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Associative (prosop)agnosia without (apparent) perceptual deficits: A case-study

David Anaki [a,b,*], Yakir Kaufman [a,c,e], Morris Freedman [a,c,d], Morris Moscovitch [a,b,**]

[a] *Rotman Research Institute, Baycrest Centre for Geriatric Care, 3560 Bathurst St., Toronto, Ontario, Canada M6A 2E1*
[b] *Department of Psychology, University of Toronto, Toronto, Canada*
[c] *Division of Neurology and Rotman Research Institute, Baycrest Centre for Geriatric Care, Ontario, Canada*
[d] *Department of Medicine, Division of Neurology, Mt. Sinai Hospital, University Health Network and University of Toronto, Toronto, Ontario, Canada*
[e] *Department of Medicine, Division of Neurology, University of Toronto, Toronto, Ontario, Canada*

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Abstract

In associative agnosia early perceptual processing of faces or objects are considered to be intact, while the ability to access stored semantic information about the individual face or object is impaired. Recent claims, however, have asserted that associative agnosia is also characterized by deficits at the perceptual level, which are too subtle to be detected by current neuropsychological tests. Thus, the impaired identification of famous faces or common objects in associative agnosia stems from difficulties in extracting the minute perceptual details required to identify a face or an object. In the present study, we report the case of a patient DBO with a left occipital infarct, who shows impaired object and famous face recognition. Despite his disability, he exhibits a face inversion effect, and is able to select a famous face from among non-famous distractors. In addition, his performance is normal in an immediate and delayed recognition memory for faces, whose external features were deleted. His deficits in face recognition are apparent only when he is required to name a famous face, or select two faces from among a triad of famous figures based on their semantic relationships (a task which does not require access to names). The nature of his deficits in object perception and recognition are similar to his impairments in the face domain. This pattern of behavior supports the notion that apperceptive and associative agnosia reflect distinct and dissociated deficits, which result from damage to different stages of the face and object recognition process.

Keywords: Face recognition; Object recognition; Apperceptive/associative; Visual agnosia; Prosopagnosia

1. Introduction

Prosopagnosia is a neurologicical deficit which is characterized by a severely reduced ability to recognize faces (Bodamer, 1947). This deficit cannot be attributed to a general loss of semantic memory or knowledge, as prosopagnosic patients can identify familiar people from their voice, gait, or salient facial features, such as a mustache. Moreover, they are able to supply ample biographical information when provided with a name, or conversely, name a person based on his or her verbal description. Thus, the face-recognition impairment associated with prosopagnosia is limited to the visual modality.

Following the classical distinction proposed by Lissauer (1890) between types of impairments in visual object recognition, the different manifestations of prosopagnosia are also traditionally classified into two broad subclasses: *apperceptive prosopagnosia* involves deficits during early (pre-categorical) stages of visual processing, prior to the formation of a facial representation. In a*ssociative prosopagnosia*, however, the patient has great difficulty in accessing semantic information of a facial percept which he or she was able to construct. One conclusion arising from this typology is that although both forms of prosopagnosic patients will be impaired in recognizing famous faces, only those with the apperceptive form of prosopagnosia will encounter difficulties in recognizing non-famous faces.

Although this dissociation has been reported in several studies (e.g., De Renzi & di Pellegrino, 1998; De Renzi, Faglioni,

* Corresponding author at: Department of Psychology, Hebrew University, Mount Scopus, Jerusalem 91905, Israel.
** Corresponding author at: Rotman Research Institute, Baycrest Centre for Geriatric Care, 3560 Bathurst St., Toronto, Ontario, Canada M6A 2E1.
E-mail addresses: danaki@mscc.huji.ac.il (D. Anaki), momos@psych.utoronto.ca (M. Moscovitch).

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Grossi, & Nichelli, 1991; Henke, Schweinberger, Grigo, Klos, & Sommer, 1998; McNeil & Warrington, 1991; Temple, 1992), and has been articulated theoretically in several models of face recognition (Bruce & Young, 1986; Burton, Bruce, & Johnston, 1990; Gobbini & Haxby, 2007; Haxby, Hoffman, & Gobbini, 2000; Hay, Young, & Ellis, 1991), recent reports have questioned its validity (e.g., Delvenne, Seron, Coyette, & Rossion, 2004; Duchaine & Weidenfeld, 2003; Farah, 1990). For example, Farah (1990) concluded, after reviewing a large corpus of associative agnosia and prosopagnosia cases, that none of them shows clear evidence of intact early visual analysis. More specific claims have undermined the validity of the neuropsychological assessment tools which commonly have been used to determine that high-order visual processes are preserved in associative prosopagnosia (Duchaine & Nakayama, 2004; Duchaine & Weidenfeld, 2003). Finally, while some traditional tests of face recognition may not have been sensitive enough to detect perceptual deficits in people with associative prosopagnosia, others have been (Delvenne et al., 2004; Farah, 1990). Findings based on these more sensitive tests lead to the conclusion that the underlying deficit in associative agnosia, for both faces and objects, is at the perceptual level, and that the dissociation between apperceptive and associative types of the disorder is artifactual (Bay, 1953; Farah, 1990).

Such a conclusion would undermine models of face and object recognition that honor this distinction. A more conservative (and maybe more warranted) approach, however, leaves open the possibility that associative (prosop)agnosia does exist, while acknowledging that the past literature may have overestimated its frequency of occurrence. Finding such a case, therefore, has important implications for theories and models of face and object perception and recognition.

In the present study, we describe a new case of acquired associative (prosop)agnosia in patient DBO, a 72-year-old male, who presented with deficits in visual object and face recognition. His object recognition in the tactile and auditory modalities is normal, and he does not seem to have any low-level visual deficits. Although he cannot identify pictures of famous figures, he is able to supply biographical information about them when presented with their names. Using a combination of traditional tests, and new ones we devised to address issues raised by critics regarding higher order face-processing deficits, we believe we can show that DBO is indeed a case which exemplifies a (prosop)agnosia of the associative type.

2. Case history

DBO is a 72-year-old right-handed male who was born in Latvia and arrived in Canada at an early age. He earned a Ph.D. degree in Chemistry and specialized as a criminologist. He was admitted to hospital on March 9, 2003, following a sudden onset of confusion and tachycardia. A CT scan showed a left occipital lobe infarct extending from the cortex into the periventricular white matter, with some parietal involvement. Areas with periventricular white matter hypodensity were observed bilaterally, some compatible with lacunar infarcts. He was diagnosed as having suffered multiple strokes secondary to emboli, related to atrial fibrillation (Fig. 1).

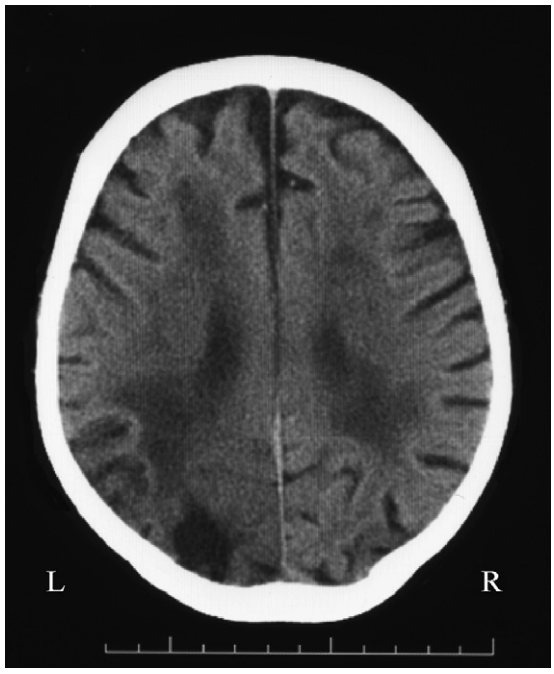

Fig. 1. A CT transversal slice showing the extent of lesion in DBO's occipital area.

Following his stroke he had memory impairments, word-finding difficulties, impaired language comprehension, impaired object, letter, word, and face recognition and a right homonymous hemianopia. There were also mild hand tremors, noted especially when he attempted to perform purposeful fine motor tasks.

He was admitted for neuro-rehabilitation at Baycrest Centre for Geriatric Care on June 2003. His full scale intellectual score in the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999) was in the average range (55th percentile). He yielded high average scores in verbal IQ subtest (84th percentile), but low average scores at performance IQ subtest (23rd percentile). His performance in the Kaplan Baycrest Neurocognitive Assessment (KBNA; Leach, Kaplan, Rewilak, Richards, & Proulx, 2000) and Dementia Rating Scale-2 (DRS-2; Jurica, Leitten, & Mattis, 2001) showed deficits in several cognitive abilities which may be attributed to his global visual agnosia. He encountered difficulties in short- and long-term verbal and visual recall, yet exhibited improved recognition capacities, verbal and visual alike. His verbal fluency and practical reasoning were average, although impairments were found in conceptual shifting (assessed also by the Wisconsin Card Sorting Task; Kongs, Thompson, Iverson, & Heaton, 2000). Problems in concentration and selective attention were also observed. DBO exhibited throughout the assessment considerable difficulties in letter and word reading, and was greatly impaired in identifying complex form and visual objects, attesting to his alexia and object agnosia. We describe his deficits in object and face recognition in more detail below. In all the tests reported henceforth (carried during July–August 2003) DBO's performance was compared