Facial-based ethnic recognition: insights from two closely related but ethnically distinct groups

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Previous studies on facial recognition have considered widely separated populations, both geographically and culturally, making it hard to disentangle effects of familiarity with an ability to identify ethnic groups *per se*. We used data from a highly intermixed population of African peoples from South Africa to test whether individuals from nine different ethnic groups could correctly differentiate between facial images of two of these, the Tswana and Pedi. Individuals could not assign ethnicity better than expected by chance, and there was no significant difference between genders in accuracy of assignment. Interestingly, we observed a trend that individuals of mixed ethnic origin were better at assigning ethnicity to Pedi and Tswanas, than individuals from less mixed backgrounds. This result supports the hypothesis that ethnic recognition is based on the visual expertise gained with exposure to different ethnic groups.

Key words: faces, ethnicity, facial recognition, exposure, cross-cultural studies

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Introduction

The human face reveals an enormous wealth of information, most importantly on identity, age, gender and ethnicity,[1] and plays an important role in mate preferences.[2]

Cross-cultural studies, for example, have shown that people generally agree on attractiveness ratings across different ethnic groups.[3–5] However, evidence also suggests that we perceive our own ethnic group differently from other ethnic groups. First, people can recognise individuals belonging to different races and ethnic groups[6] (where ethnic group refers to distinct populations within a particular racial grouping, e.g. comparing

Germans to Britons within the Caucasian grouping). Secondly, faces from the same race as the observer illicit more brain activity in regions linked to face recognition.[7] Lastly, recognition of one's own ethnic group is better than that for other ethnic groups.[8,9] One plausible explanation for superior recognition of same race and same ethnic group faces is exposure. Most people, especially young people, have more exposure to their own ethnic group.[10] This variation in exposure can contribute to the development of visual expertise for same group faces.[7] If individuals are exposed more frequently to different ethnic groups, one might expect their visual expertise to include other ethnic groups as well. Two recent studies showed that individuals from minority ethnic groups are better at recognising other ethnic groups in their area than individuals from majority ethnic groups.[7,11] Thus, despite agreement on attractiveness across races,[3–5] there may remain a significant element of ethnic recognition, and potential preference, within particular racial categories that potentially may influence mate preferences and subsequent mate choice.

To date, however, studies comparing differences within ethnic groups have focused on groups that show a significant separation of culture and geography (North America, Germany and the Czech Republic[6]). This means one cannot discount an influence of environmental and/or sociocultural factors on facial morphology and/or greater familiarity with faces of one's own ethnicity compared to other groups. In order to resolve these issues, we tested whether recognition is also possible in a population where there is a large overlap of both culture and geography between the different ethnic groups. Specifically, we tested for ethnic recognition within the African population of South Africa.

According to ethnological, linguistic and genetic data,[12–14] the South African Bantu-speaking people can be divided into two major groups: the Nguni and the Sotho group. Autosomal and Y-chromosome data group the Xhosa, Zulu, Swazi and Ndebele into the Nguni group, while the Tswana, Pedi and Sotho form part of the Sotho group. The Venda and Tsonga groups were separate.[14] These groupings are also observed in the linguistic data, except for the Tsonga, which group with the Nguni.[13] Despite this clear separation of ethnic groups, there is, however, a high degree of intermixing both between and within major groups, especially in urban areas.[15]

In this study we focused specifically on the Pedi and Tswana to determine whether individuals from the same and other groups could assign ethnicity based on facial features alone. These groups have a similar cultural background as members of the Sotho major group and they also show a very minor geographic separation: the hub of the Tswana and Pedi populations are located in the neighbouring North West and Northern Provinces of South Africa, respectively.[13,14] Despite their close association, there are genetic differences between the two groups.[16] We also assessed whether the sex or ethnic grouping of the observer affected their ability to correctly assign ethnicity. Lastly, we assessed levels of ethnic intermixing in our own sample to confirm that we were drawing subjects from a population in which individuals of different ethnicities had significant experience of each other.

Materials and methods

Full-colour facial photographs were taken of 39 individuals (14 male, 25 female, aged 18–26) belonging to the Pedi or Tswana groups. Their ethnicity and that of both parents was self-reported. Photographs were taken with a Sony Cybershot DSC P72 (default settings with 3.1 megapixels fine, soft light flash and –1.0 EV) under standard lighting conditions. Participants were asked to maintain a neutral expression. Slight lateral tilting of individual faces was corrected by rotation around the facial midline using vertical guidelines and cropped 5 cm from each side to standardise size using Corel PHOTO-PAINT v.10. Next, faces were masked to eliminate confounding factors using Corel Knockout v. 1.5 (Fig. 1). All volunteers were students at the University of Pretoria and signed a subject information and consent form briefly explaining the study. Ethical clearance for the study was obtained from the University of Pretoria (EC 030606-018).

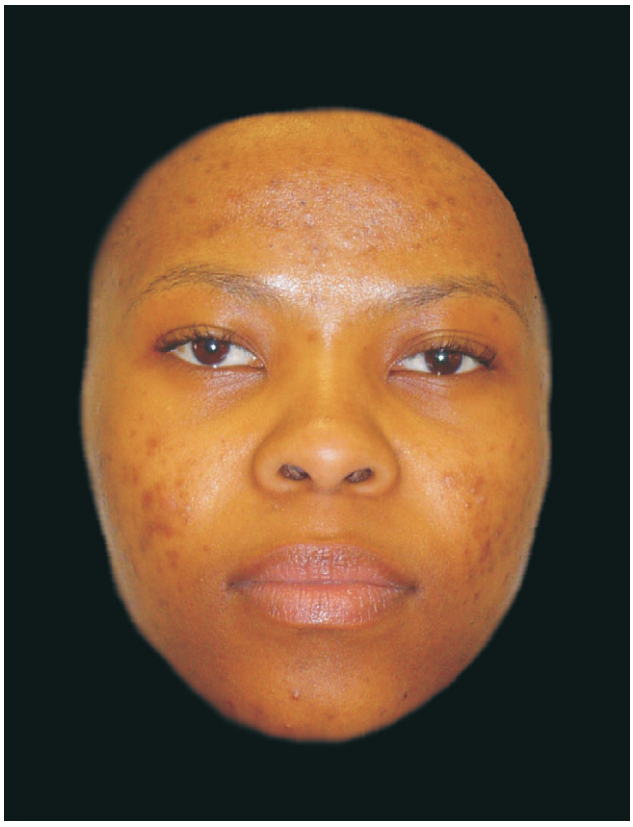

Fig. 1. The individual photographs that were used in the assessment were rotated around the facial midline, cropped and masked to eliminate confounding factors.

Thirty individuals (11 Pedi females, 8 Tswana females, 6 Pedi males, 5 Tswana males), for which both parents belonged to the same ethnic group, were used to compile 40 full-colour presentations; each presentation contained two randomly selected male photographs (1 Pedi male, 1 Tswana male) and two randomly selected female photographs (1 Pedi female, 1 Tswana female). These presentations were then displayed to 100 individuals (50 male, 50 female) of known ethnic origin. Each subject was asked to assign ethnicity to each of the images in the presentations as a forced choice between Tswana and Pedi. Thirteen participants (10 male, 3 female) were excluded from the study as both their parents were not originally from South Africa and one female participant was excluded for falling outside the age range of 18–26 years. To test whether Tswana and Pedi individuals can be correctly identified we compared the proportions of correctly rated images to the proportions expected under the binomial distribution, with a probability parameter of 0.5. Data were analysed using a binomial test in SPSS version 13.0 (Chicago, IL) and each gender was tested separately. To determine whether rater gender or rater ethnicity affected the ability to assign ethnicity, we performed a general linear model (GLM), with rater gender and rater ethnicity as 'between subject' factors. Raters were divided into four main groups: (a) both parents belonging to the Sotho major group (Sotho major), (b) both

parents belonging to the Nguni major group (Nguni major), (c) one parent belonging to the Sotho major and one parent belonging to the Nguni major group (mixed major) and (d) one or both parents belonging to the Venda or Tsonga ethnic groups (Venda/ Tsonga group).

Results

Our rater population was ethnically mixed, with 43% of the 86 raters in the study being of mixed ethnic origin (i.e. having parents belonging to two different ethnic groups). Within this mixed origin group, 19% had one parent belonging to the Nguni and one parent belonging to the Sotho major groups, while 71% had both parents belonging to the same major group but different ethnic groups within those major groups. The remaining 10% had one parent that belonged to either the Venda or Tsonga group. Overall, ethnic groupings were fluid and many individuals were exposed to different ethnic groups within, as well as between, families.

Our results revealed no significant deviation from the expected 50% for the correct assignment of Tswana and Pedi individuals. Both male (observed proportion = 0.49, $P > 0.05$, $n = 87$) and female images (observed proportion = 0.59, $P > 0.05$, $n = 87$) could not be recognised better than expected by chance alone. Rater ethnicity significantly affected the proportion of correct assignments ($P = 0.042$, $F_{3,81} = 2.881$), while rater gender did not ($P > 0.05$). Pairwise comparisons revealed that individuals from the mixed major group were significantly better at assigning ethnicity compared to the Sotho major ($P = 0.010$), Nguni major ($P = 0.009$) and Venda/Tsonga groups ($P = 0.013$). These differences were no longer significant after Bonferroni corrections, but mixed major individuals still showed a tendency to assign ethnicity better than Sotho major ($P = 0.063$), Nguni major ($P = 0.056$) and Venda/Tsonga groups ($P = 0.075$).

Discussion

A high degree of intermixing between the different ethnic groups was observed (43%) in our sample, which is likely due to drawing our subjects from an urban area. Our study population therefore had high-level exposure to individuals of different ethnicity, especially those individuals whose parents belong to different major ethnic groups.

Our results show that individuals from our study population cannot differentiate between facial features of Tswana and Pedi individuals. To our knowledge, this is the first study to test ethnic recognition in two such closely related ethnic groups, with similar environmental and sociocultural histories. We also show no difference in the ability of males and females to differentiate between Tswana and Pedi images. This suggests that perceptual or morphological differences are negligible between the genders, and it is therefore unlikely that there has been selection for one gender to be better at recognising or displaying ethnicity than the other.

Although previous studies have shown that individuals are better at recognising their own ethnic group,[7] we found that Sotho major group individuals were comparatively poor at recognising own group faces. However, individuals whose parents belonged to different major ethnic groups were better at recognising Tswana or Pedi images. This discrepancy can most probably be attributed to exposure to variation for individuals of mixed origin, who are likely to have been exposed to a greater variety of ethnic groups within their family environment.

In conclusion, our study shows that African peoples from South Africa cannot reliably differentiate between Tswana and Pedi individuals, based on facial features alone. We cannot exclude the possibility that ethnic recognition is possible based on whole body features, but our results suggest that Tswana and Pedi individuals could be used interchangeably in facial preference studies. We also show that more ethnically mixed individuals are better at recognising Tswana and Pedi faces. This is presumably because of their heightened exposure to a variety of different ethnic groups, but more research is needed to unravel the correlation between exposure and ethnic intermixing.

We thank Ronnie Nelson and Christoff Erasmus for their invaluable assistance with data collection. V.C. was supported by a National Research Foundation (South Africa) studentship, under Grant number 2053809 to J.M.G., and L.B. was supported by a Leverhulme Trust Research Fellowship during the writing of this paper. Any opinions, findings, conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Research Foundation.

Received 6 May 2008. Accepted 21 October 2009.

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