



Research report

Imagining the present: Amnesia may impair descriptions of the present as well as of the future and the past

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ABSTRACT

Recent evidence suggests that in some patients with amnesia the capacity to imagine the future is impaired in parallel with the capacity to remember the past. This paper asks whether descriptions of the present may be similarly affected. We recruited 7 patients with amnesic syndromes of varying aetiologies who were matched for age, sex and education with 7 control participants. Patients showed no deficits on subjective measures of visual imagery. They were impaired by comparison with controls on measures of imagination and future thinking. However there was an even more marked impairment on tasks requiring them to give descriptions of their current experience. Potential explanations include effects of amnesia on narrative construction or on the texture of experience itself, and the confounding influence of cognitive impairments outside the memory domain. We conclude that tasks requiring descriptions of current experience provide a valuable control condition in studies examining the relationship between memory and imagination.

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1. Introduction

Recent work has drawn attention to the fact that some patients with amnesia, over and above their evident problems in remembering the past, have difficulty in imagining virtual and possible future experiences (Hassabis et al., 2007; Klein et al., 2002; Race et al., 2011; Rosenbaum et al., 2009; Schacter et al., 2011; Schacter and Addis, 2007; Szpunar, 2010, 2011 but see also Squire et al., 2010). Hassabis et al. (2007), for example, showed that patients with amnesia associated with bilateral hippocampal atrophy gave impoverished descriptions of imagined and future scenes. Ribot (1881/1885) anticipated this discovery in the nineteenth

century, writing: 'our knowledge of the future can only be a copy of the past' (Ribot, 1885, p. 53). Related work, using functional neuroimaging, has demonstrated that the neural network involved in imagining the future overlaps substantially with the network activated by tasks requiring participants to recollect the past: key brain regions in this network include the medial prefrontal cortex, precuneus and medial posterior parietal cortex, lateral parietal and lateral temporal cortex and the medial temporal lobes (Addis et al., 2007; Botzung et al., 2008; Spreng et al., 2009; Szpunar et al., 2007).

These observations build on previous evidence that patients with amnesia find it difficult to construct imagined or

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future scenes (Tulving, 1985). It has generally been assumed that, while the capacities to remember the past and imagine the future are impaired in patients with amnesia, experience of the present is intact. The aim of this study is to assess whether the impoverished descriptions of past and future experience given by amnesics are specific to paradigms which require construction of remembered or imagined scenarios, or whether these reflect a more basic impairment which impinges upon the experience or description of the present.

2. Material and methods

2.1. Participants

Seven amnesic patients (range 23–67 years, mean 47.9 years; education range 6–13 years, mean 11.0 years) participated in the study. They were matched for age and education with seven control participants (range 23–71 years, mean 44.9; education range 5–18 years, mean 12.3 years). All patients and control participants were male and right handed. There was no clinical evidence of depression or anxiety among the patients, and their scores on the Beck Depression Scale were within normal limits.

The patients had vascular ($N = 3$), anoxic ($N = 1$) or traumatic ($N = 3$) brain injuries. Demographic and clinical features as well as neuropsychological test scores are detailed in Table 1. Neuroimaging had been performed with CT or MRI for clinical purposes, and therefore the anatomical delineation of lesions lacked detail, but as indicated in Table 1 these involved a number of brain regions and were not restricted to the temporal lobes. The patients' general intellectual ability was substantially normal, and no patient showed any evidence of aphasia. All had evidence of the classical amnesic syndrome characterised by largely intact short term but severely impaired long term memory.

2.2. Experimental tasks

2.2.1. Subjective measure of visual imagery abilities

We administered the Italian version of the Test of Visual Imagery Control¹ (TVIC – Gordon, 1949; Richardson, 1969) and a translation of the Vividness of Visual Imagery Questionnaire¹ (VVIQ – Marks, 1973) to assess patients' and control participants' subjective appraisal of their imagery abilities. The TVIC assesses the ability to form and modify a visual image, using 10 questions scored on a 5-point rating scale, yielding a maximum score of 50. The VVIQ contained 16 items rating the vividness of evoked visual imageries each scored on a 5-point scale, for a possible total score of 80.

2.2.2. Condition 1 – descriptions of imagined experiences

We adopted the approach of Hassabis et al. (2007) to assess participants' ability to describe imagined scenes. Participants were invited to summon up and describe imagined scenes on

the basis of a short cue read out to them by the experimenter e.g., 'Imagine you are lying on a white sandy beach in a beautiful tropical bay' [see Hassabis et al.'s (2007) Supplementary Material for details of all cue sentences]. Participants were asked to imagine the scene as vividly as possible and to describe it in as much detail as possible. They were asked not to describe specific memories from the past but to create something new. They were given non-specific encouragement to continue until they had finished their descriptions, at which point they were asked to confirm that they had done so. Following Hassabis et al. (2007), we used 10 scenarios, 7 involving everyday settings (a beach, museum, pub, port, market, forest and castle) while 3 were more clearly self-relevant, requiring 'episodic future thinking' (possible Christmas event, possible event over next weekend, possible future meeting with a friend). We ensured that participants recalled the task throughout. Participants' descriptions were recorded and later transcribed.

We scored these descriptions according to the criteria by Hassabis et al. (2007). A point was given for each element depicting any of the following: (i) Spatial Reference (SR), involving descriptions of spatial relationships between the different entities mentioned; (ii) Entities Present (EP), i.e., objects and people mentioned; (iii) Sensory Description (SD), involving descriptions of the sensory properties of the entities mentioned; and (iv) Thought/Emotion/Action (TEA), including introspective reports and descriptions of the thoughts, emotions and actions of others described in the scenes. In line with Hassabis et al.'s (2007) criteria, repetitions and irrelevant utterances were not included. For each participant a mean element score was computed by averaging the total number of elements described across the ten scenes (total elements/10).

2.2.3. Condition 2 – descriptions of current experience

We assessed participants' ability to report their current experience by asking them to describe two complex paintings, and two real-life settings: a room in a museum and the interior of a church. The participants gave their descriptions while inspecting 50 × 35 cm reproductions of the two paintings (the Calling of Peter and Andrew by Domenico Ghirlandaio, 1481–2 and The Banquet in the Pine Forest, by Sandro Botticelli, 1482–3) and while physically present in the real-life settings. They were asked to give as full a description of the paintings and the scenes as possible, with no time constraint. As in the preceding condition, we ensured that the participants recalled the task throughout, and they were given non-specific encouragement to continue until they had finished their descriptions, at which point they were asked to confirm that they had done so.

As in Condition 1, a point was given for each element that depicted either SR, EP, SD, or TEA. Repetitions and irrelevant utterances were not included. For each participant a mean element score was computed by averaging the total number of elements described across the 4 scenes (total elements/4). Further, and more detailed scores were derived for each participant by considering the SR, EP, SD, and TEA subcategories separately, again using an average across the four trials. It should be noted that collapsing of the complex picture trials

¹ Antonietti A and Crespi M. Analisi di tre questionari per la valutazione della vividezza dell'immagine mentale. Downloaded from the authors' web page: <http://www.psycholab.net/antonietti/>.

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