively aware of different racial groups during the study. This active awareness of racial groups or differences between racial groups was intended to facilitate belonging or identification with your own racial in-group in order to assess how this would affect your memory of same-race and cross-race faces.

If you were assigned to one of the experimental conditions, you were included or excluded by players of the same racial group as you or were included or excluded by those of a different or same race as you during the Cyberball games. In the control condition every player was included in the game. Through its influence on feelings of belonging or identification with social groups, social exclusion may affect people's motivations for attending to group members as in-groups are more important for social goals. Therefore, social exclusion may lead to important changes in the way cross-race and same-race faces are processed by influencing the motivation to process these faces, which could in turn have an influence on the cross-race effect.

### 2. Deception

In the experimental conditions, participants played a game called Cyberball, which is commonly used to experimentally manipulate social exclusion and inclusion. In this game, you were either excluded or included by members of the same race or different race. The other players in the game were not real players but are in fact programmed, computer players. The deception was used to better simulate real beliefs and feelings of exclusion, but no real players were involved in the game except for you as a participant.

**3. Negative effects associated with exclusion**

All participants played inclusion Cyberball games to attempt to control for the negative emotional effects related to the experience of exclusion. However, exclusion can induce negative feelings and emotions and if you feel that you need any additional support or information following the exclusion condition, please let me know and I will provide you with any additional contact information that you may need.

**4. Further requirements of you as a participant**

Please try not to share any information about the study that you learned through participating in the study with other students as this can bias their responses if they decide to participate in the study.

**5. Reminder of confidentiality**

I would just like to remind you that all your information will be kept confidential and stored on a password protected computer. Your name will not appear anywhere in the study and none of the data collected will be linked to you.

Thank you once again for your participation in the study! If you have any further questions please email me, Daniel Derbyshire, on DRBDAN001@myuct.ac.za. You may also contact my supervisor, Colin Tredoux, on 021 650 3424 or at colin.tredoux@uct.ac.za.

If you have any complaints or comments about the study or about the way you were treated during the study, please contact Rosalind Adams on rosalind.adams@uct.ac.za or 021 650 3417.

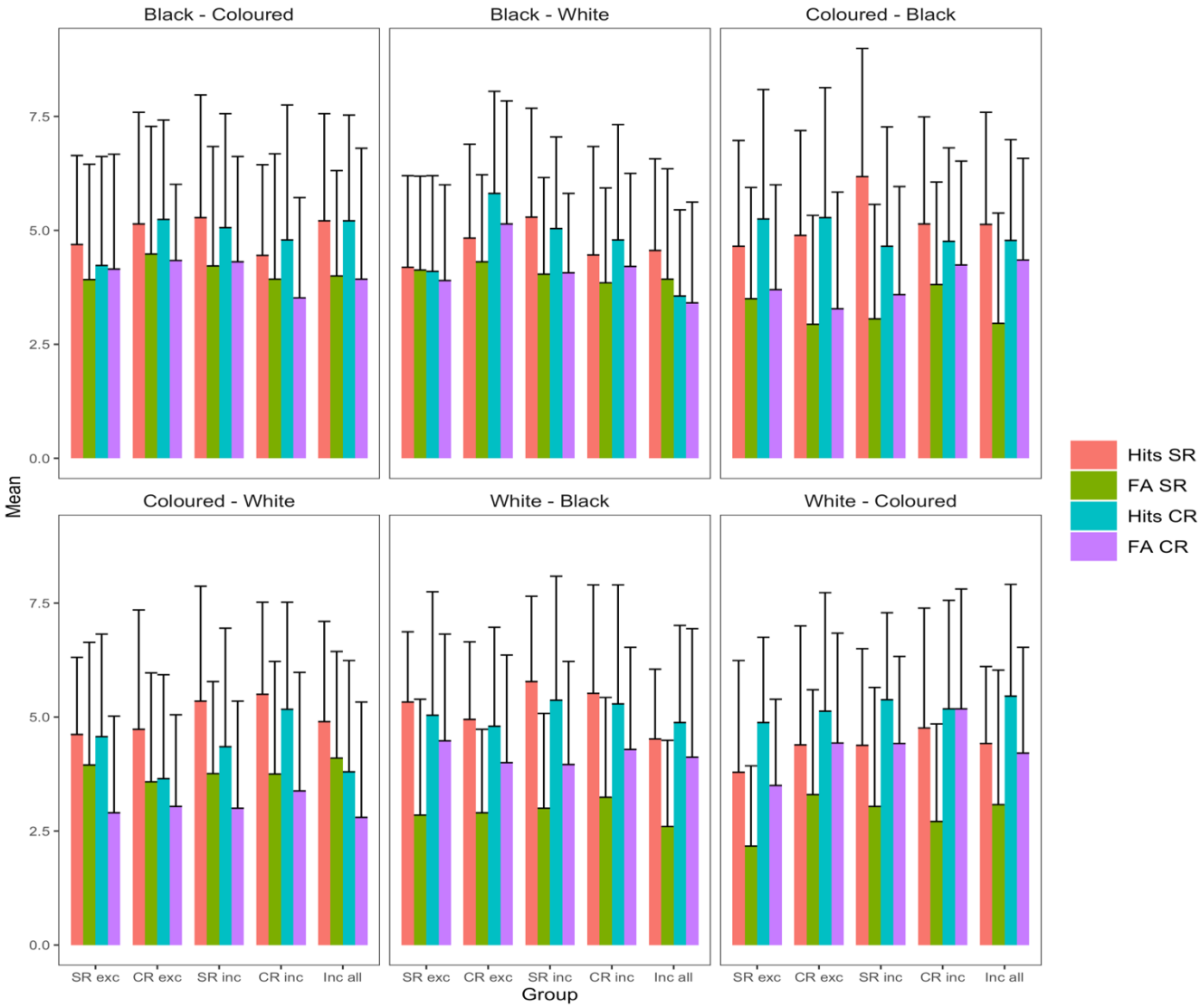
I confirm that I have seen, read through, and understood the information provided on the debriefing form:

_____(signature)

## Appendix G

### Figure 3

*Mean hits and false alarm rates for same-race and cross-race faces by participant race, out-group race and group*




*Note*. Error bars refer to standard deviation. The label above each plot refers to the combination of participant and out-group race the plot refers to (participant race is listed first, out-group race second for each plot). FA refers to false alarms, SR refers to same-race faces and CR refers to cross-race faces. 'SR exc' refers to the same-race exclusion group, 'CR exc' refers to the cross-race exclusion group, 'SR inc.' refers to the same-race inclusion group and 'CR inc.' refers to the cross-race inclusion group. Inc all refers to the include-all control condition.

**Appendix H**

**Table 4**

***Planned contrasts of d' for SR and CR faces by group, participant race and out group race***

| Group | Comparison | *Estimate* | *SE* | *Lower CI* | *Upper CI* | *p* |
|---|---|---|---|---|---|---|
| 1. SR exclusion | a. Coloured - Black | -0.07 | 0.18 | -0.43 | 0.29 | .70 |
| | b. White - Black | 0.54 | 0.16 | 0.23 | 0.85 | < .00* |
| | c. Black - Coloured | 0.25 | 0.16 | -0.07 | 0.56 | .13 |
| | d. White - Coloured | 0.11 | 0.17 | -0.22 | 0.44 | .50 |
| | e. Black - White | -0.05 | 0.15 | -0.34 | 0.24 | .74 |
| | f. Coloured - White | -0.24 | 0.18 | -0.59 | 0.11 | .19 |
| 2. CR exclusion | a. Coloured - Black | -0.01 | 0.19 | -0.39 | 0.37 | .98 |
| | b. White - Black | 0.32 | 0.18 | -0.04 | 0.68 | .08 |
| | c. Black - Coloured | -0.02 | 0.15 | -0.32 | 0.28 | .87 |
| | d. White - Coloured | 0.11 | 0.17 | -0.22 | 0.45 | .51 |
| | e. Black - White | -0.06 | 0.14 | -0.33 | 0.21 | .67 |
| | f. Coloured - White | 0.16 | 0.16 | -0.15 | 0.48 | .31 |
| 3. SR inclusion | a. Coloured - Black | 0.49 | 0.20 | 0.10 | 0.88 | .01* |
| | b. White - Black | 0.36 | 0.16 | 0.05 | 0.67 | .02* |
| | c. Black - Coloured | 0.10 | 0.15 | -0.18 | 0.39 | .47 |
| | d. White - Coloured | 0.17 | 0.17 | -0.16 | 0.50 | .31 |
| | e. Black - White | 0.06 | 0.16 | -0.25 | 0.36 | .70 |
| | f. Coloured - White | 0.00 | 0.20 | -0.39 | 0.39 | 1.00 |
| 4. CR inclusion | a. Coloured - Black | 0.19 | 0.18 | -0.16 | 0.54 | .29 |
| | b. White - Black | 0.38 | 0.18 | 0.03 | 0.73 | .03* |
| | c. Black - Coloured | -0.13 | 0.15 | -0.43 | 0.17 | .41 |
| | d. White - Coloured | 0.54 | 0.20 | 0.15 | 0.93 | .01* |
| | e. Black - White | 0.01 | 0.13 | -0.25 | 0.27 | .93 |
| | f. Coloured - White | -0.02 | 0.17 | -0.35 | 0.31 | .89 |

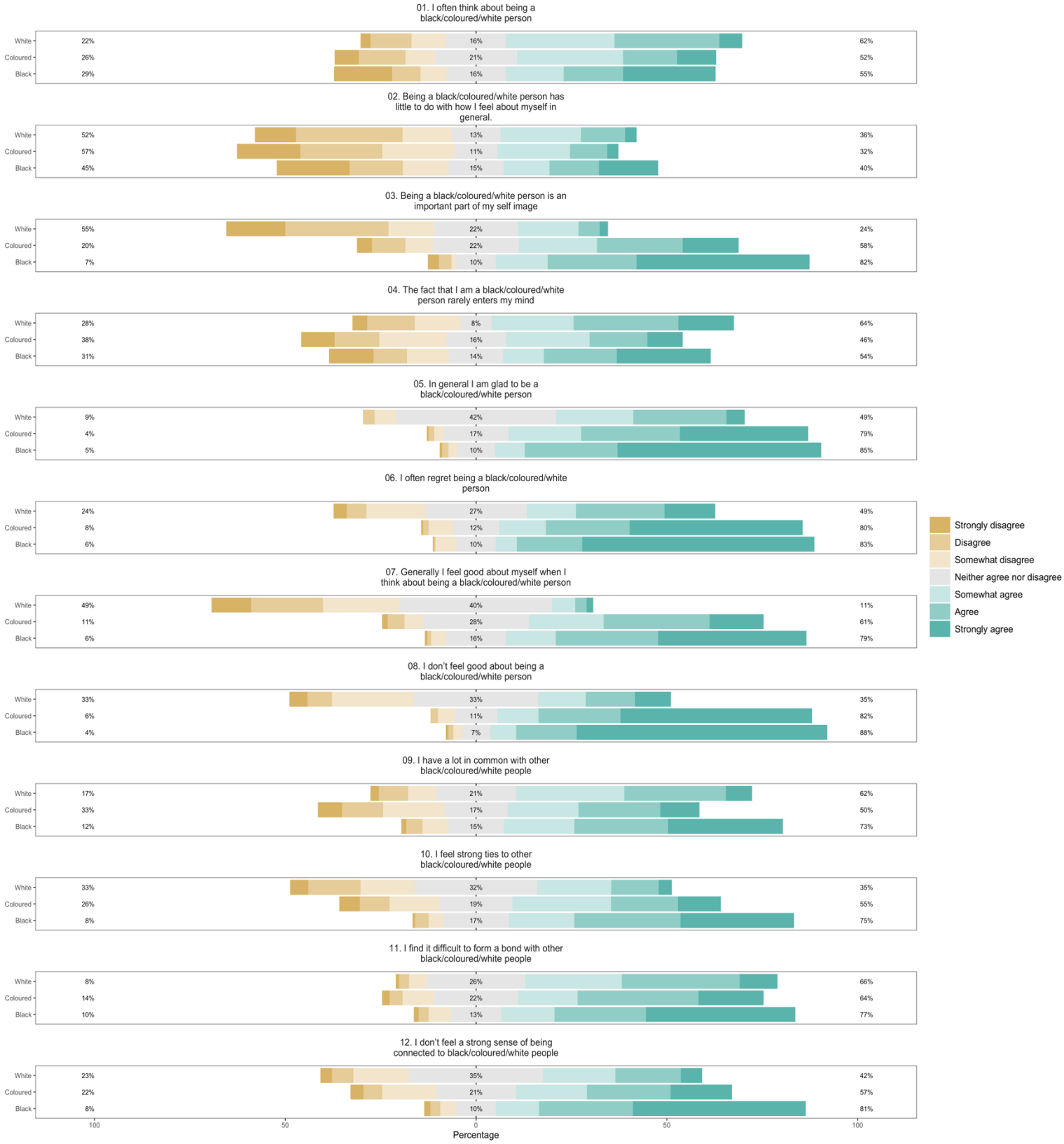
*Note. N* = 745. Comparison refers to in-group vs. out-group comparison. Estimate refers to the estimated marginal means difference for each comparison. 95% confidence interval used for all comparisons. All *p*-values are Tukey HSD adjusted.

*$p < .05$

## Appendix I

## Figure 8

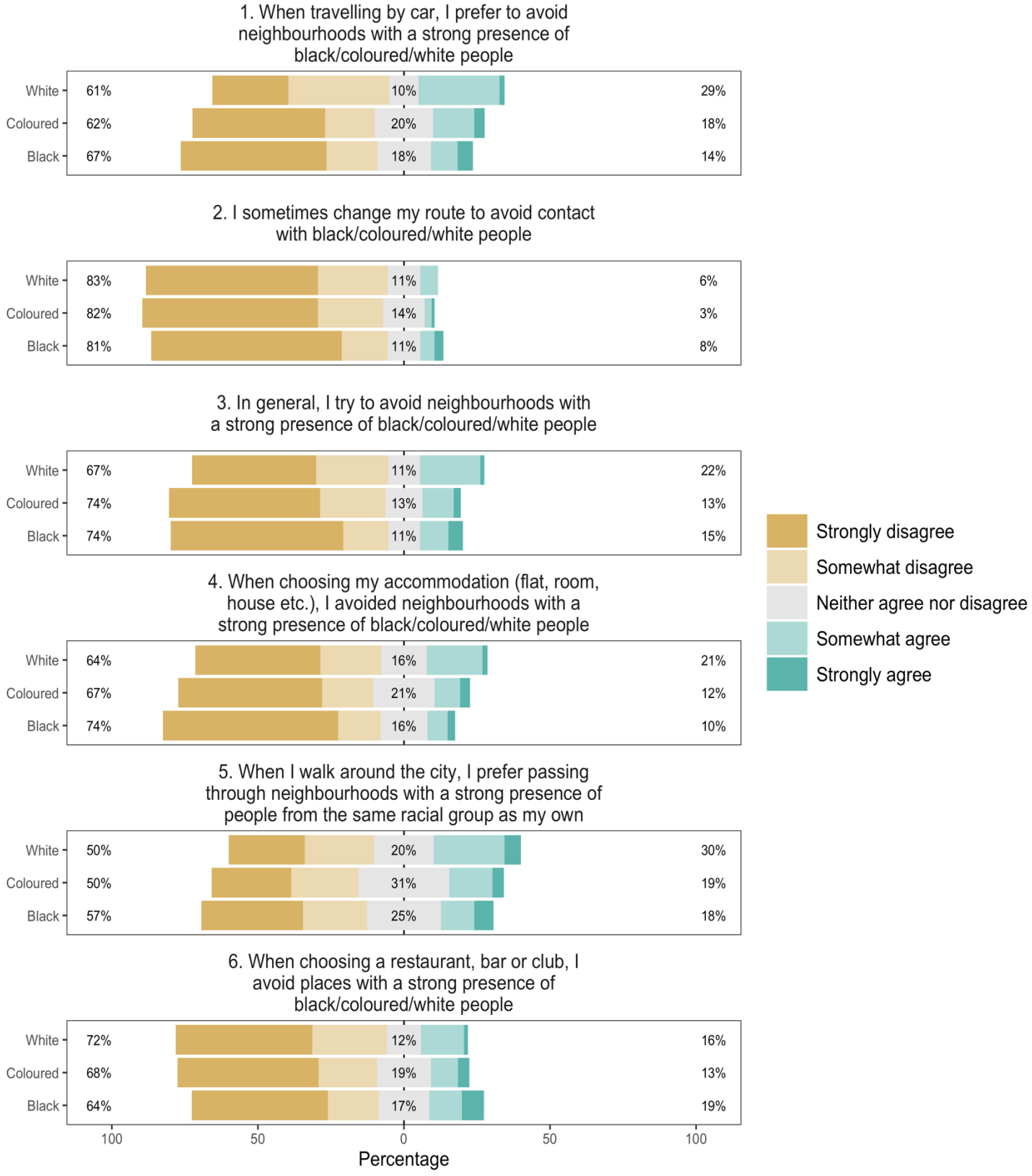
*Stacked bar chart of responses to the group identification scale by participant race*



## Appendix J

### Figure 9

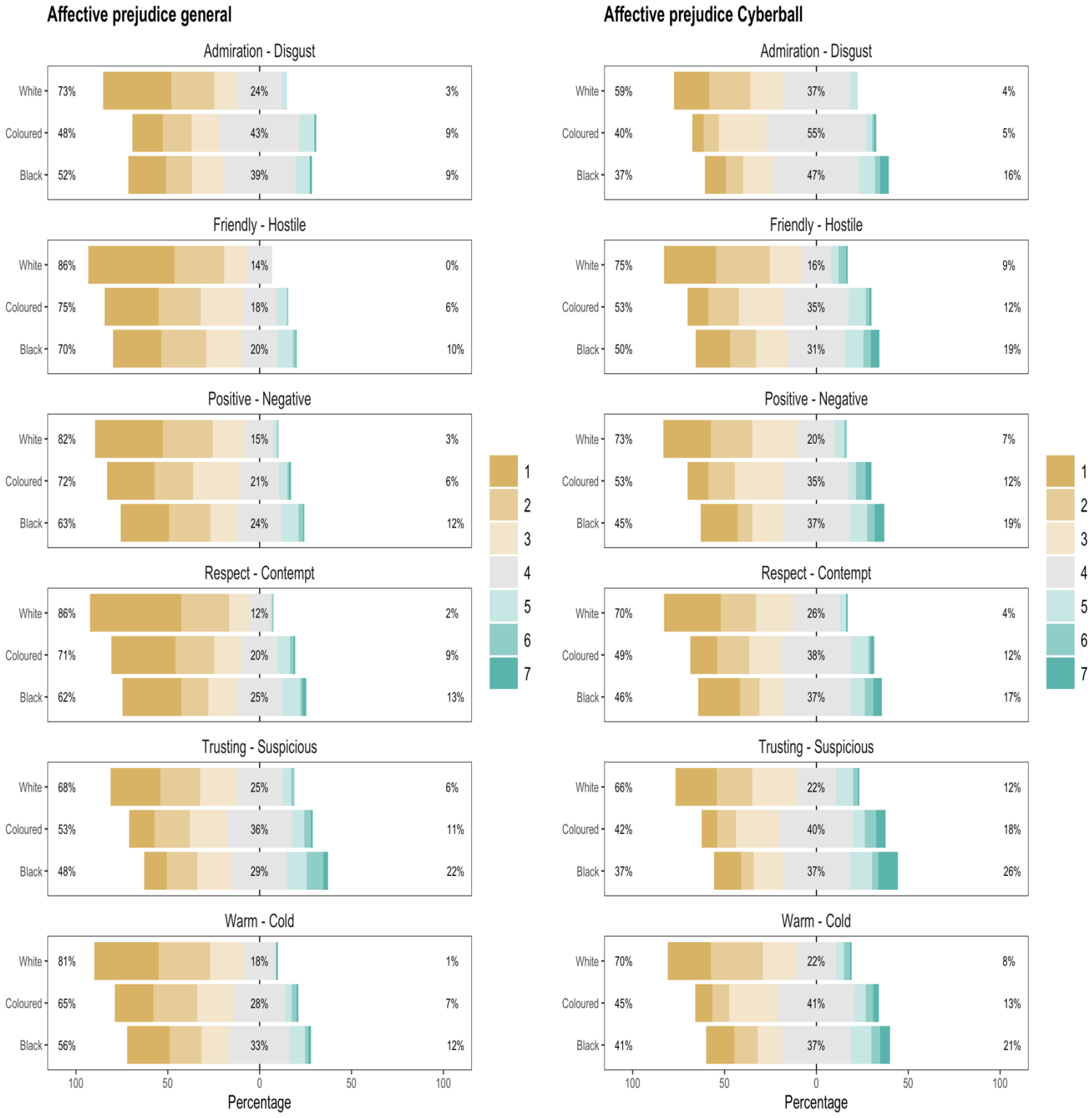
*Stacked bar chart of responses to the contact avoidance scale by participant race*



## Appendix K

## Figure 10

*Stacked bar chart of responses to affective prejudice scales by participant race*



**Appendix L**

**Table 6**

***Pearson correlations of scale measures and d' scores***

| Participant race | Measures | *d'* SR | *d*' CR | Group ID | Contact avoidance |
|---|---|---|---|---|---|
| 1. Full sample | a. *d'* SR | - | | | |
| | b. *d*' CR | .12* | - | | |
| | c. Group ID | -.11* | .01 | - | |
| | d. Contact | .06 | .03 | .02 | - |
| | e. AP general | -.18* | -.03 | .14* | .30* |
| | f. AP *Cyberball* | -.08 | .05 | .17* | .18* |
| 2. Black | a. *d'* SR | - | | | |
| | b. *d*' CR | .01 | - | | |
| | c. Group ID | -.03 | .11 | - | |
| | d. Contact | .07 | .06 | -.01 | - |
| | e. AP general | -.10 | -.06 | .04 | .33* |
| | f. AP *Cyberball* | -.13 | .06 | .06 | .16* |
| 3. Coloured | a. *d'* SR | - | | | |
| | b. *d*' CR | .15* | - | | |
| | c. Group ID | .03 | .07 | - | |
| | d. Contact | .03 | .05 | .00 | - |
| | e. AP general | -.21* | -.05 | -.14 | .35* |
| | f. AP *Cyberball* | -.08 | -.01 | -.09 | .16 |
| 4. White | a. *d'* SR | - | | | |
| | b. *d*' CR | .10 | - | | |
| | c. Group ID | .04 | -.11 | - | |
| | d. Contact | .02 | -.03 | .31* | - |
| | e. AP general | -.10 | .03 | .13 | .28* |
| | f. AP *Cyberball* | .06 | .09 | .17 | .41* |

*Note. d'* SR and *d'* CR refers to accuracy for same-race and cross-race faces respectively.

Group ID refers to the group identification scale. AP refers to affective prejudice.

* $p < .05$.