



Different patterns of recollection impairment in confabulation reveal different disorders of consciousness: A multiple case study



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ABSTRACT

Recollection is used to refer to the active process of setting up retrieval cues, evaluating the outcome, and systematically working toward a representation of a past experience that we find acceptable.

In this study we report on three patients showing different patterns of confabulation affecting recollection and consciousness differentially. All patients confabulated in the episodic past domain. However, whereas in one patient confabulation affected only recollection of events concerning his personal past, present and future, in another patient confabulation also affected recollection of impersonal knowledge. The third patient showed an intermediate pattern of confabulation, which affected selectively the retrieval of past information, both personal and impersonal. We suggest that our results are in favor of a fractionation of processes involved in recollection underlying different disorders of consciousness.

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1. Introduction

In the fourth century BC, Aristotle described two forms of retrieval. The first, *mnéme* (μνήμη), is automatic and effortless, the second, *anámnēsis* (ἀνάμνησις), requires an active search in memory (Aristotle, 2002). This ancient distinction between two forms of retrieval is still object of debate and scientific investigation in contemporary memory research. Aristotle's *anámnēsis* largely corresponds to what now is referred to as recollection. Recollection is used to refer to the active process of setting up retrieval cues, evaluating the outcome, and systematically working toward a representation of a past experience that we find acceptable (Baddeley, 1982). Phenomenologically, recollection is often characterized by the subjective experience of 'remembering'. Since the initial formulation by Tulving (1985) through the work of Gardiner and colleagues

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(Gardiner & Java, 1990; Gardiner & Richardson-Klavehn, 2000), *remembering* is defined as the phenomenological experience of consciously recalling a specific past event in its temporo-spatial context, as opposed to *knowing*, which refers to a general sense of familiarity with a past event, lacking specific temporo-spatial details. It has been shown that recollection (and its phenomenological counterpart, 'remembering') is severely impaired in amnesia and in patients with Alzheimer's disease (Dalla Barba, 1997; Huppert & Piercy, 1978; Knowlton & Squire, 1995; Yonelinas, 2001), whereas familiarity (or 'knowing') is relatively less affected. Amnesic patients, however, are not only impaired in recollecting their personal past, but are equally impaired in recollecting their personal future (Dalla Barba & Boissé, 2010; Dalla Barba, Cappelletti, Signorini, & Denes, 1997; Klein, Loftus, & Kihlstrom, 2002; La Corte, George, Pradat, & Dalla Barba, 2011; Tulving, 1985). In other words, these patients can neither consciously remember their personal past, or can they consciously imagine their personal future. Accordingly, within the framework of the Memory, Consciousness and Temporality Theory (MCTT), Dalla Barba (2002) proposed that the deficit of recollection in amnesic patients, rather than a pure memory disorder reflects a loss of Temporal Consciousness (TC), defined as a specific form of consciousness that allows individuals to temporalize objects and events according to the subordinate structures of subjective temporality, i.e. past, present and future. TC is a specific form of consciousness that allows individuals to have phenomenological experience of remembering their personal past, of being oriented in their present world and of predicting their personal future (Dalla Barba & La Corte, 2013).

In contrast, Knowing consciousness (KC, means to become aware of something as a meaning or as an element of impersonal knowledge), is usually preserved in amnesic patients. In fact they had normal access to semantic knowledge, including foresight of impersonal future.

Recollection, therefore, can be operationally defined as a non-automatic, effortful, step-by-step, reconstructive cognitive process that allows individuals to access elements and information from their personal and impersonal past and future, which are not otherwise 'immediately' (Bergson, 1889) available to consciousness.

Following the above operational definition, an important question is whether recollection is a non specific, general cognitive process, which, when affected, impairs individuals to access any type of past and future information or, alternatively, it is a task dependent cognitive process that can be selectively impaired according to the type of information, episodic or semantic, to be accessed. In other words, do we need recollection only to retrieve our personal past, i.e. 'remembering', and to foresee our personal future, i.e. 'projecting', or are we engaged in a recollection process also when we try to access past and future impersonal semantic information? If one asks you "What did you do last Wednesday?" or "What will you be doing next Wednesday", or "What are likely to be the most important progress in the medical domain in the next ten years?"

Now, if we consider that recollection is a non-specific cognitive process that is engaged in any recall situation, demanding an active, step-by-step, effortful information retrieval, this would predict that the retrieval of any kind of memory and information, which is not promptly available to consciousness, requires recollection. An alternative view, predicts that recollection may be differentially impaired according to the nature, personal *versus* impersonal, of the piece of information to be retrieved. If this is the case, it is possible that two distinct types of recollection exist, one hippocampal dependent involved in the retrieval of personal information, and a second one, independent from hippocampal activity, involved in the retrieval of impersonal information.

Impairment of recollection can express itself as 'negative' symptoms such as the failure to retrieve desired information, or as 'positive' symptoms such as memory distortions (Balota et al., 1999; Budson, Daffner, Desikan, & Schacter, 2000; Budson et al., 2002; Dalla Barba, Nedjam, & Dubois, 1999; Dalla Barba, Parlato, Iavarone, & Boller, 1995; Dalla Barba & Wong, 1995; Schacter & Slotnick, 2004). One such memory distortion is confabulation, that is the production of statements or actions that are unintentionally incongruous to the subject's history, background, present and future situation (Dalla Barba, 1993a).

This rather infrequent disorder is classically described in Korsakoff's syndrome (Benson et al., 1996; Bonhoeffer, 1904; Cermak, Uhly, & Reale, 1980; Dalla Barba, Cipolotti, & Denes, 1990; Korsakoff, 1889; Mercer, Wapner, Gardner, & Benson, 1977; Schneider, Gutbrod, & Schroth, 1996; Talland, 1961; Wyke & Warrington, 1960). But confabulation is also seen in patients suffering from ruptured aneurisms of the anterior communicating artery, subarachnoid hemorrhage or encephalitis (Alexander & Freedman, 1984; Dalla Barba, Cappelletti, et al., 1997; De Luca & Cicerone, 1991; Delbecq-Derouesné, Beauvois, & Shallice, 1990; Diamond, De Luca, & Kelley, 1997; Irle, Wowra, Kunert, & Kunze, 1992; Kapur & Coughlan, 1980; Kopelman, Guinan, & Lewis, 1995; Luria, 1976; Moscovitch, 1989, 1995; Papagno & Muggia, 1996; Schneider, Gutbrod, et al., 1996; Stuss, Alexander, Lieberman, & Levine, 1978), head injury (Baddeley & Wilson, 1986; Dalla Barba, 1993b; Demery, Hanlon, & Bauer, 2001; Schneider, von Däniken, & Gutbrod, 1996; Weinstein & Lyerly, 1968), Binswanger's Encephalopathy (Dalla Barba, 1993a), Alzheimer's disease and frontotemporal dementia (Dalla Barba et al., 1999; Kern, Van Grop, Cummings, Brown, & Osato, 1992; Nedjam, Dalla Barba, & Pillon, 2000; Nedjam, Devouche, & Daalla, 2004) and aphasia (Sandson, Albert, & Alexander, 1986). Confabulation may also be observed, on occasion, in normal subjects (Burgess & Shallice, 1996; Dalla Barba et al., 2002; Kopelman, 1987).

A number of studies have shown that confabulation can be *selective*, in the sense that it can be restricted to episodic memory, without affecting semantic memory (Burgess & McNeil, 1999; Dalla Barba, 1993a, 1993b; Dalla Barba, Boissé, Bartolomeo, & Bachoud-Lévi, 1997; Dalla Barba, Cappelletti, et al., 1997; Dalla Barba et al., 1999; Klein et al., 2002; La Corte, Serra, Attali, Boissé, & Dalla Barba, 2010; La Corte et al., 2011). Within the framework of MCTT confabulation is related to a dysfunction of TC. Namely in confabulating patients TC is still present as in normal subjects but it is somehow distorted. Indeed these patients can still remember their past, they are present to the world and they can project themselves in a personal future, but in doing these operations they make errors. Therefore confabulation involves the whole personal

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