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Are You In or Are You Out? The Importance of Group Saliency in Own-Group Biases in Face Recognition

V. Harrison
School of Psychology, Open University, Milton Keynes, UK

G. Hole
School of Psychology, University of Sussex, Brighton, UK

Ruth Habibi
Research and Development Department, East Surrey Hospital, Canada Ave, Redhill, UK

Abstract

Previous research has demonstrated several own-group biases (OGBs) in face recognition, but why they occur is unclear. Social–cognitive accounts suggest they stem from differential attention and facial processing, following the categorisation of a face as belonging to an "in" or "out" group. Three studies explored whether OGBs can be produced by mere categorisation at encoding and investigated the role of in-group membership saliency on face recognition. Participants saw 40 facial images fictionally grouped according to in-/out-group status. Studies 1 and 2 used university membership as the grouping variable and found no evidence of an OGB, and no relationship between OGB magnitude and salience of group membership. Study 3 used the same design as Study 2, but with a highly salient group characteristic: participants' stance on the U.K. Referendum (i.e., whether they were "Leave" or "Remain" supporters). In this case, an asymmetrical OGB was found, with only Remain voters demonstrating an OGB. Furthermore, a relationship between OGB magnitude and attitude toward the Referendum result was found. Overall, our results suggest that social categorisation and membership saliency alone may not be enough to moderate in- and out-group face recognition. However, when sufficiently *polarised* groups are used as in-/out-group categories, OGBs may occur.

Corresponding author:
V. Harrison, School of Psychology, Faculty of Social Sciences, The Open University, Milton Keynes MK7 6AA, United Kingdom.
Email: gini.harrison@open.ac.uk

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Every day we come into contact with a large array of faces either personally or through social and/or mainstream media. However, there is evidence that we do not process all of these faces equally. Previous research has shown that we are better at recognising faces belonging to our own racial group compared with those of another race, a robust effect known as the Own Race Bias (ORB; for review see Meissner & Brigham, 2001). Similarly, we show superior recognition for faces belonging to our own age-group (see meta-analysis by M. G. Rhodes & Anastasi, 2012); and females show an own-gender bias (Herlitz & Lovén, 2013).

Why these biases may occur remains unclear, but there is some evidence to suggest differential contact may have a role to play. For example, contact appears to play a significant role in the ORB, accounting for a small, but significant proportion of the variance in this effect (Meissner & Brigham, 2001). Similarly, recent contact with different age groups is likely to moderate our ability to recognise those faces (Harrison & Hole, 2009). Herlitz and Lovén (2013) hypothesise that the female own-gender bias may be the result of increased exposure to female faces following birth, which is then reinforced by social and psychological processes that promote increased attention to and interaction with own-gender faces. However, it remains unclear precisely what aspect of contact is likely to underlie the development of these own-group biases (OGBs).

There are broadly two classes of explanations that have been put forward to explain these types of OGBs. The first proposes that increased contact with own-group faces leads to enhanced perceptual processing for that group, compared with out-group faces. This may be due to an increased ability to extract the configural information from faces which has been claimed to underlie expertise in face recognition (G. Rhodes et al., 1989; Sangrigoli et al., 2005). Another version of the expertise explanation, based on Valentine's (1991) multidimensional face space model, suggests that the relatively higher exposure to in-group faces results in a better representation of the dimensions necessary for individuating them, compared with those needed to distinguish between out-group faces. Both of these explanations are based on the assumption that perceptual face-processing mechanisms become better tuned for the types of faces with which we have a greater amount of experience.

While perceptual expertise accounts may be able to explain OGBs that occur between in- and out-groups that vary physiognomically, they struggle for those that do not. This is problematic, as several studies have reported finding an own-group recognition advantage for faces which are physically similar but vary according to existing social categories such as university affiliation (Bernstein et al., 2007; Hehman et al., 2010; Ng et al., 2016; Shriver et al., 2008; Yan et al., 2017), sexual orientation (Rule et al., 2007), or religious beliefs (Rule et al., 2010). Furthermore, Bernstein et al. (2007) reported the elicitation of an own-group recognition advantage following the creation of experimentally defined in- and out-groups based on a bogus personality questionnaire (grouping participants as either "red" or "green" personality types), leading them to conclude that the mere categorisation of faces as belonging to an even minimally defined in- or out-group is sufficient to elicit an OGB.

Thus, the second class of explanation offered for OGBs predominantly focuses on more social explanations of face recognition. The social psychology literature has demonstrated our tendency to automatically categorise people according to whether they belong to our social in-group or out-group (e.g., Tajfel et al., 1971). It is this process that is thought to affect the way in which we subsequently process a face. Rodin (1987) suggested that categorising a face as belonging to an out-group might reduce one's motivation to attend to it, leading us to "cognitively disregard" the person (essentially rendering them invisible). Along similar lines, social cognitive models of face recognition suggest that social group status influences our motivation to attend to faces and moderates the depth and type of processing that then takes place (Hugenberg et al., 2013; Sporer, 2001). If an out-group feature is detected (whether a physiognomic facial marker or an external signifier) those individuals are processed at a more categorical level (e.g., in terms of the social categories to which they have been assigned such as age, gender, race) at the expense of more individuating information. This effectively produces an out-group homogeneity effect (Judd & Park, 1988).

This type of explanation is able to explain studies such as Bernstein's, where OGBs have been found despite facial similarity and comparable levels of expertise for in- and out-group faces. Evidence consistent with a social categorisation account can also be seen in studies which demonstrate that the ORB can be reduced or eliminated when participants are encouraged to think about Black and White faces along an alternative, in-group dimension such as a common university affiliation (Hehman et al., 2010; Shriver et al., 2008). This is in line with the Common Ingroup Identity Model (Gaertner et al., 1993) which asserts that we belong to multiple in-groups, based on a myriad of social or biological categories. The relative importance of these different dimensions is likely to be fluid and will shift according to social context (Hogg & Turner, 1987). Thus, as the salience of these groupings change, a face that is categorised as "out-group" on one dimension (e.g., race) can be reclassified as "in-group" on another (e.g., university affiliation), affecting the way it is subsequently viewed and processed.

The aim of this article is to further investigate the role of in-group membership saliency on face recognition. If OGBs are due (at least in part) to social categorisation, then the process of categorisation should be enough to elicit a recognition difference between in- and out- group faces. Thus, labelling faces according to an in-group category should result in better recognition of those faces compared with the same faces that are labelled as out-group members. In addition, if group salience plays an important role in OGBs, then this should moderate the size of this OGB. All measures, manipulations, and exclusions are reported in these studies.

Study 1

Study 1 investigated whether an OGB could be elicited for visually similar faces labelled according to university affiliation. As previous studies have predominantly focused on U.S. populations, where university identity is particularly strong (possibly due to the importance of college sports), this study explored this in a U.K. context. Previous research has increased in-group identity saliency by asking participants to reflect on their experience as part of that group (e.g., Levine et al., 2005). The aim of the second study was to examine whether increasing participants' awareness of group membership would moderate the size of the OGB.

Method

Design. This study used a design similar to that of Bernstein et al. (2007), adapted to partially replicate and extend their findings in a U.K. cohort. A mixed design was used, with one between-participants variable: group saliency (three levels: control, low, or high) and one repeated-measures variable: facial category (two levels: red or blue). Face recognition accuracy was assessed by calculating d prime (d').

Participants. Participants were recruited over a 3-week period from an opportunity sample of students attending Open University (OU) Summer Schools in the United Kingdom. In total, 87 participants took part in this study: 27 Controls (mean age = 38.30; $SD = 10.42$; 19 females), 30 Low Saliency (mean age = 37.97; $SD = 9.61$; 25 females), and 30 High Saliency (mean age = 37.80; $SD = 10.02$; 25 females). Participants' average time spent at the OU was 5.74 ($SD = 3.73$), 4.70 ($SD = 1.91$), and 5.23 ($SD = 3.16$) years, respectively; most were part-time students, with only 20% studying full-time in the Low and High salience groups, and 18.5% of the controls.

Materials. Digital photographs were taken of 80 Caucasian males aged between 19 and 30 years. Two photographs were taken of each individual, one smiling and the other neutral. All photographs were close up, frontal face images without glasses, jewellery, facial hair, or other identifying features. Using Adobe Photoshop, each photograph was standardised to 300 × 350 pixels before being greyscaled and cropped to the outline of the face. Two versions of each facial image were then created and placed on different-coloured 400 × 400 pixel backgrounds: one was placed on a red background and the other on a blue background. For the control condition, the words "Red" and "Blue" were written in black letters at the bottom of the respective backgrounds. For the Low and High category saliency conditions, the university names ("Sussex University" for red and "Open University" for blue) appeared in black letters at the bottom of the background, as these colours were associated with the respective universities (see Figure 1).

Procedure. Participants were randomly assigned to one of three experimental groups that sought to manipulate the saliency of in-group membership: Control, Low Saliency, or High Saliency. Before the face recognition task, participants took part in an autobiographical memory task that lasted 5 minutes. Those in the High Saliency group were asked to write as much as they could about a recent positive experience they had as an OU student. In contrast, Low Saliency and Control participants were asked to write about a positive experience they had when they were at school.

Immediately following the autobiographical memory task, participants completed the face recognition study on a laptop using E-Prime. After providing some basic demographic information (gender, age, and years at the OU), participants saw a randomised pool of 40 photographs (20 on a red background and 20 on a blue background). The labels that appeared at the bottom of the images varied according to experimental group: Controls saw "Blue" and "Red" (Figure 1B and D), whilst the Low and High Saliency conditions saw "Open University" and "Sussex University," respectively (Figure 1A and C). Each face appeared on the screen for 2 seconds, with an inter-stimulus interval (ISI) of 500 ms. Participants were instructed to attend to the faces, as they would later be asked to identify them. Following the learning phase, participants completed a short, unrelated filler task where they were given a minute to name as many words as they could that began with a specific letter.

The recognition test followed. This consisted of 80 photographs: 40 had previously been seen in the alternate pose during the learning phase and 40 were entirely new. Photographs

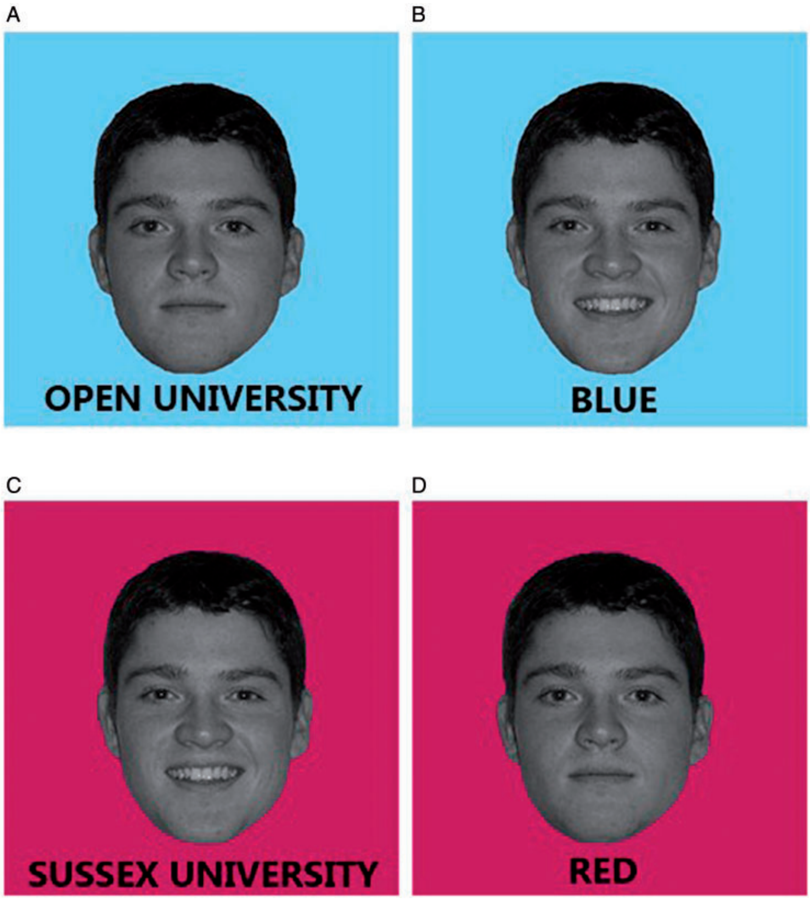

Figure 1. Example of Stimuli Used.
Note. Please refer to the online version of the article to view the figures in colour.

were counterbalanced with respect to old/new status, background, and pose, and they appeared in a different random order for each participant. Using the computer keyboard, participants had to indicate whether or not they recognized the individuals in the photos (using Y to indicate Yes and N for No). The photographs appeared individually, and at a presentation rate that was determined by the participant's speed of response (i.e., each face remained on the screen until a response was made).

Results

Since there was no effect of pose type on any of the outcome variables, data were collapsed across this variable for the purpose of analysis.

Accuracy. Estimates of *d'* were used for analysis, rather than the percentage of correct responses: *d'* is a better index of recognition discriminability since it takes into account false alarms (false recognition of distractor faces). Table 1 shows hit rate (HR; correct

Table 1. Mean Proportion of Hits and False Alarms, *d*' Accuracy Scores, and Average Reaction Times for Correct Responses.

Group saliency	Facial category	Hit rate		False alarm rate		Accuracy (*d*')		Reaction times (ms)	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Controls	Blue	0.62	0.16	0.33	0.15	0.83	0.42	1,332.59	414.40
	Red	0.64	0.12	0.30	0.15	0.95	0.44	1,289.66	401.26
Low salience	Blue	0.64	0.16	0.35	0.15	0.81	0.58	1,279.97	356.82
	Red	0.62	0.14	0.33	0.15	0.83	0.43	1,264.30	374.37
High salience	Blue	0.66	0.16	0.38	0.13	0.78	0.52	1,244.06	277.42
	Red	0.61	0.14	0.33	0.11	0.77	0.37	1,233.07	302.34

identification of target faces) and false alarm rate (FAR). In calculating *d*', a flattening constant was used (as in Wright & Sladden, 2003) so that *z*-scores could be calculated when the HR or FAR was either 0 or 1.

A two-way mixed analysis of variance (ANOVA; Three Levels of Saliency Group $\times$ Two Levels of Facial Background) revealed no significant main effect of group saliency, $F(1,84) = .82$, $p = .44$, $\eta^2_p = .02$, facial category, $F(1,84) = .40$, $p = .53$, $\eta^2_p = .005$, and no significant interaction between these two variables $F(2,84) = .\ 03$, $p = .74$, $\eta^2_p = .007$. Thus, no evidence for an OGB or moderating effects of in-group saliency was found.

To investigate the relationship between time spent at the OU and recognition accuracy, a single *d'* difference score was calculated for participants in the Low and High saliency conditions. For each participant, the *d'* score for out-group faces was subtracted from their *d'* score for in-group faces. A positive score represented better accuracy for in-group faces, and a negative score indicated the opposite. A one-tailed Pearson's correlation revealed no significant relationship between these variables ($r(58) = .05$, $p = .36$).

Discussion

The results from Study 1 found no evidence of an OGB, and manipulating the saliency of in-group membership had no effect on the relative difference between the recognition of in- and out-group faces. Thus, these findings directly contradict those of previous studies which have found an OGB for university membership. It is unclear why this is the case. It may be that this is due to the small sample size used in this study. While Bernstein et al. (2007) found a significant medium effect size with a comparable *n*, power calculations revealed that an *n* of approximately 78 participants per condition may be necessary to obtain statistical power at the .80 level.

Alternatively, as most previous studies were conducted in the United States, it may be that U.K. students have less of an affiliation with their university institutions, and therefore this dimension is not strong enough to bring about an OGB. This may be particularly the case for part-time students (which most of the participants in this study were). However, given that Bernstein et al. (2007) have previously reported an OGB using a minimal group membership paradigm based on a bogus personality test (red vs. green personalities), to which participants have no real affiliation, it is surprising that no evidence of an OGB was found in the enhanced saliency group. Thus, a second study was conducted to explicitly explore the relationship between group membership importance and OGBs with university students.

Study 2

Method

Design. A mixed design was used, with one between-participants variable: university membership (two levels: OU and Sussex University) and one repeated-measures variable: facial category (two levels: OU or Sussex). Accuracy was assessed by calculating d prime (d').

Participants. Undergraduate participants were recruited to the study via internal University emails, and advertising on student Facebook pages. In total, 97 participants took part in this study: 53 OU students (mean age = 36.62; $SD = 8.76$; 50 females) and 44 Sussex students (mean age = 20.55; $SD = 4.16$; 33 females).

Materials. The same facial photographs were used for stimuli as in Study 1. Again, two versions of each facial image were then created, and placed on both a red and a blue background, each measuring 400×400 pixels, with the words "Open University" and "Sussex University" written at the bottom of the related colour (see Figure 1A and C).

Procedure. Participants accessed the study via a link provided via email or on social media. This directed to them to the study which was created using Qualtrics survey software and customised using javascript. Following a brief demographic questionnaire to establish gender, age, and university affiliation, participants were asked to indicate how important their university membership was to them, using an adapted version of the Community Identity questions used by Dixon et al. (2019; see Table 3 for questions used). Participants were then presented with a randomised pool of 40 photographs (20 labelled as "Open University" and 20 as "Sussex University"), as part of the initial learning phase. The filler task and recognition phase followed the same procedure as in Study 1, in an online context. Images were displayed for 2 seconds each, with an approximate ISI of 500 ms (with the caveat that individual computer processing and internet speeds may have affected these timings slightly).

Results

Since there was no effect of pose type on any of the outcome variables, data were collapsed across this variable for the purpose of analysis.

Accuracy. As with Study 1, estimates of d' were used for analysis. Table 2 shows the HR and FARs.

A two-way mixed ANOVA revealed that there was no significant main effect of university membership, $F(1,95) = .98$, $p = .97$, $\eta_p^2 < .001$, or facial category, $F(1,95) = .56$, $p = .45$, $\eta_p^2 < .001$, and no interaction between these two variables, $F(1,95) = 1.09$, $p = .30$, $\eta_p^2 = .01$. To counter the potential power issues with this study, the University Groups were combined together to form a single group ($n = 97$), and the stimuli were reconceptualised as in-group or out-group faces. A paired sample t test revealed no significant OGB, $t(96) = .98$, $p = .33$, $d = 0.10$.

Group Membership. Participants were asked to indicate how important their university membership was to them, using four questions (see Table 3). Answers were recorded on a 5-point scale, where 1 = *strongly disagree* and 5 = *strongly agree*, and the sum of these scores was

Table 2. Mean Proportion of Hits and False Alarms and *d'* Accuracy Scores.

University membership	Facial category	Hit rate		False alarm rate		Accuracy (*d'*)	
		Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
OU	OU	0.54	0.18	0.25	0.16	0.90	0.44
	Sussex	0.59	0.20	0.31	0.21	0.89	0.49
Sussex	OU	0.51	0.15	0.23	0.14	0.83	0.48
	Sussex	0.51	0.17	0.20	0.16	0.95	0.59

Note. OU = Open University.

Table 3. Mean Scores and Dispersion of Group Memberships Items and Total Score.

Question	Sussex		Open University	
	Mean	*SD*	*Mean*	*SD*
Belonging to my university is important to me	4.18	0.79	4.08	0.81
I see myself as a member of my university	3.98	0.85	4.04	0.81
Overall, being a member of my university has a lot to do with my identity	3.41	1.09	3.45	0.97
I have strong ties to fellow university members[a]	3.05	1.14	2.53	1.12
Total score	14.61	3.22	14.09	3.06

[a]A significant difference between university group means $t(96) = -2.25$, $p < .05$, $d = 0.46$.

taken to indicate group membership saliency. The descriptive statistics associated with these responses can be seen in Table 3.

To investigate the relationship between the importance of university membership and recognition accuracy performance, a single *d'* difference score was calculated for each participant. To achieve this, *d'* scores for out-group faces were subtracted from the *d'* scores for in-group faces. Thus, the larger the score, the more pronounced the OGB. Spearman correlations were carried out between this difference score and each of the university membership items, and between the difference score and the total scale score; none reached significance (r_s range = .01–.05; p range = .60–.91).

Discussion

The results from Study 2 found no evidence of an OGB when participants were grouped according to university, directly contradicting those of previous studies which have found an OGB for university membership. While again, this may be due to a lack of power in the study, pooling the university students together to form one group ($n > 78$) also revealed no advantage for own-group faces, and found no relationship between OGB magnitude and a measure of group membership salience. Given that students rated university membership as being highly important to them, weak group salience is unlikely to underlie this null result. However, one critical difference between this study and others that have found an OGB with university membership is that the categories used do not represent strictly opposing categories, or particularly rivalrous groups. For example, Bernstein et al. (2007) exploited existing rivalries between universities to highlight in- and out- group distinctions. Thus, it may be that OGBs are driven by the nature of the relationship between the in-group and out-group, and that it is the perceiver's relationship with the out-group that drives the OGBs seen in previous studies.

To investigate this further, a third study was conducted using a highly salient and diametrically opposed natural social grouping variable. In June 2016, the United Kingdom had a nationwide Referendum about whether the country should remain in the European Union or leave it. This vote split the country almost 50/50, engendering intense and polarised groupings with strong affective in- and out-group membership allegiances (Hobolt et al., 2018). As individuals can vary significantly in their political and group allegiances, Study 3 sought to explore group membership salience using "Brexit" advocates and opposers.

Study 3

Method

Design. A mixed design was used, with one between-participants variable: voting group (two levels: Remain supporter or Leave supporter) and one repeated-measures variable: facial category (two levels: Remain or Leave). Accuracy was assessed by calculating d prime (d').

Participants. During the 2 weeks following the outcome of the European Union Referendum vote, U.K.-based participants were recruited to the study via Facebook using two primary accounts (and the resultant snowball sampling). To maximise recruitment from both political camps, one account belonged to a Remain voter, and the other to a Leave voter.

A total of 79 participants took part in this study: 37 Leave Supporters (mean age = 41.70; $SD = 10.64$; 29 females) and 42 Remain Supporters (mean age = 43.76; $SD = 12.73$; 32 females). Of these participants, 81% said that they had voted in the Referendum (89.2% of Leave supporters, 73.8% of Remain supporters). All were U.K. citizens.

Materials. The same facial photographs were used for stimuli as in Studies 1 and 2. Again, two versions of each facial image were then created and placed on both a red and a blue background (the colours most associated with the Remain and Leave campaigns, respectively), each measuring 400×400 pixels, with the words "Leave" and "Remain" written at the bottom of the related colour.

Procedure. Participants accessed the study via an online link provided on social media. This directed to them to the study which was created using Qualtrics survey software and customised using javascript. Following a brief demographic questionnaire to establish gender, age, campaign support, and voting status, participants were presented with a randomised pool of 40 photographs (20 labelled as "Leave" and 20 as "Remain"), as part of the initial learning phase. The filler task and recognition phase followed the same procedure in Study 2. Images were displayed for 2 seconds each, with an approximate ISI of 500 ms (with the caveat that individual computer processing and internet speeds may have affected these timings slightly). Once the recognition phase was complete, participants were asked to indicate how they felt about the outcome of the then recent Brexit vote on a 5-point Likert-type scale.

Results

Since there was no effect of pose type on any of the outcome variables, data were collapsed across this variable for the purpose of analysis.

Table 4. Mean Proportion of Hits and False Alarms and *d'* Accuracy Scores.

		Hit rate		False alarm rate		Accuracy (*d'*)	
Voting group	Facial category	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Remain supporters	Remain	0.54	0.20	0.22	0.15	1.03	0.46
	Leave	0.46	0.20	0.22	0.14	0.77	0.32
Leave supporter	Remain	0.55	0.22	0.27	0.18	0.91	0.41
	Leave	0.49	0.20	0.21	0.16	0.92	0.49

Accuracy. Again, estimates of *d'* were used for analysis. Table 4 shows the HR and FARs.

A two-way mixed ANOVA revealed that while there was no significant main effect of voting group, $F(1,77) = 0.03$, $p = .86$, $\eta^2_p < .001$, there was a significant effect of facial category, $F(1,77) = 5.65$, $p = .02$, $\eta^2_p = .07$, with Remain faces eliciting higher levels of accuracy (mean $d' = 0.97$, $SD = 0.44$) than Leave faces (mean $d' = 0.84$, $SD = 0.41$). It seems likely that this difference is predominantly driven by the particularly low *d'* rate achieved by Remain voters for Leave faces (see Table 2). Importantly, a significant interaction between these two variables was found, $F(1,77) = 6.20$, $p = .02$, $\eta^2_p = .08$, indicative of an OGB.

Follow-up paired *t* tests demonstrated a significant effect of face category for the Remain voters, $t(41) = 4.20$, $p < .001$, $d = 0.65$, showing a moderate-sized OGB. In contrast, no difference was found in the recognition accuracy for the different face categories for the Leave voters, $t(36) = -.07$, $p = .95$, $d = -0.01$. Furthermore, independent *t* tests found no significant difference in the performance of the Leave and Remain supporters for either the Leave, $t(61.14) = -1.60$, $p = .12$, $d = 0.36$, or Remain, $t(77) = 1.19$, $p = .24$, $d = 0.27$, faces.

To further explore drivers of this effect, paired *t* tests were carried out for HR and FARs. Both voting groups showed a significantly higher HR for Remain faces over Leave faces (Remain voters: $t(41) = 4.06$, $p < .001$, $d = 0.63$; Leave voters: $t(37) = 2.14$, $p < .05$, $d = 0.35$); but only Leave voters showed a significant difference for FAR (Remain voters: $t(41) = .07$, *ns*; Leave voters: $t(37) = 3.57$, $p = .001$, $d = 0.59$). Independent *t* tests found no difference in the HR and FAR rates for the Leave and Remain supporters ($t = -1.39$–$.11$; $p = .17$–$.91$).

Attitude to Referendum Outcome. Participants were asked to indicate on a 5-point scale how happy or unhappy they were with the Referendum vote outcome, with 1 indicating they were very unhappy and 5 suggesting the opposite.

The frequency of responses in Table 5 shows that the Remain voters had a relatively narrow response range: none reported being happy with the outcome and less than 10% held a neutral attitude toward the vote. In contrast, Leave supporters used all answer options on the response scale, with approximately one third of respondents indicating a neutral attitude toward the outcome. A further breakdown of the scores revealed that voters were more likely to use the extreme attitude scores (i.e., 1 and 5) than nonvoters. An independent *t* test showed that Leave voters were significantly happier with the Referendum outcome (mean = 3.62, $SD = 1.16$) than Remain voters (mean = 1.48; $SD = .67$; $t(55.99) = -9.87$, $p < .001$, $d = 2.25$).

To investigate the relationship between attitude to the Referendum outcome and recognition accuracy performance, a single *d'* difference score was calculated for each participant. To achieve this, *d'* scores for Leave faces were subtracted from the *d'* scores for Remain faces. A positive score represented better accuracy for Remain faces, and a negative score indicated the opposite.

Table 5. Frequency of Referendum Outcome Responses for Remain and Leave Supporters.

	Remain supporters			Leave supporters		
	Voters	Nonvoters	Total	Voters	Nonvoters	Total
I am very unhappy about the outcome	71 (22/31)	36.4 (4/11)	61.9 (26/42)	9.1 (3/33)	0	8.1 (3/37)
I am somewhat unhappy about the outcome	25.8 (8/31)	36.4 (4/11)	28.6 (12/42)	3 (1/33)	0	2.7 (1/37)
I am neither happy nor unhappy about the outcome	3.2 (1/31)	27.3 (3/11)	9.5 (4/42)	33.3 (11/33)	50 (2/4)	35.1 (13/37)
I am somewhat happy about the outcome	0	0	0.0	24.2 (8/33)	50 (2/4)	27.0 (10/37)
I am very happy about the outcome	0	0	0.0	30.3 (10/33)	0	27.0 (10/37)

A one-tailed Spearman correlation revealed a significant negative relationship between these two variables ($r_s(77) = -.24$, $p = .016$), suggesting that those with stronger attitudes toward the Referendum outcomes had larger difference scores. Specifically, this suggests that the more unhappy participants were with the Referendum outcome, the greater their recognition bias toward Remain faces; in contrast, the happier participants were with the outcome, the greater their recognition advantage for Leave faces.

Discussion

The results from Study 3 found evidence of an OGB when participants were grouped according to a polarised, natural, and salient dimension. When analysed in detail, an OGB was only present for Remain supporters, who showed an increased HR for in-group faces, and a larger relative difference in HRs between Remain and Leave faces compared with Leave supporters. For Remain participants, this pattern is consistent with a "cognitive disregard" explanation of OGBs, where outgroup members are given less attention than those in the in-group (e.g., Rodin, 1987). In contrast, Leave supporters showed a combination of an elevated HR and FAR for Remain faces. Studies of other OGBs, such as the ORB, have often reported that FARs are *relatively* higher for out-group faces than for in-group faces (Meissner et al., 2005). However, this difference usually arises from a *reduction* in FARs for in-group faces. In contrast, in our study, the difference arises from *increased* FARs for out-group faces.

Why this would be the case is unclear, but in the context of the vote it could be explained by the fact that Leave voters were largely vilified by Remain Supporters in the media following the Referendum outcome, and the news coverage was very "Remain" centric. Thus, in this context, Leave voters may have seen Remainers as threatening; and from an evolutionary perspective it would therefore be "safer" to overclassify faces as belonging to the out-group than to their in-group. This finding mirrors that of Ackerman et al. (2006) who found both HRs and FARs increase in white faces when a threat cue is present.

General Discussion

This article used three studies to investigate the role of in-group membership saliency on face recognition. Study 1 found no evidence of an OGB, despite manipulations to increase the social salience of in-group membership. This finding directly contradicts previous research showing that university affiliation is enough of a cue to bring about OGBs in face recognition (Bernstein et al., 2007; Hehman et al., 2010; Yan et al., 2017). This is also surprising, given work by Hehman et al. (2010) who used a novel paradigm to illustrate that increasing the salience of a common group membership (also university membership) could not only elicit an OGB but could also moderate other robust biases. Specifically, the authors found that when faces were grouped together according to race (but mixed for university affiliation), a significant ORB was demonstrated. However, when the salience of university membership was increased by presenting those same faces grouped according to university (own- and other-), the ORB disappeared and an OGB based on university affiliation emerged. Thus, it is unclear why increasing the social salience of the own-group category did not produce (or at least moderate) an OGB in Study 1; however, these findings are consistent with those of Kloth al. (2014) who were unable to replicate Hehman et al.'s findings.

At first glance, this finding presents a challenge to social cognitive models of OGBs that suggest the "mere categorisation" of a face according to one's group membership should be sufficient to elicit a recognition difference between in- and out-group faces. For example, central to the Categorization-Individuation Model (Hugenberg et al., 2013) is the notion that the primary cause of OGBs (in the absence of perceptual expertise variance for the viewed faces) is the perceiver's differential attentional focus for own- and other-group faces. Specifically, the detection of an in-group membership cue should result in attention to the individuating information for own-group faces. Conversely, the presence of a suitably salient out-group cue (whether native to the face or external) should cause faces to be processed at a more categorical level (e.g., in terms of the out-group to which they belong) at the expense of more individuating information (Bodenhausen et al., 2003). However, at the heart of this theory is the assumption that the *motivation* to individuate in-group members must be present.

While Hugenberg et al. (2013) do not elucidate what the motivational mechanisms underlying OGBs may be, it seems likely that these motivations will vary from context-to-context and individual-to-individual (Hogg & Turner, 1987) which may help to explain these inconsistent findings. Thus, it may be that the participants in our first study simply did not define themselves according to university membership, on account of them being part-time, distance-learning students. However, this seems an unlikely explanation, given that in Study 2, both groups of participants (one comprising distance-learners, and the other made up of students from a more traditional campus university) rated group membership as relatively important to them. Furthermore, while previous research has found that the degree to which individuals identify with their in-group is related to the strength of the OGB (Van Bavel & Cunningham, 2012), we failed to find support for that in Study 2. For example, despite the finding that participants rated university membership as important, this was not enough to moderate face recognition for in- and out-group faces; thus, group membership saliency alone does not seem to be sufficient to bring about an OGB. Indeed, the findings from Studies 1 and 2 are difficult to reconcile with previous research demonstrating that minimal-group membership according to arbitrary dimensions is sufficient to elicit OGBs in face recognition (e.g., Bernstein et al., 2007; Shriver et al., 2008).

One factor underlying these incongruent findings may be the nature of the face stimuli that were used. Our research used different facial photographs at study and test. However, previous studies that found an own-group recognition advantage for existing social in-groups tended to use the same images at presentation and test (e.g., the studies of university affiliation; Bernstein et al., 2007; Hehman et al., 2010; Ng et al., 2016; Shriver et al., 2008;

Yan et al., 2017), sexual orientation (Rule et al., 2007), and religious beliefs (Rule et al., 2010)). Thus, while previous studies may be more reflective of mechanisms underlying picture recognition, this study is likely to better represent real-world face recognition processes.

An alternative explanation may lie in the nature of the relationship between the in- and out-group members. For example, work in this area has often used U.S.-based universities that have constructed their group membership manipulations along historic, sports-related rivalries (Bernstein et al., 2007; Hehman et al., 2010; Shriver et al., 2008). Therefore, the juxtaposition of these opposing groups may give rise to particularly salient group membership cues, and (in particular) perhaps it is the nature of the opposing or rivalrous groups that drives the OGB. For example, research demonstrates that rivalry (or significant opposition) is a powerful phenomenon with significant behavioural, attitudinal, and emotional consequences (Kilduff et al., 2010), eliciting greater in-group favouritism and out-group discrimination (Abbink & Harris, 2019). The United Kingdom does not have the same culture of university sports, and competitive university rivalries, so natural university rivalries do not exist in the same way (although future research may want to investigate whether OGBs can be elicited using Cambridge and Oxford as the grouping categories, given their longstanding traditions of sporting rivalry). It may therefore be that the out-group categories used in Studies 1 and 2 were not suitably opposed (or rivalrous) and were therefore unlikely to elicit differential motivation in participants to attend to one group over another.

Study 3 supports the notion that polar opposition of groupings (or perceived rivalry) may be necessary to bring about an OGB. In this case, an OGB was found for Remain supporters. While no OGB was found for Leave voters, this is not necessarily problematic for a social–cognitive explanation of OGBs. If the saliency of group membership moderates OGBs by affecting the differential motivation one has to individuate in- and out-group members, then this asymmetrical pattern of recognition is not surprising given the context of our participants' attitudes toward the Referendum outcome. It is clear from Table 5 that Remain supporters felt more strongly about the result of the vote than those who supported Leave; and while almost all Remain voters reported being unhappy with the outcome, Leave supporters indicated much more heterogeneity in their attitudes. Thus, the degree to which participants identified as members of the two groups is significantly different; as is their opinion of the opposing group. Furthermore, the significant correlation between OGB magnitude and attitude toward the Referendum outcome mirrors the work of Van Bavel and Cunningham (2012) who found that increased in-group identification was predictive of OGBs. Again, this supports the idea that polar opposition of groups may enhance in-group membership cues and give rise to OGBs.

The absence of an OGB in Leave supporters may also be explained in the context of post-Referendum Britain, where Leave voters were subjected to a public cultural backlash and were actively shamed and denigrated on both social and mainstream media. Many Leave supporters were forced to hide their political allegiance for fear of social repercussions (Sanghani, 2016). Thus, group membership is not only more complex for this group but the perceived threat from (and therefore salience of) Remain supporters may have led them to use a more liberal classification of faces as belonging to an "out-group," which would in turn drive up FAR and HRs for these faces. Again, this speaks to the importance of social and contextual motivations in the production of OGBs.

Conclusion

The current studies provide mixed support for social–cognitive explanations of OGBs. Specifically, little evidence was found to support a "mere categorisation" OGB effect, and results suggest that group membership saliency alone is unlikely to be enough to elicit an OGB. Instead, the *opposing* nature of the relationship between the in- and out-groups may be of particular importance. Our findings suggest that OGBs may be socially elicited in situations where in- and out-groups are opposed enough to engender group alignment and encourage individuation of in-group members. It is unclear what dimensions are likely to give rise to meaningful and rivalrous in-/out-group categorisations, but they are likely to be socially determined and culturally specific, and polarising groupings may be particularly salient. Contextual factors may also play a role in shaping OGBs by influencing the extent to which we wish to engage with in- and out-group members, and how liberally or conservatively we subsequently categorise them. Future studies should seek to elucidate what the contextual and motivational mechanisms that drive OGBs are likely to be.

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ORCID iD

V. Harrison https://orcid.org/0000-0001-7668-4574

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