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A unique look at face processing: the impact of masked faces on the processing of facial features

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Abstract

This experiment utilized a masked priming paradigm to explore the early processes involved in face recognition. The first experiment investigated implicit processing of the eyes and mouth in an *upright* face, using prime durations of 33 and 50 ms. The results demonstrate implicit processing of both the eyes and mouth, and support the configural processing theory of face processing. The second experiment used the same method with *inverted* faces and the third experiment was a combination of Experiments 1 and 2. The fourth experiment utilized *misaligned* faces as the primes. Based on the pattern of results from these experiments, we suggest that, when a face is inverted, the eyes and mouth are initially processed individually and are not linked until a later stage of processing. An upright face is proposed to be processed by analysis of its configuration, whereas an inverted face is initially processed using first-order relational information, and then converted to an upright representation and transferred to face specific regions for configural analysis.

Keywords: Face perception; Holistic processing; Configural processing; Masked priming

1. Introduction

Face perception and the subsequent recognition of social cues is a vital aspect of human functioning. The face provides information not only about the age, gender and identity of the individual, but also the intention and emotion. Faces are based on a similar

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configuration, and are continually changing. Despite this dynamic interplay of movement and emotions, we are able to recognize hundreds of individuals under dramatically different lighting conditions and orientations. This ability raises the question of how we are able to differentiate individuals with such expertise. It has been claimed that the specific process that provides us with this critical skill only occurs for faces, rather than being a general process involved in the recognition of all objects (for a review, see Kanwisher & Moscovitch, 2000).

All faces are comprised of the same fundamental configuration or arrangement of features. Hence, some researchers claim that we process the relationship amongst these features, and not merely the features themselves, to differentiate faces (for a review, see Maurer, Le Grand, & Mondloch, 2002). In his classic paper, Yin (1969) demonstrated that inversion resulted in a more pronounced deleterious effect on memory recognition for faces than for other object categories including houses, airplanes, men in motion, or faceless figures. This dramatic effect was ascribed to the disruption of configural processing, which only affected faces. Since this time, the effect of face inversion on processing has been studied extensively (e.g. Diamond & Carey, 1986; Farah, Wilson, & Drain, 1998; Freire, Lee, & Symons, 2000; Haxby et al., 1999; Hillis, Hiscock, & Rexer, 1995; Kanwisher, Tong, & Nakayama, 1998; Leder & Bruce, 2000; Leder, Candrian, Huber, & Bruce, 2001; Parr, Dove, & Hopkins, 1998; Rhodes, Brake, & Atkinson, 1993; Tanaka & Farah, 1993). In a recent review, Maurer et al. (2002) discusses converging results from many studies that demonstrate that face perception proceeds configurally and that effects of inversion can be ascribed to the disruption of this process.

Many variants of configural processing have been proposed (Farah et al., 1998). Specifically, three primary classes of processes have been posited. Conceivably, each class may apply under different conditions. *First-order relational processing* involves the determination of whether the structure matches a face-like configuration. In other words, these processes determine the presence of facial features in a face-like configuration, rather than an intricate analysis of the configuration of the face. Following these first-order relational processes, which recognize the object as a face, additional processes that are specific to facial analysis are invoked (Maurer et al., 2002).

First-order relational processing of faces has been demonstrated under a variety of experimental conditions. For instance, experiments using schematic faces with only two circles representing eyes and one line for the mouth have demonstrated patterns of results that are specific to faces, such as fusiform face area (FFA) activation (Tong, Nakayama, Moscovitch, Weinrib, & Kanwisher, 2000). Patients with spatial neglect seem to be less likely to neglect a schematic face than a scrambled face (Vuilleumier, 2000). Priming extinction patients with either two circles or two crosses within the context of a schematic face reduces extinction of the two circles or crosses on subsequent presentations, despite the absence of any schematic face surrounding them (Vuilleumier & Sagiv, 2001).

According to Moscovitch and Moscovitch (2000), when a face is inverted the object processing system initially creates an upright representation of the face that is then transferred to the FFA. To initiate transfer to the FFA, first-order configural processing is suggested to be responsible for identifying the object as a face (Maurer et al., 2002).

Second-order relational processing is thought to be utilized when the identity of a face needs to be ascertained. Second-order relational processing has been posited to compare