



The involuntary nature of music-evoked autobiographical memories in Alzheimer's disease

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ABSTRACT

The main objective of this paper was to examine the involuntary nature of music-evoked autobiographical memories. For this purpose, young adults, older adults, and patients with a clinical diagnosis of probable Alzheimer's disease (AD) were asked to remember autobiographical events in two conditions: after being exposed to their own chosen music, and in silence. Compared to memories evoked in silence, memories evoked in the "Music" condition were found to be more specific, accompanied by more emotional content and impact on mood, and retrieved faster. In addition, these memories engaged less executive processes. Thus, with all these characteristics and the fact that they are activated by a perceptual cue (i.e., music), music-evoked autobiographical memories have all the features to be considered as involuntary memories. Our paper reveals several characteristics of music-evoked autobiographical memories in AD patients and offers a theoretical background for this phenomenon.

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1. Introduction

Autobiographical memory refers to the ability to remember past personal events. This component of memory is reported to be severely deteriorated in Alzheimer's disease (AD) (El Haj, Postal, & Allain, 2012; El Haj, Postal, Le Gall, & Allain, 2011; Fromholt & Larsen, 1991; Greene, Hodges, & Baddeley, 1995), which implies changes in the strength, quality, and direction of the identity of AD patients (Addis & Tippett, 2004). Due to the devastating consequences of autobiographical memory deterioration, there is a growing interest in finding procedures that enhance autobiographical recall in AD patients. A prominent research topic related to this inquiry is research about music-evoked autobiographical memories.

Several authors have investigated autobiographical recall of AD patients before and after music exposure. Foster and Valentine (2001), for instance, assessed the autobiographical production of a mild and a moderate AD group with a substantially modified adaptation of the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975). In this experiment autobiographical recall was tested in four conditions: with the opus of Vivaldi's "Four Seasons", with novel music, with cafeteria noise, and in silence. This procedure was partially repeated by Irish et al. (2006) who, with the Autobiographical Memory Interview (Kopelman, Wilson, & Baddeley, 1991), assessed autobiographical recall of a mild AD group in two conditions: with the Vivaldi's "Spring" movement from the "Four Seasons" and in silence. Recently, with a free narrative method, El Haj et al. (2012) assessed autobiographical recall of a mild AD group in three conditions: in silence, after being exposed to the opus of Vivaldi's "Four Seasons" and after being exposed to their own chosen music. Despite the dissimilarity of their methods, these three papers pointed to one common conclusion: music exposure enhanced autobiographical recall in AD patients.

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In the latter papers, music-enhanced autobiographical recall was suggested to be related to several factors: arousal improvement (Foster & Valentine, 2001), anxiety reduction (Irish et al., 2006), and emotional enhancement (El Haj et al., 2012). However, these papers did not investigate memory processes that might explain the autobiographical enhancement. Our paper aims to address this shortcoming by emphasizing the involuntary nature of the music-enhanced autobiographical recall in AD patients.

Involuntary autobiographical memories are “conscious memories of personal events that come to mind spontaneously” (Johannessen & Berntsen, 2010). Even though they pop into awareness without any attempt to retrieve them, these memories are believed to be elicited in response to a cue in the environment (Berntsen, 1996; Kvavilashvili & Mandler, 2004). For instance, in a diary study in which involuntary autobiographical memories were recorded immediately after they had occurred, Berntsen (1996) found that involuntary memories were usually retrieved in the presence of one or two perceptual cues. The author (Berntsen, 2009) commented that “A piece of music heard on the radio may stir a memory of a moment from the past. Such occurrences are known as involuntary autobiographical memories. They often occur in response to environmental stimuli or aspects of current thought”. This idea, that music acts as a trigger for involuntary autobiographical memories fueled our interest to examine the involuntary character of music-evoked autobiographical memories. The characteristics of involuntary memories are described in the following paragraphs.

First of all, in contrast with their voluntary counterparts, involuntary autobiographical memories have been found to be more specific. Berntsen (1998), for instance, compared involuntary autobiographical memories recorded in participants’ dairies with voluntary autobiographical memories elicited in response to verbal cues in laboratory. The author found that involuntary autobiographical memories were more specific than their voluntary counterparts. In line with this finding, several papers have reported that involuntary memories were found to be of specific events as opposed to general events (Ball & Little, 2006; Berntsen & Hall, 2004; Schlagman & Kvavilashvili, 2008). In addition to their specificity, involuntary autobiographical memories were also reported to be accompanied by more emotional reactions and impact on mood than their voluntary equivalents (Berntsen & Hall, 2004; Rubin, Boals, & Berntsen, 2008).

Automaticity is another characteristic of involuntary autobiographical memories. Automaticity is typically measured in terms of memory retrieval time. Schlagman and Kvavilashvili (2008), for instance, found that involuntary memories are retrieved almost twice as fast as voluntary memories. The automaticity aspect of involuntary memories can be attributed to the little executive engagement in the retrieval of these memories. According to Rasmussen and Berntsen (2009), involuntary retrieval might access specific memories with little executive control involved. This, because the activation of involuntary memories relies on a high level of cue-item discriminability, which can be said to replace part of the role that executive control plays in voluntary memories.

In summary, involuntary autobiographical memories occur in response to perceptual stimuli. They are more specific, accompanied with more emotional reaction and impact on mood, and retrieved faster than their voluntary counterparts.

1.1. *The aim of this study*

Several authors reported autobiographical enhancement in AD patients due to music exposure (El Haj et al., 2012; Foster & Valentine, 2001; Irish et al., 2006). However, the memory processes underlying this phenomenon were not investigated. Our paper aims to address this shortcoming by investigating the involuntary nature of the music-enhanced autobiographical recall in AD patients. Therefore, AD patients and older adults were asked to generate autobiographical memories in two conditions: in silence and after music exposure. In general, we predicted that memories evoked after music exposure would have a more involuntary nature than memories evoked in silence. More specifically, and in line with previous research investigating the nature of involuntary memories, we hypothesized that music-evoked autobiographical memories would: (1) be more specific, (2) be accompanied with more emotional content and impact on mood, (3) be retrieved faster, and (4) engage fewer executive processes than memories evoked in silence.

2. Method

2.1. *Participants*

Sixteen patients with a clinical diagnosis of probable AD (National Institute of Neurological and Communications Disorders and Stroke—Alzheimer’s disease and Related Disorders Association criteria; McKhann et al., 1984) were recruited from local retirement homes. Their score on the MMSE ranged from 21 to 26 points. Age and educational level (in terms of years of education) of these patients were matched with those of a group of 16 older adults, respectively, $t(30) = .97, p > .10$, and $t(30) = 1.68, p > .10$. The older adults were often the spouses, relatives, or friends of the AD patients. The MMSE score of the older adults showed normal cognitive functioning, with a range between 27 and 30 points. However, this score was significantly higher than that of the AD group, $t(30) = 9.01, p < .001$. The older adults verbal abilities were matched with those of a group of 16 young adults according to the Mill Hill test (French translation by Deltour, 1993). The young adults were students from the University of Angers. Although these participants had a significantly higher number of years of education than the older adults, $t(30) = 3.67, p < .01$, no differences in verbal ability were found between the groups on the Mill Hill test, $t(30) = 1.28, p > .10$.

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