APPLIED COGNITIVE PSYCHOLOGY
Appl. Cognit. Psychol. (2008)
Published online in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/acp.1465

Anxiety and Terrorism: Automatic Stereotypes Affect Visual Attention and Recognition Memory for White and Middle Eastern Faces

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SUMMARY

Automatic stereotypes and emotional state can affect cognitive processes such as attention, perception, and memory. Two experiments were carried out to investigate whether anxiety and stereotypes of Middle Easterners influence attention and recognition memory in White participants. A dot-probe procedure was used, with White and Middle Eastern faces as stimuli. The results showed that anxious participants who were exposed to terrorism-related words showed a visual bias toward Middle Eastern faces, and were more accurate at recognizing both White and Middle Eastern faces. Non-anxious participants, after exposure to the same primes, showed an attentional bias toward the White faces. Overall, participants were more accurate at recognizing the White faces than the Middle Eastern faces. Copyright © 2008 John Wiley & Sons, Ltd.

Stereotypes are cognitive structures through which characteristics are attributed to all members of a group. Devine (1989) proposed that stereotypes are automatic, and therefore outside of conscious control. Although there is some debate at present as to whether stereotypes are truly automatic (Blair, 2002; Dasgupta & Greenwald, 2001; Lowery, Hardin, & Sinclair, 2001), there is a wealth of evidence that stereotypes can be activated outside of awareness (Blair, Judd, & Fallman, 2004; Correll, Park, Judd, & Wittenbrink, 2002; Lambert et al., 2003).

Stereotypes can influence other cognitive processes. For example, Correll et al. (2002) found that participants were more likely to misidentify an object as a weapon when held by a Black target than when held by a White target, and Hugenberg and Bodenhausen (2004) found that participants were faster to categorise an ambiguous face as Black if it had a hostile facial expression.

Stereotypes can also guide visual attention. Eberhardt, Goff, Purdie, and Davies (2004) activated both positive and negative stereotypes of Blacks using images and words in priming procedures. Visual attention was then measured using the dot-probe task, in which a White face appeared on one side of the screen and a Black face appeared on the other side of the screen. The faces remained on screen for a short time, after which a faint dot appeared in one of their two locations. The participant had to respond as quickly as possible

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to the dot. Reaction times are faster if the dot appears on the same side of the screen that the participant is already attending to. Using this procedure, Eberhardt et al. (2004) found that participants primed with words or images consistent with Black stereotypes showed an attentional bias towards Black faces in the dot-probe task.

The dot-probe task was originally developed by MacLeod, Mathews, and Tata (1986) for investigating attentional bias in clinically anxious participants. Anxiety has been shown to be important in guiding visual attention. For example, MacLeod et al. (1986) found that anxious participants directed their attention toward threatening words, while non-anxious participants averted their attention away from them. Bradley, Mogg, Falla and Hamilton (1998) and Mogg and Bradley (1999) found that anxious participants directed their attention towards angry faces, while non-anxious participants directed their attention toward happy or neutral faces.

There is also evidence that anxiety may increase the likelihood of stereotype activation. Schaller, Park, and Mueller (2003) found that anxiety induced by the dark increased the likelihood that Black males would be perceived as dangerous. Maner et al. (2005) showed participants a film clip intended to induce fear and found that they were more likely to perceive the facial expressions of Black and Arab individuals as hostile than participants who viewed a neutral film clip.

The experiments presented in this paper used a dot-probe task to investigate patterns of visual attention to White and Middle Eastern faces after priming with stereotype-consistent primes. Since the attacks over the last several years in countries such as the USA, the United Kingdom, Indonesia, and Spain, Middle Easterners have become stereotyped as extremists. Racial prejudice can be a subtle force, quite distinct from older forms of racism, in which people are openly aggressive or hostile towards members of other racial groups. ''Modern racism'' describes the feelings held by an individual about another racial group which may be entirely unconscious or unrecognised by the individual (Brigham, 2005). It is this type of implicit prejudice that the priming procedure aimed to invoke, by providing participants with a series of terrorism-related words.

The procedures of the experiments presented in this paper are very similar to those successfully used by Eberhardt et al. (2004) to examine Black stereotypes. However, as anxiety has been shown to influence both stereotype activation (Maner et al., 2005; Schaller et al., 2003) and visual attention (MacLeod et al., 1986; Mogg & Bradley, 1999), measures of state and trait anxiety were included. State anxiety refers to a person's anxiety level at any given moment in time, whereas trait anxiety is a measure of a person's more stable and general anxiety level (Spielberger, Gorusch, Lushene, Vagg, & Jacobs, 1983). It is predicted that participants who have been primed with terrorism-related words will orient attention toward the Middle Eastern faces in the dot-probe task, and that this effect may be depend on how anxious the participant is.

Experiment 2 expands on Experiment 1 by also examining recognition memory for the White and Middle Eastern faces. A consistent finding in the face recognition literature over the last 40 years is that people are better able to recognise faces of their own race than faces of other races (Horry & Wright, 2008; Malpass & Kravitz, 1969; Wright, Boyd, & Tredoux, 2003). This association is usually called the own-race bias (ORB), but it is sometimes referred to as the cross-race effect. The bias is characterised by higher accuracy for own-race faces than other-races, as well as a shift in response criterion (Sporer, 2001). Participants tend to respond to other-race faces less conservatively than own-race faces, which increases false alarm rates for other-race faces.

DOI: 10.1002/acp

The majority of studies on the ORB have examined memory for White compared to Black faces, although a few have examined memory for White compared to East Asian faces and MacLin, MacLin and Malpass (2001) examined recognition of Black and Hispanic faces. For reviews, see Meissner and Brigham (2001) and Sporer (2001). One ethnic group which has been largely overlooked in the cross-race recognition literature is Middle Easterners, although two studies conducted in Israel examined Jewish and Arab participants' recognition of Jewish and Arab faces (Rattner, Weimann, & Fishman, 1990; Weimann, Fishman, & Rattner, 1988), and Sporer (1999, reported in Sporer, 2001) examined White Germans' and Turkish participants' memories for White and Turkish faces, and found a weak ORB with the White participants. Overall, the own-race bias has been shown to be very robust, and Experiment 2 aims to provide more evidence for the generalisability of the effect.

There are some arguments that the ORB may be influenced, directly or indirectly, by stereotyping. Sporer's (2001) in-group/out-group model (IOM) proposes that when a face of another race is encountered, the perceiver automatically categorises the face as an out-group exemplar. This categorisation process can then lead to qualitatively different processing strategies for own- and other-race faces. For example, the processing may be shallower for other-race faces than for own-race faces, as they are ''cognitively disregarded'' (Rodin, 1987). It is possible that by activating negative stereotypes of Middle Eastern people, participants will be more likely to cognitively disregard faces categorised as out-group members. On the other hand, participants may be motivated to be more vigilant in the processing of the Middle Eastern faces after viewing terrorism-related primes (Brigham, 2005), which may improve recognition.

In sum, this paper presents two experiments which use a dot-probe procedure to examine patterns of visual attention after priming with terrorism-related words. It is predicted that anxious participants may selectively attend to Middle Eastern faces after priming, while non-anxious participants may avert their attention from the Middle Eastern faces. Experiment 2 also investigates recognition memory for the faces. It is predicted that participants will be more accurate with the White faces than with the Middle Eastern faces, showing the typical ORB. However, recognition accuracy may also be influenced by the stereotype activation produced by the priming procedure.

EXPERIMENT 1

Method

Participants and design

One hundred and twenty five participants (mean age = 21.80 years, range = 18–42; 78% female) took part for course credit or for £3. The participants were recruited through the subject pool, and consisted mainly of undergraduate students, although some postgraduates and staff also took part. Ninety-nine participants (79%) identified themselves as White; only the data from the White participants were included in the analysis.

A 2×2 mixed design was used. Participants were randomly allocated to one of two between subjects conditions with the constraint that the groups should be of approximately equal size (control $n = 50$, primed $n = 47$): the terrorism primed condition and the no-prime condition. The location of the dot in the dot-probe task varied within subjects.

DOI: 10.1002/acp

State anxiety and trait anxiety were measured. The dependent variable was the reaction time (milliseconds) to respond to the location of the dot.

Materials

A subliminal priming procedure was used with terrorism-related primes. This procedure has been successfully used by Eberhardt et al. (2004, studies 3 and 4) to activate a racial stereotype. The words used in the priming task were obtained from a pilot study with 14 participants. They were asked to independently write down as many words as they could think of related to the idea of ''terrorism.'' Participants were asked not to write any words which were related directly to race, such as ''IRA'' or ''Muslim''. The 10 most commonly cited words were then selected for use in the priming task. These words were: *terrorist, bomb, fear, hate, death, extremism, panic, attack, threat,* and *murder.*

A second pilot study revealed that participants' stereotypes of Middle Eastern men include facial hair. An internet image search was used to obtain images of 26 bearded White men and 26 bearded Middle Eastern men. These faces were rated by an independent sample for typicality of their race ($n = 14$) in a third pilot study. The participants rated the faces on a five-point scale according to whether they perceived them to be very typical (5) to not at all typical (1) of their race (either White or Middle Eastern). Two different face pairs were presented in the dot-probe task, and these consisted of the two highest rated White and Middle Eastern bearded faces.[1]

The State-Trait Anxiety Inventory (STAI: Spielberger et al., 1983) was used. The STAI consists of two 20-item questionnaires, one measuring state anxiety and one measuring trait anxiety. All of the items are rated along a four-point scale. The ratings are then summed together (positive items are reverse scored), with higher scores reflecting greater anxiety. On each questionnaire, scores can range between 20 and 80.

Procedure

The procedure was designed to reflect as closely as possible the design of Eberhardt et al. (2004, study 3), as they had successfully produced a visual bias effect with Black faces. Participants were tested individually by a White experimenter, and were informed that they were performing two separate tasks looking at vigilance. The experiment was run on a Dell PC using E-Prime software for Windows.

Participants were informed that the priming task was examining ''how well people can remain vigilant to rapidly presented stimuli.'' A fixation point appeared in the centre of the computer screen for 2000 milliseconds. A pre-mask then appeared for 40 milliseconds on the left or right hand side of the screen. This was followed by a priming word for 75 milliseconds, after which a post-mask appeared for a further 40 milliseconds. The pre- and post-masks simply consisted of the letter X repeated nine times. Each word was presented 3 times in a random order, resulting in 30 trials. In the control condition, participants saw the mask for the entire duration of 155 milliseconds. The words were approximately 750 mm $\times$ 7 mm on the screen. There were four practice trials prior to the priming task, which used the same stimuli as the control condition. Participants had to press the left hand button on a response box if the stimulus appeared on the left and the right hand button if the stimulus appeared on the right. Reaction times to this task were of no theoretical interest and so were not recorded.

[1]Please contact the corresponding author for the images of the faces used in Experiments 1 and 2.

DOI: 10.1002/acp

For the dot-probe task, participants were told that they were completing a ''facial interference'' task, which would examine how distracting a face can be in a test of vigilance. A fixation point appeared in the centre of the screen for a randomly determined interval (2, 4, or 6 seconds). The two faces (950 mm × 650 mm) would then appear on either side of the screen for 450 milliseconds, after which a faint grey dot would appear in one of their two locations. The dot had a diameter of 5 mm. The locations of the faces on the screen were fully counterbalanced, and the two different pairs were presented in a random order. Prior to the 96 experimental trials, participants completed six practice trials using the word *FACE* instead of the images. The participant had to press the left button on the response box if the dot appeared on the left and the right button if it appeared on the right. They were told to be as quick and as accurate as possible.

After the dot-probe task, participants completed the STAI (Spielberger et al., 1983). The participants were then thanked and debriefed. They were asked not to discuss the experiment with anyone else.

Results

Data preparation

Following the procedure of Mogg and Bradley (1999), incorrect trials were excluded from the analysis. These were trials in which the participant misidentified which side of the screen the dot appeared on. Reaction times on incorrect trials are not a measure of how long it takes to find the dot; rather, they may be a reflection of some other cause, such as a momentary lapse in concentration. Two participants were removed from the dataset due to high error rates. For the remaining participants, error rates varied from 0.00 to 10.50%, with a mean of 1.71% (SD = 2.13%). Analyses of the accuracy data revealed no significant effects, as the majority of participants were making no or few errors.

Median reaction times for each dot position (Middle Eastern and White) were calculated for each participant. Medians were used because they provide a more stable measure of central tendency than means, as they are more resistant to outliers. Median reaction times for the Middle Eastern dot position (skewness = 1.23, SE = 0.25) and for the White dot position (skewness = 2.38, SE = 0.25) were positively skewed. Reciprocal transformations were carried out to reduce the skew (Middle Eastern skewness = −0.04, SE = 0.25; White skewness = −0.04, SE = 0.25), thus changing the nature of the dependent variable from reaction time to reaction speed. The analyses were run on the transformed data, although all we will report are the untransformed values for clearer interpretation.

Correlations between the anxiety measures (state anxiety and trait anxiety) were analysed. The two measures were significantly correlated ($r = .62$, $p < .001$). However, from past research, it was predicted that these different types of anxiety may play different roles in the guidance of visual attention, and they were therefore analysed separately.

Analysis

A two-way mixed ANOVA (condition – control vs. primed, dot position – Middle Eastern vs. White) was conducted on the reciprocally transformed data. There was a significant effect of condition ($F(1, 95) = 4.68$, $p = .03$, $\eta_p^2 = .05$); reaction speed was faster in the primed condition ($M = 640.25$ milliseconds, SD = 101.40 milliseconds) than in the control condition ($M = 710.22$ milliseconds, SD = 178.16 milliseconds). Without taking account of the anxiety measures, participants were responding faster in the primed condition than in the control condition. All other effects were non-significant.

DOI: 10.1002/acp

A three-way mixed ANOVA was conducted, which included trait anxiety as well as condition and dot position. A significant interaction was found between condition, dot position, and trait anxiety ($F(1, 93) = 4.49$, $p = .04$, $\eta_p^2 = .05$), meaning that the association between trait anxiety and reaction speed varied across conditions. Correlations between trait anxiety and reaction speed were carried out. In the control condition, participants with higher trait anxiety responded slower to the dot when it appeared in the location of the Middle Eastern face than participants with lower trait anxiety ($r = -.17$). In the primed condition, the opposite association was found. Participants with higher trait anxiety responded faster to the dot in the Middle Eastern face position than participants with lower trait anxiety ($r = .07$).

A second three-way ANOVA was run, with state anxiety instead of trait anxiety. There was a significant two-way interaction between dot position and state anxiety ($F(1, 93) = 5.09$, $p = .03$, $\eta_p^2 = .05$). Low anxious participants were faster to respond to the White faces than high anxious participants ($r = -.11$). Anxiety was not related to reaction speed to the Middle Eastern faces ($r = -.01$). This resulted in an attentional bias toward White faces in low anxious participants, and toward Middle Eastern faces in high anxious participants.

Discussion

Experiment 1 showed that participants' attention could be influenced by a priming procedure. High trait anxious participants showed a visual bias towards Middle Eastern faces after exposure to terrorism-primes, whereas low trait anxious participants showed the opposite bias, toward the White faces.

This finding is in line with the existing literature on the processing of threat cues in anxious individuals (Bradley et al., 1998; MacLeod et al., 1986; Mogg & Bradley, 1999), which has shown that anxious participants direct their attention toward threatening stimuli, whereas non-anxious participants avert their attention away from threatening stimuli. The results of Experiment 1 suggest that after exposure to terrorism primes, participants began perceiving Middle Eastern faces as threat cues, and directed their attention accordingly.

State anxiety, on the other hand, was associated with reaction times regardless of condition; low state anxious participants responded slower to the dot in the position of the White face than high anxious participants. This resulted in a visual bias toward White faces in participants with low state anxiety, and a visual bias towards Middle Eastern faces in participants with high state anxiety. One speculative conclusion from this is that high state anxiety encourages the processing of Middle Eastern faces as threat cues, and therefore, the priming procedure is redundant.

Experiment 2 used a similar dot-probe task to Experiment 1, with longer stimulus presentation times of 900 milliseconds. A larger number of faces were used (six pairs), and recognition memory for the faces was tested in an old/new recognition test. It is predicted that recognition accuracy will be higher for the White faces than for the Middle Eastern faces, and that accuracy may be influenced by participants' anxiety levels and experimental condition.

EXPERIMENT 2

Method

Participants and design

One hundred and twenty seven university students (mean age = 22.35 years, range = 18–42 years, 65% female) participated in return for course credit on a research methods course or

DOI: 10.1002/acp

for £3. These participants were, again, recruited through the subject pool, and so consisted mostly of undergraduates, as well as some postgraduates and staff. One hundred (79%) of the participants identified themselves as White; only the data from these participants were included in the analyses. This was an independent sample, so none of these participants had taken part in Experiment 1 or any pilot studies.

A $2 \times 2 \times 2$ mixed design was used. Participants were randomly allocated to the terrorism-primed condition or to the no-prime condition, with the constraint that the groups should be of equal size ($n = 50$). The second factor, whether the dot in the dot-probe task appeared in the location of the White face or the Middle Eastern face, varied within subject. The third factor, which also varied within subject, was race of face in the recognition task (White vs. Middle Eastern). State and trait anxiety were measured.

The dependent variables were reaction times to respond to the dot in the dot-probe task (milliseconds) and accuracy in the recognition task. The signal detection theory measure *d'* was used, as it estimates participants' abilities to distinguish old stimuli from new (Stanislaw & Todorov, 1999).

Materials

Six different face pairs from the pool of bearded faces which were collected and rated for Experiment 1 were used in the dot-probe task. A further 12 faces were used as foils in the recognition task. All of these faces had been rated above the midpoint on a typicality rating task in a pilot study. The small number of stimuli was used due to the difficult nature of the encoding situation – the targets were presented for only 900 milliseconds, and under divided attention. Using 6 face pairs meant that each pair would be seen a sufficient number of times for the participants to be able to recognise them. The targets and foils were counterbalanced across participants.

The same photographs were used at encoding and testing. Although it is recognised that this raises the possibility that participants may respond to the stimulus rather than the face, the attentional bias is the main focus of this paper. However, this is a caveat to bear in mind while interpreting the results.

The State-Trait Anxiety Inventory (STAI) was again used.

Procedure

The procedure was the same as Experiment 1, with the following changes: First, during the dot-probe task, the faces were presented for 900 milliseconds. The presentation time was increased after piloting revealed that the 450 milliseconds exposure time used in Experiment 1 made the recognition test too difficult.

Second, after the dot-probe task, participants completed a recognition test, in which they were shown the 12 targets along with 12 foils. Each face was shown individually, and participants had to press the left button on the response box if they recognised the face and the right button if they did not. The faces stayed on the computer screen until the participant had made their response.

Participants were told that accuracy was more important than speed in this task, and so reaction times were not recorded.

Results

Data preparation

Trials in the dot-probe task in which the participant misidentified the location of the dot were, again, excluded from the analysis. The mean error rate was 1.23% (SD = 1.53%),

DOI: 10.1002/acp

with error rates varying between 0.00 and 7.29%. Analyses of the accuracy data revealed no significant effects, as the majority of participants were making no or few errors.

Median reaction times were then obtained for each participant at each dot position (Middle Eastern and White). The distributions of median reaction times in both the White dot position (skewness = 1.51, SE = 0.24) and the Middle Eastern dot position (skewness = 1.68, SE = 0.24) were positively skewed. Reciprocal transformations were conducted to reduce the skew (White skewness = 0.09, SE = 0.24; Middle Eastern skewness = 0.14, SE = 0.24). Analyses were carried out on the transformed data, changing the dependent variable from reaction time to reaction speed. However, for ease of interpretation, untransformed group means are reported.

The trait and state anxiety scores were correlated ($r = .28$, $p = .005$). However, they were analysed separately, as past research indicates that they may play different roles in the guidance of visual attention. It is interesting to note that the correlation between trait and state anxiety scores was much smaller in Experiment 2 ($r = .28$) than in Experiment 1 ($r = .62$) ($z = 4.40$, $p < .001$). One possibility for this difference is that there was a time of year effect taking place: Experiment 1 was conducted in the Spring term of the University year, while Experiment 2 was conducted in the Summer term, just prior to the examination period for most undergraduates, when state anxiety may have been naturally inflated.

Reaction speed analysis

A 2-way mixed ANOVA and two 3-way ANOVAs, with state and trait anxiety, were conducted on the reciprocal transformed data. The 2-way ANOVA yielded no significant effects (all Fs ≤ 1.62, all ps $\geq .21$, all η_p^2s $< .02$). Similarly, the trait anxiety ANOVA failed to show any significant effects (all Fs ≤ 2.82, all ps $\geq .10$, all η_p^2s $< .03$). This is in contrast to Experiment 1, in which a significant interaction was found with trait anxiety ($\eta_p^2 = .05$). Possible reasons for this discrepancy are presented in the discussion.

The state anxiety ANOVA, however, revealed a significant main effect of state anxiety ($F(1, 96) = 4.44$, $p = .04$, $\eta_p^2 = .04$). In both conditions, participants with higher state anxiety responded slower to the dot ($r = -.17$), whether it was in the location of the Middle Eastern face or the White face. There were no other significant effects (all Fs ≤ 1.30, all ps $\geq .26$, all η_p^2s $< .02$).

Recognition data

Signal detection theory was used to calculate d' scores for the Middle Eastern and White faces in the recognition test. d' was calculated using the formula (($d' = z$ hit rate $- z$ false alarm rate), where hit rate = (hits + 0.5)/(hits + misses + 1) and false alarm rate = (false alarms + 0.5)/(false alarms + correct rejections + 1.)). The d' values were then entered into a 2-way mixed ANOVA (condition and race of face), and two separate ANOVAs, with trait and state anxiety as factors.

A 2-way ANOVA revealed a significant main effect of race of face ($F(1, 98) = 7.65$, $p = .007$, $\eta_p^2 = .07$). The mean d' was higher for White ($M = 2.01$, SD = 0.75) than for Middle Eastern ($M = 1.79$, SD = 0.87) faces.[2] This is evidence of the predicted own-race bias, as participants were more accurate at identifying faces of their own race than faces of the other race. These were no other significant effects (Table 1).

[2]A similar shift is found with A', an alternative SDT measure which makes different assumptions from d' (although it is "at least as stringent", Wickens, 2002, p. 72; see also Pastore, Crawley, Berens, & Skelly, 2003). The mean A' for White faces was .88 ($SD = .08$), and for Middle Eastern faces was .85 ($SD = .12$). Conclusions are the same if A' is used.

DOI: 10.1002/acp

Table 1. Mean d' scores for Middle Eastern (ME) and White faces in Experiment 2

	Mean d' scores		95% confidence intervals	
Condition	ME	White faces	ME	White faces
Control	1.79	2.04	1.55, 2.03	1.83, 2.25
Primed	1.79	1.99	1.55, 2.04	1.78, 2.20

When hits and false alarms were analysed separately, however, it was found that the ORB was produced by increased false alarms for Middle Eastern faces (12.5%) compared to White faces (6.17%), $F(1, 98) = 12.94$, $p = .001$, $\eta_p^2 = .12$. There was no difference in hit rates between White (79.00%) and Middle Eastern (78.13%) hit rates, $F(1, 98) = 0.10$, $p = .76$, $\eta_p^2 < .01$. This was reflected by a shift in response criteria between White ($C = -.23$) and Middle Eastern ($C = -.14$) faces, with participants responding more conservatively for White faces than Middle Eastern faces, $F(1, 98) = 3.72$, $p = .06$, $\eta_p^2 = .04$.

Two 3-way ANOVAs were then conducted, with trait and state anxiety included. There was a marginally significant two-way interaction between condition and trait anxiety ($F(1, 96) = 3.26$, $p = .07$, $\eta_p^2 = .03$). In the control condition, trait anxiety was negatively associated with recognition accuracy ($r = -0.09$), whereas in the primed condition, the opposite association was found ($r = 0.25$). The state anxiety analysis revealed no significant effects (all η_p^2s $< .01$).

Discussion

An own-race bias was found, with participants more accurate at identifying White faces than Middle Eastern faces. This is the first time that an ORB has been found with White and Middle Eastern faces in the United Kingdom. However, participants were still much more accurate than chance at recognizing the Middle Eastern faces. There are, however, a couple of caveats to bear in mind when interpreting the results. First, the amount of facial hair on the faces was not controlled. The Middle Eastern faces, on average, had a greater amount of facial hair than the White faces. However, facial hair can be seen as a feature in itself, which does vary between different racial groups, and which may therefore contribute to recognition processes (see MacLin & Malpass, 2001 for a discussion of hairstyle as a racial marker). It is therefore possible that the facial hair on the Middle Eastern faces obscured some of the features, making recognition more difficult than for the White faces. Second, the relatively small number of faces used raises the possibility that the stimuli were not representative of the groups to which they belonged (Wells & Windschitl, 1999). However, all of the faces had been rated for typicality by an independent sample, and only faces rated above the mid-point were included in the study.

State anxiety was associated with recognition accuracy, although the direction of the association was dependent upon condition. In the control condition, state anxiety was negatively associated with recognition memory, so that participants who were more anxious were less accurate in their identifications. In the primed condition, on the other hand, state anxiety was positively associated with recognition accuracy, so that participants who were more anxious were also more accurate. This was true for both the Middle Eastern

DOI: 10.1002/acp

and the White faces, in contrast to the prediction that the recognition of Middle Eastern faces would be affected to a greater degree by anxiety than the recognition of White faces.

State anxiety was also positively correlated with reaction speed in the dot-probe task. Participants with higher state anxiety scores also showed faster overall responses. This is, again, an unexpected effect, as Experiment 1 showed that state anxiety was associated with increased reaction times to the White dot position only, and not with reaction times to the Middle Eastern face position.

The discrepancies in the reaction speed results of Experiments 1 and 2 are likely to be due to the increase in stimulus presentation time from 450 to 900 milliseconds. One possibility is that the reaction speed data from Experiment 1 were reflecting very early capturing of attention, whereas the reaction speed data from Experiment 2 were reflecting where participants' attention eventually rested. Nine hundred milliseconds may have been sufficient time to move attention away from one stimulus to the other, or back into the centre of the screen. This could explain why Experiment 2 failed to replicate the association between trait anxiety and reaction time, and why state anxiety was associated with overall reaction times, rather than interacting with race of face.

The reaction speed and recognition data, taken together, show that more anxious people were generally faster, and, in the primed condition, were more accurate at recognizing faces. One explanation for this is that higher state anxiety encourages a sort of hyper-vigilance, which could explain the decreased reaction speed in the dot-probe task. Participants who had been exposed to terrorism-related primes may have also been devoting more cognitive resources to the processing of faces, regardless of race.

GENERAL DISCUSSION

The reported studies show that stereotyping and anxiety are associated with visual attention and face recognition accuracy. After priming with terrorism-related words, anxious participants show an attentional bias towards Middle Eastern faces. Non-anxious participants, on the other hand, show an attentional bias towards White faces. These results closely mirror findings from previous dot-probe experiments, in which anxious participants directed attention towards threat cues such as angry faces and threatening words (Bradley et al., 1998; MacLeod et al., 1986; Mogg & Bradley, 1999). This suggests, therefore, that after being primed to think about terrorism, participants began perceiving the Middle Eastern faces as threat cues on the basis of their racial stereotypes.

The results also support Eberhardt et al.'s (2004) findings that racial stereotypes, activated through subliminal priming, can guide visual attention toward faces of other races. However, in contrast to Eberhardt et al.'s (2004) studies, priming alone was not sufficient to influence attention, rather, anxiety interacted with the priming to produce the effect. This could be due to the different nature of the stereotypes of Middle Eastern and Black men. Terrorism is a topic which currently occupies much space in the media and the public consciousness, while the stereotyping of Black men as criminal is subtler, and does not tend to dominate the headlines to the same degree. Terrorism could therefore be more closely related to anxiety than crime at the current time.

These effects were only found with a short stimulus presentation time (450 milliseconds), and were not found when the presentation time was doubled to 900 milliseconds. It may be that the attention bias found with short exposures was a result of very early

DOI: 10.1002/acp

attentional capture, and that 900 milliseconds was sufficient time for attention to return to the centre of the screen, or toward the other face on screen.

Experiment 2 also showed that priming and anxiety are associated with the ability to accurately recognise faces. For participants who did not receive any priming, anxiety was negatively correlated with recognition accuracy, such that participants who were more anxious were also likely to be less accurate. For participants in the primed condition, however, anxiety was positively correlated with accuracy for both White and Middle Eastern faces. It is possible that priming with terrorism-related words caused anxious participants to become more vigilant to all of the stimuli, and encouraged deeper processing, which then led to better recognition memory. For control participants, on the other hand, anxiety may have hindered recognition memory.

This paper shows an own-race bias in White participants for the recognition of White and Middle Eastern faces. In contrast to most face recognition research, the faces were presented under conditions of divided attention, with two faces being presented simultaneously. The presentation time (900 milliseconds) was also much shorter than those commonly used in face recognition research, which tend to be between 3000 and 5000 milliseconds (although MacLin et al. (2001) found an ORB for Black and Hispanic faces with presentation times of 500 milliseconds). This finding, therefore, adds to arguments for the generalisability of the own-race bias across races.

In sum, the experiments show that stereotype activation and emotional state can influence visual attention and face recognition memory. Anxious participants who are exposed to terrorism-related primes show a visual bias toward Middle Eastern faces (Experiment 1), and are more accurate at recognizing faces (Experiment 2), whereas non-anxious participants who are exposed to the same primes show a visual bias towards White faces (Experiment 1) and are less accurate at recognizing faces. Overall, participants demonstrated an own-race bias when recognizing White faces and Middle Eastern faces; this is the first time the bias has been demonstrated in the United Kingdom with Middle Eastern faces.

Terrorism is a topic which currently makes a daily appearance in the news headlines. Understanding how exposure to such information can affect cognitive processes such as attention and memory is therefore of great importance. There may be certain contexts in which people are more attentive to the processing of faces, and therefore more accurate at identifying faces. If this is true, then it may be that eyewitnesses may be more accurate than was previously believed in certain situations, with faces of other races as well as with faces of their own race.

ACKNOWLEDGEMENTS

This research was funded by the Economic and Social Research Council.

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