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Perceptual and semantic contributions to episodic memory: evidence from semantic dementia and Alzheimer's disease

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Abstract

Previous group studies involving patients with semantic dementia, who have impaired semantic memory associated with temporal lobe atrophy, have documented the preservation of pictorial recognition memory, in contrast to patients with early Alzheimer's disease, who characteristically exhibit amnesia. The present study replicated this general pattern, although four of the semantic dementia patients with the most severe semantic deficit additionally had impaired recognition memory. Three factors that might contribute to this pattern of memory performance were examined: atrophic damage to medial temporal lobe regions, degradation of semantic representations, and disruption to visuo-perceptual processes. Assessment of MRI scans revealed that atrophy affecting the perirhinal cortex region accurately predicted the recognition memory deficit seen at advanced stages of semantic dementia, but there was no evidence that it could be attributed directly either to degraded semantic knowledge or disrupted perceptual processing. In Alzheimer's disease, evidence suggested that visuo-perceptual impairment might be involved in the poor recognition memory typically seen in the disorder. These results have implications for the differential diagnosis of semantic dementia and Alzheimer's disease and for cognitive and neural theories of human long-term memory. © 2002 Elsevier Science (USA). All rights reserved.

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It was some 30 years ago that Tulving (1972) first suggested the fractionation of long-term memory into two psychologically and neurologically distinct systems: episodic and semantic

memory. Episodic memory allows the “reliving” of events that an individual has personally experienced in past life. It is responsible for memorial phenomena as diverse as, for example, recalling seeing an elephant on safari last year or recognizing a picture of an elephant as having been present in a previous set of drawings. By contrast, semantic memory can be thought of as our store of knowledge about the world, including vocabulary, concepts, and facts—information that is retrieved without recalling when and where it was

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initially learned (such as the fact that an elephant has a trunk, for example). Although this distinction has endured (Tulving, 1995; Tulving & Markowitsch, 1998) and has undoubtedly relevance to the clinical diagnosis of patients with memory disorders (Garrard, Perry, & Hodges, 1997; Patterson & Hodges, 2000), there remains considerable debate among psychologists and neuroscientists over the nature of the cognitive and neural relationship between these two types of memory (e.g., Hintzman, 1984; McKoon, Ratcliff, & Dell, 1986; Squire & Zola, 1998; Vargha-Khadem et al., 1997).

Semantic dementia is a particularly useful disorder in which to investigate the relationship between semantic and episodic memory because patients with the disease show poor performance on a range of tests of semantic memory, including those measuring semantic knowledge about words, pictures, and sounds. For example, patients typically exhibit impairment at naming pictures of familiar objects and animals, word to

picture matching, sorting words or pictures into categories, and demonstrating the use of everyday objects (Hodges, Patterson, Oxbury, & Funnell, 1992; Hodges, Patterson, & Tyler, 1994; Hodges, Bozeat, Ralph, Patterson, & Spatt, 2000). It is important to stress that this impairment does not simply reflect a naming problem: deficits are also seen on tasks for which the name of a test item is less critical, such as the Pyramid and Palmtrees test (Howard & Patterson, 1992), in which participants judge which of two pictures is associated with a target picture (see Fig. 1a for an example), and on tests requiring matching environmental sounds to pictures (Bozeat, Lambon Ralph, Garrard, Patterson, & Hodges, 2000). Language remains fluent and naming errors are semantic rather than phonological in type. It has been argued that the consistent neuropsychological pattern of deficits in semantic dementia indicates a progressive degradation of central semantic knowledge (Bozeat et al., 2000; Hodges et al., 1994; Patterson & Hodges, 2000).

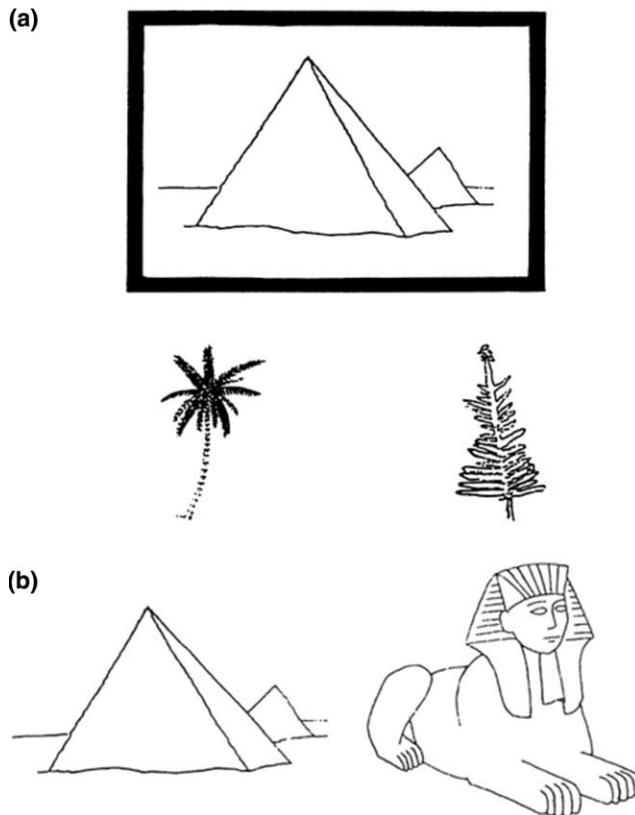


Fig. 1. Examples from (a) the Pyramid and Palmtrees test (Howard & Patterson, 1992) and (b) the Pyramid and Palmtrees recognition memory test.

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