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Any theory of face recognition must specify what is encoded in order for a face to be recognized at a later time. Theories of face recognition tend to highlight the importance of either individual feature encoding or holistic processing (see Valentine, 1988, for review). However, very little information is available about where exactly people look when processing a face. The current study examined the nature of eye movements in the learning and recognition of human faces. The goals of the study were twofold: (a) to determine where people look when learning and recognizing faces, and (b) to determine if fixation patterns change as a function of face inversion.

Sixteen participants studied 20 color photographs of faces for 10 seconds each in preparation for a recognition memory test. In the test phase all 20 previously viewed faces (familiar) and 20 novel faces (unfamiliar) were presented in pseudo-random order until the participant responded (mean response time = 2397 ms). Half of the familiar faces and half of the novel faces were presented in the upright orientation. The remaining faces were presented in the inverted orientation. Eye movements were recorded during both the study and test phases using a dual-Purkinje image eyetracker.

Mean percent correct was lower for inverted (66%) than for upright faces (79%), $p < .05$, suggesting that the participants were engaged in a representative face processing task.

During the study phase, 56% of total viewing time was spent fixating on the eyes, 18% on the nose, 12% on the mouth, and the remaining 13% on the rest of the face (ears, chin, cheeks, and forehead). Thus, fixating on the eyes is an important part of the face encoding process. Because the amount of total viewing time differed from the study to the test phase, viewing time on specific regions was compared as proportions of total viewing time. Overall, as Figure 1 shows, the proportion of total fixation time spent on facial features for the study and the test sessions was very similar. However, there were reliable differences in the proportion of total viewing time for the mouth and the ear features, $p < .05$. These findings suggest that similar features are chosen for analysis during both face learning and recognition. Figure 1 also shows that the familiarity and inversion manipulations produced very little change in the proportion of time devoted to these selected features with only the mouth showing a reliable difference, $p < .05$.

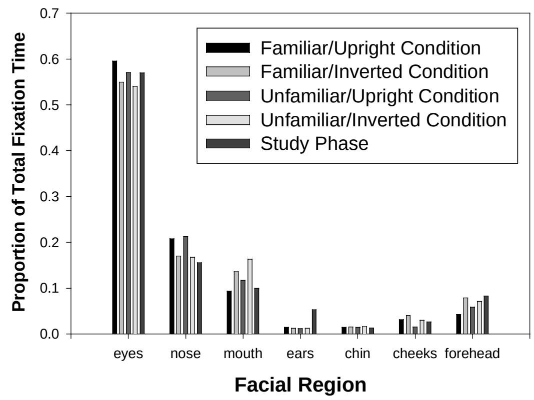

Figure 1: Proportion of total time in facial region for study condition and four test conditions.

If holistic processing is more likely with upright faces than inverted faces, we might expect less sampling of individual facial features in the former condition compared to the latter. Instead, the proportion of fixations on which the eyes moved from one facial region to a new region was not reliably different as a function of orientation (.84 upright, .81 inverted, $F < 1$). Therefore, the decrement in recognition performance due to inversion does not appear to be a consequence of the differential sampling of facial features.

Overall, the results indicate: (a) that similar facial features are selected for analysis during face learning and recognition, and (b) that there is very little difference between the fixation patterns for upright and inverted faces.

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References

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