



Abstract and concrete categories? Evidences from neurodegenerative diseases

Eleonora Catricalà^{a,*}, Pasquale A. Della Rosa^b, Valentina Plebani^c,
Gabriella Vigliocco^d, Stefano F. Cappa^{c,e}

^a Laboratory of Neuropsychology, IRCCS Istituto Neurologico Carlo Besta, Milano, Italy

^b Institute of Molecular Bioimaging and Physiology (IBFM)-CNR, Milano, Italy

^c Division of Neuroscience, San Raffaele Scientific Institute, Milano, Italy

^d Experimental Psychology Research Department, Division of Psychology and Language Sciences, University College London, London, England

^e Institute for Advanced Study IUSS Pavia, Pavia, Italy

ARTICLE INFO

Article history:

Received 12 December 2013

Received in revised form

10 August 2014

Accepted 24 September 2014

Keywords:

Semantic memory

Abstract concepts

Concrete concepts

Living-non living dissociation

Emotion

Social relation

Alzheimer's disease

Semantic variant of the primary progressive aphasia

ABSTRACT

We assessed the performance of patients with a diagnosis of Alzheimer's disease (AD) and of the semantic variant of primary progressive aphasia (sv-PPA) in a series of tasks involving both abstract and concrete stimuli, which were controlled for most of the variables that have been shown to affect performance on lexical-semantic tasks.

Our aims were to compare the patients' performance on abstract and concrete stimuli and to assess category-effects within the abstract and concrete domains. The results showed: (i) a better performance on abstract than concrete concepts in sv-PPA patients. (ii) Category-related effects in the abstract domain, with emotion concepts being preserved in AD and social relations being selectively impaired in sv-PPA. In addition, a living-non living dissociation may be (infrequently) observed in individual AD patients after controlling for an extensive set of potential confounds.

Thus, differences between and within the concrete or abstract domain may be present in patients with semantic memory disorders, mirroring the different brain regions involved by the different pathologies.

© 2014 Published by Elsevier Ltd.

1. Introduction

A cardinal property of human cognition is the ability to represent knowledge about the world. This is commonly referred to as semantic memory (Tulving, 1972). Semantic memory is assumed to provide for the organization of the knowledge about the manifold entities (i.e., idea, zebra, hammer, love, challenge), whose conceptual representations may be supported by different types of information. How concepts are represented in semantic memory is a matter of debate. Categorization ability is a key principle, allowing not only to group concepts together according to specific types of information, but also to extend to novel entities the general knowledge about a category inferred from its members. How categorization occurs, how semantic categories are organized, which concepts are grouped together and on which basis, are questions still far from having an answer (Caramazza and Shelton, 1998; Martin, 2007; Patterson et al., 2007).

The observation of neurological patients showing selective impairments of conceptual knowledge for specific categories has played a major role in the development of this area of research. Dissociations have been reported between different domains of knowledge, such as abstract and concrete concepts (Warrington, 1975). Moreover, within the concrete domain, a number of dissociations have been described among distinct categories, involving living (animals, fruits and vegetables) and non living entities (tools, vehicles, furniture) (for a review see Capitani et al., 2003). Dissociations between domains or categories of knowledge have been reported in patients with Alzheimer's Disease (AD) and the semantic variant of Primary Progressive Aphasia (sv-PPA) (Gorno-Tempini et al., 2011), also known as Semantic Dementia (SD) (Snowden et al., 1989; Hodges et al., 1992). Notwithstanding the considerable number of studies, the results are far from consistent. In particular, the same dissociation (i.e., abstract vs. concrete or living vs. non living) may be reversed/different in these two pathologies, or may also present in opposite directions in patients affected by the same condition. Only a very limited number of studies have investigated the abstract/concrete dichotomy in patients with AD, reporting a poorer performance for abstract than for concrete words (Rissenberg and Glanzer, 1987; Fung et al., 2000; Yi et al. 2007), or no significant

* Correspondence to: IRCCS Istituto Neurologico Carlo Besta, Via Celoria 11, 20133 Milano, Italy Tel.: +39 02 23942704.

E-mail address: e.catricala@libero.it (E. Catricalà).

differences (Graham et al., 2004; Hsieh et al., 2012). In contrast, studies on single cases or on groups of patients affected by SD have reported better performance on abstract than concrete concepts (i.e., reversal of the concreteness effect) (Warrington, 1975; Breedin et al., 1994; Cipolotti and Warrington, 1995; Macoir, 2009; Reilly et al., 2007; Papagno et al., 2009; Bonner, 2009; Yi et al., 2007). Some authors have even proposed that preserved abstract word knowledge is a typical feature of SD (Grossman and Ash, 2004), and that this effect is related to the severity of the semantic impairment (Bonner et al., 2009). Other studies, however, highlighted an impairment for both word types (Hoffman and Lambon Ralph, 2011; Jefferies et al., 2009), and have concluded that the disproportionate impairment for concrete words is rare and may be attributed either to individual differences in premorbid abilities (Jefferies et al., 2011) or to methodological confounds (i.e., higher familiarity for abstract than concrete concepts, or low imageability difference between abstract and concrete concepts) (Hoffman et al., 2012).

Within the concrete domain, the living–non living dissociation in AD is generally characterized by a better performance on non living items (Chertkow and Bub, 1990; Garrard et al., 1998; Gonnerman et al., 1997; Silveri et al., 1991; Zannino et al., 2002), although there are also studies reporting the opposite dissociation (Gonnermann et al., 1997) or no significant differences (Tippett et al., 1996). Only a limited number of case studies showed a dissociation between living and non-living in sv-PPA (i.e., Barbarotto et al., 1995; Lambon Ralph et al., 2003; Lambon Ralph et al., 1998; Zannino et al., 2006a), as sv-PPA patients generally show a poor performance for both categories. These studies, however, are difficult to compare, due to differences in the characteristics of stimuli and in the tasks.

In considering these inconsistencies, it has also been argued that materials were insufficiently matched for familiarity, and word frequency (Funnell and Sheridan, 1992); visual complexity (Stewart et al., 1992) and age of acquisition (Silveri et al., 2002). In addition, other factors, such as name agreement (Albanese, 2007), emotional valence (Brousseau and Buchanan, 2004) and manipulability (Filliter et al., 2005), or differences based on the semantic features of the concepts, such as semantic relevance (Sartori and Lombardi, 2004) and semantic distance (Zannino et al., 2006b) have also been shown to play a role. When categories were matched for many of the aforementioned variables, some studies found a persisting category effect (Silveri et al., 2002; Zannino et al., 2002; Martinaud et al., 2009), while others reported an attenuation or cancellation of the category effect (Tippett et al., 1996, 2007). It is noteworthy that some investigators (Moreno-Martinez and Laws, 2008; Gale et al., 2009) have shown that AD performance on lexico-semantic tasks is only quantitatively worse, rather than qualitatively different from that of healthy elderly controls, with the same size and direction of the category effects.

Within the abstract domain, potential differences across categories have been seldomly investigated. Some patient studies have assumed that different organizational principles underlie the representation of concrete and abstract concepts (i.e., associative for abstract rather and categorical for concrete) (see Crutch and Warrington, 2005). This assumption, however, does not imply that different categories cannot be identified within the abstract domain, even if a greater overlap between abstract categories may exist, given the absence of distinct physical identifiers for category members. Nonetheless, in the few studies of AD and sv-PPA patients, abstract concepts have been grouped in a single category (Rissenberg and Glanzer, 1987; Jefferies et al., 2011). In one of the first reports concerning semantic memory impairments in AD, Martin and Fedio (1983) showed preserved word comprehension for emotion words. Word comprehension was assessed using a Symbol Referent Test, where subjects were asked to match “abstract pictorial representations with printed words denoting objects, actions, emotion, and modifiers”. AD patients were impaired in

the comprehension of single words related to objects (table), actions (to sit), or modifiers (strong), but not for emotion words (happy, sad, hungry, love). However, a recent study assessing the comprehension of emotion words as compared to other abstract words and concrete words in both AD and sv-PPA, using two word comprehension tasks, one to assess abstract and concrete items, the other emotions, failed to find support for selective preservation of emotion words (Hsieh et al., 2012).

In addition, there is some evidence for concepts referring to social behaviors to be distinct from other abstract concepts. A selective activation of the bilateral superior anterior temporal lobes was highlighted when participants were asked to judge the meaning relatedness of social concepts (i.e., honor) as compared to concepts describing animal functions (i.e., nutritious) (Zahn et al., 2007).

The general aim of the current study was to assess semantic knowledge impairments in patients affected by neurodegenerative diseases, i.e., patients with AD and sv-PPA and for both concrete and abstract concepts. Differences in performance between patient groups may reflect the severity of a lexical-semantic impairment, or the different pattern of anatomical involvement in the early stage of disease, leading to qualitative differences between domains or categories of knowledge.

We specifically address the abstract/concrete dissociation and the presence of category effects in the abstract and concrete domains, trying to overcome some of the limitations of the previous studies. To assess concrete and abstract concepts, we use two batteries of tests involving different semantic categories, respectively living and non living entities for concrete concepts and human action, cognition, attribute, emotion and social relation for abstract concepts. The tests are characterized by an extremely tight control of the main variables that could influence performance on the tasks. We used two different batteries of tests specifically tailored to concrete (Catricalà et al., 2013) or to abstract concepts (Della Rosa et al., 2014). The necessity to create ad-hoc instruments to identify impairments in each knowledge domain type of knowledge is due to the difference in terms of hypothesized semantic representations (see Crutch and Warrington, 2005) for each type of knowledge, and to the difficulty or impossibility to investigate concepts in either domain through the same type of material (i.e., pictures or words) or with the same tools. In particular, the use of a single task for both types of concepts can actually result in an advantage of one domain over the other (i.e., association tasks are more suitable for abstract than for concrete words; synonym judgment tests are more suitable for concrete than abstract, in agreement with the hypothesis of different underlying organizations see Crutch and Warrington, 2005). To the best of our knowledge, no previous study has compared AD patients and sv-PPA patients with controls using the same series of tasks employing both abstract and concrete concepts, assessing both input and output modalities and controlling for a large number of variables that could account for the subjects performance.

The abstract/concrete dissociation remains poorly investigated in AD and very controversial in sv-PPA. The few studies on AD reported a concreteness effect or no differences between abstract and concrete concepts. In sv-PPA, inconsistent results have been attributed to methodological confounds. In the present study, we looked for genuine abstract/concrete dissociations beyond potential methodological constraints related to tasks or stimuli characteristics in each domain, trying to overcome possible artefactual influences resulting in a differential performance for concrete or abstract concepts.

As for category-related effects, their presence in the concrete domain has been extensively investigated in AD. However, the studies are very heterogeneous in the results and in the variables taken in consideration. Within the concrete domain, we aim at identifying a genuine category-effect (i.e., living–nonliving), when taking into account those confounding variables that may account

Download English Version:

<https://daneshyari.com/en/article/7320839>

Download Persian Version:

<https://daneshyari.com/article/7320839>

[Daneshyari.com](https://daneshyari.com)