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Cross-race correlations in the abilities to match unfamiliar faces

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ABSTRACT

The other-race effect in face identification has been documented widely in memory tasks, but it persists also in identity-matching tasks, in which memory contributions are minimized. Whereas this points to a perceptual locus for this effect, it remains unresolved whether matching performance with same- and other-race faces is driven by shared cognitive mechanisms. To examine this question, this study compared Arab and Caucasian observers' ability to match faces of their own race with their ability to match faces of another race using one-to-one (Experiment 1) and one-to-many (Experiment 2) identification tasks. Across both experiments, Arab and Caucasian observers demonstrated reliable other-race effects at a group level. At an individual level, substantial variation in accuracy was found, but performance with same-race and other-race faces correlated consistently and strongly. This indicates that the abilities to match same- and other-race faces share a common cognitive mechanism.

1. Introduction

The other-race effect (ORE) refers to a phenomenon wherein faces of an observer's own race tend to be recognized more accurately than faces of another race. This effect has been reported consistently in the face recognition and eyewitness identification literature (see, e.g., Malpass & Kravitz, 1969; Marcon, Meissner, Frueh, Susa, & MacLin, 2010), and has been replicated widely with different ethnic groups (e.g., Bothwell, Brigham, & Malpass, 1989; Chiroro & Valentine, 1995; Walker & Tanaka, 2003), pointing to a remarkably robust phenomenon. While the effect has been demonstrated typically with recognition memory tasks, which require the identification of newly learned faces after an interval, it is also observed with tasks in which memory factors are minimized (Megreya & Bindemann, 2009; Megreya, White, & Burton, 2011). Such matching tasks point to a perceptual locus for the ORE, at face encoding. These tasks are also characterized by broad individual differences between observers. However, limited data is still available with regard to the consistency of these individual differences in the processing of same- and other-race faces. Consequently, the question arises of whether individual differences in the identity matching of same-race and other-race faces reflect shared or dissociable mechanisms. In this study, we therefore report two experiments to explore the correlation of individual performance across these tasks.

Face-matching tasks are now used widely in psychology (for a recent review, see Fysh & Bindemann, 2017b). In these tasks, observers typically have to compare the identities of pairs of simultaneously-presented unfamiliar faces (see, e.g., Bindemann, Avetisyan, & Blackwell, 2010; Burton, White, & McNeill, 2010; White, Kemp, Jenkins, & Burton, 2014), or compare a single target to a concurrent array of identities (Bruce et al., 1999; Megreya & Burton, 2006b, 2008). These matching tasks reveal that identification of unfamiliar faces is surprisingly difficult. For example, under highly optimized conditions, in which observers compare high-quality pairs of photographs that depict people on the same day, under similar lighting, and with neutral facial expressions, 10–20% errors are typically found (Burton et al., 2010; Megreya & Burton, 2008). Accuracy is lower still when one-to-many face comparisons are required (Megreya & Burton, 2006b; Megreya, Sandford, & Burton, 2013), and when viewing conditions are further compromised by, for example, added variation in a person's appearance (Fletcher, Butavicius, & Lee, 2008; Jenkins, White, Van Montfort, & Burton, 2011; Megreya et al., 2013; White, Kemp, Jenkins, Matheson, & Burton, 2014), reduced image-quality (Bindemann, Attard, Leach, & Johnston, 2013; Burton, Wilson, Cowan, & Bruce, 1999), or time pressure (Bindemann, Fysh, Cross, & Watts, 2016; Fysh & Bindemann, 2017a; Lee, Vast, & Butavicius, 2006).

Whereas face-matching has been studied widely with Caucasian (e.g., Burton et al., 2010; Megreya & Burton, 2006a, 2006b; White, Burton, Jenkins, & Kemp, 2014) and Arab faces (e.g., Megreya et al., 2013; Megreya & Bindemann, 2015; Megreya & Burton, 2008), only a few studies have compared the performance of Caucasian and Arab

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observers for these different face categories. Using same- and other-race face-matching tasks with Arab and Caucasian observers, Megreya and Bindemann (2009) revealed consistent OREs, but these effects were expressed differently in both groups of observers. Specifically, Arab observers displayed a processing advantage for the internal features of faces (i.e., the region encompassing the eyes, nose and mouth), whereas Caucasian observers relied more on external features comprising the hair and face outline. In addition, these groups of observers also exhibited different response biases during face matching. Namely, Caucasian observers were biased to classify pairs of other-race faces as depicting one person, independent of whether these depicted the same person or two different people, whereas Arab observers were generally less accurate in classifying other-race faces. This finding converges with later research with one-to-many face-matching tasks, in which Caucasians were more prone to make false positive identifications for other-race faces, whereas Arab observers were more likely to decide that a target was not present in a concurrent identity array (Megreya et al., 2011).

The differences in the expression of the ORE, both in terms of the face features that are prioritized in matching decisions (i.e., internal versus external, see Megreya & Bindemann, 2009), and the measures in which this effect is expressed (Megreya et al., 2011), suggest that different attributes might be required to match same- and other-race faces. In turn, this raises the question of whether observers who are good at matching faces of their own race are also good at processing faces of another race. It is now well established that substantial individual differences exist among observers performing pairwise (e.g., Bindemann, Avetisyan, & Rakow, 2012; Burton et al., 2010) and one-to-many face-identity comparisons (e.g., Bindemann, Brown, Koyas, & Russ, 2012; Bobak, Hancock, & Bate, 2016; Bruce et al., 1999; Megreya & Bindemann, 2013; Megreya & Burton, 2006b). In pairwise face-matching, for example, these individual differences are such that accuracy ranges from close-to-chance to perfect across participants (see, e.g., Bindemann, Avetisyan, et al., 2012; Burton et al., 2010). With regard to the ORE, these individual differences are interesting theoretically, as these may shed further light on the cognitive mechanisms governing face processing.

This question is also important practically, as broad individual differences are found in trained professionals who perform face-matching daily in occupational environments, such as security officers at passport control (White, Kemp, Jenkins, Matheson, et al., 2014; Wirth & Carbon, 2017). Passport officers encounter people from many different races in these real-life face-matching settings. However, as little is still known about how individual differences in a person's face matching ability transcend across races, it is unresolved whether person identification at passport control is compromised by the ORE. An important step for investigating this problem further is to understand the relationship between same- and other-race face-matching accuracy in individual observers.

To investigate this question, the current study compared the matching of same- and other-race faces in Arab and Caucasian observers using pairwise (Experiment 1) and one-to-many (Experiment 2) identity face-matching tasks. Consistent with previous research, we expected to find a clear ORE for both groups of observers in these experiments. The question of main interest was whether performance with same- and other-race faces would also correlate across individuals.

2. Experiment 1

In this experiment, the ORE was assessed in a pairwise face-matching task, in which Arab and Caucasian observers were shown two side-by-side images of unfamiliar faces. To assess the OREs, these pairs consisted either of Arab or Caucasian faces, and depicted either the same person (an identity match) or two different people (an identity mismatch). The aim of this experiment was to assess whether individuals' matching performance correlated for same- and other-race faces, thus pointing at shared underlying processing mechanisms, or whether it was strictly dissociable.

2.1. Method

2.1.1. Participants

A total of 74 participants volunteered to take part in this study. These comprised 40 Caucasian participants (30 female) from the University of Kent with a mean age of 19.7 years (SD = 1.7), and 34 Arab observers (24 female) from Menoufia University in Egypt, with a mean of 21.6 years (SD = 4.9). Participants received course credit or a small payment for taking part in the study. None of these participants had spent over 3 months in a country with a majority population dissimilar from their own race. All participants reported normal or corrected-to-normal vision.

2.1.2. Stimuli

The stimuli consisted of 200 face pairs. Of these, 100 were Caucasian face pairs taken from the Glasgow University Face Database (GUFD; see Burton et al., 2010), and 100 were Arab face pairs from an Arab database (see Megreya & Burton, 2008). Half of each of the Caucasian and Arab face pairs depicted the same person in both the images (identity matches), and half of them depicted two different people (identity mismatches). All faces were male, as suitable comparison faces of Arab women were unavailable due to the headscarf culture. In addition, all faces were presented in greyscale on a white background, with a neutral expression, and in full-face frontal view (see Fig. 1). Images of the same person were only taken a few minutes apart, but with different cameras to ensure these images did not match in their pictorial aspects (see Burton, 2013). Each face image measured maximally 350 pixels in width at a resolution of 72 ppi.

Note that the Caucasian identity mismatches were created in a previous study with a sorting technique, which was applied to generate pairwise similarity measures (see Burton et al., 2010). The face identities that were rated most similar were then paired together. For the mismatch pairs from that stimulus set that were employed in the

Fig. 1. Examples of Arab (left) and Caucasian (right) face pairs from the matching task in Experiment 1, depicting an identity match and a mismatch.