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Neuropsychologia 45 (2007) 163–173

NEUROPSYCHOLOGIA

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Spontaneous retrieval of affective person knowledge in face perception

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Available online 6 June 2006

Abstract

In a functional magnetic resonance imaging experiment, we explored whether affective person knowledge based on memories formed from minimal information is spontaneously retrieved in face perception. In the first stage of the experiment, participants were presented with 120 unfamiliar faces. Each face was presented with a description of one of four types of behaviors: aggressive, disgusting, neutral, and nice. In the second stage, participants were scanned while engaged in a one-back recognition task in which they saw the faces that were associated with behaviors and 30 novel faces. Although this task is a simple perceptual task that neither demands person evaluation nor retrieval of person knowledge, neural responses to faces differed as a function of the behaviors. Faces associated with behaviors evoked stronger activity than did novel faces in regions implicated in social cognition—anterior paracingulate cortex and superior temporal sulcus. Explicit memory for the behaviors enhanced the neural response in these regions. Faces associated with disgusting behaviors evoked stronger activity in left anterior insula than did faces associated with aggressive behaviors. This effect was equally strong for faces associated with explicitly recalled behaviors and faces associated with non-recalled behaviors. The findings suggest that affective person knowledge acquired from minimal information is spontaneously retrieved in face perception, engaging neural systems for analysis of social cognition and emotions.

Keywords: Social cognition; First impressions; Trait inferences

1. Introduction

People are able to maintain distinct mental representations of a practically unlimited number of individuals, and as the great social psychologist Solomon Asch remarked "impressions form with remarkable rapidity and great ease" (Asch, 1946, p. 258). Impression formation has been a central topic of research for social cognition (Fiske, Lin, & Neuberg, 1999; Macrae & Bodenhausen, 2000). This research has shown that when people intend to form impressions of other people, these impressions are formed on-line with a disproportionate influence of initial information. Mental representations of other people are structured around a set of inferred traits and an overall evaluation of the person (Wyer & Srull, 1989). One source of trait inferences is the behavior of others. Numerous studies have shown that people make quick unreflective trait inferences from minimal behavioral information, often ignoring the context of the behavior (Gilbert & Malone, 1995; Trope & Alfieri, 1997).

People make trait inferences about other people even when they do not intend to do so (Uleman, Blader, & Todorov, 2005; Uleman, Newman, & Moskowitz, 1996) and such spontaneous trait inferences can be dissociated from the memory for the behaviors, which triggered the inferences (Carlston & Skowronski, 1994; Carlston, Skowronski, & Sparks, 1995; Todorov & Uleman, 2002). Todorov and Uleman (2003) also showed that spontaneous trait inferences occur when the cognitive resources of participants are severely constrained, suggesting that the inference process is fairly automatic (Bargh, 1994). In this paper, we explore the neural correlates of spontaneous retrieval of trait inferences during face perception. Understanding how such inferences affect face perception is critical for building neural models of the processes that associate the visual appearance of a face with a rich contextual representation of a person.

In one of the first attempts to outline a neural model of social cognition, Brothers wrote that "the visual appearance of a face in social cognition is analogous to a stream of speech in linguistic processing: the face stimulus is immediately and obligatorily transformed into the representation of a person (with dispositions and intentions) before having access to consciousness" (Brothers, 1990, p. 35). We decided to use functional brain imaging to study the neural correlates of the spontaneous retrieval of affective person knowledge during face perception. More specifically, we tested whether faces that are associated with specific

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0028-3932/$ – see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.neuropsychologia.2006.04.018

traits (e.g., aggressive) – based on hearing about a single behavior – evoke distinctive neural responses while performing a task that does not explicitly require person evaluation or retrieval of information associated with the person.

The present research builds on and extends previous work on perception of personally familiar individuals. Using fMRI, Gobbini, Leibenluft, Santiago, and Haxby (2004) demonstrated that perception of personally familiar individuals causes changes in a distributed network of areas that extend beyond a visual memory for a face. Faces of personally familiar individuals evoked a stronger response than faces of famous familiar faces and unfamiliar faces in areas associated with social cognition. The response modulation in these areas might reflect the spontaneous retrieval of social knowledge about the personality and attitudes of close friends and relatives. This type of information is critical for appropriate social behavior and can be tightly linked to the visual representation of the face. While the work of Gobbini et al. focuses on retrieval of information that is acquired over long periods of time and repeated interactions, in this paper, we explore the retrieval of person knowledge acquired from minimal information.

The experiment was modeled upon behavioral studies showing that a single behavior is sufficient to trigger a trait inference (Todorov & Uleman, 2002, 2004). In the first stage of the experiment, participants were presented with a large number of unfamiliar faces (120) paired with verbal descriptions of behaviors. Participants were instructed to memorize the behaviors. We used four classes of behaviors: aggressive, disgusting, nice, and neutral (Fig. 1A). For each participant, behaviors were randomly assigned to faces. Thus, the same faces appeared with different behaviors for different participants. The neural responses to faces were measured with fMRI in the second stage of the experiment in a rapid event-related design (Fig. 1B). Participants were presented with all faces from the learning task intermixed with novel faces and were scanned while performing a one-back recognition task. This task is a simple perceptual matching task that requires neither evaluation of the faces nor retrieval of the behavioral information. Thus, it measures implicit evaluation of

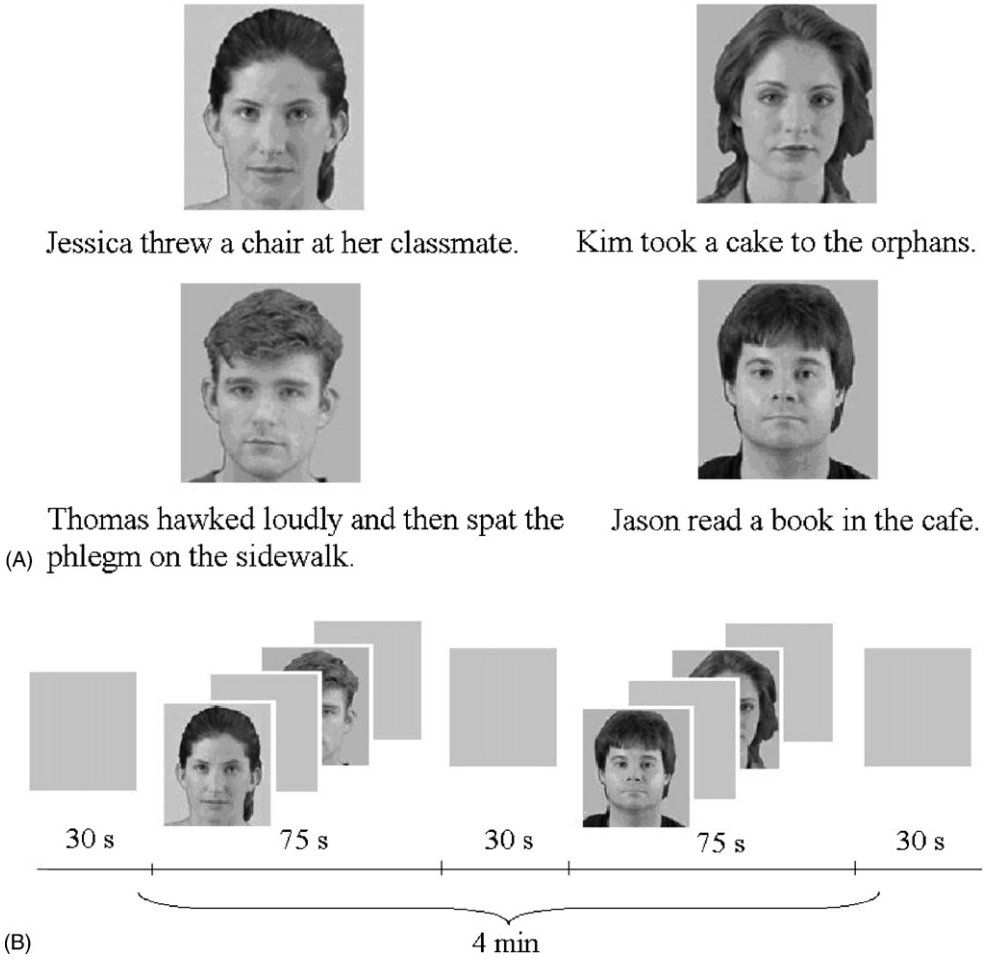

Fig. 1. (A) Examples of categories of stimuli used in the experiment. Each face was paired with a single behavior from one of four categories: aggressive, disgusting, nice, or neutral. For each participant, behaviors were randomly assigned to faces. Thus, the same face appeared with different behaviors for different participants. Each face–behavior pair was presented for 5 s. The order of face–behavior pairs was randomized. Participants were told that this was a memory experiment and instructed to memorize the behaviors. (B) Temporal sequence of stimuli in a time series. Faces were presented on gray–white background in a pseudo-random order in which there was an equal probability that a face from any of the five categories (novel, aggressive, disgusting, nice, and neutral) would follow the preceding face. A time series consisted of three 30 s fixation epochs, separating two blocks of presentations of 25 faces for 1 s each, with an inter-trial interval of 2 s. There were six time series, each lasting 4 min.