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Research report

Alteration of autobiographical memory in amnestic mild cognitive impairment

Eve Tramoni [a,b,*], *Olivier Felician* [a,b,c], *Lejla Koric* [b,c], *Michele Balzamo* [c], *Sven Joubert* [d] *and Mathieu Ceccaldi* [a,b,c]

[a] *INSERM U 751, Marseille, France*
[b] *Aix-Marseille Université, Faculté de Médecine, Marseille, France*
[c] *Assistance Publique – Hôpitaux de Marseille, Hôpital La Timone, Service de Neurologie et Neuropsychologie, Marseille, France*
[d] *Centre de Recherche de l'Institut Universitaire de Gériatrie de Montréal, Quebec, Canada*

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ABSTRACT

The concept of amnestic mild cognitive impairment (aMCI) concerns a population of older individuals at high risk of developing probable Alzheimer's disease. Although anterograde memory deficits have been largely documented in patients with aMCI, little is known about the integrity of their autobiographical memory (AuM). This study aimed at evaluating AuM in aMCI individuals and at investigating whether their ability to retrieve AuMs varied as a function of whether the tests used required recognition or effortful retrieval processes.
Fourteen aMCI patients and 14 matched controls underwent a standard neuropsychological evaluation and an extensive autobiographical assessment. AuM was explored using verbal material, the Autobiographical Memory Interview, and a visual task of personal photographs. Together, these tests tapped the semantic and episodic components of AuM and different cognitive processes involved in retrieval (recall and recognition).
Results indicate that AuM is altered in aMCI patients. This impairment affects both episodic and semantic components of AuM, and is characterized by a general difficulty in recollecting personal episodes covering the entire lifespan, along with a loss of recognition of recently experienced episodes. Furthermore, recollection of personal episodes was correlated with scores on tests requiring retrieval abilities, while recognition of familiar photographs was correlated with scores on tests assessing encoding/storage of new information.
Results suggest that the AuM deficit in aMCI patients may result from the combination of two mechanisms, an anterograde memory impairment impeding the storage of newly experienced events, and a global alteration of recollection affecting the recall of AuM covering all periods of life. Alteration of these processes may possibly be related to the progression and distribution of the neuropathological lesions in medial temporal and frontal lobe structures found in Alzheimer's disease.

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* *Corresponding author*. Laboratoire Epilepsies et Cognition, INSERM U-751, Université de la Méditerranée, Faculté de médecine Timone 27, Bd Jean Moulin 13385, Marseille Cedex 5, France.
E-mail address: eve.tramoni@univmed.fr (E. Tramoni).
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1. Introduction

Detecting Alzheimer's disease (AD) in the earliest stages represents one of the major challenges of current research in the field of neurodegenerative disorders. The concept of amnestic "mild cognitive impairment" (aMCI) has emerged to define a population of subjects at high risk of developing probable AD (Dubois and Albert, 2004; Nestor et al., 2004; Petersen et al., 1999, 2001; Sarazin et al., 2007; Winblad et al., 2004). Patients with aMCI present with memory complaints, preserved autonomy and impaired anterograde memory performance for age and education (Petersen et al., 2001). In recent years, much attention has been given to the characterization of the anterograde memory impairment of aMCI individuals. In contrast, only two studies have investigated the status of their autobiographical memory (AuM), which concluded to the presence of an early AuM impairment (Leyhe et al., 2009; Murphy et al., 2008).

AuM deficits may result from retrieval difficulties (Levine et al., 1998), or defective encoding/storage processes (Manes et al., 2001; Rubin and Greenberg, 1998), all of which have been found to be impaired in aMCI (Chetelat et al., 2003). The present study aims at evaluating the respective contribution of these two distinct cognitive processes in the AuM deficit exhibited by aMCI patients. In the two previously published studies focussing on AuM in MCI, AuM was evaluated with interview-based tasks (Leyhe et al., 2009; Murphy et al., 2008). This kind of procedure requires generative retrieval, which includes strategic, elaborative and inhibitive processes, mediated by frontal/executive functions (Baddeley and Wilson, 1986; Moscovitch and Melo, 1997; Petrides, 2000; Piolino et al., 2007). These studies, in which the tests mainly involved retrieval abilities, do not allow drawing clear conclusions about the exact mechanisms underlying the AuM deficit in aMCI. In contrast, recognition tasks allow assessing the integrity of memories which otherwise may not be retrieved using free recall tasks. For instance, recognition of personal photographs, which only requires the subject to determine if photographs are familiar or not, offer visual and contextual cues that allow a more direct access to personal memory traces (Gilboa et al., 2004; Joubert et al., 2004; Manes et al., 2001). Hence, AuM interviews primarily tap executive retrieval processes while recognition of personal photographs primarily target encoding/storage processes. The goal of this study was thus to investigate the cognitive process underlying AuM deficits in aMCI patients by testing whether their ability to retrieve AuMs varied as a function of whether the tests used required effortful processes (retrieval) versus effortless processes (recognition).

2. Methods

2.1. Subjects

Fourteen patients fulfilling criteria for aMCI were enrolled in the present study (6 men, 8 women; mean age 75.1 years, standard deviation – SD 6.4). In agreement with usual aMCI criteria (Petersen et al., 2001), patients were selected according to the following: absence of dementia, intact activities of daily living (CDR = .5 and IADL = 0) (Morris, 1993; Lawton and Brody, 1969), preserved general cognitive functioning (Mini Mental State Examination – MMSE score > percentile 10) (Folstein et al., 1975; Kalafat et al., 2003), presence of a memory complaint (corroborated by an informant) and performances of more than 1.5 SD below the mean of control subjects on a standardized episodic memory test (the total free and cued delayed recall scores of the RL/RI-16, a French version of the Free and Cued Selective Reminding Test; Grober et al., 1988; Van Der Linden et al., 2004). All patients were recruited in our Memory Clinic and were accompanied by a reliable informant. They all underwent medical, neurological and neuropsychological examinations, a brain CT scan or magnetic resonance imaging and routine laboratory workup to exclude non degenerative causes of memory impairment. Fourteen healthy controls matched for age, gender and education participated to the study (6 men, 8 women; mean age 70.4, SD 8.7).

All participants had normal or corrected-to-normal vision and were French native speakers. Exclusion criteria were a history of delirium, alcohol or substance abuse, psychiatric or neurological disorder (preceding the onset of aMCI in the patient group), epilepsy and major systemic disease. Informed consent was obtained from all participants.

2.2. Standard neuropsychological assessment

Patients underwent formal neuropsychological testing as part of their clinical workup. They completed two tasks assessing respectively visual perceptual and visuospatial abilities (Benton et al., 1978, 1983), a French picture naming task (line drawings of objects) (Deloche and Hannequin, 1997), the Wechsler Adult Intelligent Scale (WAIS)-III Information subtest (Weschler, 2000) which assesses general cultural knowledge, and four tasks assessing executive functions (see Table 2 for the detail of the tests administrated).

Anterograde verbal memory was assessed with two learning tasks: the Wechsler Memory Scale (WMS)-III logical memory subtest (Wechsler, 2001) and the RL/RI-16 (Van Der Linden et al., 2004). This later task maximizes learning by inducing semantic processing at encoding but also by controlling for encoding and retrieval conditions. Delayed recall is first assessed through free recall, then through cued recall for the missing words, leading to two main scores: free and total (free + cued) recall. This procedure has been shown to discriminate an apparent memory impairment caused by inefficient strategies or impaired attention (subjects impaired on free recall but benefiting from cueing) from a genuine memory impairment considered as a true memory defect related to impaired storage (subjects incapable of improving their performance although words are cued) (Grober et al., 1988; Dubois, 2000; Petersen et al., 1994; Pillon et al., 1994). Anterograde visual memory was assessed with the DMS48, a recognition memory task that requires little attentional/executive processes (Barbeau et al., 2004).

All subjects then underwent a detailed AuM assessment. Control subjects were assessed during a single session with an

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