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## Influence of cross-ethnic social experience on face recognition accuracy and the visual perceptual strategies involved



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### ABSTRACT

The cross-ethnic effect (in the literature, usually termed the cross-race effect) is defined as the greater difficulty in recognizing faces of other ethnicities compared with faces of one's own. The aims of the present research were: 1) to test the hypothesis that the cross-ethnic effect is due to lack of contact with the other ethnicity. 2) to study possible differences in the perceptual mechanisms employed in face recognition as a function of the contact degree between ethnicities, which may be the basis of the cross-ethnic effect. We compared two ethnic groups with a high degree of contact, but different identities and cultural values: Andalusian Gypsies and Andalusian Caucasians. Both groups had to recognize a set of East Asian, Caucasian, and Gypsy faces while eye movements were monitored. In accordance with the contact hypothesis, our results revealed no differences between Gypsies and Caucasians observers in face recognition success. However, East Asian faces were more poorly recognized than Gypsies and Caucasian faces by both observer groups. With respect to the perceptual strategies, despite achieving similar face recognition performance, Caucasian and Gypsy observers employed different visual exploration strategies. Gypsies focused their attention on the eyes, while Caucasians fixated more on the nose than Gypsies. Our results support the contact hypothesis as an explanation for the cross-ethnic effect, and show how cultural factors imply differences in perceptual strategies even between close ethnic groups.

### Introduction

People are better at identifying faces of their own ethnicity than those of other ethnicities. This phenomenon is known as the cross-race effect and has been widely studied and replicated in recent decades (MacLin & Malpass, 2003; Meissner & Brigham, 2001; Sporer, 2001). The cross-race effect has usually been conceptualized using the term race; however, we prefer to use the term ethnic, given that race in humans refers to a biological construct created from prevailing social perceptions without scientific evidence from biology, genetics, or physical anthropology (Anderson & Nickerson, 2005; Sternberg, Grigorenko, & Kidd, 2005; Witzig, 1996). The present research aims to study how the degree of contact with other ethnicities modulates the cross-race effect (henceforth cross-ethnic effect) in face recognition and the visual perceptual mechanisms involved in this process.

Several social and cognitive hypotheses have been proposed to account for the cross-ethnic effect, with social attitudes, physiognomic variability between ethnicities, and inter-ethnic contact being the most prominent explanations (Meissner & Brigham, 2001; Ng & Lindsay, 1994). Although there is no total consensus across studies, hypotheses based on inter-ethnic contact have received greater support (Goldinger, He, & Papesh, 2009). The contact hypothesis predicts that the recognition accuracy of other

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ethnicity members is directly related to the quantity and quality of contact with people of that ethnic group (Goldstein & Chance, 1985; Vrij & Winkel, 1989). This approach is empirically supported by the findings of Meissner and Brigham's (2001) meta-analysis, where authors across 29 independent studies found that inter-ethnic contact plays a significant mediating role in the cross-ethnic effect. For example, studies in ecological contexts have shown that people living in integrated neighbourhoods are better able to discriminate other ethnic faces than those living in segregated neighbourhoods (Feinman & Entwisle, 1976).

The effect of inter-ethnic contact level on face recognition could be explained by perceptual learning mechanisms (Goldinger et al., 2009). Gibson (1969) defined perceptual learning as “an increase in the ability to extract information from the environment, as a result of practice and experience with the stimulation coming from it”. According to this theory, and given the existence of physiognomic differences between ethnic groups (Kelly et al., 2005), an increase in the degree of exposure to members of other ethnicities should improve the ability to discriminate between the characteristic facial features of those ethnicities. Thus, a higher degree of contact with the other ethnicity would teach people which perceptual strategies they should use to properly process the faces of that ethnic group.

Previous literature has shown that perceptual mechanisms and visual attention patterns employed during face recognition differ as a function of the ethnicity of the observer (Blais, Jack, Scheepers, Fiset, & Caldara, 2008; Hills & Pake, 2013). Visual attention in face processing tends to be restricted to internal facial features, with a systematic visual scan pattern over the eyes, nose, and mouth (e.g., Althoff & Cohen, 1999; Groner, Walder, & Groner, 1984). It has been estimated that approximately 90% of fixation time is spent on these face regions (Henderson, Falk, Minut, Dyer, & Mahadevan, 2001). However, ethnicity, cultural background, and social experience lead to a different weighting of each one of these regions. For example, Blais et al. (2008) showed that Eastern cultures (e.g. East Asians) use more holistic perceptual strategies, with more fixations directed toward the nose (the central region of the face), whilst people of Western Caucasian cultures focus more on the eye region, performing scan paths that involve more analytic strategies (see Miyamoto, Nisbett, & Masuda, 2006, for a study of holistic and analytic perceptual differences between cultures). Similar results have been obtained by Caldara, Zhou, and Miellet (2010), Goldinger et al. (2009) and Hills and Pake (2013), showing that observers from different ethnicities looked at different facial features when they tried to recognize the same faces. Given these differences in the visual scan path and the particular physiognomy of each ethnicity, deficits in cross-ethnic recognition may be due to observers not attending to the most diagnostic facial features of other ethnicities (Hills & Pake, 2013). For instance, an individual may have learnt to use a specific perceptual strategy to recognise faces because this strategy fits well with the physiognomic features of their ethnicity and it is part of their cultural background and social experience. However, this strategy will be problematic for recognising faces from other unfamiliar ethnicities with different physiognomic features, which would lead to poorer performance, and could thus explain the cross-ethnic effect. On the other hand, according to the contact hypothesis, a greater degree of contact with other ethnicities would help adapt the visual exploration strategies to the physiognomy of each ethnicity and thus improve facial recognition accuracy.

The aim of this research was to advance our understanding of the perceptual mechanisms underlying the contact hypothesis and their implications for the cross-ethnic effect. We focused on two ethnic groups: Andalusian Caucasians and Andalusian Gypsies. These groups have a high degree of contact, but they differ considerably in terms of their identity and cultural values. Caucasians and Gypsies (Romanies) in Andalusia have shared the same geographical area since the XV century. Approximately 300,000 Gypsies live in this region of Spain, and in Granada – the city where this study was conducted – the Gypsy community is particularly well integrated. There are two historic heritage neighborhoods (Albaicín and Sacromonte) with a large Gypsy population where Andalusian Gypsies and Caucasians co-exist and live in harmony with tourists from many different countries. However, in spite of this co-existence, in many aspects the Gypsy identity remains significantly different from other Andalusians. Gypsies have assimilated a set of cultural factors, traditions, affiliation, and common history that has defined them as a distinct ethnic group for many centuries.

To achieve our objective, an Andalusian Gypsy group and an Andalusian Caucasian group performed a standard face recognition task adapted to the study of the cross-ethnic effect (Ng & Lindsay, 1994; Vizioli, Foreman, Rousselet, & Caldara, 2010). In this task, Andalusian Gypsies and Caucasian participants had to view a set of faces from an unfamiliar ethnicity (East Asian faces) and from their own ethnicities (Caucasian and Gypsy faces) under instructions to memorize them for a later recognition test. While the participants were viewing the faces, eye movements were continuously monitored by Eyelink II eye tracking system. Eye movements are a good index of visual attention allocation and play an important functional role in face processing (Henderson, Williams, & Falk, 2005). For example, longer fixation times on specific facial features help to encode, retain, and better retrieve these features, ensuring greater recognition accuracy (Goldinger et al., 2009). In accord with previous studies in the literature (Althoff & Cohen, 1999; Blais et al., 2008), we evaluated the number and duration of fixations on the three face regions that are critical for face processing (eyes, nose, and mouth).

We had two main objectives: 1) to test the hypothesis that the cross-ethnic effect is due to the lack of contact with the other ethnicity. Faces from unfamiliar ethnic groups (in our case, East Asians) should be recognized more poorly than faces from their own ethnicity (cross-ethnic effect). On the other hand, the cross-ethnic effect should not occur if the observer has sufficient experience with members of the other ethnicities. Given that Andalusian Gypsies and Caucasians live in close proximity (high or moderate degree of contact), we hypothesized that there will be no differences between Gypsy and Caucasian observers in recognizing faces (Hypothesis 1a). However, both should be particularly poor at recognizing the faces of East Asians, an unfamiliar ethnicity for both observer groups (Hypothesis 1b). Therefore, we expect to find a main effect of the type of face to be recognized (hereinafter called Face Culture). 2) As a second objective, we explore the possible differences in the perceptual mechanisms employed by Gypsies and Caucasians in face recognition of familiar and unfamiliar ethnicities. Differences in the visual exploration strategies as a function of the degree of contact with the other ethnicity (contact hypothesis) could underlie the cross-ethnic effect. First, we expect to find distinct visual strategies in the recognition of Caucasian, Gypsy, and East Asian faces because of the physiognomic differences between them (Hypothesis 2a). Second, due to the degree of contact between Gypsies and Caucasians, both ethnicities should have

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