
NEUROBEHAVIORAL GRAND ROUNDS—INTRODUCTION

Retrograde episodic and semantic memory impairment correlates with side of temporal lobe damage

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INTRODUCTION

Controversy continues about which brain structures and circuitry underlie the retrieval of past (remote) memories—autobiographical, personal semantic, or general semantic—and also about which lesion sites are critical for retrograde amnesia (RA) to occur (Kopelman, 2008). This issue relates, of course, to the differential predictions of consolidation theory and of multiple trace theory regarding patterns of retrograde amnesia (and indeed the predictions of other theories). The controversy also relates to issues regarding the differential pattern of left hemisphere versus right hemisphere damage, particularly in the temporal lobes, an issue which has influenced the literature since important studies by De Renzi et al. (1987) and O'Connor et al. (1992). De Renzi et al. (1987) described a woman who, following an episode of herpes encephalitis that affected the left temporal lobe, showed a severe impairment of semantic memory with relatively preserved autobiographical memories, whereas O'Connor et al. (1992) reported a patient with right temporal lobe damage (also from herpes encephalitis), who showed disproportionately severe impairment in the recall of autobiographical incidents, relative to remote semantic memories. It is this latter contrast between left- and right-sided damage which the present authors address.

As Buccione et al. (2008, this issue) have described in their balanced and fair introduction, there are controversies about laterality effects on RA both in lesion studies of patients and in functional imaging studies of healthy participants. Moreover, my impression is that lesion studies, as here, have more commonly reported a particularly marked effect of right-sided lesions on autobiographical incident recall, whereas functional neuroimaging investigations have more frequently emphasised the importance of left-sided circuitry (Maguire et al., 2000; Svoboda et al., 2006).

The present paper contrasts the performance of a herpes encephalitis patient with predominantly right-sided pathology with that of a patient who has bilateral but more severe left-sided damage. The authors have reported a partial double dissociation, in which their right-sided patient showed impairments mainly in the autobiographical domain (both episodic and personal semantic), whereas their left-sided patient showed poor performance across all domains, but more severe in non-autobiographical memory (both for public events and general semantic knowledge) than in autobiographical memory. The authors have attributed the left-sided patient's pattern to impaired language abilities and the loss of semantic competencies, whereas the right-sided patient's autobiographical memory loss might be related to either impaired visual imagery, or loss of the subjective experience of auto-noetic consciousness (which I prefer to call 'the sense of recollection'), or to an effect of right-sided damage upon emotional experience. They were not able to pin this down more precisely.

As always in the real world, the patients' lesions were not entirely clean. On detailed quantified MRI, patient RS showed slight atrophy of the right hippocampus as well as damage in the left hemisphere which extended beyond the left temporal lobe. Similarly, patient AS, who had extensive right-sided temporal lobe damage, also showed small areas of signal change in the left hippocampus and left temporal polar cortex.

Nevertheless, a pattern did emerge. Patient AS was particularly impaired in retrieving autobiographical incident memories across all time-periods. He also showed some impairment in retrieving childhood and early adult personal semantic memories but, curiously, he showed a reversed temporal gradient whereby his recent retrieval of such memories was normal. He was not significantly impaired in retrieving news events in response to a verbal questionnaire, and he was impaired in defining only those words which had entered the vocabulary in the last decade. By contrast, RS with predominately left-side damage showed a moderate but definite impairment in the retrieval of both

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autobiographical incident and personal semantic memories across all time-periods. She was also impaired in recalling news events from the 1990s, although it should be noted that this was a verbal test and her verbal IQ had been affected. She showed particularly pronounced impairment in defining new words which had entered the Italian vocabulary across the last 4 decades.

Previous studies have made similar comparisons. My colleagues and I (Kopelman et al., 1999) compared 2 patients with unilateral left temporal lobe damage with 3 patients with predominantly right temporal lobe damage, resulting from herpes encephalitis in all cases. We found a double dissociation between autobiographical incident recall and performance on a famous name-completion task, and we also looked at correlations with quantitative regional MRI findings in larger samples of patients (Kopelman et al., 2003). However, as the present authors have described, not all of our results fitted a clear left/right dissociation. There have been various other investigations but, in general, these reports still total relatively few patients, and detailed quantitative MRI (or other neuroimaging findings) were not included in the earlier studies.

The present authors have not addressed how their findings relate to current controversies regarding the consolidation versus multiple trace theories of retrograde amnesia. Because of the fairly extensive nature of these patients' neuropathology, the authors probably felt that they could not make clear statements about this. However, the clear implication from their findings is that something about right/left laterality differences needs to be built into those theories. They have also not discussed the contrast that I perceive between the findings of many lesion studies, such as this one, and those of many functional imaging studies in healthy participants, which have commonly reported predominant activation of left-sided hippocampal-frontal circuits in autobiographical memory retrieval (Maguire et al., 2000; Svoboda et al., 2006). To my mind, this remains an unresolved

issue. However, it will not be solved by functional imaging investigations alone. Further detailed neuropsychological (lesion) investigations, such as this one, are essential, and these should incorporate quantitative MRI (and/or other neuroimaging) findings alongside detailed reports of the pattern of remote memory loss.

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