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SYMPOSIA — INTRODUCTION

Telling It Like It Isn't: The Cognitive Neuroscience of Confabulation

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INTRODUCTION

Patients who confabulate provide information or act based on information that is obviously false or that is clearly inappropriate for the context of retrieval. The patients are unaware of these falsehoods, which has led Moscovitch (1989) to coin the term "honest lying" to describe this intriguing symptom. Patients with confabulation will sometimes cling to their false beliefs even when confronted with the truth or despite being aware of contradictory evidence. Most neuropsychologists could probably agree with the above description; however, despite over a century of research, much else remains controversial. This symposium provides an overview of current ideas about confabulation and presents novel empirical research on the phenomenon. Several aspects of the controversies that characterize the field are represented in this collection of studies. These include even the most basic question of how confabulation should be defined and how many types of confabulation there are. The studies also address questions regarding the neural basis of confabulation and regarding the neurocognitive mechanisms that may underlie its occurrence. We briefly discuss each of these three issues below.

DEFINITION AND CLASSIFICATION

The term "confabulation" was first used by Emil Kraepelin in 1886 (Koehler & Jacoby, 1978) to describe several types of falsification of memory, including the recounting as true memories of haphazard events that lack correspondence to real experienced events. Similarly, Korsakoff considered "pseudo-reminiscences" a fundamental aspect of the memory disorder he observed in alcoholic patients (Victor & Yakovlev, 1955). He specifically attributed patients' confusions to errors of memory, and considered them misrepresentations of past events. In his view, pseudo-reminiscences could reflect complete inventions of events, distortions of memories, or memories ascribed to the wrong period in patients' lives.

Since then, confabulation has been used to denote a wide range of errors in memory as well as distortions in other cognitive domains. In its most striking form, confabulation can refer to highly implausible bizarre descriptions of false realities, such as claiming to be a pirate on a spaceship (Damasio, Graff-Radford, Eslinger, Damasio, & Kassell, 1985) or watching members of one's family being killed (Stuss, Alexander, Lieberman, & Levine, 1978). The term confabulation has also been used to describe less dramatic errors such as intrusions, embellishments, elaborations, and paraphrasing of actual memories, as well as high false alarm rates on tests of anterograde amnesia. Various attempts have been made to distinguish these different kinds of confabulation. For example, Berlyne (1972) distinguished between momentary and fantastic confabulations. He suggested that the former, which are more common, are typically brief and reflect true content that is displaced in time; the latter, in contrast, are more grandiose and stable in content, and appear without provocation. Berlyne concluded that fantastic confabulation is a distinct entity, having nothing in common with momentary confabulation. Kopelman (1987) argued that a more useful distinction is that between spontaneous confabulation and provoked confabulation: Spontaneous confabulation is rare and occurs in the context of an amnesic syndrome superimposed on frontal dysfunction, whereas provoked confabulation is a common, normal response to faulty memory. Kopelman's terminology is now commonly used by many investigators of confabulation. However, it too poses difficulties, for example when clearly implausible information is provided in the course of natural conversation or in response to a casual question. By Kopelman's classification, direct experimental investigation of spontaneous confabulation is almost impossible. By definition, spontaneous confabulations cannot be experimentally induced, because the induction of false accounts already defines them as provoked confabulation.

Classification of different types of confabulation also involves distinguishing them from other types of false ideas, most notably delusions. There are obvious similarities

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between confabulation, particularly of the fantastic or spontaneous type, and delusions. Both delusions and confabulations involve the production of unintentional false statements, both are resistant to contradictory evidence, and both have been shown to be influenced by motivational biases. Berrios (2000) has argued that because confabulation involves a propositional attitude and falls within the realm of false narrative production, it cannot be formally distinguished from delusion. He suggests that confabulation is a form of delusion, when the latter is more flexibly and broadly defined. Others have more cautiously proposed that the observed similarities between confabulations and delusions could serve to construct neurocognitive models that highlight their common mechanisms. Such models have centered on dysfunctional forms of belief monitoring (Langdon & Bayne, 2010; Metcalfe, Langdon, & Coltheart, 2007; Turner & Coltheart, 2010) or causal affective and motivational factors (Fotopoulou, 2010) that are thought to be common to both disorders. An alternative view is that the correspondence between the disorders may constitute merely a surface similarity and that empirical and theoretical attempts should be made to better dissociate them rather than obscure the boundaries between them. Kopelman (1999, 2010), for example, emphasizes the context in which the two disorders occur (psychiatric *vs.* neurological) and the fact that confabulation is a memory-related phenomenon whereas delusion is a belief formation disorder. He notes several clinical characteristics that distinguish the two, most notably the fact that delusions tend to be more systematic and pervasive, encompassing many realms of life, whereas confabulations are more isolated and fleeting in nature. If delusions have a memory component at all, it appears to be related to biased delusion-congruent *encoding* of novel information (Gilboa, 2010) whereas confabulation appears to be primarily a disorder of *retrieval* (see below).

Rather than classifying different types of confabulations, Talland (1965) and subsequently Moscovitch (1989) have aimed to identify the core characteristics common among all forms of confabulation, and these characteristics have since become the focus for many theoretical and empirical studies of confabulation, including the ones that appear in the present issue. Both Talland and Moscovitch have described confabulation as (i) an account based in memory that is false with respect to the context in which the event is placed, and may contain false or grossly inaccurate details within its own context. In this issue, La Corte et al. (2010) suggest that even this most fundamental characteristic of confabulation can be used as basis for characterizing specific types of confabulation, and focus on the distinction between generic and specific interjected memories. (ii) Patients typically exhibit anosognosia for their memory problem and are unaware of the fact that they are confabulating. Thus, confabulations are not intentionally produced and are probably not the result of compensatory mechanisms. That said, there is accumulating evidence that confabulations may reflect unintentional motivations and drives, and therefore are positively biased, leading some to coin the term motivated or self-enhancing confabulation (Conway & Tacchi, 1996; Fotopoulou, Conway, Griffiths, Birchall, & Tyrer, 2007). This portrayal of confabulation as being positively biased is challenged by Bajo and colleagues (2010, this issue) who suggest that, while an emotional bias may exist, it is not necessarily a positive one (cf. Metcalf, Langdon, & Coltheart, 2010). (iii) Patients may act upon their confabulation, reflecting their genuine belief in the false memory. This characteristic was subsequently highlighted by Schnider (2008). He suggested that such behavior represents a unique type of confabulation with distinct neurocognitive mechanisms, for which he introduced the term behaviorally spontaneous confabulation. The existence of a possible dissociation between behaviorally spontaneous confabulation and verbally spontaneous confabulation is addressed by Turner et al. (2010) and Nahum et al. (2010) in the present issue. (iv) Confabulations are most frequent in the autobiographical domain, and autobiographical confabulations are usually associated with the strongest confidence in their veracity. However, some cases of spontaneous confabulation have been reported that are not directly related to the patient's own life (Baddeley & Wilson, 1988) and under certain conditions of testing, confabulations may also appear on semantic memory tasks. Kan and colleagues (2010, this issue) present a convincing example of this, as they elicit misjudgments in a semantic task, with the aim of probing the mechanisms underlying memory errors in confabulation. The predominance of confabulation in autobiographical recall compared with semantic memory may be a function of the complex narrative structure of the former; furthermore, the conviction with which autobiographical confabulations are held may reflect the fact that the self-schema is the richest and most complex schema representation humans have (Gilboa, 2004; Gilboa, Alain, Stuss, Melo, Miller, & Moscovitch, 2006). The studies by Kan et al. (2010) and Nahum et al. (2010) in this issue, which demonstrate that confabulation can occur in domains other than episodic memory, may help elucidate the mechanisms underlying confabulation and may clarify its relationship with autobiographical memory.

Because of the complexity associated with the definition and taxonomy of confabulation, many investigations of confabulation resort to a combination of methodologies to assess confabulation and to quantify symptoms. In most studies in this issue, patients were identified based on initial clinical observation of spontaneous confabulation (Bajo et al., 2010; Kan et al., 2010; Nahum et al., 2010; Turner et al., 2010), as is common in confabulation research. These observations are usually derived from patients' clinical records, and some authors provide examples of these confabulations in their case descriptions (Nahum et al., 2010; Turner et al., 2010). Qualitative descriptions may become critical in studies that attempt to investigate the mechanisms of specific types of confabulation, such as spontaneous *versus* provoked confabulations, behaviorally spontaneous confabulations (Schnider, 2008), or semantically anomalous confabulations (Dalla Barba, 1993).

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Attempts to more precisely quantify confabulations usually rely on structured interviews that use open-ended questions to probe provoked confabulations, such as Dalla-Barba's confabulation questionnaire (Dalla Barba, 1993, 2002) or variants of the Crovitz cue word test (Moscovitch & Melo, 1997). This approach was also used in several of the studies in this issue (Bajo et al., 2010; Kan et al., 2010; Nahum et al., 2010; Turner et al., 2010). La Corte et al. (2010, this issue) based their definition of confabulation entirely on patients' performance on questionnaires. Although provoked confabulations occur in the absence of spontaneous confabulations, we are not aware of reports of verbally spontaneous confabulation in patients who are not also susceptible to provoked confabulations of the type induced by questionnaires. This is probably the justification for the implicit assumption that performance on open-ended questions can serve as an index of spontaneous confabulation; however, although provoked and spontaneous confabulations coexist, they may reflect distinct mechanisms, and a double dissociation between the two types of confabulation could potentially be observed.

NEUROANATOMY AND ETIOLOGY

Just as there remains uncertainty as to how to best classify confabulation, questions remain regarding its neuroanatomical underpinning. Dual-lesion hypotheses suggest that a combination of damage to prefrontal structures and to areas that support memory functions, such as the basal forebrain and medial temporal lobes, is required for confabulation to occur (Damasio et al., 1985; DeLuca, 1993). However, an extensive review of the literature (Gilboa & Moscovitch, 2002) found that lesions to ventromedial aspects of the prefrontal cortex appear to be sufficient for confabulation; additional damage to memory-related structures was reported in only approximately 50% of the cases. Damage to regions that cause an amnesic syndrome may promote the production of confabulations but is not necessary for their occurrence.

Extending this view, it has also been suggested that substantial damage to any part of the anterior limbic system (including the basal forebrain, anterior insula, hypothalamus, and amygdala) can produce confabulation (Schnider, 2008). However, the link between confabulation and specific lesions in frontal or anterior limbic regions has been questioned, either directly (e.g., Dalla Barba, Nedjam, & Dubois, 1999) or implicitly, in studies that investigate confabulation in conditions that are not associated with specific damage to these regions, such as healthy aging, dementia, and psychiatric disorders such as schizophrenia. Phenomena of falsification of memory can be found in many of these conditions, but the question remains whether they share the same underlying mechanisms as confabulation associated with damage to ventromedial prefrontal cortex or the anterior limbic system.

Studies in the present issue appear to point to significant differences between confabulations arising in the context of focal lesions and false memories associated with other etiologies. For example, La Corte et al. (2010, this issue), investigated provoked confabulations in dementia of the Alzheimer's type and in younger confabulating amnesics of various nonprogressive etiologies including Korsakoff's disease, cerebrovascular accidents, and multiple sclerosis. They found that amnesic confabulators were significantly more prone to produce confabulations than Alzheimer's patients, and only amnesic patients produced what the authors termed "semantically anomalous" confabulations. Semantically anomalous confabulations are probably more similar to Berlyne's (1972) fantastic confabulations and Kopelman's (1987) spontaneous confabulations. The findings therefore suggest that Alzheimer's disease (at least in early stages of the disease, when posterior cortical regions are primarily affected) may be associated with production of provoked, but not spontaneous, confabulations. Evidence for distinct mechanisms of confabulation associated with focal neurological lesions and diffuse disorders also comes from the study of Lorente-Rovira et al. (2010, this issue) who examined confabulation in schizophrenics in the context of a fable recall task. In line with previous studies (Dab, Morais, & Frith, 2004; Lorente-Rovira, Pomarol-Clotet, McCarthy, Berrios, & McKenna, 2007), the authors found that provoked confabulation in their patient group was not associated with episodic memory impairment, but rather, was linked to semantic memory impairment. Schizophrenics' confabulations were characterized by reorganization and reconstruction of elements in the original story, rather than the invention of completely new memories. It is important to note that memory distortions or confabulations in schizophrenia are related more to the negative symptomatology such as thought disorders symptoms rather than to delusions (Dab et al., 2004; Gilboa, 2010; Kopelman, 1999; Lorente-Rovira et al., 2007).

MECHANISMS AND UNDERLYING NEUROCOGNITIVE PROCESSES

Controversies over both the classification of confabulation and its neuroanatomical basis reflect more fundamental questions about the underlying mechanisms and neurocognitive processes that may best account for the observed phenomena. Elucidating these mechanisms is critical for understanding the various forms of confabulation, and may also help us gain better insight into the operation of neurocognitive systems in healthy individuals. Many models and theories have been proposed, which can be broadly categorized as belonging to one of three types: temporality/source confusion theories, strategic retrieval theories, and motivational accounts[1]. These are briefly described below.

[1] A fourth 'category' is eclectic accounts that suggest that confabulation is the result of a confluence of many different abnormalities which may greatly vary across patients, rather than a symptom with a specific set of underlying neurocognitive mechanisms. These are not discussed here.

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Temporality Theories

In 1889, Korsakoff put forward the hypothesis that patients who confabulate have a disturbed sense of chronology, so that they may correctly remember the content of events but confuse features of events that occurred at different times (Victor & Yakovlev, 1955). This notion also figures in several of more recent accounts (Dalla Barba, 1993, 2002; Johnson, Hashtroudi, & Lindsay, 1993; Schnider, Gutbrod, Hess, & Schroth, 1996; Schnider & Ptak, 1999). For instance, Schnider and Ptak (1999) proposed that behaviorally spontaneous confabulators suffer from temporal context confusion (TCC), which they conceptualized as an inability to suppress previously activated, but currently irrelevant, memory traces. Turner and colleagues (2010, this issue) empirically evaluated the idea that, in confabulation, memories from an older time period intrude thought and are judged as currently relevant. They used a variant of Schnider and colleagues' TCC task, a temporal source identification task, and a reality-monitoring task. Confabulating patients in their study displayed a source-monitoring deficit that was more general than might be predicted by the TCC account, and also showed a reality-monitoring deficit (cf. Johnson, O'Connor, & Cantor, 1997). These findings suggest that temporality deficits may be a prime example of a more general deficit in the ability to distinguish among different contexts or sources of information.

In later developments of their view, Schnider and colleagues (Nahum, Ptak, Leemann, & Schnider, 2009; Schnider, 2008) have conceptualized spontaneous confabulation as an impairment in filtering information according to its current relevance to ongoing reality. In so doing, the authors relate confabulation to alterations in the basic operations of the reward system of the brain and to an impairment in extinction, rather than to disruption of temporal aspects of cognition. Importantly, the failure of a filtering mechanism is proposed as the basis of behaviorally spontaneous confabulation, but not necessarily of other types of confabulation. Nahum and colleagues (2010, present issue) describe a patient with limbic encephalitis who did not confabulate in response to standard tests of provoked confabulation but acted as if she were living in a different reality, and interpret her confabulation as a failure of extinction. It is of interest that the patient did express her confabulations verbally as well as behaviorally, but not in response to semi-structured questionnaires. In Kopelman's (1987) terminology, she may be considered a case of spontaneous confabulation in the absence of provoked confabulations.

Another variant of temporality theory is Dalla Barba's (1993, 2002) temporality and consciousness account. This theory proposes that the three dimensions of temporality—past, present, and future—map onto three types of confabulation that are expressed in the context of past episodic memory, current time-place disorientation, and future plans, respectively. The account distinguishes a "knowing" consciousness and a "temporal" consciousness, which represent two modes of relating to objects: as an undetermined categorical entity and a determined specific entity. While the former is expressed in the form of habits and semantics, the latter relates to unique personal events, specified in time. La Corte and colleagues (2010, this issue) document the tendency in both confabulating amnesic patients and in patients with dementia to retrieve habitual, generic, well learned information and to mistake it for specific events (phenomenon they term "habits confabulation"). They interpret such habit errors as reflecting a disruption in temporal consciousness, leading the individual to rely on knowing consciousness instead. Highly engraved habits and routines also appear to play a role in the production of confabulations by the patient described by Nahum et al. (2010, this issue) and similarly have been highlighted by theories of strategic retrieval (Burgess & Shallice, 1996; Gilboa et al., 2006). Whether the mechanism underlying this phenomenon is one of disturbed temporal consciousness, disrupted extinction of highly salient cues, or a deficit in specification of retrieved memories remains to be determined.

Strategic Retrieval Theories

In keeping with the original descriptions of confabulation, many investigators consider confabulation an intrinsic memory phenomenon (Burgess & Shallice, 1996; Gilboa & Moscovitch, 2002; Kopelman, 1999; Moscovitch, 1989). Because confabulation affects remote memories acquired before brain damage occurred, it is often used as a model for the breakdown of retrieval processes. It is especially relevant as a model of an indirect form of retrieval in which the target memory is not elicited immediately by the cue but needs to be recovered through strategic search processes akin to problem solving. Strategic retrieval processes operate at input to frame the memory problem and initiate a search, to constrain it, and to guide it toward local, proximal cues that can activate associative memory processes. Furthermore, once a memory is recovered, strategic processes operate at output to monitor if the recovered memory is consistent with the goals of the memory task and with other knowledge, thereby verifying whether the recovered memory is likely true or false. Strategic retrieval theories focus on investigating and characterizing how memory-monitoring processes break down in confabulation.

Kan and colleagues (2010, present issue) probe postretrieval monitoring in confabulation within the semantic domain using a semantic illusion task that requires participants to verify the accuracy of general statements. They report that confabulating amnesics more often mistakenly endorsed inaccurate but semantically confusing statements than nonconfabulating controls. Moreover, confabulators also failed to reject false statements where the foil was semantically unrelated to the correct answer. The researchers ascribe this impairment in confabulating patients to a deficit in the sensitivity of a "felt rightness" monitoring heuristic (Gilboa & Moscovitch, 2002; Moscovitch & Winocur, 2002), which has been shown to operate very rapidly and outside of consciousness (Gilboa, Alain, He, Stuss, & Moscovitch, 2009).

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Kan and colleagues propose that even unrelated foils produce a salient felt rightness signal, thereby interfering with the otherwise automatic detection of false information. Turner et al. (2010, this issue) invoke a similar account to explain possible differences in source- and reality-monitoring between confabulating and nonconfabulating patients. It is worthwhile noting the similarity between felt rightness monitoring and the filtering mechanism proposed by Schnider (2008). Both are considered automatic, preconscious, and impenetrable to higher cognitive processes such as reasoning. Both are thought to be supported by similar brain regions as well. It is still an open question whether these are distinct processes, or whether they reflect different theoretical frameworks describing the same phenomenon.

Motivated Confabulation

Jaspers was the first to make the distinction between form and content in psychopathology (Jaspers, 1913/1997). Within the confabulation literature, content was largely ignored other than in broad characterizations such as Berlyne's "fantastic" confabulation. In recent years, there has been growing interest in the content of confabulation, but rather than treating content as a distinct theme, several theorists consider the content of confabulation to be inherently linked to the mechanism by which it arises. Conway and Tacchi (1996) described a patient whose confabulations, they argued, reflected an unconscious attempt to transform a current distressful reality into a harmonious, comfortable alternative one. By this account, a failure in controlled editing of memories combined with motivational biases forms the basis for confabulation. This line of thought has been developed extensively by Fotopoulou and colleagues (e.g., Fotopoulou et al., 2007; Fotopoulou, Solms, & Turnbull, 2004), who consider confabulation to reflect a combination of faulty reconstructive memory processes and self-enhancing biases. These suggestions are partly challenged by Bajo et al. (2010, this issue), who report that, although their patients' confabulations were more likely to be rated as having affective content than their true memories, there was no clear positive bias. Their findings further revealed that the affective valance of confabulations was positively associated with current mood states, such that confabulations tended to be mood congruent, rather than mood incongruent as the protective/self-enhancing hypothesis would predict. They too observed a high proportion of neutral/generic confabulations (see above), which reflect a person's most salient self representations. Thus, if motivation plays a formative part in confabulation, it may be that the need for stability and continuity amidst change and chaos better describes that motivation than self-enhancement.

In conclusion, the articles in the present issue are relevant to a wide variety of questions that are at the forefront of confabulation research. They demonstrate the importance of precise characterization of the nature of patients' confabulation and the circumstances under which they are observed, as well as the value of carefully designed experimental investigations into the mechanisms responsible for their occurrence. In so doing, we hope the current collection of papers will inform and inspire future studies of this unique neurological phenomenon.

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