Master thesis

The underlying processes of Cross Race Facial recognition.

Social Motivation versus Perceptual Expertise.

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Abstract (ENG)

This research was conducted to examine which processes underlie the mistakes individuals make when it comes to Cross Racial Face Recognition. Individuals tend to have better recognition for same race faces than other race faces, an effect called the Cross Race Effect. The two processes that were examined in the current work were social motivation and perceptual expertise. Social motivation was manipulated by means of social exclusion. Perceptual expertise was manipulated by means of a question about what emotion the participants saw in the faces during the confrontation phase. It was also expected that individuals who are socially excluded have a higher need to belong in general, the results support this assumption. All other assumptions regarding the social motivation and facial recognition, hit rates and false alarm rates were not supported. For perceptual expertise, it was expected that individuals who focus on emotion in encoding a face are better at recognizing other race-faces afterwards than individual who do not focus on emotion. This effect did not appear, instead the opposite happened; individuals who focus on emotion were better at recognizing same race faces than individuals who do not focus on emotion. It was also expected that the focus on emotion should lead to higher hit rates and lower false alarm rates in the recognition phase. This combination of high hit rates and low false alarm rates result in a better recognition for faces. Results suggest that people who focus on emotion indeed have lower false alarm rates for other race faces, but not for same race faces. The hit rates did not differ between the groups. This research is a good starting point for future research about the processes that could explain the Cross Race Effect. The theoretical as well as practical implications from these results will be described in the discussion.

Abstract (NL)

Dit onderzoek is uitgevoerd om de processen te onderzoeken die ten grondslag liggen aan de fouten die mensen maken als het gaat om het herkennen van gezichten van een andere groep. Individuen hebben de neiging om gezichten van hun eigen groep beter te herkennen dan gezichten van een andere groep, ook wel het *Cross Race Effect* genoemd. De processen, sociale motivatie en perceptuele expertise, werden onderzocht. Sociale motivatie werd gemanipuleerd door middel van sociale uitsluiting. Perceptuele expertise werd gemanipuleerd door middel van een vraag over welke emotie de deelnemers zagen in de gezichten tijdens de confrontatie. Er werd verwacht dat individuen die sociaal werden uitgesloten een grotere *need to belong* hebben in het algemeen, de resultaten ondersteunen deze veronderstelling. Alle andere aannames met betrekking tot de sociale motivatie en gezichtsherkenning werden niet ondersteund. Voor perceptuele expertise werd verwacht dat individuen die zich moesten focussen op de emotie in een gezicht tijdens de confrontatie beter zijn in het herkennen van gezichten van een andere groep dan individuen die zich niet focusten op emotie. Dit effect bleek er niet te zijn, maar individuen die zich moesten focussen op emoties waren juist beter in het herkennen van gezichten van hun eigen groep dan individuen die niet op emotie moesten focussen. Er werd ook verwacht dat de focus op emotie zou leiden tot hogere *hit rates* en lagere *false alarm rates* bij de gezichtsherkenning. Deze combinatie van een hoge *hit* en lage *false alarm rates* betekent betere herkenning van gezichten. De resultaten laten zien dat mensen die zich richten op emotie lagere *false alarm rates* hadden als het ging om gezichten van een andere groep, dit gold niet voor gezichten van hun eigen groep. De *hit rates* verschilden niet tussen de groepen. Dit onderzoek is een uitgangspunt voor toekomstig onderzoek naar de onderliggende processen van het *Cross Race Effect*. De theoretische en praktische uitkomsten van deze resultaten zullen worden besproken in de discussie.

The underlying processes of Cross Race Facial recognition.

Identifying suspects, recalling an event, and face recognition seem to be difficult processes for individuals. As a result wrong suspect identifications are common incidents in the criminal justice system (Wells & Olson, 2001). Nevertheless, in the courtroom, eyewitness- and expert testimonies prove to be a strong influence on juries and in many countries the criminal justice system, most often, relies on these identifications (Hugenberg, Miller, & Claypool, 2007; MacLin, MacLin, & Malpass, 2001). Unfortunately, evidence shows that eyewitness identification frequently leads to convictions of innocent people (MacLin et al., 2001).

A study by Josephson and Holmes (2008) gives an example of what could go wrong in eyewitness identifications. In this study 40 participants in a racially diverse area of the United States watched a video of a property crime being committed. After 24 hours, they returned to the police station to pick the suspect out of a photo line-up. Unfortunately, a majority of participants misidentified the suspect or believed he was not in the line-up, but correct identifications were higher when the eyewitness and suspect were of the same race of the participants, than when they were from another race. Also, misidentifications were higher when the suspect was from another race than from the same race as witnesses themselves. (Josephson & Holmes, 2008).

It seems that all eyewitnesses, even experts with ample experience with identifying suspects, experience difficulties with recognizing individuals (Plant & Peruche, 2005). Importantly, it appears that it is even harder to recognize suspects from another race. Eyewitnesses are less likely to misidentify someone of their own race than they are to misidentify someone of another race (Wells & Olson, 2001). This effect of perceiving difficulties with identifying and recognizing other race faces is also known as the Cross Race Effect (CRE).

The CRE is a relevant phenomenon for the criminal justice system, police officers, jurors and judges because of the consequences for these parties, victims and suspects. For example the

consequences of misidentifying members of racial out-groups (Bringham & Malpass, 1985) and the problems described before. Misidentifications could lead to several problems for the perceiver (for example, feelings of quilt and embarrassment) and the victim (for example, feelings of being stereotyped). At last, as stated before, wrong convictions are probably the most problematic consequence of eyewitness misidentifications (Hugenberg et al., 2007).

The Cross Race Effect

The CRE is vested in the fact that individuals tend to perceive individuals of other races all "look alike" (Sporer, 2001b). Individuals of a particular race are different from each other in relation to our knowledge of other nationalities, as well as to proximity and contacts with that race or ethnic group as a whole. The Cross Race Effect is a worldwide phenomenon, for example, to the Europeans all Asians look the same, while to the Asians the white-skinned people all look the same (Sporer, 2001a). The CRE shows that individuals may have difficulty perceiving the uniqueness or individuality faces of an other-race (Kovalenko & Surudzhii, 2014).

Both social motivational processes and expertise processes have been proposed to explain the effect (Bernstein, Young, & Hugenberg, 2007). On one hand, social motivational processes include the motivation of people to pay more attention to in-group members and to encode in-group members relatively better than out-group members because in-group members afford an opportunity to fulfil belonging needs. On the other hand, expertise processes state that individuals are relatively inexpert at distinguishing between other race faces (Bernstein et al., 2007). Individuals can become experts at distinguishing features of same-race faces when they have more contact with members of their own race compared to members of other races (Malpass & Kravitz, 1969; Valentine & Endo, 1992). To understand and explain the CRE, it is important to understand the two processes that underlie the CRE (e.g., social motivational processes and expertise processes). Therefore, the aim of the present research will be to investigate whether the

Cross Race Effect is explained by mainly social motivational processes, expertise processes, or both.

Social motivation

The human need to interact with other humans and to be accepted by them is called social motivation (McClinktock, 1972). Social belonging needs fulfil many psychological needs and it helps individuals to cope with stressors (Correl & Park, 2005; Taylor et al., 2000). If this social belonging need is threatened (e.g., by means of social exclusion) individuals tend to perceive it as a punishment and this will lead to psychological stress (Williams, 2007). Individuals who have a high need to belong are better than others at identifying facial expressions and vocal tones (Pickett, Gardner, & Knowles, 2004).

In-group members fulfil social belonging needs better than out-group members and individuals have a higher need to belong to their in-group (Correl & Park, 2005). Perhaps individuals are therefore better at recognizing in-group faces than out-group faces.

The need to belong can be threatened by means of social exclusion (Williams, 2007). A consequence of social exclusion is that it increases an individual's motivation to forge social bonds with new sources of potential affiliation, this is called the social reconnection hypothesis (Maner, DeWall, Baumeister, & Schaller, 2007). Maner, et al. (2007) found support for this social reconnection hypothesis in their study. They found that the threat of social exclusion led participants to express greater interest in making new friends, to increase their desire to work with others, to form more positive impressions of novel social targets, and to assign greater rewards to new interaction patterns (Maner et al., 2007). These novel social targets could be from the in-group or out-group. They also found that once rejected, individuals are left with a strong desire to be accepted, which leads them toward interaction partners with whom they might affiliate. The experience of social exclusion serves as a signal that an individuals' need for social

connection, or need to belong, is not being satisfied. As a consequence of this social exclusion, the excluded individuals, for example the participants who are excluded from throwing the ball in the virtual Cyberball game, may feel an especially strong desire to form bonds with other people, so as to satisfy that need (Maner et al., 2007). Thus, individuals who are socially excluded want to reconnect with other people. As stated before, individuals from the in-group provide the most satisfaction, perhaps people want to reconnect more with in-group individuals and less with the out-group individuals. Therefore, recognition for the in-group faces could be better after social exclusion because these faces fulfil more belonging needs than out-group faces. To test these assumptions the following hypotheses will be tested:

H1a: Individuals who are socially excluded have a higher need to belong for all faces than individuals who are socially included.

H1b: Individuals with a high need to belong have better recognition for in-group faces than individuals with a low need to belong.

Hits versus False alarms

When it comes to facial recognition, people can make two type of errors. One can recognize an innocent individual as a suspect, so that individual is falsely accused. This is called a false alarm. On the other hand, an eyewitness does not recognize a suspect, so a guilty individual is recognized as innocent. This is called a miss. Both mistakes could lead to wrongful convictions. In this thesis, the hits (e.g. the suspect is correctly recognized) and false alarms are taken into account because the combination of these two lead to a score that can measure how good a person did on a facial recognition task. This score is called the d-score (*'d)* (Stanislaw & Torodov, 1999).

Besides the need to belong, another aspect of social motivation could be the motivation to perform good on a recognition task. Successful recognition of an individual can be flattering and

if recognition fails it can be embarrassing to both individuals. Maintaining contact and position in an individual's in-group or community requires one to recognize and accord individuality to a large number of persons (Malpass, 1981). If an individual does not recognize an important person of their in-group, it can do some damage to the relation between them. Recognition of in-group faces is, in this point of view, more useful than recognition of out-group faces, because individuals usually have a higher need to belong to their in-group than to the out-group (Williams, 2007). Therefore, it is more useful to accurately recognize in-group faces than out-group faces.

Accurate recognition of the in-group also contributes to a good relation between individuals (Malpass, 1981). Performing well on a recognition memory task should therefore be important to individuals. They should feel motivated to accurately recognize same-race individuals and less to other race faces. The expectation is that the more hits a participant makes on a memory task, the better they are at memory performance. When participants are socially included, their motivation to do good on the test is sufficiently high, therefore the expectation is that the hits, or correct yes responses, are also high. The false alarms, recognizing a face when it was not presented in the confrontation, could go up as a consequence of the social exclusion, because their need to belong is high and they want to reconnect with every face they see. To test these assumptions the following hypothesis will be tested:

H2a: Individuals who are socially excluded have a higher d for in-group faces than individuals who are socially included.

H2b. Individuals who have a higher need to belong have a higher hit rate for in-group faces on a memory performance task than individuals with a lower need to belong.

H2c: Individuals who have a higher need to belong have a higher false alarm rate for in-group faces on a memory performance task than individuals with a lower need to belong.

Perceptual Expertise and CRE

The perceptual expertise model states that people have different expertise in processing same-race versus other-race faces. This difference in expertise leads to different recognition accuracy. For example; less contact with other-race individuals (than with same-race individuals) leads to fewer opportunities to distinguish other-race faces from each other. A consequence of this process is that individuals are relatively inexpert at distinguishing between other-race faces (Bernstein et al., 2007; Malpass & Kravitz, 1969; Valentine & Endo, 1992). The study of Carroo (1986) supports the finding that more contact leads to better recognition. In this study, black American and black African men had to recognize previously seen white male faces. The black American participants had significantly more interaction and contact with whites in daily life than black African participants. The black American participants performed significantly better and made fewer false alarms than the black African participants on the recognition task. Thus, it seems that more contact with other races leads to better recognition and fewer false identifications (e.g. false alarms).

The causes of perceptual expertise vary, it could be due to a lack of contact, this may lead to a lack of expertise with the dimensions which other-race faces vary (McLin & Malpass, 2001) and low levels of expertise with other-race faces could evoke less holistic and more feature-based processing of other-race faces instead of more individuating processing (Rhodes, Brake, Taylor, & Tan, 1989). Thus, little contact with other-race faces could cause individuals to process these faces less as a whole and causes them to focus more on details of the face instead of focussing on the individuals' emotions or personality aspects. The latter enhances perceptual expertise because it causes deeper processing, better encoding and better recognition (Craik & Lockhart, 1972).

Deeper processing or focus on more specific features in a face (e.g., eyes, lips etc.) in a other-race face may serve to eliminate only remembering skin colour (Lavrakas, Buri, &

Mayzner, 1976). In addition, Johnston and Edmonds (2009) suggest that the features of the face individuals focus on when they look at a same-race/in-group face differ from the focus of looking at another-race/out-group face. When individuals look at an in-group face then internal features of the face (e.g., eyes, nose and mouth area) are more important for recognition than external features (e.g., face shape and hair). The opposite effect occurs when an individual looks at an out-group face (Johnston & Edmonds, 2009).

Various studies show that 'deep processing' instructions result in greater recognition when these are given during the study phase of a recognition experiment (Malpass, 1981). Craik and Lockhart (1972) developed this 'deep processing' approach. Specifically, instructions directing subjects to specific facial features, or to judgements of sex would be considered to produce shallow processing, while instructions orienting participants to emotional aspects (e.g., dishonesty etc.) of the face produce deeper processing (Craik & Lockhart, 1972). In short, if individuals make a short interpretation of the faces emotional aspects, for instance whether the face seems honest/dishonest or happy/unhappy to them, participants should remember these faces better at a recognition task. A short instruction to make the participants focus on these aspects should be enough to enhance the recognition of other-race faces (Malpass, Lavigueur, & Weldon, 1973). Therefore, a short instruction to make the individual focus on the emotion in a face could increase an individual's perceptual expertise with other race faces. Perhaps, a single question is enough to make the participant focus on the faces' emotional aspects. To test this assumption, the following hypothesis will be tested:

H1a: Individuals who focus on the face's emotions in the encoding phase are better at recognizing other-race faces afterwards than people who do not focus on these aspects.

H1b. Individuals who focus on the face´s emotions in the encoding phase have higher hit rates in the recognition phase than people who do not focus on these aspects.

H1c. Individuals who focus on the face´s emotions in the encoding phase have lower false alarm rates in the recognition phase than people who do not focus on these aspects.

In this study, we will investigate which processes, social motivation and/or perceptual expertise, underlie Cross Race Facial recognition. In the experiment, the hypothesis regarding social motivation were manipulated by means of social exclusion. Perceptual expertise was manipulated by means of a single question about where to focus on in a face (emotion versus non-emotion) during a confrontation with suspects. The next section will elaborate more on how these manipulations were done in this thesis.

Method

Participants

In total, 223 participants participated in this study. The minority of the participants, 28% were male (n = 63) and the other 72% were female (n = 160). The average age was 33.9 years and varied between the age of 18 and 65 (SD = 12,74). The majority of the participants were born in the Netherlands, 97,4% (n=221). The other participants were born in Croatia (n=1) or Sweden (n=1). Almost all participants, 97,3% (n=218) identified most with the Dutch nationality group. The other 2,7% (n=4) identified with another nationality, namely the German (n=1), Moroccan (n=1), Somalin (n=1) or Moluccan (n=1) nationality group.

Design

This research was based on a 2 (training versus no training) x 2 (social inclusion versus social exclusion) design. In this study, the participants were randomly assigned to one of the four conditions. The distribution over the conditions was not perfect. Almost all conditions were evenly distribution, ranging from 50 to 67 participants per condition. The participants participated on voluntary basis.

Procedure and measures

Participants were invited by means of an email and social media (Facebook, LinkedIn, WhatsApp). The email and social media content contained an anonymous link to the experiment which was conducted with Qualtrics. The participants were randomly assigned to one of the four conditions. The first page of the experiment was an informed consent regarding the nature of the task, the participants were unaware of the goal of the experiment. The participants could agree or disagree with the experiment. If the participants agreed with the terms of the experiment they started with questions about the demographics of the participant and a scale question about the self-efficacy regarding face recognition.

The self-efficacy was measured with four items (α=.85). An example of an item was: "I am good at recognizing faces" (see APPENDIX I for all the items).

After answering these questions the participants went to first phase of the experiment, which was a confrontation. In this phase the first independent variable, emotion vs non-emotion, was manipulated by means of a confrontation and, later on in the experiment, a line-up. In the confrontation, the participants were exposed to 14 suspects, seven Caucasian- and seven Moroccan suspects. The faces that were used in this line-up came from the Radboud Face Database (Langer et al., 2010). Half of the participants had to answer the question; 'What emotion do you see?' (fig. 1) and the other half had to answer the question; 'Where do you focus on?' (fig 2).

Figure 1. What emotion do you see?

Figure 2. Where do you focus on?

After the participants answered the question they could move on to the next suspect until they saw all 14 suspects. When the participants finished the confrontation the participants moved on to the next phase of the experiment; a virtual ball tossing game, or Cyberball game (Williams & Jarvis, 2006). In this phase the second independent variable, namely social inclusion vs. social exclusion was manipulated. The participants had to click on a link which led them to another page with instructions belonging to the game. Next, the participants played the virtual tossing game with two other virtual players. The duration for this game was equal for all participants, they tossed the ball 30 times, but half of the participants were excluded from the tossing after the first 15 tosses.

In the final phase, participants got to see a line-up with 28 faces, of which 14 faces the participants had seen before in the confrontation and 14 faces they had never seen before.

Participants were aware of the number of faces they were about the see but not that there were 14 faces they had seen before. Again, half of the faces where Caucasian and half was Moroccan. The faces were showed from a side viewpoint. To make the experiment not too easy, the faces were showed from a side angle so the participants had to take a good look before they could answer the question if they had seen the face before (see fig. 3). To interpret how good an individual is at face recognition, *d*' had to be calculated. The *d*' measures the distance between the scores of the stimuli (presented face) and no-stimuli (not presented face) means in standard deviation units. To calculate *d',* first the *hit rate* and the *false alarm rate* had to be calculated. The *hit rate* is found by dividing the number of hits by the total number of signal trials. The *false alarm rate* is found by dividing the number of false alarms by the total number of noise trials (Stanislaw & Torodov, 1999). In this thesis, the *hit rate* is the total hits of an individual divided by 14. The *false alarm rate* is the total false alarms of an individual also divided by 14. Next, is calculating *d'.* SPSS has a function to calculate *d'*. The same is done for in-group faces and out-group faces, but here, to calculate the hit rate and the false alarm rate, the total hits/false alarms were divided by 7.

In a pilot study (n = 5) faces that were shown in a front view resulted in a higher average d-score (*d'* = 1.36) than faces that were shown in a side angle (*d'* = 1,08). So, faces that were shown from a side angle were harder to recognize than faces from a front view. Therefore, side angle faces were used in the line-up phase from this experiment.

Figure 3. Line-up face

The experiment ended with questions about feelings of inclusion or exclusion during the Cyberball game. To test if the participants felt excluded after the manipulation a five-item scale was used. This scale has a Cronbach's α of .85. A high score on this scale means that the participants felt included (with a maximum score of 5) and a low score on this scale means that the participants felt excluded after playing the Cyberball game (with a minimum score of 1). An example of an item was: "I had the feeling that I was part of the group" (see APPENDIX II for all the items).

The questions were based on the study of Williams et al. (2002). They suggested that exclusion lowers feelings of belonging, positive mood and self-esteem. The last part of the experiment contained a single question about the difficulty regarding face recognition and questions about any distractions during the experiment (see APPENDIX III). After the participants answered all question they were thanked for their participation.

Manipulation of Social Motivation

The second phase of the experiment was the social motivation manipulation. As stated before, by means of a Cyberball game, social inclusion or social exclusion was used to manipulate social manipulation (Williams, Cheung, & Choi, 2000). Social exclusion can be created if participants are excluded from the ball-tossing game, social inclusion is created when participants participate in the ball-tossing game. Although this is not a real-life setting and it is played with fictitious others whom the participants did not know and whom they did not expect to meet, the participants in the research of Williams and Jarvis (2006) actually cared about the extent to which they were included. Individuals are sensitive to cues that indicate rejection, which is what happens in the Cyberball situation.

The participants in the present study played the ball-tossing game with two others whom they did not know and whom they would not expect to meet. In the social inclusion condition, participant threw the ball with two others. The participants threw the ball for 30 times. In the social exclusion condition, which also contained 30 tosses, at first participants were included within the tossing, but for the last 15 tosses the participants were excluded. The others did not throw the ball to the participant anymore. This will make the participants feel excluded, which could lead to more need to belong and reconnection with others after the ball-tossing game.

Manipulating Perceptual Expertise

Perceptual expertise was manipulated by means of a question about the face the participants got exposed to. Participants were assigned to one of two groups; an emotion group and a non-emotion group. The participants in the emotion group were exposed to a confrontation with 14 faces, of which 7 Caucasian faces and 7 Moroccan faces in random order. Langer, et al. (2010)

examined how these faces were interpreted by individuals. In this study the neutral faces were interpreted as truly neutral, and not angry or intimidating (Langer et al., 2010).

Participants in the emotion group had to answer a targeted, closed question when they got to see a single face, e.g., 'What emotion do you see? This question was asked when the face was in sight, after the participants answered the question they could move on to the next face. This question makes the participants focus on personal/emotional aspects (e.g. dishonesty etc.) of the face. The focus on personal/emotional aspects of the face produces deeper processing, better encoding and better recognition afterwards (Craik & Lockhart, 1972). The participants in the non-emotion group were also exposed to a confrontation with a total of 14 faces of which 7 Caucasian and 7 Moroccan faces in random order. But they had to answer the question; 'Where do you focus on?'. This question was asked to make sure participants in all groups looked at the faces for the same amount of time.

To measure perceptual expertise a memory performance task was used. This task includes two phases; a confrontation phase, which is described above, and the line-up, which was the third face. A memory performance task is a way to measure the CRE. Kovalenko & Surudzhii (2014) conducted a study to examine the CRE. The participants in this study had to recognize the faces they had been shown earlier. The faces that had been shown were faces who represented the own group representatives and the representatives of other ethnic groups. After a certain amount of time some faces were shown again, but also faces that had not been demonstrated earlier. Participants had to answer each time if they had seen the face earlier, yes or no (Kovalenko & Surudzhii, 2014).

In confrontation phase of this study the participants had to process the faces and answer the questions. In the last phase of the experiment, participants got to see a line-up with 28 faces, of which 14 faces the participants had seen before in the confrontation and 14 faces they have

never seen before. The participants had to answer one question with every face; 'Have you seen this face before?' Yes or no.

Measures

Measuring a yes/or no task involves signal trials, which present one or more signals, or faces in this thesis (Stanislaw & Torodov, 1999). According to the Signal Detection Theory (SDT), participants in yes/no tasks base their response on how high they value the decision variable of the task. If this decision variable is sufficiently high during a task, the participant responds yes (a signal was presented). If the decision variable is sufficiently low during a given task, the participant responds no (no signal was presented) (Stanislaw & Torodov, 1999). Translated to this study, if a participant memorizes a face during the confrontation phase and the participant recognizes that face during the line-up, then the decision variable of that face was sufficiently high to respond with a 'yes' (e.g. I have seen this face before). If a face cannot be recognized by the participant during the line-up then the decision variable was sufficiently low, and the participant responses with a 'no' (e.g. I have not seen this face before). The value that defines sufficiency high is called the criterion (Stanislaw & Torodov, 1999). In this thesis, the criterion is based on feelings of recognition associated with each stimulus idem (a same-race or other-race face). What describes the performance on yes/no tasks is the correct yes response, a *hit*, and incorrect yes responses, a *false alarm* (Stanislaw & Torodov, 1999). As stated before, with these two responses *d'* can be calculated which measures how good an individual is at face recognition.

To interpret *d'* the minimum and the maximum had to be checked. In this study the minimum *d'*, which indicates the worst score, for all faces is -11.61 and the maximum score, which indicates a perfect *d'*, is 10.81. For in-group faces the minimum is -11.61 and maximum is 11.61 and for out-group faces the minimum is -11.22 and the maximum is 11.22. These scores are specific for this study.

Results

Need to belong

A Univariate Measures Analysis of Variance was conducted to compare the effect of the focus on emotion versus non-emotion and inclusion versus exclusion on the need to belong. Hypothesis 2a proposed that individuals who are socially excluded have a higher need to belong than individuals who are not socially excluded. The results of the ANOVA indicated a significant main effect between inclusion versus exclusion and the need to belong, $F(1,219) = 116.33$, $p < .001$. As expected, the exclusion group score higher on the need to belong ($M = 2.43$, $SD = 0.77$) than people who were included ($M = 3.43$, $SD = 0.55$). The main effect of the focus on emotion versus non-emotion on the need to belong was not significant, $F(1,219) = 0.73$, $p = .395$. The interaction effect of the focus on emotion versus non-emotion manipulation versus inclusion manipulation was also significant, $F(1,219) = 5.79$, $p = .017$. The emotion group who were excluded scored higher on the need to belong ($M = 2.3$, $SD = 0.08$) than the emotion group who were included ($M = 3.5$, $SD = 0.09$). The non-emotion group who were excluded scored also higher on the need to belong ($M = 2.6$, $SD = 0.10$) than the non-emotion group who were included ($M = 3.4$, $SD = 0.09$). Overall, the exclusion groups scored higher on the need to belong than the included groups, the focus on emotion versus non-emotion made no difference in the need to belong. Thus, as expected, individuals who were socially excluded have a higher need to belong than individuals who were socially included. Therefore, support was found for hypothesis 1a.

A Pearson product-moment correlation coefficient was computed to assess the relationship between the need to belong and the in-group *d'*. Hypothesis 1b assumes that individuals with a high need to belong have a higher *d'* for in-group faces than individuals with a low need to belong. The results (see Table 1) however show no significant correlation between

the need to belong and the in-group *d'* $r(219) = 0.03$, $p = .666$. Thus, there is no support for Hypothesis 2b that individuals with a high need to belong also have a higher d' for in-group faces.

Table 1 Pearson's correlation coefficients with the variables (n=219).

	Need to belong	In-group *d'*	Out-group *d'*	In-group Hit rate	Out-group Hit rate	In-group False alarms	Out-group False alarms
Need to belong	-						
In-group *d'*	.029	-					
Out-group *d'*	-.060	-.189**	-				
In-group Hit rate	-.004	.536**	-.180**	-			
Out-group Hit rate	-.063	.173**	.482**	.309**	-		
In-group False alarms	-.011	-.612**	.194**	.052	.080	-	
Out-group False alarms	-.063	.194**	-.480**	.466**	.351**	.164*	-

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

Overall Score on Face Recognition

A repeated measures Analysis of Variance (R-ANOVA) was conducted to compare the effect of the focus on emotion versus non-emotion and inclusion versus exclusion on the overall score on face recognition (*d'*) of in-group and out-group faces. Hypothesis 2a assumes that individuals who are socially excluded have a higher *d´* for in-group faces than individuals who are socially included. Hypothesis 3a proposed that individuals who focus on the face's personality aspects and emotions in the encoding phase (emotion condition) are better at recognizing other-race faces afterwards, than people who do not focus on these aspects (non-emotion condition).

The results of the ANOVA indicated no significant main effect between the in-group d' and out-group d', $F(1.219) = 0.19$, $p = .665$. The between subject effect of emotion on face recognition was significant, $F(1,219) = 4.553$, $p = .034$. This main effect was qualified by a significant interaction with group (in-group vs out-group faces), $F(1,219) = 3.922$, $p = .049$. For In-group faces, face recognition was higher when individuals focused on emotion ($M = 0.99$, $SD = 0.48$, $p = .040$) than when individual did not focus on emotion. For out-group faces no significant difference was found ($p = .184$). Moreover, the between subject effect of inclusion versus exclusion on face recognition was not significant, $F(1,219) = 0.410$, $p = .523$. The interaction effect of emotion manipulation versus inclusion manipulation was not significant, $F(1,219) = 1.907$, $p = .169$.

Thus, there is no support for hypothesis 2a, individuals who were socially excluded were not better at recognizing in-group faces. there is some evidence that people who focus on emotion in the encoding phase are better in recognizing faces than people who do not focus on emotion, but this only account for faces from the same race and not, as expected, for out-group faces. Therefore, hypothesis 3a is not supported.

Hit rates

A repeated measures Analysis of Variance (R-ANOVA) was conducted to compare the effect of the focus on emotion versus non-emotion and inclusion versus exclusion on the hit rates. Hypothesis 2b assumes that individuals who are socially excluded have a higher hit rates for In-group faces than individuals who are socially included. Hypothesis 3b proposed that individuals who focus on the face's personality aspects and emotions in the encoding phase (emotion condition) haver higher hit rates for out group faces, than people who do not focus on these aspects (non-emotion condition).

The results of the ANOVA indicated a significant main effect between the in-group hit rates and out-group hit rates, $F(1.219) = 26.83$, $p < .001$. The in-group hit rates are lower ($M = 0.20$, $SD = 0.17$) than the out-group hit rates ($M = 0.27$, $SD = 0.18$). The between subject effect of emotion on the hit rates was not significant, $F(1,219) = 2.22$, $p = .137$. Moreover, the between subject effect of inclusion versus exclusion on the hit rates was also not significant, $F(1,219) = 0.07$, $p = .799$. The interaction effect of emotion manipulation versus inclusion manipulation was not significant, $F(1.219) = 0.31$, $p = .579$. Thus, there is no support found for hypothesis 2b that individuals who are socially excluded have significant a higher hit rates for in-group faces than individuals who are socially included. Also, individuals who focus on the face's personality aspects and emotions in the encoding phase (emotion condition) have higher hit rate for out-group faces, than people who do not focus on these aspects (non-emotion condition). Therefore, hypothesis 3b is also not conformed.

False alarms

A repeated measures Analysis of Variance (R-ANOVA) was conducted to compare the effect of the focus on emotion versus non-emotion and inclusion versus exclusion on the false alarm rates. Hypothesis 2c proposed that individuals who are socially excluded have a higher false alarm rates for in-group faces than individuals who are socially included. Hypothesis 3c assumes that individuals who focus on the face's personality aspects and emotions in the encoding phase (emotion condition) haver lower false alarm rates for out group faces, than people who do not focus on these aspects (non-emotion condition).

The results of the ANOVA indicated a significant main effect between the in-group false alarm rates and out-group false alarm rates, $F(1,219) = 66.68$, $p < .001$. The in-group false alarm rates are higher ($M = 0.12$, $SD = 0.15$) than the out-group false alarm rates ($M = 0.04$, $SD = 0.03$). These descriptive statistics explain why the two main effects of in-group/out-group hit rates and

in-group/out-group false alarm rates are both significant, but the main effect of in-group and out-group d' is not. The effects of the hit rate and false alarm rate go in different directions. The in-group hit rate is lower than the out-group hit rate, but the in group false alarm rate is higher than the out group false alarm rate. This results in no significance on the d'.

The between subject effect of emotion on the false alarm rates was marginally significant, $F(1,219) = 3.32$, $p = .070$. This main effect was qualified by the significant interaction effect with in-group false alarm rates versus out-group false alarm rates, $F(1,219) = 4.40$, $p = .037$. The in-group false alarm rates were significantly lower when individuals focused on emotion ($M = 0.10$, $SD = 0.01$) than when individual did not focus on emotion ($M = 0.14$, $SD = 0.01$, $p = .048$). For the out-group false alarm rates no significant difference was found ($p = .304$). Moreover, the between subject effect of inclusion versus exclusion on the false alarm rates was not significant, $F(1,219) = 0.37$, $p = .546$. The interaction effect of emotion manipulation versus inclusion manipulation was not significant, $F(1.219) = 2.61$, $p = .108$.

Overall, exclusion had no effect on the false alarm rates for in-group faces, therefore no support was found for hypothesis 2c that individuals who are socially excluded have a higher false alarm rates for in-group faces than individuals who are socially included. Hypothesis 3c stated that individuals who focus on emotion in the encoding phase have lower false alarms for out group faces, than individuals who do not focus on these emotions. This hypothesis is also not confirmed.

Summary of results

From the analyses, it could be stated that there is support for hypothesis 1a that individuals who are socially excluded have a higher need to belong, than individuals who are socially included. There was no support found for hypothesis 1b that individuals with a high need to belong also have a higher *d'* for in-group faces.

Hypothesis 2a assumed that individuals who are socially excluded are better at recognizing in-group faces. The results do not support this assumption, therefore hypothesis 2a cannot be confirmed. Furthermore, individuals who have a higher need to belong do not have a higher hit rate for in-group faces on a memory performance task than individuals with a lower need to belong. Therefore, hypothesis 2b can also not be confirmed. Same accounts for hypothesis 2c, individuals who have a higher need to belong do not have a higher false alarm rate for in-group faces on a memory performance task than individuals with a lower need to belong.

For hypothesis 3a, there is some evidence that people who focus on emotion in the encoding phase are better in recognizing faces than people who do not focus on emotion, but this only accounts for in-group faces (same race faces) and not, as expected, for out-group faces (other race faces). The hypothesis regarding the hit rates, 3b, is also not confirmed. Individuals who focus on emotion do not have a higher hit rate in the recognition phase, than people who do not focus on emotion. Hypothesis 3c regarding the false alarm rates of people is partly confirmed. Analysis show that people who focus on emotion have lower false alarm rates in the recognition phase than people who do not focus on emotion, but this only accounts for out-group faces (other race) and not for in-group faces (same race).

Discussion

The Cross Race Effect is a phenomenon referring to the tendency to be better in recognizing same-race (or in-group) faces than cross race faces (or out-group faces). The study of Bernstein, et al. (2007) proposed two processes that could explain the CRE namely; social motivation and perceptual expertise. Their study suggests that more research is needed to show how these two processes act together to elicit biases in face recognition. The recent thesis examined whether the Cross Race Effect can be manipulated by enhancing social motivational processes (for example when people are included or excluded from a group) or expertise processes (for example by

means of a question about which emotion participant see in a presented face). Social motivational processes include the motivation of people to pay more attention to in-group members than out-group members and expertise processes state that individuals are relatively inexpert at distinguishing between other race faces.

Social motivational processes

It was expected, for the social motivational processes, that people who were excluded from playing the Cyberball game would have a higher need to belong in general, than individuals who were not included during the Cyberball game. This was also the case in this thesis. There was no difference in the hit rate and the false alarm rate between the individuals who were included and excluded. There was also an interaction effect found between the focus on emotion versus non-emotion, inclusion versus exclusion and the need to belong, this meant that excluded participants have a higher need to belong than the included participants, whether they focused on emotion or not, made no difference in the need to belong.

The social context of this thesis was an eyewitness confrontation. The faces were presented as suspects who the participants had to remember. The social context affects the in-group and out-group categorizations. Moreover, the social-cognitive model predicts that when same race (in-group faces) are placed in a contexts that provoke out-group categorization, recognition of that face should be weakened (Shriver, Young, Hugenberg, Bernstein, & Lanter, 2008). Also, the study of Ackerman, et al. (2006) shows that recognition of faces is sometimes better when faces seem angry or intimidating to the perceiver. In this study, white participants had to look at black and white faces who showed either neutral or angry expressions and later the participants attempted to identify previously seen faces. The results show that recognition for angry black faces was greater than for angry white faces (Ackerman et al., 2006). It seems that angry faces are thus a social cue to pay more attention to out-group faces. In the current thesis the

faces were neutral (Langer et al., 2010), but maybe the social context had the same effect as angry faces. In short, perhaps the social context of an eyewitness line-up could evoke the same effect (e.g. paying more attention to out-group faces and therefore no better recognition for in-group faces than out-group faces) as the angry faces in the study of Ackerman, et al (2006). This could explain the finding that in this thesis no CRE was found. In the future, the social context could also be taken into account to investigate whether this has an influence on the CRE.

Another explanation could be that the participants did not perceive the presented faces in the line-up as potential sources of positive social contact because the presented faces were photos and not real life sources. This could decrease the likelihood of social reconnection (Maner et al., 2007). The assumptions about social motivation in the current thesis were based on the social reconnection hypothesis, which suggests that the threat of social exclusion lead individuals to express greater interest in making new social connections. This means that exclusion can lead individuals to turn toward others as sources of renewed social connection. In short, social exclusion leads to a higher need to belong. Individuals want to reconnect with others after being rejected, but not necessary with the people who rejected them (Maner et al., 2007). This effect is most likely to happen when an individual expects actual interaction with that other person (Twenge, Baumeister, Tice, & Stucke, 2001).

A possible explanation is that the faces from the line-up were not perceived as a realistic source of social connection to the participants, and therefore the social reconnection effect did not happen.

Expertise processes

For the other process, the expertise processes, it was expected that people who focus on the face's personality aspects and emotions during the confrontation are better at recognizing out-group faces afterwards than people who do not focus on these aspects. Out-group faces were not better recognized when people who focus on emotion versus non-emotion. Instead, in-group faces were better recognized when people focused on emotion versus non-emotion. The results suggest that individuals who focus on emotion do not have a higher hit rate in the recognition phase, than people who do not focus on emotion. Moreover, people who focus on emotion have lower false alarm rates in the recognition phase than people do not focus on emotion, but this only accounts for out-group faces (other race) and not for in-group faces (same race).

In this study, to make an individual focus on a face' personality aspects and emotions a single question was asked; "What emotion do you see?". A study of Malpass, et al. (1973) showed that a short training with instructions about how to process a face (by focusing on personal and emotional aspects) should be enough to enhance recognition of other-race faces. The training in this study differed from the current thesis. The study of Malpass, et al (1973) included a one hour visual training with feedback. The participants had to remember faces and had to choose the right face out of four faces. They received immediate feedback after they made their choice. The control group in this study received no feedback about how they were doing. Perhaps the manipulation in the current thesis, which included a single question, was not enough training for the participants to enhance deeper processing. On the other hand, Hugenberg et al. (2007) recently found that instructing white perceivers to pay attention to the individuating characteristics (e.g. the specifics characteristics of a face) in black faces and warning them for the CRE was sufficient to improve the recognition of other race faces to the point that it was equal to recognition for SR faces. Thus, instructing participants to individuate other race faces appears

sufficient to eliminate the CRE (Hugenberg et al., 2007). Following this evidence, it seems that instructing participants to focus on specific characteristics of a face (e.g. emotion) should be enough to lessen the CRE, but in the current thesis this was not the case. This might be due to the fact that in the current thesis only a single question was asked. Participants had no prior knowledge of the CRE. Perhaps a warning about the CRE beforehand diminishes the CRE and not the focus on emotion. Further research could focus on prior knowledge of the CRE and investigate if this is the factor that influences the CRE.

This thesis was a laboratory study, therefore participants could be forced to pay equal amount of attention to the faces, regardless of the race. This is one of the characteristics of laboratory studies. In real cases, eyewitnesses might pay less attention to faces of another race than to faces of one's own race. This could lead to a stronger CRE in real cases and a less stronger effect in laboratory studies (Wells & Olson, 2001). Perhaps, this is what happened in the current thesis. Participants could take the time they need to process the other race face, and thereby reduce the CRE. To investigate this finding further research could take response time also in account when examining the CRE.

Strengths, limitations and implications

A strong aspect of this research is the fact that this research combines two processes in order to explain the Cross Race Effect; social motivational processes and perceptual expertise. This combination provides new insights about the underlying mechanisms of the Cross Race Effect. With these two processes combined, it is possible to determine which one has the most influence on the occurrence of the Cross Race Effect. This can contribute to the improvement of Cross Race Facial Recognition and eyewitness identifications.

There are also limitations and questions about this study. The participants were invited by means of an email or social media. Participants could choose when and where the experiment

was conducted. The experimenter had no control over variables as setting and distractions. This resulted in the given that participants reported distraction during the experiment (e.g. from the television or background noise). This could have led to paying less attention to the faces and therefore less encoding and remembering. A possibility to improve the manipulations is to set up the research in a laboratory for example. In this case, it is possible to put all the participants in the same context so that environmental factors will not affect their answers.

The results suggest that there is no significant difference between the people who focus on emotion versus those who focus on non-emotion, but several studies indicate that a small training should be enough to shift the participants focus on emotion. The manipulation of focusing on emotion was perhaps insufficient. Therefore, the perceptual expertise manipulations need to be improved for further research. A possible improvement could be that participants receive more knowledge about how to process a face accurately, instead of one single question.

The Cyberball game took place after the encoding phase. Most studies who investigated the role of social motivation on face recognition manipulated the participants' motivation before encoding and these studies found that social motivation indeed enhances recognition (Van Bavel, Swencionis, O' Connor, & Cunningham, 2012). An explanation for this enhanced recognition could lie in social categorization. According to this perspective, when people see a face, they immediately categorize this faces as an in-group or out-group member. This categorization influences the depth and type of processing of the faces. If the face is categorized as an in-group member, individuals are more socially motivated to encode this face because this face belongs to the same social category, which means deeper and better processing of that face (Van Bavel et al., 2012). The current thesis manipulated exclusion after encoding took place. Perhaps, if the Cyberball game took place before the encoding, as in the study of Van Bavel, et al., (2012) or if the in-group/ out-group categorization was made more salient, participants were more motivated

to remember the faces, which could have led to better facial recognition. Follow-up studies could take this into account and make the study a 2x2x2 design, which half of them have the Cyberball game before the encoding and half after the encoding phase or could make the in-group/out-group categorization more salient.

The following implications are useful for the practices of Cross Race Facial recognition and the field of eyewitness performances. Research that combines perceptual expertise and social motivation to explain the Cross Race Effect is scarce at the moment. The results of this thesis are innovative and showed that, in this thesis, mostly perceptual expertise is the underlying mechanism of the Cross Race Effect. Social motivation had no role in this thesis and there was also no interaction between perceptual expertise and social motivation. These findings are an addition to existing knowledge in the field of the Cross Race Effect. This could be relevant for practical implications and is hopefully a starting point for further research about the underlying mechanisms of the Cross Race Effect.

This thesis showed that perceptual expertise processes seem to play a role in whether the Cross Race Effect occurs, this can influence the accuracy of eyewitnesses and police officers remembering a suspect during a crime. Therefore, it is relevant to explore how eyewitnesses and police officers could be trained best to focus on the personal or emotional aspects of a suspect.

Although the Cross Race Effect found in this thesis was not as strong as expected, several studies suggest that it is a common phenomenon in Cross Race Facial recognition. It seems that enhancing individuals' perceptual expertise with other race faces diminishes the effect and this knowledge could be used in the field of face recognition.

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APPENDIXES

APPENDIX I SCALE SUFFICIENCY RECOGNIZING FACES

Hoe schat u uw prestaties in met betrekking tot het herkennen van gezichten?

	Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens
Het komt vaak voor dat ik iemand herken.	○	○	○	○	○
Als ik iemand een keer heb gezien dan vergeet ik dat gezicht niet snel.	○	○	○	○	○
Ik ben goed in het herkennen van gezichten	○	○	○	○	○
Ik vergeet gezichten snel.	○	○	○	○	○

APPENDIX II SCALE EXLCUSION MANIPULATION

Er volgen een aantal stellingen over het balspel wat u heeft gespeeld. U gooide een bal over met twee andere medespelers die familie of vrienden van u waren.

Hoe voelde u zich na het spelen van het balspel?

	Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens
Ik voelde mij onderdeel van de groep.	○	○	○	○	○
Ik voelde mij buitengesloten.	○	○	○	○	○
Ik had het gevoel dat ik controle had over wat er in de groep gebeurde.	○	○	○	○	○
Ik voelde mij belangrijk in de groep.	○	○	○	○	○
Ik voelde mij onzeker in de groep.	○	○	○	○	○

APPENDIX III SCALE MANIPULATION CHECKS

In de eerste ronde van dit onderzoek werd u geconfronteerd met 14 verdachten waarbij u een vraag moest beantwoorden. Er volgen nu een aantal stellingen over deze ronde.

	Zeer mee oneens	Oneens	Neutraal	Mee eens	Zeer mee eens
Ik heb uitgebreid naar de gezichten gekeken tijdens de confrontatie.	○	○	○	○	○
Ik heb mij tijdens de confrontatie goed kunnen concentreren op de gezichten.	○	○	○	○	○