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LAST BUT NOT LEAST

The role of skin colour in face recognition

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Abstract. People have better memory for faces from their own racial group than for faces from other races. It has been suggested that this own-race recognition advantage depends on an initial categorisation of faces into own and other race based on racial markers, resulting in poorer encoding of individual variations in other-race faces. Here, we used a study – test recognition task with stimuli in which the skin colour of African and Caucasian faces was manipulated to produce four categories representing the cross-section between skin colour and facial features. We show that, despite the notion that skin colour plays a major role in categorising faces into own and other-race faces, its effect on face recognition is minor relative to differences across races in facial features.

People are better at recognising faces from their own racial group than faces from other racial groups (for reviews, see Meissner and Brigham 2001; Sporer 2001). It has been suggested that this other-race effect (ORE) depends on an initial categorisation of faces into own and other race based on racial markers, resulting in poorer encoding of individual variations in other-race faces (Bernstein et al 2007; Levin 2000; MacLin and Malpass 2001, 2003; Shutts and Kinzler 2007; but see Caldara et al 2004) and on greater expertise in processing own-race typical facial features (Malpass and Kravitz 1969).

In 1758 Carolus Linnaeus proposed that the human species was made of subcategories, and suggested skin colour (red, yellow, black, and white) as a primary racial marker. Even today, when such claims come under vigorous scientific and social criticism, the tendency to use skin colour to categorise faces into different races seems almost automatic and unavoidable. Research to date has not explored the relative contribution of skin colour to the ORE. Here we test this by systematically manipulating skin colour, while leaving facial features unchanged.

Specifically, we manipulated the skin colour in pictures of African and Caucasian faces creating four categories representing the cross-section between skin colour and facial features (figure 1a). We then used a face-recognition task to explore the relative roles of skin colour and facial features in own-race recognition advantage. If the ORE depends on skin colour alone, a recognition advantage for own-race skin tone, regardless of facial features, should emerge. In contrast, if the ORE depends on facial features alone, a recognition advantage for own-race features, regardless of skin colour should emerge. Finally, skin colour and facial features may interact to produce the ORE.

Forty-eight Caucasian undergraduate students (mean age 24.5 years, SD = 3.4 years, eighteen males) completed the face-recognition task. During the study phase of the task, 16 faces were presented in a random order. Participants were instructed to memorise the faces for a later discrimination task. Trials in the study phase commenced with a fixation cross (1000 ms) followed by a face (1000 ms). The next trial started 2000 ms after the disappearance of the face. The test phase immediately followed, with the 16 old faces and 16 new faces presented in a random order.

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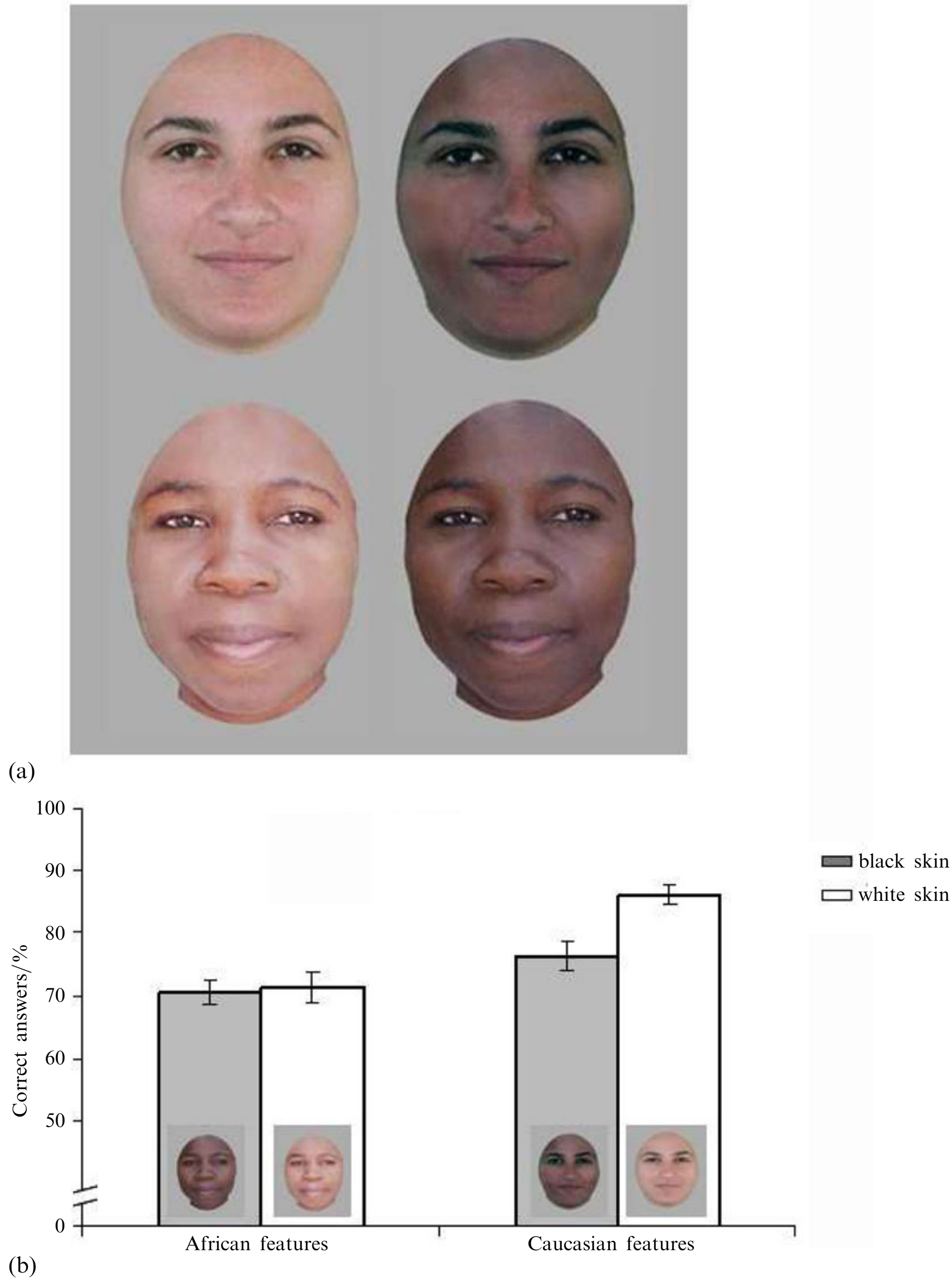

Figure 1. [In colour online, see http://dx.doi.org/10.1068/p6307] (a) Examples of the four face categories employed in the study; (b) mean percentage correct and standard error bars for the four face categories.

Test-phase trials begun with a fixation cross (500 ms) followed by a face (1000 ms). Participants pressed one key for an old face and another key for a new face. The key-press initiated the next trial.

The stimuli consisted of 64 chromatic pictures: 16 original African faces (African features/black skin), 16 original Caucasian faces (Caucasian features/white skin), 16 whitened African faces (African features/white skin), and 16 blackened Caucasian faces (Caucasian features/black skin). The original pictures were taken from the NimStim face stimulus set (Tottenham et al, in press) and the Tel-Aviv University face database (Frenkel and Bar-Haim 2006). Half of the faces within each category were female. All faces were cropped to remove external features. Skin-colour conversions were achieved through extraction of red – green – blue (RGB) values from 16 coordinates on each face within a face pair to be converted and matched. Specifically, we sampled four pixels on the forehead (two per side), two pixels below each eye, two pixels on each cheek, two pixels on the left and right sides of the chin, one between the eyes, and one on the nose. These RGB values from each coordinate were superimposed on the matched other-race face at the same coordinates. Then, filtering and colour-curve-adjustment tools were applied to achieve the skin colour conversion effect throughout the rest of the colour-converted face. These procedures were carried out with Adobe Photoshop CS2 software.

Each participant was tested with one of four versions of the task. The four versions were created to make sure that each face was presented only once in a given version (either with black or white skin), and that each face was presented once in a study session and once in a test session across the different versions. Each version included 32 faces, 8 of each of the four face categories described above. 16 faces (4 of each category) were assigned to the study phase (old) and 16 (4 of each category) to the test phase (new). A given face was presented either as 'old' or as 'new' in each version. The faces were assigned to the study and test phases on the basis of distinctiveness ratings (see Lee et al 2000 for a similar procedure) collected in a preliminary study. Average distinctiveness did not differ across the four categories for 'old' and 'new' faces ($p > 0.48$).

Proportion-correct responses were computed for each of the four face categories (figure 1b). An ANOVA with skin colour (black, white) and features (African, Caucasian) as repeated factors revealed better performance for white than black skin faces ($F_{1,47} = 11.43$, $p < 0.001$) and for Caucasian than African features ($F_{1,47} = 48.90$, $p < 0.001$). These effects were subsumed under a significant skin colour by features interaction ($F_{1,47} = 5.23$, $p < 0.05$).

Follow-up contrasts revealed that our Caucasian participants remembered Caucasian faces with white skin colour (86.2%) better than Caucasian faces with black skin colour (76.3%) ($t_{47} = 4.32$, $p < 0.0001$, $d' = 1.26$). No such difference appeared between African faces with black (70.5%) or white (71.3%) skin colours ($t_{47} = 0.28$, $p = 0.78$, $d' = 0.08$). Remarkably, recognition was better for faces with Caucasian features and black skin colour than for faces with African features with either black or white skin colour ($ts_{47} = 2.22$ and 2.43, ps < 0.05, d's $= 0.65$ and 0.71, respectively).

These findings suggest that even a salient racial marker such as skin colour plays only a secondary role to facial features in the ORE. First, recognition of other-race features was low for both types of skin colour. Second, the recognition of own-race features combined with other-race skin colour was better than the recognition of both types of other-race features. Although skin colour as a racial marker reduced recognition of own-race features to some extent (see also MacLin and Malpass 2001), it did not augment recognition of other-race features. Thus, despite the notion that skin colour plays a major role in categorising faces into own and other-race faces, its effect on face recognition is minor relative to differences across races in facial features. In fact, other-race facial features appear to serve as a primary racial marker that reduces face recognition. And, only once a face is categorised as belonging to ones own race on the basis of its features, colour becomes an additional component that modulates recognition.

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