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The influence of divided attention on holistic face perception

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Abstract

There is evidence that upright, but not inverted, faces are encoded holistically. The holistic coding of faces was examined in four experiments by manipulating the attention allocated to target faces. In Experiment 1, participants in a divided attention condition were asked to match two upright flanker faces while encoding a centrally presented upright target face. Although holistic coding was evident in the full attention conditions, dividing attention disrupted holistic coding of target faces. In Experiment 2, we found that while matching upright flanker faces disrupted holistic coding, matching inverted flanker faces did not. Experiment 3 demonstrated that the differential effects of flanker orientation were not due to participants taking longer to match upright, than inverted, flanker faces. In Experiment 4, we found that matching fractured faces had an intermediate effect to that of matching upright and inverted flankers, on the holistic coding of the target faces. The findings emphasize the differences in processing of upright, fractured and inverted faces and suggest that there are limitations in the number of faces that can be holistically coded in a brief time.

Keywords: Face perception; Holistic coding; Divided attention; Face inversion; Modularity

1. Introduction

Each face is similar to every other human face – with two eyes, a nose and a mouth in approximately the same spatial arrangement. Despite this homogeneity,

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each person can "probably identify several thousand faces" (Ellis, 1981, p. 171). It is generally agreed that there are two distinct types of information which may be used to recognize faces: featural (or part-based) information, where the focus is on the individual facial features[1] (e.g. the nose, hairstyle), and configural information, where the spatial relationships between the features are the focus (see reviews by Farah, Wilson, Drain, & Tanaka, 1998; Rhodes, Brake, & Atkinson, 1993; Searcy & Bartlett, 1996; Valentine, 1988). Closely related to the concept of configural information is the proposal by Tanaka and Farah (1993) that faces are represented as *holistic*, unparsed gestalts or templates, in which featural and configural information are not separable sources of information.[2]

Tanaka and Farah (1993) operationalized the concept of holistic processing by using a task in which participants were taught to recognize a series of faces (e.g. Jim) and subsequently tested on their recognition of individual facial features (eyes, nose and mouth) in a two-alternative forced-choice recognition test containing the original and foil features. There were two conditions: the part in isolation (e.g. Jim's nose alone), and the part in the whole face (e.g. Jim's nose in Jim's original face). Tanaka and Farah reasoned that if faces are represented holistically, then performance would be better in the whole-face than in the isolated-part condition – and this was what was found. From these data, Tanaka and Farah (1993) suggested that upright faces are represented holistically.

Along with upright face stimuli, Tanaka and Farah (1993) also presented participants with inverted face, scrambled face and house stimuli and tested the recognition of features in isolation and in the whole face. In contrast to the results obtained with upright faces where performance was better in the whole-face than the isolated-part condition, the participants performed equivalently in the whole-face and isolated-part conditions for each of these other stimuli. This pattern of results suggests that upright faces are represented more holistically than these other objects and that inverted and scrambled faces and other objects (in this case, houses) are processed in a more featural manner (although it is possible to find a whole object advantage for some other non-face objects; see Gauthier & Tarr, 1997; Gauthier, Williams, Tarr, & Tanaka, 1998; Tanaka & Gauthier, 1997).

In addition, a number of researchers (e.g. Farah, Wilson, Drain, & Tanaka, 1995; Moscovitch, Winocur, & Behrmann, 1997) argue that there is a face-specific recognition system which processes holistic information from upright faces, while inverted faces and other objects are processed in a featural manner by a more

[1] It is commonplace in the area of face perception to state that the features of the face are discrete entities (i.e. the eyes, nose and mouth). As George and Hole (1998) point out, this does not mean that these features are especially salient to the visual system. Nevertheless, they discuss research in the areas of feature salience, eye-movement recording, the face inversion effect and neurophysiological studies that indicate that these facial parts do have some special status in face processing.

[2] At present, it is unclear whether there are important processing differences between configural and holistic representations. Although this issue requires further investigation, we are not attempting to distinguish between the different terms used to describe non-part information. Further discussion of the different terminologies can be found in Searcy and Bartlett (1996), Hole, George, and Dunsmore (1999) and Rhodes et al. (1993).