

Recall and recognition memory in amnesia: Patients with hippocampal, medial temporal, temporal lobe or frontal pathology

Michael D. Kopelman^{a,*}, Peter Bright^{a,1}, Joseph Buckman^a, Alex Fradera^a, Haruo Yoshimasu^{a,2}, Clare Jacobson^a, Alan C.F. Colchester^b

^a King's College London, Institute of Psychiatry, London, United Kingdom

^b Kent Institute of Medicine and Health Sciences, University of Kent, Canterbury, Kent, United Kingdom

Received 28 July 2005; received in revised form 10 October 2006; accepted 22 October 2006
Available online 30 November 2006

Abstract

The relationship between recall and recognition memory impairments was examined in memory-disordered patients with either hippocampal, medial temporal, more widespread temporal lobe or frontal pathology. The Hirst [Hirst, W., Johnson, M. K., Phelps, E. A., & Volpe, B. T. (1988). More on recognition and recall in amnesics. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 14, 758–762] technique for titrating exposure times was used to match recognition memory performance as closely as possible before comparing recall memory scores. Data were available from two different control groups given differing exposure times. Each of the patient groups showed poorer recall memory performance than recognition scores, proportionate to the difference seen in healthy participants. When patients' scores were converted to Z-scores, there was no significant difference between mean Z-recall and Z-recognition scores. When plotted on a scatterplot, the majority of the data-points indicating disproportionately low recall memory scores came from healthy controls or patients with pathology extending into the lateral temporal lobes, rather than from patients with pathology confined to the medial temporal lobes. Patients with atrophy extending into the parahippocampal gyrus (H+) performed worse than patients with atrophy confined to the hippocampi (H–); but, when H– patients were given a shorter exposure time (5 s) and compared with H+ at a longer exposure (10 s), their performance was virtually identical and did not indicate any disproportionate recall memory impairment in the H– group. Parahippocampal volumes on MRI correlated significantly with both recall and recognition memory. The possibility that findings were confounded by inter-stimulus artefacts was examined and rejected. These findings argue against the view that hippocampal amnesia or memory disorders in general are typically characterised by a disproportionate impairment in recall memory. Disproportionate recall memory impairment has been observed in a number of published cases, and the reason for the varying pattern obtained across hippocampal patients requires further examination.

© 2006 Elsevier Ltd. All rights reserved.

Keywords: Amnesia; Memory disorders; Hippocampus; Medial temporal lobes; Recognition; Recall

1. Introduction

It is widely accepted that recognition memory reflects a combination of a familiarity judgement and a degree of conscious recollection, whereas recall memory depends upon

recollective processes (Giovanello & Verfaellie, 2001; Jacoby, Toth, & Yonelinas, 1993; Mayes, Holdstock, Isaac, Hunkin, & Roberts, 2002). However, there is considerable controversy concerning the effects of amnesia upon recall and recognition memory, respectively. One view is that hippocampal amnesia, including cases of developmental amnesia, is specifically characterised by a disproportionate impairment in recall memory, whereas recognition memory is preserved. A second view is that amnesic or memory-disordered patients in general manifest disproportionate recall memory impairment. A third view is that amnesia, including that which follows focal hippocampal pathology, produces a proportionate impairment in both recall and recognition memory. This controversy relates to views of

* Corresponding author at: 3rd Floor, Block 8, South Wing, St. Thomas's Hospital, London SE1 7EH, United Kingdom. Tel.: +44 207 188 5396; fax: +44 207 633 0061.

E-mail address: michael.kopelman@kcl.ac.uk (M.D. Kopelman).

¹ Now at Anglia Ruskin University, Cambridge, United Kingdom.

² Now at Dept. of Neuropsychiatry, Showa University, Northern Yokohama Hospital, Japan.

hippocampal function—whether the hippocampi are involved in encoding/retrieval processes in general, or whether they contribute specifically to the contextual/associative/relational memory processes which characterise recollection. This, in turn, relates to whether recollection (recall) and familiarity (recognition) should be viewed as ‘redundant’ processes (recollection incorporates whatever happens in familiarity plus further operations), ‘independent’ (different but overlapping operations) or ‘exclusive’ processes (different and non-overlapping).

On the basis of a meta-analysis of single case and small group studies of memory-disordered patients, Aggleton and Shaw (1996) (see also Aggleton & Brown, 1999) argued that patients with pathology within the hippocampi, fornices, mammillary bodies, mamillo-thalamic tract or anterior thalamic showed impairments on verbal and visual recall but not recognition memory. In such patients with damage to what they called the ‘extended hippocampal circuit’, memory based on familiarity judgements (recognition) was intact, whereas recall memory, involving recollection of contextual features, such as time and spatial location, was impaired. They argued that combined hippocampal and parahippocampal (including entorhinal and perirhinal) lesions were required to produce an impairment in familiarity-based or recognition memory. However, there was a ‘floor’ effect in the recall scores of the subjects with larger lesions in their meta-analysis, making interpretation difficult.

There are other cases, which provide support for this hypothesis. Vargha-Khadem, Gadian, Watkins, and Connelly (1997) described three patients with a developmental amnesia for everyday events, resulting from brain injuries in infancy or early childhood. These patients showed a pronounced loss of hippocampal volume bilaterally, and their neuropsychological test performance revealed impairments on verbal and visual recall but not recognition memory, the latter being tested with material that included lists of words, non-words, familiar faces and unfamiliar faces. These findings suggested that, whilst recall of episodic memories was impaired as a result of these patients’ hippocampal pathology, recognition memory and semantic memory were spared. More detailed evidence in support of this in one of these cases was published by Baddeley, Vargha-Khadem, and Mishkin (2001), using the Doors and People Test battery (Baddeley, Emslie, & Nimmo-Smith, 1994). Moreover, Mayes et al. (2002); (Holdstock et al., 2002; Mayes et al., 2004) have described in detail an adult-onset patient, YR, who suffered selective bilateral lesions to the hippocampi. Across 43 recognition memory tests, YR showed significant impairment relative to controls, but the impairment was very minor (mean $Z = -0.5$) and clinically significant ($>2S.D.$) in only 10% of tests. By contrast, YR showed a severe and disproportionate impairment on recall tests (mean $Z = -3.6$), which was clinically significant in 95% of tests (Mayes et al., 2002). Further investigations showed that YR was unimpaired on a forced-choice object recognition memory test, but was clearly impaired at an equivalently difficult yes/no object recognition test (Holdstock et al., 2002), and she was also impaired at recognition of associations between different kinds of information, even when tested by forced-choice tasks (Mayes et al., 2004). Bastin et al. (2004) and Aggleton et al. (2005) have reported a

similar cases, and Holdstock, Mayes, Gong, Roberts, and Kapur (2005) a patient in whom non-verbal (but not verbal) recognition memory was relatively spared, possibly related to asymmetrical SPECT findings. Interestingly, Henke et al. (1999) described a patient with hypoxic bilateral hippocampal damage whose initial recall and recognition memory impairment evolved through time to a more selective recall deficit. Moreover, Yonelinas et al. (2002) reported that 56 cardiac arrest patients with presumed hypoxic brain damage involving the hippocampi showed disproportionate impairment on a word-list recall test, relative to recognition memory performance, standardised according to Z-scores. In addition, some functional imaging investigations have produced evidence of differential medial temporal activations during tasks involving recollection or familiarity processes, consistent with this hypothesis (Davachi, Mitchell, & Wagner, 2003; Eldridge, Knowlton, Furmanski, Bookheimer, & Engel, 2000; Ranganath et al., 2004).

There is, however, an older tradition, which argues that disproportionate impairment in recall memory or recollective processes is characteristic of amnesic patients in general, and that memories based on familiarity alone are relatively preserved in amnesia (Giovanello & Verfaellie, 2001; Hirst et al., 1986; Hirst, Johnson, Phelps, & Volpe, 1988; Huppert & Piercy, 1976, 1978; Warrington & Weiskrantz, 1982; Yonelinas, Kroll, Dobbins, Lazzara, & Knight, 1998). For example, Huppert and Piercy (1976, 1978) found that amnesic patients made memory judgements purely on the basis of ‘trace strength’ or familiarity, even when they had been asked to make more specific evaluations about item recency or frequency. Hirst et al. (1986, 1988) showed that, after matching amnesic patients’ performance to that of healthy subjects in two different ways on a recognition memory test, the amnesic group’s recall scores were disproportionately impaired, relative to the controls. Giovanello and Verfaellie (2001) employed a very similar design to that of Hirst et al. (1986, 1988), finding that they replicated Hirst et al.’s result in one task, but not the other. These authors argued that amnesic patients and healthy participants performed the two tasks in different ways, and that this was consistent with a differential impairment of recollective memory in the amnesic patients.

The third view – namely, that (verbal and visual) recall and recognition memory are proportionately impaired in amnesia – has been advocated by Squire and colleagues in a series of publications (Haist, Shimamura, & Squire, 1992; Manns, Hopkins, Reed, Kitchener, & Squire, 2003; Manns & Squire, 1999; Reed & Squire, 1997; Stark, Bayley, & Squire, 2002; Stark & Squire, 2003). These authors have argued that patients with damage thought to be limited to the hippocampal region consistently show impairments on tests, such as the Recognition Memory Test, especially if a delay is introduced (Reed & Squire, 1997), the Doors and People Test (Manns & Squire, 1999), the recognition component of the Rey Auditory Verbal Learning Test (Manns et al., 2003), as well as on a wide variety of other recognition memory tests, whether tested by forced-choice or yes/no recognition procedures (Reed & Squire, 1997; Stark & Squire, 2003). Consistent with these findings, Kopelman and Stanhope (1998) used a variant of Hirst et al. (1988) technique, matching performance on recognition memory testing and avoiding

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات