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## A longitudinal study of confabulation



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## ABSTRACT

Confabulation, the production of statements and actions that are unintentionally incongruous to the subject's history, background, present and future situation, is a rather infrequent disorder, observed in several conditions affecting the nervous system. Little is known about the quantitative and qualitative evolution of confabulation in time. In this study we evaluated longitudinally the evolution of this disorder in a group of severe confabulators, using the Confabulation Battery (CB), a sensitive tool to detect confabulations in various memory domains. It was found that confabulations were stable over time and not temporally limited. It was also found that "Habits Confabulations" (HCs), i.e., habits and repeated personal events mistaken as specific, unique past and future personal episodes, or well-known public events when semantic knowledge is concerned, was the more frequently observed type of confabulation. Confabulations were also more prominent in the domain of Temporal Consciousness (TC), i.e., a specific form of consciousness that allows individuals to remember their personal past, to be oriented in their present world and to predict their personal future, than in Knowing Consciousness (KC), i.e., a specific form of consciousness allowing individuals to be aware of past, present and future impersonal knowledge and information. Confabulations showed also persistence, i.e., confabulations at the same questions over time, and consistency, i.e., same type of confabulation at the same question over time. These findings are discussed within the framework of the Memory, Consciousness and Temporality Theory.

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## 1. Introduction

Some patients with significant memory impairment show confabulation, the production of statements and actions that

are unintentionally incongruous to the patient's history, background, present and future situation (Dalla Barba, 1993a).

This rather infrequent disorder is a classical and pathognomonic sign of Korsakoff's syndrome (Benson et al., 1996;

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Bonhoeffer, 1904; Cermak, Uhly, & Reale, 1980; Dalla Barba, Cipolotti, & Denes, 1990; Korsakoff, 1889; Mercer, Wapner, Gardner, & Benson, 1977; Wyke & Warrington, 1960). But confabulation is also observed in patients suffering from ruptured aneurysms of the anterior communicating artery, subarachnoid hemorrhage or encephalitis, head injury (e.g., Baddeley & Wilson, 1986; Dalla Barba, 1993b), Binswanger's Encephalopathy (Dalla Barba, 1993a); Alzheimer's disease and frontotemporal dementia (Attali, De Anna, Dubois, & Dalla Barba, 2009; Dalla Barba, Nedjam, & Dubois, 1999; Kern, Van Grop, Cummings, Brown, & Osato, 1992; La Corte, Serra, Boissé, & Dalla Barba, 2010; Nedjam, Dalla Barba, & Pillon, 2000; Nedjam, Devouche, & Dalla Barba, 2004) and aphasia (Sandson, Albert, & Alexander, 1986). Confabulation may also be observed, on occasion, in normal subjects (Dalla Barba et al., 2002; Kopelman, 1987).

Since the early description of this phenomenon, clinicians and scientists have distinguished between two types of confabulation (Bleuler, 1949; Bonhoeffer, 1904; Flament, 1957; Talland, 1961). Kopelman (1987), synthesizing these distinctions, proposed to distinguish between “provoked” and “spontaneous” confabulation. According to Kopelman, provoked confabulation reflects a normal response to a faulty memory, whereas spontaneous confabulation reflects the production of an “incoherent and context-free retrieval of memories and associations” (Kopelman, 1987, p.1482) resulting from the superimposition of frontal dysfunction on an organic amnesia. The provoked/spontaneous distinction correctly captures two extreme forms of confabulation, which may have different underlying neurocognitive mechanisms.

Dalla Barba and co-workers (Dalla Barba & Boissé, 2010; La Corte et al., 2010) proposed a taxonomy of confabulation based on a qualitative account of their content. Based on clinical and experimental studies showing that confabulations often consist of personal habits, which are considered by the patient as specific personal episodes, Dalla Barba and co-workers found that what they named “Habits Confabulation” (HC) was the more frequently observed type of confabulation in their studies (Dalla Barba & Boissé, 2010; La Corte et al., 2010; Serra et al., 2014).

Confabulation is not associated to any specific brain lesion. It is frequently observed following orbitofrontal lesions, but can occur in patients with lesions in more than twenty anterior and posterior brain regions. Indeed, as proposed by Dalla Barba & La Corte (2013 and 2015), what seems to be most important for confabulation is neither etiology nor locus of damage, but at least partial or unilateral integrity of the hippocampus. Gilboa and Moscovitch found that out of 79 patients with confabulation two had unilateral perirhinal lesions and one had a unilateral parahippocampal lesion. None of these patients had lesions involving the hippocampus (Gilboa & Moscovitch, 2002). Twenty eight additional confabulating patients not included in Gilboa's and Moscovitch's review had also preserved hippocampus (Dalla Barba & Boissé, 2010).

Drawing on the Memory, Consciousness and Temporality Theory (Dalla Barba, 2002), it has been shown that patients confabulate exclusively (Dalla Barba, 1993a; Dalla Barba, Boissé, Bartolomeo, & Bachoud-Lévi, 1997; Dalla Barba, Cappelletti, Signorini, & Denes, 1997), or significantly more frequently (Dalla Barba, 1993b; Dalla Barba & Boissé, 2010;

Dalla Barba, Boissé, et al., 1997; Dalla Barba et al., 1990; La Corte, George, Pradat, & Dalla Barba, 2011), in Temporal Consciousness (TC), i.e., a specific form of consciousness that allows individuals to remember their personal past, to be oriented in their present world and to predict their personal future, than in Knowing Consciousness (KC), i.e., a specific form of consciousness allowing individuals to be aware of past, present and future *impersonal* knowledge and information.

An open question concerning confabulation is whether or not it should be considered a transient sign observable in the acute or sub acute stage of patients with acquired brain injury. It is uncontroversial that, on some occasions, confabulations may decrease and disappear in few days or weeks, or even suddenly recover (Dalla Barba, Barbera, Brazzarola, & Marangoni, 2016). However, little is known about the quantitative and qualitative evolution of confabulation in time. To the best of our knowledge, only one study (Schnider, Ptak, von Däniken, & Remonda, 2000) followed up eight confabulators for several months, observing that seven of them eventually stopped confabulating. Unfortunately, the above study doesn't provide any quantitative measure of confabulation. Another study, evaluated confabulations longitudinally for 9 months and found that they were correlated to the severity of memory impairment and to errors on executive tests.

Little is known about persistence, i.e., confabulations at the same questions over time, and consistency, i.e., same type of confabulation at the same question over time. This information would show to which degree confabulators confabulate randomly and inconsistently, or they tend to confabulate to the same questions, with the same type of content, when tested with the CB at different times. Dalla Barba et al. (1990) found that in their patient CA persistence and consistency were main features. Tested in different sessions, CA showed a persistence of 91% and a consistency of 78%. In another study on a single case, Fotopoulou, Solms, and Turbull (2004) found that confabulations were consistent over time.

The main aim of the present study is to observe the evolution of confabulation in time, using the CB, a tool that allows both the quantification and the qualification of confabulation. The prediction is that the quantity and the quality of confabulation should not change in time, provided that the patients' brain lesion is not progressive. Based on previous studies of the Dalla Barba's group, it is also predicted that HC would be the more frequently observed type of confabulation, and that confabulations in TC would be more frequent than confabulation in KC.

## 2. Materials and methods

### 2.1. Participants

A total of 26 participants entered the study. Thirteen confabulating amnesic (CA) patients (5 female, mean age: 58.6, range: 42–82, years of education: 12, range: 5–17, all right-handed) of various etiologies (see Table 1 for CA patients characteristics) and 13 age and education matched normal controls (NCs, 5 female, mean age: 58.6, range: 42–82, years of education: 14, range: 8–18, all right-handed). None of the patients was in an

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