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Face Recognition: Establishing the Effect of Positive Emotion on Eliminating the Cross-Race Deficit

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STATEMENT OF CONTRIBUTIONS

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ABBREVIATIONS

CFMT.....	Cambridge Face Memory Test
CR.....	Cross-race
ORB.....	Own-race bias
SD.....	Standard Deviation
WRIAS.....	White Racial Identity Attitude Scale

ABSTRACT

The own-race bias (ORB) is a well-established phenomenon in which individuals are able to recognise and distinguish between faces of their own race better than faces of other races (Meissner & Brigham, 2001; Slone et al., 2000). The cognitive and social factors responsible for the ORB remain unclear (Slone et al., 2000) and a definitive explanation for this phenomenon remains to be elucidated (Teitelbaum & Geiselman, 1997). The aim of this study is to build on the findings published by Johnson and Fredrickson (2005) and to test the hypothesis that positive emotions, relative to negative emotions, reduce the ORB in face recognition. Brief video segments will be used to induce positive or negative emotions in participants, followed by a face recognition task to establish the influence of emotion on the ability to recognise own-race and cross-race faces.

The results displayed here are in direct contrast to those observed by Johnson and Fredrickson (2005). Our results showed a substantial, though non-significant, difference between performance in the Caucasian CFMT for the comedy and horror conditions. However, no significant difference between performance in the Chinese CFMT for the comedy and horror conditions was observed.

The discussion centres around the findings of the experiments conducted in this study providing a clear rejection of the hypothesis that positive emotions can reduce the ORB.

2. INTRODUCTION

2.1. Face recognition

Face recognition is one of the most important functions of the human visual system, with the face, being a crucial site for the identification of others and conveying essential social information (Duchaine & Yovel, 2007). The importance of the role of face perception in social interactions is highlighted by the underlying psychological processes, which are known to be present from birth (Johnson & Morton, 1991), to be complex and to involve large and widely distributed areas in the brain (Haxby et al., 2000). The other race effect is one of the most well-known effects in the face processing literature, and a recent paper (Johnson & Fredrickson, 2005) found results that directly undermined traditional explanations for the other race effect and suggested an alternative account. Due to the important implications of their results, my thesis examines whether their results can be replicated.

2.2. The Other Race Effect

It has long been assumed that recognising members of a race different to one's own is more difficult than recognising self-race faces (Feingold, 1914). The own-race bias (ORB) is a well-established phenomenon in which individuals are able to recognise and distinguish between faces of their own race better than faces of other races (Meissner & Brigham, 2001; Slone et al., 2000).

The cross-race (CR) deficit has been confirmed in a wide variety of participants (Anthony et al., 1992; Bothwell et al., 1989; Shapiro & Penrod, 1986). The recognition bias is prevalent among all racial groups (Ng & Lynsday, 1994; Teitelbaum & Geiselman, 1997) but some evidence suggests the effect is most pronounced for Caucasians viewing members of racial minority groups (Meissner & Brigham, 2001).

The prevalence of the bias has significant practical and societal costs (Johnson & Fredrickson, 2005); for example, the ORB makes cross-racial eyewitness identifications highly unreliable and has dire consequences for the criminal justice system (Doyle, 2001; Kassin et al., 1989). The cognitive and social factors responsible for the ORB remain unclear (Slone et al., 2000) and a definitive explanation for this phenomenon remains to be elucidated (Teitelbaum & Geiselman, 1997).

2.3. Hypotheses underlying the Cross Race (CR) deficit

There are several proposed hypotheses which have been put forward in an attempt to explain the cognitive factors underlying the ORB.

2.3.1. Contact hypothesis

The contact hypothesis predicts that increased contact with CR individuals should increase recognition accuracy, with the degree of interracial contact being negatively associated with the level of ORB (Chiroro & Valentine, 1996). The prediction that living among members of another race will reduce the CR recognition deficit has been supported by some experimental evidence (Carroo, 1986; Chiroro & Valentine, 1995; Cross et

al., 1971) but not by others (Ng & Lynsday, 1994). However, attending integrated or predominantly cross-race schools has, in some cases, been shown to reduce the deficit (Feinman & Entwhistle, 1976) whereas in another case it had no effect (Malpass & Kravitz, 1969).

A meta-analysis covering the last 30 years of research has shown that interracial contact accounts for only 2% of the variance in ORB across samples (Meissner & Brigham, 2001). Negative racial attitudes have been shown to be correlated with limited interracial contact but no relationship has been found to exist between the ORB and racial attitudes (Ferguson et al., 2001).

2.3.2. Perceptual differences

More recently research has suggested that the ORB results from differences in the perception of own-race and cross-race faces (Rhodes et al., 1989; Tanaka et al., 2004). Indeed, the other race effect is typically attributed to perceptual mechanisms tuned to better represent same race faces than other race faces due to differential exposure. Generally, faces are recognised holistically; that is, a face is seen as a collective whole instead of a collection of parts (Tanaka & Farah, 1993; Maurer et al., 2002). A classic demonstration of holistic face processing is the *inversion effect*, in which turning a face upside down and thereby changing its spatial configuration, dramatically impairs recognition of the face (Farah et al., 1998). In contrast, inversion has little impact on object recognition (Farah et al., 1998).

Some evidence suggests that one reason for the ORB may be that cross-race faces are perceived less holistically than own-race faces (Rhodes et al., 1989; Tanaka et al., 2004), and more like objects. Consistent with this possibility, Tanaka and colleagues found that people rely on more information for recognising own-race faces than for cross-race faces (Tanaka et al., 2004). Furthermore, the inversion effect is more disruptive to recognising own-race faces than cross-race faces (Rhodes et al., 1989). One of the neural areas involved in facial recognition is the fusiform face area (FFA) (Tong et al, 2000). The FFA is less active in response to cross-race faces than own-race faces (Golby et al., 2001), which again suggests that cross-race faces are perceived less holistically than own-race faces.

2.3.3. **Racial categorisation hypothesis**

An additional explanation put forward for the ORB is that when viewing CR faces, people focus more on cues of racial category than on cues of individual identity (Levin, 2000; Maclin & Malpass, 2003). It has been shown that an enhanced ability to categorise cross-race faces by race is correlated with an impaired ability to recognise cross-race faces (Levin, 2000), which seems a severely paradoxical effect. This finding suggests that the ORB occurs because encoding information about racial category interferes with encoding individuating information (Levin, 2000). Maclin and Malpass (2003) argue that the act of categorising a face by race alters how individual facial features are represented in memory. For instance, after categorising a face as 'African American', one may remember the skin tone as being darker than it actually was and facial features as more

like a prototypical racial exemplar than they were (Maclin and Malpass, 2003). This same authors demonstrated that a feature acting as a racial marker (in this case, hair) can cause a face to be perceived and remembered differently, confirming that other-race faces are perceived categorically (Maclin & Malpass, 2001). The authors concluded that the altered perception of cross-race faces due to the categorisation process may underlie the ORB (Maclin and Malpass, 2003).

2.4. **Broaden-and-Build Theory**

A different perspective on emotions has led to the prediction and subsequent testing of whether experienced positive emotions can reduce the ORB by Johnson and Fredrickson (2005). The broaden-and-build theory states that certain discrete positive emotions – including joy, interest, contentment, pride and love – although phenomenologically distinct, all share the ability to ***broaden*** people's momentary thought-action repertoires and ***build*** their enduring personal resources, ranging from physical and intellectual resources to social and psychological resources (Fredrickson, 2001). The theory, put forward by Fredrickson, provides a new perspective on the evolved adaptive significance of positive emotions (Fredrickson, 2001). Whereas many negative emotions narrow individuals' momentary thought-action repertoires by calling forth specific action tendencies (e.g. attack, flee) many positive emotions broaden individuals' momentary thought-action repertoires, prompting them to pursue a wider range of thoughts and actions than is typical (Fredrickson & Branigan, 2005). Joy, for instance, broadens by creating

the urge to play, push the limits and be creative (Fredrickson, 2001). These urges are evident not only in social and physical behaviour but also in intellectual and artistic behaviour (Ellsworth & Smith, 1988; Frijda, 1986).

One aspect of the broaden-and-build theory, the *broaden hypothesis* predicts that positive emotions widen the scope of attention and literally enhance an individual's ability to see the "big picture" (Fredrickson & Branigan, 2005). Several studies have illustrated that positive emotions are able to facilitate holistic attention processes (Basso et al., 1996; Derryberry & Tucker, 1994). In the investigation between global and local attentional processes, studies have shown that individuals with negative emotional traits, such as anxiety focus more on local elements, whereas those with positive emotional traits, such as optimism, focus more on global elements (Basso et al., 1996).

There is evidence which links positive emotions to more holistic perceptions. In these cases positive or negative feedback was used to induce mood during global-local tasks, in which failure feedback produces a local bias and success feedback produces a global bias (Derryberry & Tucker, 1994). It has been shown that induced positive emotions produced global biases on a global-local choice task (Fredrickson & Branigan, 2005) and that the frequency of Duchenne smiles were positively correlated with faster reaction times to local targets (Johnson et al., 2004).

An additional prediction of the broaden-and-build theory is that positive emotions help to build social resources, possibly by diminishing the salience of group differences (Johnson & Fredrickson, 2005). It is known

that positive affect produces more inclusive categorisation strategies, which increase perceived similarities between groups (Isen et al., 1992). One study has found that induced positive affect promotes the use of more inclusive social categories, making participants more likely to view each of their groups as part of one larger, all encompassing group (Dovidio et al., 1995). However, it is not know whether these social categorisations extend to racial perceptions.

2.5. Previous published data (Johnson & Fredrickson, 2005)

Extrapolating from the broaden-and-build theory, this previous study utilised experiments designed to test the hypothesis that positive emotions, relative to negative emotions or neutral states, may reduce the ORB in face recognition (Johnson & Fredrickson, 2005). Caucasian participants (n=89) were recruited to view Black and White faces for a face recognition task and were shown videos eliciting joy, fear or neutrality before the learning and testing phases of the task (Johnson & Fredrickson, 2005). It was found that the results, shown in Figure 1, were consistent with the hypothesis; joy, relative to fear or a neutral state, experienced before either the learning or testing phase of the task improving the recognition of Black faces and erasing the ORB.

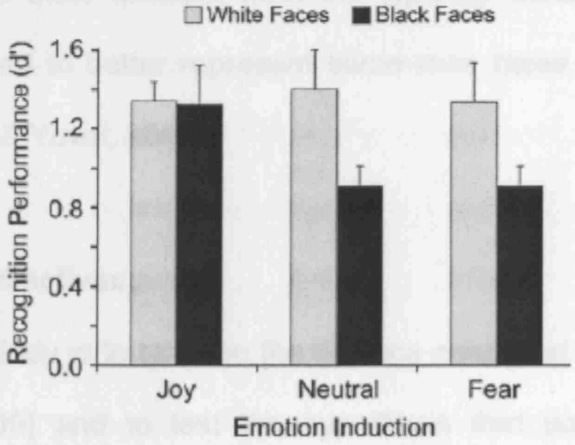

Figure 1: *Recognition performance for own-race (White) and cross-race (Black) faces as a function of emotion induction (taken from Johnson & Fredrickson, 2005).*

The authors draw on the broaden-and-build theory to explain their results, suggesting that the broadening effect of positive emotions may increase recognition of CR faces by promoting more holistic perceptual processes (Johnson & Fredrickson, 2005; Basso et al., 1996; Fredrickson & Branigan, 2005). They also propose that positive emotions may decrease the salience of racial categories, by promoting more inclusive social categorisations (Johnson & Fredrickson, 2005; Dovidio et al., 1998; Isen et al., 1992). This is in line with the racial categorisation theory, put forward by Levin (2000) suggesting that the positive emotions may facilitate more accurate memory distortions due to categorising the faces by race (Johnson & Fredrickson, 2005).

The results observed by Johnson and Fredrickson suggest that the CR deficit is not due to long-term tuning to the properties of same race faces, which is consistent with the findings of Levin (Levin, 2000). This

interpretation are quite different from the typically attributed perceptual mechanisms tuned to better represent same race faces than other race faces (Duchaine & Yovel, 2007).

2.6. Aims and objectives

The aim of this study is to build on the findings published by Johnson and Fredrickson (2005) and to test the hypothesis that positive emotions, relative to negative emotions, reduce the ORB in face recognition.

The design of this study is similar to that used by Johnson and Fredrickson (2005); brief video segments will be used to induce positive or negative emotions in participants, followed by a face recognition task to establish the influence of emotion on the ability to recognise own-race and cross-race faces. We will employ a facial recognition test which shows a larger other race deficit, compared to that seen by Johnson and Fredrickson (2005), so we will be better able to determine whether positive mood can erase the other race deficit.

2.7. Significance of this study

Although this study may be deemed a replication of already existing data, there are some significant advantages that the present data will hold over those previously published by Johnson and Fredrickson (2005).

Firstly, it is necessary to emphasise that the results observed by Johnson and Fredrickson (2005) undermine much of the previous theories about the CR deficit by suggesting that perceptual accounts do not explain the CR deficit, so it would be important to determine whether the effect is

replicable. Johnson and Fredrickson (2005) looked at the effect of emotions on the ability to recognise Caucasian (own-race) and Black (cross-race) faces, whereas this study will concentrate on the effect of induced emotion on the ability to recognise Caucasian (own-race) and Chinese (cross-race) faces.

Johnson and Fredrickson (2005) showed that positive emotions were able to eliminate the ORB using only a perceptual face recognition task. The face recognition task employed in this study will be the Cambridge Face Memory Test (Duchaine & Nakayama, 2006), which measures face memory. Performance on this test will depend on both perceptual mechanisms and memory, although the test does not provide a means to measure the perceptual processes alone (Duchaine & Nakayama, 2006). However, it is our ability in face memory, not face perception which determines our success in identity recognition in everyday life, which is why this test is considered an appropriate tool for my purposes. Our results will assess whether positive mood affects performance for face memory, rather than that of face perception, as investigated by Johnson and Fredrickson (2005).

Furthermore, the original other race deficit observed by Johnson and Fredrickson (2005), although significant, was fairly small.

3. MATERIALS AND METHODS

3.1. Subjects

To recruit participants, this study was advertised on the UCL Psychology subject pool, a database which attracts participants not only from within UCL, but from surrounding universities and also local professionals. In addition, subjects were also recruited by email sent to UCL Institute of Neurology MSc students requesting volunteers as well as through friends, colleagues and acquaintances. Some subjects were also recruited from a list of previous control participants from the Social Perception Group of Dr. Duchaine.

Sixty subjects were tested in total (27 males, 30 females) with comparable numbers of men and women assigned to each testing group. The mean age of participants was 25.28 years (sd = 4.22).

The handedness of each participant was noted. The majority of subjects were right handed and the left handed individuals (n=5) were distributed equally among the testing groups.

3.1.1. Inclusion criteria

Subjects were required to be Caucasian (White), fluent in English and between the ages of 18 and 40.

Subjects were also required to have normal, or corrected to normal vision and none of the participants had any problems recognising faces or any

family history of such conditions. This was to eliminate the possibility of any visual and/or perception problems.

3.2. Stimuli

3.2.1. Emotion Induction Videos

Four short videos, obtained from 'youtube' (www.youtube.com), were used to induce different emotions in the participants. Two comedy clips, one of stand up comedian Peter Kay (3min 22s) and the other of Welsh comedian Rhod Gilbert (3min 46s), were used to induce positive feelings. Two clips, taken from the films 'What lies beneath' (4min 44s) and 'Psycho' (5min 18s), were used to induce more negative emotions.

All people portrayed in the videos were Caucasian. Participants were randomly assigned to view either the Comedy (n=30) or Horror (n=30) videos, presented on a laptop, as an induction prior to and during the task.

3.2.2. Facial Recognition Tasks

Two forms of the Cambridge Face Memory Test (CFMT), devised by Duchaine and Nakayama (2006), were used to investigate the participant's ability in facial memory and recognition. The Caucasian CFMT uses only Caucasian faces as the visual stimuli, whereas the Chinese CFMT uses only Chinese faces. The CFMT uses grey-scale images of individuals, all of which are male gender, with neutral emotional expression so that false recognition of smiling faces would be avoided (Baudouin et al., 2000). Additionally, head hair is removed from the images of faces so participants

cannot use hair as a distinguishing feature to remember the faces (Duchaine & Nakayama, 2006).

The construction of Caucasian CFMT and the Chinese CFMT are identical, using six novel faces and consisting of four stages; practice, introduction/same images, novel images and novel images with noise. Initially a 'practice' stage occurred that familiarises participants with the procedure by mimicking the stages which will follow. It used cartoon faces in the same fashion that the target faces will be presented.

In the subsequent 'introduction/same images' stage, the subject was instructed to memorise a novel face. Three study images of the face were presented in sequence, each for three seconds, at a left ⅓ profile, a frontal view and a right ⅓ profile view. Figure 2 shows these three study views of a target face.

Figure 2: *Examples of study views of a target face for Caucasian CFMT (top) and Chinese CFMT (bottom). Study views are presented for three seconds each.*

The subject was then presented with 3 test faces simultaneously and was forced to decide which face was the target face previously seen, shown in Figure 3. Each test item includes an item identical to one which the participants was required to memorise. This was done once for the left ⅓ profile, once for the frontal view and once for the right ⅓ profile view. Six target faces were used and this procedure was repeated for the remaining five target faces.

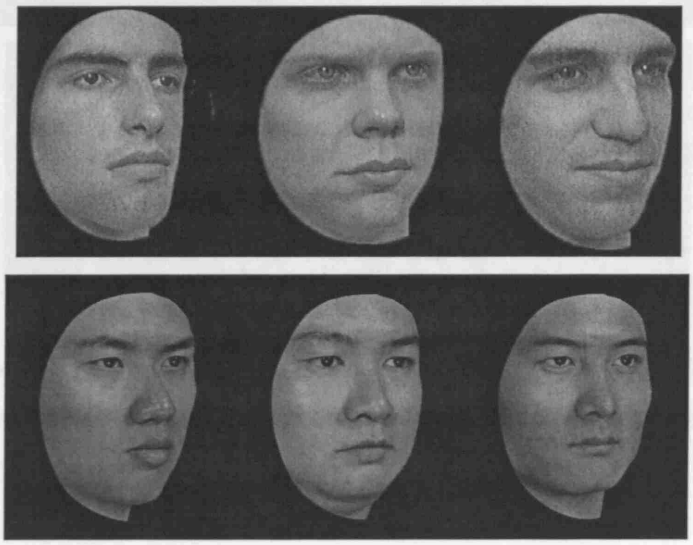

Figure 3: *Examples of test items from the introduction. The right-hand face for the Caucasian CFMT (top) and left-hand face for the Chinese CFMT (bottom) are the same images as those shown in the study view (Figure 2).*

In the following 'no-noise' stage, participants were presented with simultaneous frontal views of the 6 target faces previously seen and were given 20 seconds to review this image. After the review image, participants were presented with 30 forced choice test items (6 target faces x 5 presentations) in a fixed random order. Each test item contained 3 faces, all presented at either a left ⅓ profile, a frontal view or a right ⅓

profile view, one of which is a target face. All the images were novel in which either the lighting, pose or both varied from the target face memorised, shown in Figure 4. The correct answer could have been any of the target faces.

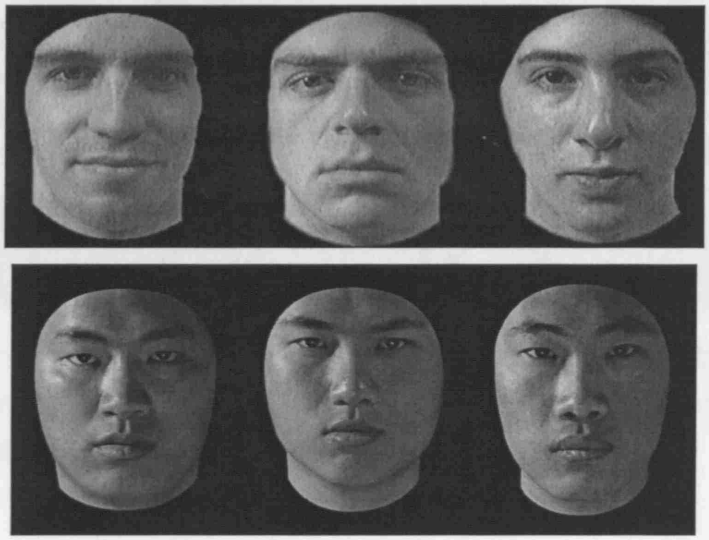

Figure 4: *Examples of test items from the novel images section. The left-hand face for the Caucasian CFMT (top) and middle face for the Chinese CFMT (bottom) are the target faces.*

In the final 'novel images with noise stage', participants were first presented with the review image again for 20 seconds. Following this, 24 novel items (6 target faces x 4 presentations) were presented in a fixed, random order. This stage is identical to the previous scenario but with the addition of Gaussian noise disturbing the facial images. This part of the test is thought to increase the dependence of facial recognition on the face-specific holistic processes that are normally involved in everyday facial recognition and also keep performance from ceiling effects (Duchaine & Nakayama, 2006; McKone et al., 2001).

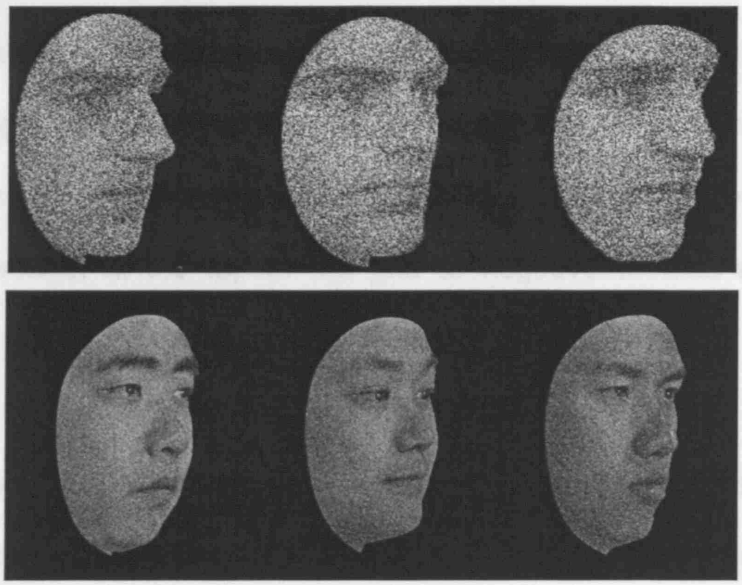

Figure 5: *Examples of test items from the novel images with noise section. The right-hand face for the Caucasian CFMT (top) and right-hand face for the Chinese CFMT (bottom) are the target faces.*

The performance of each participant is given as a score out of 72 for the number of correct answers in each of the three sections (18; 30; 24). The score is converted to a percentage and the data is compared using a 2-way analysis of variance (ANOVA), which was conducted between experimental groups, using SPSS 14.0 (2005).

3.3. Emotion Induction Manipulation Checks

Two self report measures were used to assess the effectiveness of the emotion inductions.

3.3.1. Affect Grid

Immediately after the face recognition task was completed, participants indicated their emotion felt during the videos by marking an affect grid, shown in Appendix I. The affect grid (Russell, Weiss & Mendelsohn, 1989)

represents subjective experience as a nine-by-nine matrix varying along two dimensions, valence and arousal, such that, for example, positive valence and high arousal indicate a feeling of joy. Valence runs from negative on the left of the grid to positive on the right and arousal runs from positive arousal at the top of the grid to negative arousal at the bottom.

Participants marked a cross on the matrix of the affect grid to indicate their feelings during each of the videos. Separate scores were given for valence and arousal based on the number of squares difference between the participants response and a normal, everyday feeling, which was deemed the centre of the grid, denoted (0,0). For instance, a response to the right of (0,0) would be a positive valence score, whereas a response to the left would give a negative valence score.

For each participant, the valence score was multiplied by the arousal score for each video and then these two values were added together to give a composite score. These overall scores for the Affect Grid were then analysed between groups using a 2-way analysis of variance (ANOVA) in SPSS 14.0 (2005).

3.3.2. Retrospective Emotion Report

Participants also completed a retrospective emotion report (adapted from Ekman, Friesen & Ancoli, 1980), as shown in Appendix II. Subjects were asked to indicate the degree (on a scale from 1 to 8) to which they felt

each of seven different emotions (amusement, anger, anxiety, fear, happiness, joy, sadness) during the video. Scores were calculated by combining the point values of the responses marked by the respondents for both positive (amusement, happiness, joy) and negative emotions (anger, anxiety, fear, sadness). The values for each video for each subject were then summed to give a mean composite score for each participant. These overall scores for the Retrospective Emotion Report were then analysed between groups using a 2-way mixed analysis of variance (ANOVA) in SPSS 14.0 (2005).

3.4. Racial Identity Scales

Two racial identity scales were included in this study and administered to subjects to assess their racial attitudes. This was included as extreme racial views could affect participants' performance on the tasks (Chinese CFMT in particular).

3.4.1. Modern Racism Scale

The Modern Racism Scale is intended to measure a dimension of the cognitive component of racial attitudes (McConahay, 1986). It is probably the most frequently used instrument for measuring racial attitudes (Akrami & Ekehammar, 2005). It asks subjects to agree or disagree with a set of beliefs that White people may or may not have about Black people (McConahay, 1986). The scale consists of a set of 7 questions, which were slightly adapted from the original, as shown in Appendix III. Although McConahay's instrument is focused on attitudes toward African

Americans, it was found that "minority" was substituted for "Black" in studies assessing racial prejudice against any ethnic minority groups and this was one of the adaptations applied (Aosved & Long, 2006; Ducot-Sabey, 1999).

On the Modern Racism Scale, five-point Likert scales (1=strongly disagree, 5=strongly agree) are also used by participants to respond to the seven questions. The scores shown in Figure 6 were used when marking questions 2 – 7. The reverse scale was used to score question 1. The higher the overall score for the Modern Racism Scale, the greater the racist attitude of the individual.

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
-2	-1	0	1	2

Figure 6: *Table to show scores used in the marking of the Modern Racism Scale and the WRIAS.*

These overall scores for the Modern Racism Scale were then analysed between groups using a 2-way analysis of variance (ANOVA) in SPSS 14.0 (2005).

3.4.2. White Racial Identity Attitude Scale (WRIAS)

The White Racial Identity Attitude Scale (WRIAS) is a rationally derived scale based on Helms (1984) model of White racial identity development (Helms & Carter, 1990). The scale consists of a set of 50 questions, shown in Appendix IV, which are characterised by attitudes about White people and oneself as a White person, as well as attitudes about Black

people and one's relationship to them (Helms & Carter, 1990). As with the Modern Racism Scale, the WRIAS was adapted to our purposes by substituting "minority" for "Black" in the questionnaire, although there is no evidence that this has been carried out previously.

Subjects used five-point Likert scales (1=strongly disagree, 5=strongly agree) to describe themselves, when completing the questionnaire. For some questions the racist answer is 1, for others it is 5. The scores shown in Figure 6 were used to mark questions 2, 3, 7, 8, 12, 13, 17, 18, 22, 23, 27, 32, 33, 37, 38, 41, 42, 43, 47and 48, for which the racist answer was 5. Questions 16, 19, 21, 26, 28, 31, 45 were deemed ambiguous and omitted from the scoring. The reverse scoring system was applied to the remaining questions for which the racist answer was 1. Overall individual scores are calculated by adding these values of the responses for each respondent. These overall scores for the WRIAS were then analysed between groups using a 2-way analysis of variance (ANOVA) in SPSS 14.0 (2005).

3.5. Testing Procedure

Each experimental session consisted of six stages: first emotion induction video, introduction of CFMT task, second emotion induction video, no-noise and noise sections of CFMT task, emotion induction manipulation checks and racism questionnaires.

For the participants assigned to the comedy video groups, the clip of comedian Peter Kay was used as the first emotion induction, prior to

testing, and the clip of comedian Rhod Gilbert was used as the second emotion induction, after the introduction section of the CFMT. Similarly for the horror film clips, the first emotion induction video clip was 'What lies beneath', with 'Psycho' being the second emotion induction video.

3.6. Experimental Groups

This was a 2 (emotion induction; joy or fear) x 2 (race of face: Caucasian or Chinese) study, thereby creating 4 experimental groups. These groups are shown in Figure 7.

Emotion induction video	**Face recognition task**
Comedy	Caucasian CFMT
Horror	Caucasian CFMT
Horror	Chinese CFMT
Comedy	Chinese CFMT

Figure 7: *Details of experimental groups.*

4. RESULTS

4.1. Length of time living in UK

As a significant number of subjects recruited for this study originated from outside the UK (22), so to ensure that length of time, in years, that participants had resided in the UK was similar between groups, participants were asked to provide the date they began residing in the UK. The mean number of years that participants had been living in the UK was 17.3 (SD =11.7).

A 2 (film induction: comedy or horror) x 2 (race of face: Caucasian or Chinese) between-subjects analysis of variance (ANOVA) was conducted on the length of time, in years, that participants had resided in the UK to ensure that these were similar between groups. No main effect was found of the length of years on the film, F (1, 56) = 0.275, p = 0.602 or the CFMT test, F (1, 56) = 1.017, p = 0.318. No significant effect of the length of time in UK between groups was found for the interaction between the film and the test, F (1, 56) = 0.078, p = 0.780, so it can be inferred that length of time living in the UK is not likely to contribute to differences in results between the groups.

4.2. Racism Scales

Racism scales were administered to subjects to assess the degree of racial attitudes of participants, which, if extreme, could affect participants performance on the facial recognition tasks (Chinese CFMT in particular), therefore contributing to a difference between groups.

4.2.1. Modern Racism Scale

The scores of participants on the Modern Racism Scale were compared between groups using a 2 (film induction: comedy or horror) x 2 (race of face: Caucasian or Chinese) between-subjects analysis of variance (ANOVA). The mean score across all groups was -5.95 (SD = 4.11). There was no main effect for film induction F (1, 56) = 0.938, p = 0.337 or CFMT task F (1, 56) = 1.063, p = 0.307. No significant difference in the scores of participants between groups was found, F (1, 56) = 0.282, p = 0.597.

4.2.2. White Racial Identity Attitude Scale

The scores of participants on the WRIAS were compared using a 2 (film induction: comedy or horror) x 2 (race of face: Caucasian or Chinese) between-subjects analysis of variance (ANOVA). The mean score across all groups was -38.93 (SD = 14.04). No main effect of CFMT task, F (1, 56) = 0.585, p = 0.448 or film induction, F (1, 56) = 1.193, p = 0.279 was observed. No significant difference between the interaction effect of CFMT task and film induction, F (1, 56) = 0.085, p = 0.772.

Hence, it can be assumed that, given the similarity in performance in racial assessment questionnaires across the groups, differences in racial attitudes are not likely to be a contributing factor to any observed differences between groups on performance of the facial recognition tasks.

4.3. Emotion Manipulation Checks

Emotion manipulation checks were carried out on participants to assess whether the emotion-induction videos were effective at producing the desired emotional response.

4.3.1. Affect Grid

The effectiveness of the emotion inductions was supported by reported valence and arousal on the affect grids, which were completed immediately after the testing phase. A composite score (valence x arousal) collapsed across both videos was calculated for each subject.

The comedy clips resulted in higher reports of positive valence and arousal in comparison with the horror clips, whereas the horror clips resulted in higher reports of negative valence and arousal compared to the comedy clips; Mean = 4.47 for comedy (SD=6.77), Mean = -5.53 for horror (SD=6.25).

A 2 (film induction: comedy or horror) x 2 (race of face: Caucasian or Chinese) between-subjects analysis of variance (ANOVA) was conducted on the composite scores of participants from the affect grid.

The ANOVA revealed no main effect for CFMT test on Affect Grid responses, F (1, 56) = 1.221, p = 0.274, but a significant main effect for the type of film clip observed on subjects' responses in the Affect Grid, F (1, 56) = 35.035, $p < 0.001$. This proves that the emotion induction videos generated the intended emotional response, with reports of positive emotions higher for the comedy film inductions and greater reports of

negative emotions for the horror film inductions The interaction between film and test showed no effect on the participants responses in the Affect Grid, F (1, 56) = 0.305, p = 0.583.

4.3.2. Retrospective Emotion Report

The results from the Retrospective Emotion Reports, completed after the testing phase of the task, reinforce the affect grid results by showing that the emotion-induction videos were effective in producing the desired emotional response. Composite scores for positive emotions (amusement, happiness, joy) and negative emotions (anger, anxiety, fear, and sadness) collapsed across both videos were calculated for each subject. Participants viewing the clips of the comedians reported significantly higher levels of positive emotions, Mean=5.06 (SD=1.24), such as joy and amusement than the participants viewing the horror clips, Mean=2.07 (SD=0.94). Likewise, the horror clips resulted in significantly higher reports of negative emotions, Mean=3.52 (SD=1.152), such as fear and anxiety, compared to the comedy clips, Mean=1.27 (SD=0.37).

A 2 (emotion polarity: positive or negative) x 2 (film induction: comedy or horror) mixed factor analysis of variance (ANOVA) was conducted on the composite positive and negative scores of participants from the emotion report. The within-subjects variable was the emotion polarity and the film induction was the between-subjects variable.

A main effect of emotion polarity was observed, F (1, 58) = 41.56, p < 0.001, but there was no main effect of film, F (1, 58) = 4.394, p = 0.40.

There was a significant interaction between emotion polarity and film induction, F (1, 58) = 208.38, p <0.001, with reports of positive emotions higher for the comedy film inductions and greater reports of negative emotions for the horror film inductions.

A post-hoc paired T-test was employed to examine, within each film induction group, whether there was a significant difference between reported positive and negative emotion. For the comedy film clips, a significant difference was observed between positive (Mean=5.06) and negative (Mean=1.27) emotion reports, t (29) = 15.867, p < 0.001. For the horror film clips, a significant difference was also observed between positive (Mean=2.07) and negative (Mean=3.52) emotion reports, t (29) = -5.304, p < 0.001.

As shown in Figure 8, the comedy clips produced an increase in positive emotions relative to the horror film induction, and for negative emotions, horror shows an increase in negative emotions relative to the comedy film induction.

Taken together, these results confirm that the comedy and horror film clips were successful in inducing the desired positive and negative emotions respectfully.

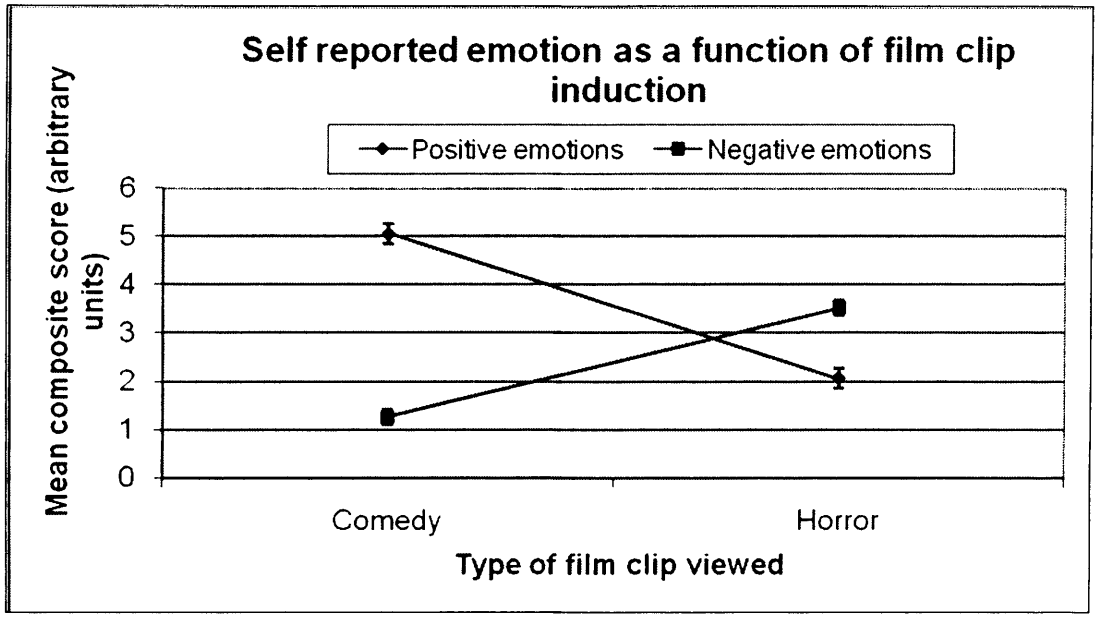

Figure 8: *Graph to show the difference in self-reported positive and negative emotion as a function of film induction. Error bars indicate standard error.*

4.4. CFMT

To analyse performance on the CFMT task, a 2 (film induction: comedy or horror) x 2 (race of face: Caucasian or Chinese) between subjects analysis of variance (ANOVA) was conducted on the results.

The ANOVA revealed a main effect of CFMT test, F (1, 56) = 5.597, p= 0.021. There is a significant performance difference between the two CFMT tests, with participants performing better on the Caucasian CFMT, Mean 83.15 (STDV=9.85), than the Chinese CFMT, Mean 76.99 (STDV=10.51) . This was to be expected, as this difference forms the basis of the ORB. There was no significant effect of film on CFMT performance, F (1, 56) = 0.699, p = 0.407, meaning CFMT performance for participants within each film induction was similar.

When examining the interaction effect between CFMT test and film induction, there was no significant interaction, F (1, 56) = 2.506, p= 0.119. The mean scores for each testing group are tabulated in Figure 9 and shown graphically in Figure 10.

CFMT Task	Film induction	Mean Score on CFMT (%)	Standard Deviation (STDV)
Caucasian	Comedy	86.30	6.66
Caucasian	Horror	80	11.64
Chinese	Comedy	76.019	11.12
Chinese	Horror	77.96	10.15

Figure 9: *Table showing mean scores for each testing group of the CFMT task.*

From this it can be inferred that the emotion induction videos had no effect on abolishing the difference in score between the Caucasian and Chinese CFMT i.e. the CR deficit.

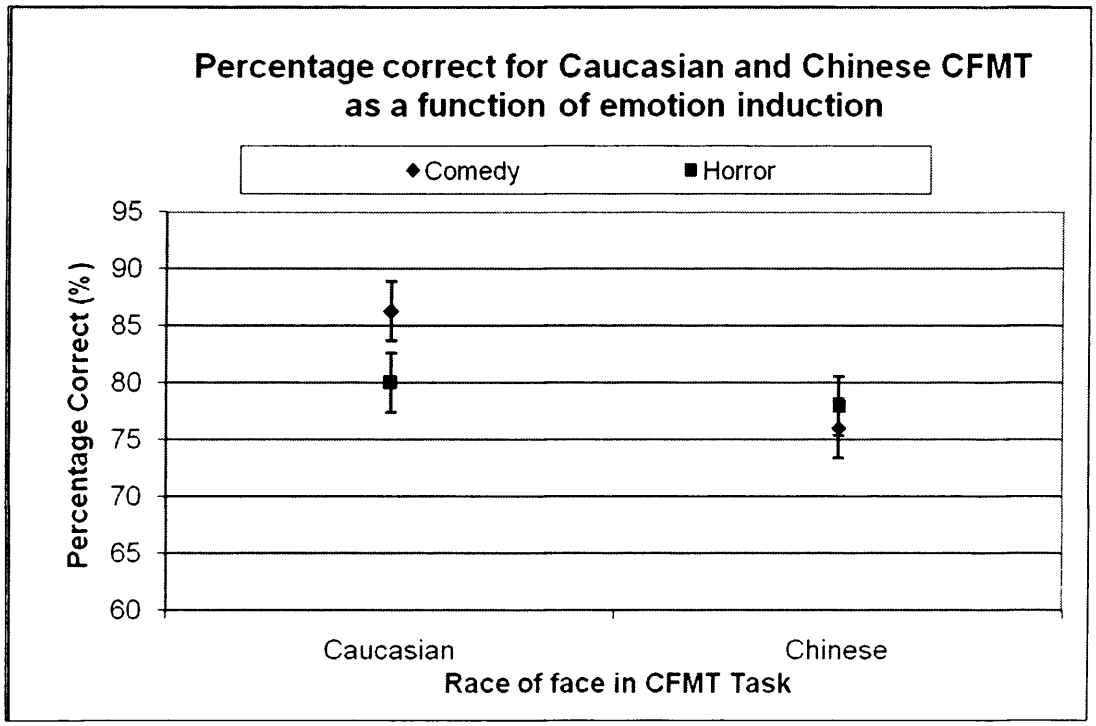

Figure 10: *Graph to show the difference in CFMT performance after either comedy or horror film induction as a function of race of face in CFMT task. Error bars indicate standard error.*

The findings observed here are quite different to those observed by Johnson and Fredrickson (2005). The previous study observed that emotion induction did not alter recognition performance for Caucasian faces (Johnson & Fredrickson, 2005). However, our results showed a substantial, though non-significant, effect of the inductions on performance in the Caucasian CFMT for the comedy and horror conditions. CFMT scores with Caucasian faces were more than six percent higher after the comedy clips compared to the horror clips.

The results with the Chinese CFMT were also inconsistent with the previous study. Johnson and Fredrickson (2005) found a significant effect of positive emotion inductions on the recognition of Black faces, whereas

our results showed no significant difference between performance in the Chinese CFMT for the comedy and horror conditions, with scores on the Chinese CFMT only one percent different between the comedy clips compared to the horror clips.

5. DISCUSSION

The aim of this study was to investigate the findings published by Johnson & Fredrickson (2005) that indicated that positive mood can erase the other race deficit. If they are correct, their findings suggest that the processes underlying the other race effect and face processing more generally need to be reconsidered. To attempt to replicate their finding, video segments were shown to induce positive or negative emotions in participants followed by a face recognition task to assess the influence of emotion on the ability to recognise own-race and cross-race faces.

5.1. Summary of findings

The results of the experiments conducted in this study provide a clear rejection of the hypothesis that positive emotions can reduce the ORB. Analysis of the emotion manipulation checks was carried out on participants and confirmed that the comedy and horror film clips were successful in inducing the desired positive and negative emotions respectfully. Analysis of the length of time, in years, that participants had resided in the UK was similar between groups to ensuring that that this factor was not likely to contribute to differences in results between the groups. There was no significant difference found between groups on either of the racisms scales ensuring that differences in racial attitudes were not likely to be a contributing factor to any observed differences between groups on performance of the facial recognition tasks.

The results show a significant performance difference between the two CFMT tests, with participants performing better on the Caucasian CFMT than the Chinese CFMT. This was to be expected, given that only Caucasian subjects were recruited, as this forms the basis of the CR deficit.

When examining the interaction effect between CFMT test and film induction, there was no significant interaction. The failure to find an interaction demonstates that inducing positive emotions in participants prior to and during the face recognition task, emotion induction videos had no effect on abolishing the difference in score between the Caucasian and Chinese CFMT i.e. the CR deficit.

Not only did we fail to find an interaction, our results revealed a pattern strongly at odds with Johnson & Frederickson (2005). Despite the lack of significance, a clear pattern is observed, showing a strong performance difference in the Caucasian CFMT between those participants which received the comedy film induction and those which received the horror film induction, while there was no significant difference between different emotion induced performance on the Chinese CMFT. The pattern we found demonstrates that the failure to replicate the previous findings was not due to limited subject numbers, insensitive measures, or the other factors that could have contributed to the non-significant interaction. Rather we found results that were qualitatively different from Johnson & Frederickson (2005).

5.2. Significance of this data in the context of published literature

The results displayed here are in direct contrast to those observed by Johnson and Fredrickson (2005). This previous study designed experiments to test the hypothesis that positive emotions, relative to negative emotions or neutral states, may reduce the ORB in face recognition (Johnson & Fredrickson, 2005). Caucasian participants (n=89) were recruited to view Black and White faces for a face recognition task and were shown videos eliciting joy, fear or neutrality before the learning and testing phases of the task (Johnson & Fredrickson, 2005). They observed that the positive emotion induction did not alter recognition performance for Caucasian faces, relative to negative or neutral emotion induction (Johnson & Fredrickson, 2005). However, our results showed a substantial, though non-significant, difference between performance in the Caucasian CFMT for the comedy and horror conditions. CFMT scores with Caucasian faces were more than six percent higher after the comedy clips compared to the horror clips.

The results with the Chinese CFMT were also inconsistent with the previous study. Johnson and Fredrickson (2005) found a significant effect of emotion inductions on the recognition of Black faces, with further analysis revealing that the joy induction resulted in higher discrimination of Black faces compared to neutral induction and also fear induction (Johnson & Fredrickson, 2005). Improved recognition of Black faces in the joy conditions was found to be due to significantly higher hit rates, relative

to the fear conditions and neutral conditions (Johnson & Fredrickson, 2005). Additional evidence for the role of emotions in elucidating the CR deficit was provided by the correlations between self-reported emotions and recognition of Caucasian and Black faces (Johnson & Fredrickson, 2005). Conversely, our results showed no significant difference between performance in the Chinese CFMT for the comedy and horror conditions, with scores on the Chinese CFMT only one percent different between the comedy clips compared to the horror clips.

The results observed by Johnson and Fredrickson suggest that the CR deficit is not due to long-term tuning to the properties of same race faces, which is consistent with the findings of Levin (Levin, 2000). On the basis of data from visual search and perceptual discrimination tasks, Levin interpreted that the CR deficit occurs because people emphasise visual information specifying race at the expense of individuating information when recognising CR faces (Levin, 2000). His findings support an explanation for the CR deficit based on feature coding differences between CR and same race faces (Levin, 2000). This is further supported by a study which demonstrates that a feature acting as a racial marker (in this case, hair) can cause a face to be perceived and remembered differently, confirming that other-race faces are perceived categorically (Maclin & Malpass, 2001). This interpretation are quite different from the typically attributed perceptual mechanisms tuned to better represent same race faces than other race faces (Duchaine & Yovel, 2007). Our failure to find support for the effect of mood on other race face scores raises

questions about this racial categorisation interpretation, thus lending support to the simple perceptual tuning account.

5.2.1. Critique of methodology

There are some significant differences in the methodology of this study and that published by Johnson and Fredrickson (2005), which may account for some of the differences between the data.

An important difference between the studies is that Johnson and Fredrickson (2005) used Black faces in their recognition task and observed an effect of positive emotion induction on the CR deficit, whereas no emotion induction effect was observed on the Chinese faces in the recognition task used here. The fact that different effects were observed with faces of different race could imply that faces of different race may not be perceived in the same way.

All participants recruited by Johnson and Fredrickson (2005) were Caucasian students at the University of Michigan, although it is not stated whether they were all originally from America, or whether foreign participants were included. Due to the large number of subjects required for this study and the time available in which to recruit and test participants, experiments was left open to all nationalities of fluent English speaking Caucasians. Although the different nationalities of participants were taken into account by analysing the length of time they had been living in the UK, there may be cultural differences which could impact on

cross-race face recognition. For instance, Caucasians of different nationality might see the white faces as from another ethnic group i.e. an 'outgroup' member and hence possibly from another race? It would be useful, if this study was to be repeated or extended to limit the subjects to native British Caucasians only.

With regards to control groups, Johnson and Fredrickson (2005) used a neutral mood induction as a positive control, in addition to the joy and fear inductions, but did not use a negative control. Their results for the effect of the neutral and fear inductions on participants' performance in the face recognition task were very similar which it why it was decided, for this study, to only employ the fear induction. Perhaps, if time and recruitment of participants had allowed, it would have been beneficial to include a neutral control to establish whether the horror clip had a negative effect on participants' performance of the face recognition tasks with respect to neutral emotions, although it is not thought that this would have added much value to the results.

The differences observed between the data presented here and those described in the previous study could be attributed to the difference in construction of the face recognition tasks used. The face recognition task used by Johnson and Fredrickson (2005) consisted of a learning phase, followed by a testing phase, which enabled the authors to examine the effects of positive emotion on the encoding and recognition phases separately. The structure of the CFMT is different, with four stages

combining learning and testing within each stage making it more difficult to be able to separate the effect of the emotion inductions on encoding and recognition phases. However, as Johnson and Fredrickson observed an effect of positive emotion induction on both the encoding and recognition phases separately, it is not thought any differences between ours and the previous study's findings can be attributed to the difference in structure between the two tasks.

The face recognition task utilised by Johnson and Fredrickson (2005) presented faces of both male and female gender and observed, across all conditions, that there was a main effect of gender of face, with White female faces being recognised the best. An interaction of gender of face and race of face was also observed, although they claimed that the gender of face did not interact with the emotion condition or participants gender, but the results of these analyses were not provided. The CFMT used in this study presents only male faces, as it is well observed that men and women perform equivalently when presented with male faces, but that women display an advantage when female faces are used (Lewin & Hertlitz, 2002; McKelvie et al., 1993).

In the face recognition task employed by Johnson and Fredrickson (2005), participants were required to indicate whether they had seen a face previously by answering "yes" or "no" on a keypad (Johnson and Fredrickson, 2005). As the test images are the same as those used in the learning phase, participants could respond correctly by recognising the

image rather than the face (Hay & Young, 1982). In the CFMT, however, distracter faces were presented alongside the target faces and many of these distracter individuals were presented repeatedly, so that participants could not simply make a familiar/unfamiliar discrimination (Duchaine & Nakayama, 2006). It is for these reasons, the CFMT is considered a more useful tool for research purposes, compared to the perceptual task used by Johnson and Fredrickson (2005) and performance on the CFMT, compared to the perceptual task by Johnson and Fredrickson (2005), may give a truer indication of face recognition performance.

In addition, it was realised that there might be a confound effect of the videos. Both the comedy clips presented a single comedian as the focus of the clip whereas the horror clips both focused on two characters. The participants watching the horror clips may have been more distracted by the two characters, with their attention fleeting between them, compared to the comedy videos, in which the subjects could focus on one individual. This may have had implications on the emotions induced and been a contributing factor to the fact that a greater difference in performance was observed between groups for the Caucasian CFMT task compared to the Chinese CFMT task.

5.3. Validity of theory proposed by Johnson and Fredrickson

In light of the evidence presented in this study, questions must be raised over the claims published by Johnson and Fredrickson (2005). Drawing from the broaden-and-build theory, the authors suggested that positive

emotions, by promoting more inclusive social categorisation (Dovido et al., 1998; Isen et al., 1992), decrease the salience of racial categories (Johnson & Fredrickson, 2005). That is, that positive emotions may facilitate more accurate memories of cross-race faces by reducing memory distortions, due to categorising the faces by race (Johnson & Fredrickson, 2005; Maclin & Malpass, 2003). This suggestion supports the theory, put forward by Levin, that other race effects are caused by selection of different facial features in same and other race faces, such that individuating information is selected in same race faces whereas race specifying information is emphasised in representations of other race faces at the expense of individuating information (Duchaine & Yovel, 2007; Levin, 2000). Given the evidence presented here, it seems that these claims may be unfounded or at least overemphasised. Our failure to find an effect is consistent with traditional accounts of the cross-race deficit which propose that the perceptual mechanisms used for face processing are tuned by the type of face regularly viewed. This tuning leads to more precise representation of the regularly viewed faces, which are usually same race faces.

Furthermore, Johnson and Fredrickson suspected that their lack of effect of positive emotions on recognition of own race faces was due to a ceiling effect of holistic processing and that any increase in holistic processing arising from positive emotion may not alter performance (Johnson & Fredrickson, 2005). In addition, it is suggested that, if Caucasian faces are already perceived as in-group members, no improvement in own-race face

recognition would be expected from using more social categorisations (Johnson & Fredrickson, 2005).

Our data contradicts these proposed explanations, as a substantial, though non-significant, difference between performance in the Caucasian CFMT for the comedy and horror conditions was observed here, with CFMT scores with Caucasian faces were more than six percent higher after the comedy clips compared to the horror clips.

5.4. Future directions

Considering the results presented here, there are some limitations of this study, which could be addressed in future studies.

It would be worth investigating other races, both in terms of the race of the faces in the facial recognition tasks and the race of participants. As Johnson and Fredrickson (2005) have claimed that elimination of the CR deficit by emotion induction exists for Black faces and the data shown here provides evidence against this for Chinese faces, it would be interesting to see whether the abolishment of the CR-effect could be found for faces of other race, and whether this only exists for certain race faces and not others. With regards to participants, it would be worth recruiting subjects of others races to assess their performance on Caucasian face recognition tasks and whether this could be eliminated by emotion induction.

Additionally, the positive emotion in both the previous and this study focuses on joy and humour, so the findings cannot be generalised for all

positive emotion (Johnson & Fredrickson, 2005). The question remains as to whether a positive emotion, such as contentment, would produce a similar effect on the CR deficit (Johnson & Fredrickson, 2005). It could be that certain positive emotions, for example laughter, produce a greater effect on the CR deficit than others, and this would be worth investigating. The negative emotions may be just as important to take into account when considering "outgroup" members. For instance, fear may be especially important whereas a negative emotion like disgust might not be.

Furthermore, the mechanism underlying the CR deficit is still debated. This mechanism needs to be elucidated in order to understand how the CR deficit can be abolished. It is all very well Johnson and Fredrickson claiming to be able to eliminate the CR deficit but their experiments do not address the mechanism (or mechanisms) by which this elimination occurs. In my opinion, more investigation is needed to confirm if this emotion induction effect of reducing the CR deficit is real or not. If it does exist, it would be interesting to assess how positive mood improves performance, whether, for example, it is by processing of parts, processing of spacing or both.

The practical implication of this research could include the development of methods to improve eyewitness testimony or the design of interventions to reduce racial bias in the workplace (Johnson and Fredrickson, 2005).

5.5. Conclusion

In conclusion, the results in this study contrast with those previously published (Johnson & Fredrickson, 2005), which showed that positive mood can erase the other race effect. Here, no significant effect of positive emotion was found on participants performance on a CR face task, although a non-significant difference of positive emotion was observed on performance in the same-race face task. This raises questions over the claims published by Johnson and Fredrickson (2005) on the role of positive emotions in elucidating the ORB and confirms that further investigation is needed into the mechanisms underlying the CR deficit.

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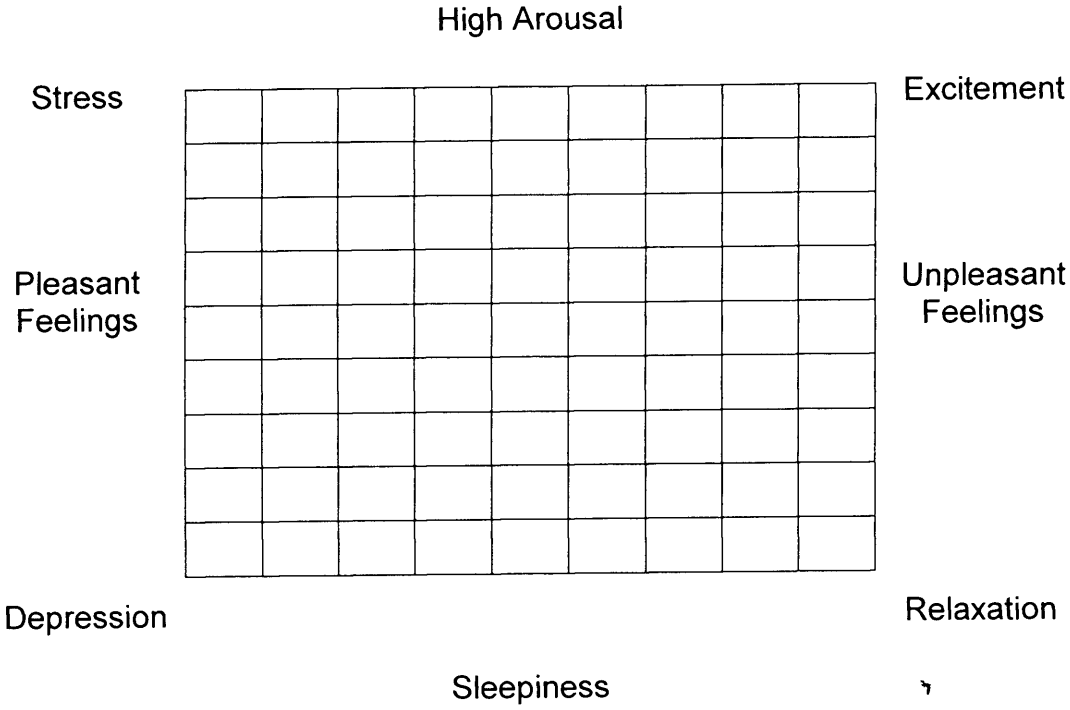
Appendix I – The Affect Grid

Please mark a response in the grid that most accurately represents how you were feeling during the video.



Appendix II – Retrospective Emotion Report

Please mark the response that most accurately represents the degree of each emotion experienced during the video.

1. Amusement	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
2. Anger	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
3. Anxiety	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
4. Fear	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
5. Happiness	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
6. Joy	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling
7. Sadness	1	2	3	4	5	6	7	8
	No emotion			Moderate feeling				Strongest feeling

Appendix III – Modern Racism Scale

Please mark the response that most accurately represents your views.

1. It is easy to understand the anger of Ethnic minorities.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

2. Ethnic minorities have more influence upon school desegregation plans than they ought to have.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

3. Ethnic minorities are getting too demanding in their push for equal rights.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

4. Over the past few years Ethnic minorities have received more economically than they deserve.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

5. Over the past few years the government and news media have shown more respect to Ethnic minorities than they deserve.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

6. People of Ethnic minorities should not push themselves where they're not wanted.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

7. Discrimination against Ethnic minorities is no longer a problem.

1	2	3	4	5
Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree

Appendix IV – White Racial Identity Attitude Scale

This questionnaire is designed to measure people's social and political attitudes. There are no right or wrong answers. Please mark the response that most accurately represents your views.

1. I hardly think about what race I am.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
2. I do not understand what Ethnic minorities want from Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
3. I get angry when I think about how Whites have been treated by ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
4. I feel as comfortable around Ethnic minorities as I do around Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
5. I involve myself in causes regardless of the race of the people involved in them.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
6. I find myself watching people of Ethnic minorities to see what they are like.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
7. I feel depressed after I have been around people of Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
8. There is nothing I want to learn from Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree

9. I seek out new experiences even if I know a large number of people from different ethnic minorities will be involved.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
10. I enjoy watching the different ways that people from Ethnic minorities and White people approach life.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
11. I wish I had a friend of different Ethnic origin.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
12. I don't feel that I have the social skills to interact with people of Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
13. A person of an Ethnic minority who tries to get close to you is usually after something.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
14. When a person of an Ethnic minority holds an opinion with which I disagree, I am not afraid to express my viewpoint.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
15. Sometimes jokes based on the experiences of Ethnic minorities are funny.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
16. I think it's exciting to discover the little ways in which people from Ethnic minorities and White people are different.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
17. I used to believe in racial integration but now I have my doubts.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree

18. I'd rather socialise with White people only.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
19. In many ways people from Ethnic minorities and White people are similar but they are also different in some important ways.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
20. Ethnic minorities and Whites have much to learn from each other.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
21. For most of my life, I did not think about racial issues.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
22. I have come to believe that people from Ethnic minorities and White people are very different.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
23. White people have bent over backwards trying to make up for their ancestors mistreatment of Ethnic minorities, now it is time to stop.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
24. It is possible for people from Ethnic minorities and White people to have meaningful social relationships with each other.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
25. There are some valuable things that White people can learn from Ethnic minorities that they cannot learn from other Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
26. I am curious to learn in what ways people from Ethnic minorities and White people differ from each other.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree

27. I limit myself to White people activities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
28. Society may have been unjust to Ethnic minorities, but it has also been unjust to Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
29. I am knowledgeable about which values Ethnic minorities and Whites share.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
30. I am comfortable wherever I am.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
31. In my family we never talked about racial issues.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
32. When I must interact with a person of an Ethnic minority I usually let him/her make the first move.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
33. I feel hostile when I am around people of Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
34. I think I understand values of people from Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree

35. People from Ethnic minorities and White people can have successful intimate relationships.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
36. I was raised to believe that people are people regardless of their race.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
37. Nowadays, I go out of my way to avoid associating with Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
38. I believe that Ethnic minorities are inferior to Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
39. I believe I know a lot about the customs of Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
40. There are some valuable things that White people can learn from Ethnic minorites that they cannot learn form other Whites.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
41. I think that it's okay for people from Ethnic minorities and White people to date each other as long as they don't marry each other.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
42. Sometimes I'm not sure what I think or feel about people from Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
43. When I am the only White in a group of people from different Ethnic minorities I feel anxious.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree

44. White people and people from Ethnic minorities differ from each other in some ways but no single race is superior.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
45. I am not embarrassed to admit that I am White.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
46. I think White people should become more involved in socialising with Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
47. I don't understand why people from Ethnic minorities blame all White people for their social misfortunes.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
48. I believe that White people look and express themselves better than people from Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
49. I feel comfortable talking to people from Ethnic minorities.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree
50. I value the relationships that I have with my friends who are from different Ethnic origin.	1 Strongly Disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly Agree