

SPECIAL ISSUE

THE NEUROPSYCHOLOGY OF AUTOBIOGRAPHICAL
MEMORY

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ABSTRACT

This special issue of *Cortex* focuses on the relative contribution of different neural networks to memory and the interaction of 'core' memory processes with other cognitive processes. In this article, we examine both. Specifically, we identify cognitive processes other than encoding and retrieval that are thought to be involved in memory; we then examine the consequences of damage to brain regions that support these processes. This approach forces a consideration of the roles of brain regions outside of the frontal, medial-temporal, and diencephalic regions that form a central part of neurobiological theories of memory. Certain kinds of damage to visual cortex or lateral temporal cortex produced impairments of visual imagery or semantic memory; these patterns of impairment are associated with a unique pattern of amnesia that was distinctly different from the pattern associated with medial-temporal trauma. On the other hand, damage to language regions, auditory cortex, or parietal cortex produced impairments of language, auditory imagery, or spatial imagery; however, these impairments were not associated with amnesia. Therefore, a full model of autobiographical memory must consider cognitive processes that are not generally considered 'core processes,' as well as the brain regions upon which these processes depend.

Key words: anterograde amnesia, retrograde amnesia, perceptual disorders, temporal lobe, visual cortex, memory

INTRODUCTION

Over the last few years, we have been developing a multi-system model of memory by combining our basic understanding of neuropsychology and neuroanatomy with behavioral studies. This development began with a study of oral traditions (Rubin, 1995), and was then extended to autobiographical memory (Rubin, 1998; Rubin and Greenberg, 1998, in press). Researchers disagree about the precise meaning of "autobiographical memory"; for example, some view it as a form of episodic memory (Kopelman and N. Kapur, 2001; Rubin, 1998), while others use different definitions of these terms and thereby arrive at the opposite view (Conway, 2001). Still others prefer the term "recollective memories" (Brewer, 1995). When we use the term "autobiographical memory," we refer to memories that have several properties. First, like episodic memory, autobiographical memory "receives and stores information about temporally dated episodes or events and temporal-spatial relations among them" (Tulving, 1983, p. 21). Second, such memories involve something more than the mere retrieval of stored data: the person remembering

the memory must be conscious of the prior conscious experience, a self-reflective mental state that Tulving terms *autonoetic consciousness* (Tulving, 1985). As with many of the other cognitive processes we will discuss, autonoetic consciousness is not sufficient for autobiographical memory (it plays a role in other processes, such as prospective memory (Wheeler, Stuss, and Tulving, 1997)) but it is a necessary feature: many philosophical accounts (Brewer, 1995) and the reports of some amnesics (e. g. Crovitz, 1986; O'Connor et al., 1992) suggest that an autobiographical memory should be accompanied by a sense of reliving as well as the belief that the remembered event actually occurred. We define an *autobiographical memory* as a memory of a personally experienced event that comes with a sense of recollection or reliving. *Autobiographical facts* (Brewer, 1995), on the other hand, are bits of personally relevant information that are retrieved without this sense of reliving.

Most theories of memory claim that memory requires an interaction between medial temporal lobes, frontal lobes, and the rest of the cortex (Conway and Pleydell-Pearce, 2000; Damasio, 1989; Fuster, 1995; Kopelman, 2000; Kopelman and N. Kapur, 2001; Mayes and Roberts, 2001; Markowitsch, 2000; McClelland et al., 1995; McDonald et al., 1999; Murre, 1999; Murre et al., 2001; Shastri, 2002; Squire, 1992). The implications of this claim have rarely been investigated, however. In particular, most major theories do not dissect memory storage into modality-specific components. Conway and Pleydell-Pearce (2000), for example, state that memories are stored in an “undifferentiated pool” called “event-specific knowledge” (Conway and Pleydell-Pearce, 2000, Figure 1, p. 265; also see Conway, 1992, 1995a and Conway and Rubin, 1993 for further discussion of this idea). Kopelman’s model provides a detailed analysis of executive and emotional systems that play a role in memory, but devotes only a single module to storage (Kopelman, 2000, Figure 6, p. 608; Kopelman and N. Kapur, 2001, p. 1417). Along the same lines, McClelland and colleagues (1995, Figure 14, p. 444), Squire (1992), Murre (1999, Figure 1, p. 269), and Markowitsch (2000) all focus on medial temporal regions and devote little attention to posterior neocortical storage sites. McDonald and colleagues (1999) mention the hippocampus, the amygdala, the frontal lobes, the thalamus, and the basal ganglia – in fact, almost every region *besides* the posterior neocortex. Even theories that do mention memory in the neocortex do not address the relative contributions of several different cortical areas to memory in general (with the exception of studies addressing anterior and lateral temporal regions, which we review later in the paper). We are not claiming that we know little about the roles of these neocortical regions – in fact, the contrary is generally true – but rather that any such knowledge has rarely found its way into neurobiological theories of *memory and autobiographical memory* specifically. Nor are we embarking on a rehash of current theories or a simple assignment of a function to a region; instead, we are attempting to ask more detailed questions: given what we know about autobiographical memory on the behavioral level, which brain regions should be involved? Most importantly, what are the particular contributions of each of these regions to autobiographical memory, and what happens when they are damaged or destroyed?

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