Acquired prosopagnosia as a face-specific disorder: Ruling out the general visual similarity account

Thomas Busigny a,∗, Markus Graf b, Eugène Mayer c, Bruno Rossion a

a Université Catholique de Louvain, Louvain-la-Neuve, Belgium
b Max Planck Institute for Human Cognitive and Brain Sciences, München, & Max Planck Institute for Biological Cybernetics, Tübingen, Germany
c University Hospital of Geneva, Switzerland

ARTICLE INFO

Article history:
Received 19 December 2009
Received in revised form 28 February 2010
Accepted 25 March 2010
Available online 1 April 2010

Keywords:
Acquired prosopagnosia
Face recognition
Object recognition
Specificity
Visual similarity

ABSTRACT

Prosopagnosia is classically defined as a disorder of visual recognition specific to faces, following brain damage. However, according to a long-standing alternative view, these patients would rather be generally impaired in recognizing objects belonging to visually homogenous categories, including faces. We tested this alternative hypothesis stringently with a well-documented brain-damaged prosopagnosic patient (PS) in three delayed forced-choice recognition experiments in which visual similarity between a target and its distractor was manipulated parametrically: novel 3D geometric shapes, morphed pictures of common objects, and morphed photographs of a highly homogenous familiar category (cars). In all experiments, PS showed normal performance and speed, and there was no evidence of a steeper increase of error rates and RTs with increasing levels of visual similarity, compared to controls. These data rule out an account of acquired prosopagnosia in terms of a more general impairment in recognizing objects from visually homogenous categories. An additional experiment with morphed faces confirmed that PS was specifically impaired at individual face recognition. However, in stark contrast to the alternative view of prosopagnosia, PS was relatively more impaired at the easiest levels of discrimination, i.e. when individual faces differ clearly in global shape rather than when faces were highly similar and had to be discriminated based on fine-grained details. Overall, these observations as well as a review of previous evidence, lead us to conclude that this alternative view of prosopagnosia does not hold. Rather, it seems that brain damage in adulthood may lead to selective recognition impairment for faces, perhaps the only category of visual stimuli for which holistic/configural perception is not only potentially at play, but is strictly necessary to individualize members of the category efficiently.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

Can recognition of faces be selectively impaired following brain damage, leaving object recognition abilities intact? This question has been of interest to neurologists, cognitive neuropsychologists and cognitive neuroscientists in general at least ever since Bodamer (1947) coined the term “prosopagnosia” to refer to “the selective disruption of the perception of faces, one’s own face as well as those of others, which are seen but not recognized as faces belonging to a particular owner” (Bodamer, 1947, English translation by Ellis & Florence, 1990, p. 83). Providing evidence for a face-specific disorder following brain damage is important because it would apparently support the view that faces are processed specifically, and thus that at least some aspects of face processing could be studied in relative isolation with respect to general visual object recognition.

In his definition of prosopagnosia, Bodamer (1947) further stated that “the disorder appears in varying strengths and together with the most different forms of agnosia, but can be separated from these from the outset” (Ellis & Florence, 1990, p. 83). Yet, despite the accumulation of cases of acquired prosopagnosia reported over the years, this important issue of domain-specificity remains largely unclear and debated (e.g., Barton, 2008; Blanc-Garin, 1984; Damasio, Damasio, & Van Hoesen, 1982; Farah, Levinson, & Klein, 1995; Gauthier, Behrmann, & Tarr, 1999; McNeil & Warrington, 1993; Riddoch, Johnston, Bracewell, Boutsen, & Humphreys, 2008). One major reason for this lack of clarification is that, unfortunately, most cases of prosopagnosia1 reported in the literature have not

* Corresponding author at: Université Catholique de Louvain (UCL), Faculté de Psychologie et des Sciences de l’Education (PSP), Unité de Cognition et Développement (CODE), Place du Cardinal Mercier, 10, B-1348 Louvain-la-Neuve, Belgium.
Tel.: +32 0 10 47 92 60; fax: +32 0 10 47 37 74.
E-mail address: thomas.busigny@uclouvain.be (T. Busigny).

1 Here the term prosopagnosia will refer to the classical neurological syndrome of acquired prosopagnosia (AP), without any reference to cases of congenital or developmental prosopagnosia, i.e. the lifelong impairment in processing faces with-
Table 1
A summary of the findings for the 13 “pure prosopagnosic” patients reported in the literature.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Case</th>
<th>Lesion</th>
<th>Objects</th>
<th>Faces</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Renzi (1986)</td>
<td>Patient 4</td>
<td>Right parahippocampal gyrus, lingual gyrus, fusiform gyrus, calcarine fissure, cuneus</td>
<td>- Figure-ground discrimination: intact</td>
<td>- BFRT (short form): impaired (18/27)</td>
</tr>
<tr>
<td>De Renzi, Perani, Carlesimo, Silveri, and Fazio (1994)</td>
<td>OR</td>
<td>Right temporal lobe involving T3, T5 &amp; T6; right parietal lobe involving P1 &amp; P2</td>
<td>- Object naming: intact</td>
<td>- BFRT (short form): intact (21/27, no RTS)</td>
</tr>
<tr>
<td>Takahashi et al. (1995)</td>
<td>Case 3</td>
<td>Right temporo-occipital lobe, involving fusiform &amp; lingual gyri</td>
<td>- Italian coins discrimination: intact</td>
<td>- Familiarity judgment: impaired</td>
</tr>
<tr>
<td>Buxbaum, Glosser, and Coslett (1996)</td>
<td>WB</td>
<td>Bilateral occipital lobes</td>
<td>- Object naming (real objects; drawings): intact</td>
<td>- BFRT: impaired (37/54, very slow)</td>
</tr>
<tr>
<td>De Renzi and di Pellegrino (1998)</td>
<td>Anna</td>
<td>Bilateral posterior cingulate gyrus, infra- &amp; supracalcarine areas, mesial part of the superior parietal lobe</td>
<td>- Perceptual categorization: intact</td>
<td>- Famous faces recognition: impaired</td>
</tr>
<tr>
<td>Wada and Yamamoto (2001)</td>
<td></td>
<td>Right infero-occipital lobe, involving fusiform gyrus and lateral occipital region</td>
<td>- Low-level visual processing (line length, counting dots, shapes, line orientation): intact</td>
<td>- Matching unfamiliar faces: impaired</td>
</tr>
<tr>
<td>Rossion et al. (2003), Schiltz et al. (2006), Busigny and Rossion (in press)</td>
<td>PS</td>
<td>Right infero-occipital lobe and middle temporal gyrus; left mid-ventral gyrus &amp; posterior cerebellum</td>
<td>- Visual segmentation: intact</td>
<td>- Matching unfamiliar faces: impaired</td>
</tr>
</tbody>
</table>


دریافت فوری
متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات