Faces and races in the brain

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Humans are better at recognizing individuals of their own race than of other races. Golby ***et al.*** now show that same-race faces elicit more activity in brain regions linked to face recognition.

One of the more mysterious and compelling questions in psychology is how the presence of other people changes individual behavior. The study of neural systems governing social interaction dates from the late 1800s, when the famous case of Phineas Gage led researchers to conclude that the frontal lobes were involved in responses to social mores and customs[1]. However, only recently have researchers begun to explore the neural basis of an aspect of social behavior that is widely discussed and debated in our cultural life—how behavior varies with social group membership. Two studies published last year examined how social groups defined by race relate to activation of the amygdala, a structure thought to be involved in emotional learning and evaluation[2,3]. In this issue, Golby and colleagues at Stanford University extend this new research domain by investigating how neural systems related to face identification and recognition are influenced by racial group membership[4].

Social psychologists have long noted that our ability to recognize individual faces varies depending on the racial identity of the perceiver and the face being recognized[5]—subjects recognize faces from their own racial group with greater accuracy than faces from other racial groups. One plausible explanation for this same-race memory advantage is that people tend to have more experience with faces from their own race and thus develop expertise at their recognition[6]. Support for this idea comes from the finding in US culture that the same-race advantage is greater for European-Americans than African-Americans[7], who tend to have more interactions with members of other races by virtue of being a minority.

The study of Golby and colleagues complements these behavioral results by using functional magnetic resonance imaging (fMRI) to examine whether the same-race advantage for face identification might involve the fusiform face area or FFA, a region of the temporal lobe known to be important for face recognition[8,9]. Both European-American and African-American subjects were asked to remember pictures of faces from both racial groups (Fig. 1), along with pictures of objects (antique radios) as a control condition. In a later recognition test, the European-American subjects showed a significant same-race advantage in identifying faces. Consistent with previous findings, the African-American subjects showed a weaker, non-significant same-race recognition advantage. In their analysis of the fMRI data, Golby *et al.* first identified the FFA in each subject as the region of the fusiform gyrus that responded more to faces than to objects. For most subjects, this was in the right hemisphere, as previously reported. The authors then compared the response of this region to European-American versus African-American faces. Paralleling the behavioral same-race advantage, subjects in both racial groups showed greater activation in the FFA for faces of their own race. In an additional analysis, the authors tried to directly relate brain activation for same- and other-race faces to the behavioral same-race memory advantage. They correlated the magnitude of the same-race memory advantage across subjects with the magnitude of the differences in activation evoked by same- and other-race faces. Two regions emerged from this correlation analysis, one in the left fusiform gyrus and the other in the right hippocampal and parahippocampal gyri. The authors propose that these regions may be involved in the enhanced recognition of same-race faces.

This study investigates a new combination of topics that reach across disciplines. It is a particularly nice example of such cross-disciplinary research because the authors are trying to relate a behavioral question with a long history of investigation in social psychology to a brain region with a relatively well-understood function. Previous research on these topics allows the authors some added confidence in drawing conclusions about the significance of activation responses to these social stimuli and the behavior assessed. The depth of the audience this study is likely to reach is broad, not only because it combines disciplines, but also because of the nature of the question. The study of race in any context has implications of wider social and cultural interest. However, because the finding has a potentially broad impact and is the only study to date that has examined the neural systems of cross-race face identification, its conclusions should be interpreted cautiously.

One contribution of this study relates to the debate about the role of expertise in the FFA. It has been argued that the FFA is not innately specialized for recognizing faces, but rather responds to all classes of stimuli that we have developed an 'expertise' in recognizing[10,11]. Activation of the FFA by faces might thus occur because people have acquired expertise for faces. One difficulty in evaluating the role of expertise in the FFA is that there are few classes of stimuli that we are 'expert' at recognizing whose individual exemplars vary as subtly as faces. Although some studies have found evidence for the activation of this 'face' area by highly practiced non-face stimuli, the issue remains hotly debated. The Golby *et al.* study provides another window into these issues, in that race-dependent differences are likely to be due to expertise—people are more 'expert' at recognizing individuals of their own race because of greater exposure. The greater activation seen for same-race faces in the FFA may also reflect this expertise. The Golby *et al.* study is distinct from other studies of expertise in that the stimuli being compared were categories of faces. The two populations of subjects and faces thus control for many of the stimulus differences present in comparisons between faces and other stimulus classes. Although these results do not address whether the FFA is specialized for faces, they do suggest that varying the level of expertise with different classes of face stimuli can differentially activate the FFA. Future studies could examine other social categories of face stimuli (for example, those defined by age), or more directly assess the subjects' previous experience with different social groups.

The other primary implication of this study is that the enhanced FFA response

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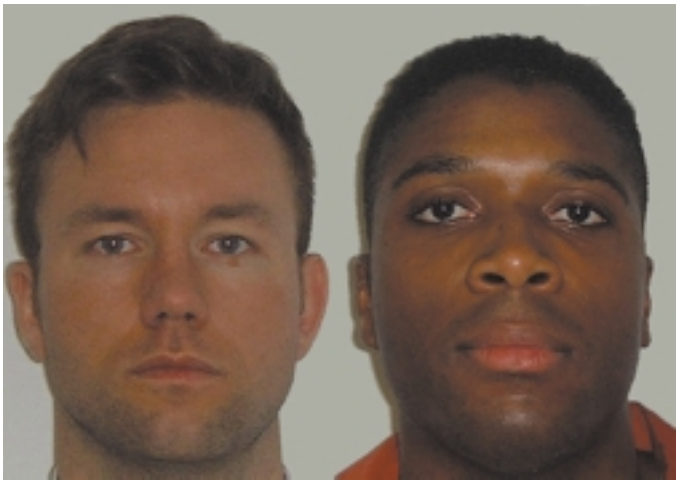

Fig. 1. Two example face images similar to those used in the Golby *et al.* study. Humans are better at recognizing faces of their own race, and Golby *et al.* report that same-race faces also preferentially activate face-selective regions of visual cortex.

to same-race faces may be related to the same-race memory advantage. This claim is a little more tenuous given the existing data. Although a few previous studies have examined brain activation patterns related to memory for faces[12,13], only one found a link between activation of the fusiform gyrus and later face recognition. Unlike the Golby *et al.* results, this study found that right, not left, fusiform activation predicted better recognition performance[14]. Other research suggests that a strong FFA response does not necessarily lead to good recognition. For example, inverted faces, which subjects recognize poorly, robustly activate the FFA[15].

Some aspects of the Golby *et al.* data cast doubt on the putative link between the same-race memory advantage and the FFA response. For instance, although the European-American subjects showed a greater same-race memory advantage, the African-American subjects showed a more consistently enhanced FFA response to same-race faces. All the African-American subjects showed greater FFA activation for same-race faces, compared to approximately 75% of the European-American subjects. In addition, the left hemisphere region of the fusiform gyrus found to be correlated across subjects with the magnitude of the same-race memory advantage is not the same as the predominantly right hemisphere region that was identified as the FFA in individual subjects. The authors suggest that these separate right and left hemisphere regions may be related to processing different aspects of the stimuli, with the left hemisphere specifically related to memory. However, given the variability of the precise location of the FFA across subjects and the lack of other evidence suggesting that the left fusiform region is involved in face memory, it is hard to conclude from these data alone that the FFA has any significant role in the same-race memory advantage. Although the Golby *et al.* data are suggestive, further investigation is needed to determine the connections among the FFA, same-race expertise in face processing and the same-race memory advantage.

Of course this study's broad appeal is not due to its potential contribution to our understanding of the role of the FFA, but because it is one of the first to examine the neural systems related to social group membership. There is a growing trend for psychologists to turn to brain imaging techniques as a tool to investigate social interaction. As new researchers begin to use functional neuroimaging techniques to study questions with a potentially large cultural impact, it is important to consider some caveats that are sometimes forgotten. Perhaps the most significant is that functional neuroimaging is a correlational technique in which brain signals vary depending on the stimuli presented and/or mental operations performed. These brain activation patterns by themselves tell us little about behavior or the causal links between brain structure and behavioral function. Only by combining evidence from converging techniques with the systematic variation of behavioral tasks can we begin to understand the significance of a brain activation pattern or the precise function of any given brain region. It is tempting to conclude from a study like the one by Golby *et al.* that we have learned something fundamental about the impact of race on face identification by connecting it to activation of the FFA. Unfortunately, this is premature. Although there are times when neuroscientific evidence can enhance our understanding of a complex human behavior, it is more often the case today that our understanding of complex human behaviors enhances our understanding of brain function. However, it is not unreasonable to expect that, in the future, as our investigations of the neural systems of social phenomena become more sophisticated, our understanding of social behavior will benefit.

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