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Reports

Resource-dependent effects during sex categorization

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ABSTRACT

The limited capacity of face perception resources in the left cerebral hemisphere was examined using a sex categorization task. One study tested the hypothesis that sex categorization is impeded whenever feature extraction resources in the left hemisphere are simultaneously being utilized by another task. This hypothesis was tested by presenting prime faces for either 32 ms or 320 ms to either the left or right visual-field just before centrally presented target faces were categorized by sex. Results showed that sex categorization was slower after prime faces were presented for 32 ms in the right visual-field compared to the left visual-field. This difference was not found after the 320 ms prime length. The results are interpreted in the context of a neurocognitive model of social perception and suggest that efficient sex categorization depends, in part, on the availability of facial feature extraction resources in the left hemisphere.

Our interactions with others are influenced by our initial perceptions of them. When we encounter others, much of our attention is directed towards the face. Faces capture a disproportionate amount of our attention compared to other visual stimuli (Bindemann, Burton, Hooge, Jenkins, & de Haan, 2005). Thus, the current research focuses on face perception as an initial step in social information processing. It builds on a neurocognitive model of social perception in which distinct face-processing strategies give rise to distinct social representations (Zárate, Sanders, & Garza, 2000). The model contends that resources associated with these strategies are distributed across the cerebral hemispheres and are limited in capacity. The current research examines how the limited-capacity of these resources influences social categorization.

Cerebral asymmetries in social perception

Zárate et al.'s (2000) neurocognitive model of social perception maintains that processing asymmetries across the cerebral hemispheres underlie conceptually distinct social cognitive phenomena. This model accounts for social categorization and social individuation by hypothesizing that each phenomenon is driven by the distinct processing strategies that are distributed across the cerebral hemispheres. Left hemisphere (LH) processes identify the category membership features of others more efficiently and therefore facilitate social categorization. Right hemisphere (RH) processes integrate the individuating characteristics of others more efficiently and therefore facilitate social individuation. These processes work in parallel to produce various dissociations between group- and person-based social perception (Sanders, McClure, & Zárate, 2004; Zárate, Stoever, MacLin, & Arms-Chavez, 2008).

This model derives from feature versus configural processing distinctions identified in the neurocognitive literature on face perception. Facial features (e.g., eyes, nose, mouth) and their specific arrangement or spatial configuration on a face are central to models of face perception (Cabeza & Kato, 2000; Farah, Wilson, Drain, & Tanaka, 1998). Processes that encode specific facial features are differentiated from processes that encode spatial configurations of facial features. Feature encoding processes permit the categorization of faces along social categorical dimensions (e.g., race) (Levin, 1996; Schyns, Bonnar, & Gosselin, 2002). Configural encoding processes permit the identification of faces as particular individuals (Leder & Bruce, 2000; Yin, 1969).

These distinct encoding strategies are distinguished by the cerebral hemispheres. The LH is more attentive to specific facial features than to configurations of features (Scott & Nelson, 2006). It mediates categorical visual processes that are sensitive to similarities between other-race faces (Golby, Gabrieli, Chiao, & Eberhardt, 2001). The RH is more attentive to configurations of features than to specific features (Scott & Nelson, 2006). It mediates coordinate visual processes that are sensitive to differences between own-race faces (Golby et al., 2001). In summary, the encoding of specific facial features permits social categorization of an individual and the LH is more adept at feature encoding. The integration of facial features into a feature configuration permits identification of an individual and the RH is more adept at configural encoding.

Further support for the neurocognitive model of social perception has been demonstrated using unilateral visual-field presenta-

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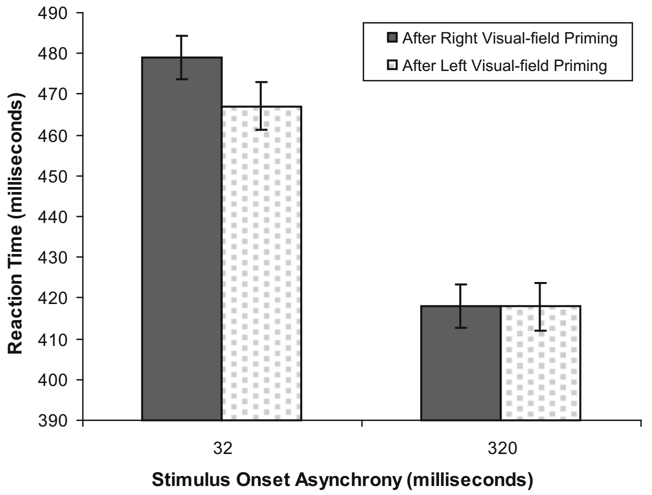

Fig. 1. Mean response latencies for sex categorization as a function of visual-field priming and stimulus onset asynchrony.

tion techniques. These techniques involve the presentation of stimuli to the left or right of a central fixation point. Stimuli that are presented to the left of a fixation point or left visual-field (LVF) are initially processed in the RH, whereas stimuli that are presented to the right of a fixation point or right visual-field (RVF) are initially processed in the LH. Subsequent task performance is reflective of left or right hemisphere processing efficiency (Kim, Levine, & Kertesz, 1990).

Various studies have used visual-field techniques in combination with reaction time (RT) measures (Zárate & Sanders, 2004; Zárate et al., 2000) and galvanic skin response measures (Sanders et al., 2004) to test the neurocognitive model of social perception. These studies show that conceptually distinct social cognitive phenomena are moderated by processing differences across the cerebral hemispheres. For instance, our memory for a target group is superior in the LH, whereas our memory for a specific target is superior in the RH (Zárate et al., 2000). In addition, social category priming effects are more pronounced in the LH, whereas individual similarity priming effects are more pronounced in the RH (Zárate et al., 2000). Furthermore, classically conditioned responses to a target group are more efficiently developed in the LH, whereas classically conditioned responses to a specific target are more efficiently developed in the RH (Sanders et al., 2004). Collectively, the LH consistently responds to social stimuli at the group level, whereas the RH consistently responds to social stimuli at the person level.

When we encounter others, both hemispheres simultaneously begin to extract facial information. The LH extracts facial feature information that can then be used to categorize others along social categorical dimensions. The RH extracts facial feature configurations that can then be used to identify specific people. Previous research suggests that the processing strategy that dominates during the initial encoding ultimately influences our perception of others (Zárate et al., 2008). Thus, a disruption in the processing strategy that dominates during initial encoding should disrupt the associated social perceptions. For example, if the LH's ability to extract specific facial features is disrupted, ensuing social categorization processes should be impeded. The ability to impede social categorization is important because of the automaticity with which social categorization activates stereotypical information that can negatively influence social interactions (Brewer, 1988; Dovidio, Evans, & Tyler, 1986; Fazio & Dunton, 1997; Zárate & Smith, 1990).

The research presented here examines how social categorization is influenced by the availability of hemispherically distinct processing resources. Our hypothesis is derived from multiple resource theory (MRT). MRT contends that distinct limited-capacity processing resources exist and are distributed across the cerebral hemispheres. These processing resources are differentially recruited to complete any one task (Boles & Law, 1998; Wickens, 1992, 2002). MRT predicts that task performance will suffer whenever two consecutively presented tasks recruit the same resources. The current research tests the hypothesis that distinct face-processing resources are distributed across the cerebral hemispheres and have a limited processing capacity. The extraction of facial information is assumed to take time and occur in a serial fashion. While information is being extracted, subsequent requests for information extraction (e.g., encountering another face) are delayed until the existing information extraction process is complete. Once facial information extraction begins, the efficiency with which the system can extract subsequent facial information depends on how temporally close subsequent facial information is presented. If subsequent facial information is presented before initial facial information has been extracted, subsequent facial information extraction will be disrupted.

Research on perceptual and conceptual masking suggests how temporally close subsequent stimulus information should be presented in order to interfere with initial stimulus information extraction. Loftus and Ginn (1984) demonstrate that perceptual information extraction is not complete within the first 50 ms of stimulus onset but is complete after the first 300 ms of stimulus onset. Thus, in the current research, we manipulated prime–target stimulus onset asynchrony (SOA). One SOA was set below the amount of time required for perceptual information extraction from the prime to complete (32 ms) and another was set above the amount of time required for perceptual information extraction from the prime to complete (320 ms).

Because the LH is more efficient at feature extraction, it is predicted that when a prime face is presented in the RVF–LH for less than the amount of time it takes to extract perceptual information from it (32 ms), participants will be slower to categorize a subsequent centrally presented target face by sex than when a prime face is presented in the LVF–RH. This is because feature extraction resources in the LH will not have completed extracting facial feature information in the prime face by the time the target face requests the same resources. Yet when a prime face is presented in either the RVF–LH or LVF–RH for longer than the amount of time it takes to extract perceptual information from it (320 ms), subsequent centrally presented face categorization times are expected to be similar. These times are expected to be similar because both hemispheres are capable of extracting facial feature information within 320 ms. Thus, feature extraction from either a LVF–RH or RVF–LH prime face will be complete by the time a target face requests the same resources. Both prime lengths (30 ms and 320 ms) are fast compared to most priming studies, reducing any conscious decision making strategies (Neely, 1976). Thus, any priming or inhibitory effects are theorized to be due to perceptual processing mechanisms.

Overview

A sex categorization task was employed within a divided visual-field methodology. Participants used a response pad to categorize centrally presented target photos of Mexican-American males and females by sex. Prior to categorizing each target photo, a prime photo (either a Mexican-American male or female) was briefly presented to either the RVF–LH or LVF–RH with either a 32 ms or 320 ms SOA between prime and target photos. RTs to target photo categorizations were recorded.