Memories Supporting Myself: Autobiographical Memory Supports Self-Continuity in Alzheimer's Disease

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Abstract

We investigated, for the first time, how people with mild Alzheimer's disease (AD) reflect on continuity of their self (i.e., whether they are the same person they were before). We invited people with mild AD and control participants to conduct The Thinking about Life Experiences (TALE) Scale. More specifically, we invited participants to indicate whether they think about their life story: when they want to feel that they are the same person that they were before (Item1), when they are concerned about whether they are still the same type of person that they were earlier (Item2), when they are concerned about whether their values have changed over time (Item3), when they are concerned about whether their beliefs have changed over time (Item4) and, when they want to understand how they have changed from who they were before (Item5). The scores of people with AD and control participants on the items of the TALE scale were similar, except for the first item on which people with AD provided higher scores than did control participants. As demonstrated by scores on Item1, people with mild AD can retrieve autobiographical memories to reflect on situations in which they want to feel that they are the same person that they were before. In other words, people with mild AD can draw on their personal and meaningful events to maintain a continuous sense of self or even to reflect on situations in which they are concerned about their self-continuity.

Key words*:* Alzheimer's Disease: autobiographical memory; self; self-continuity

Introduction

Autobiographical memory refers to the ability to retrieve general information, as well as specific events, accumulated since early ages and which allows us to construct our sense of self and our feeling of identity and continuity [1, 2]. Autobiographical memory is compromised in Alzheimer's Disease (AD), leading to a diminished sense of self in people with AD [3]. In this study, we investigated how people with AD use autobiographical memories to support their sense of self.

Generally speaking, prior research has been focused on the neuroanatomical substrates and cognitive characteristics of autobiographical memory decline in AD [4-7]. Research on the cognitive characteristics of autobiographical memory decline in AD has emphasized the difficulty to retrieve specific autobiographical memories in people with AD (i.e., specific events situated in time and space) [8-14]. Difficulties in retrieving specific autobiographical memories have been even considered as a marker of subtle cognitive decline associated with AD, that is, a risk factor for AD [15]. Research on the cognitive characteristics of autobiographical decline in AD has also reported 1) the difficulty of people with AD to retrieve recent autobiographical memories [10, 16], 2) the difficulty of people with AD to subjectively relive their autobiographical memories [17-21], as well as 3) the positive relationship between autobiographical decline and executive dysfunction in AD [22, 23]. Interestingly, cognitive research has emphasized the relationship between autobiographical decline and diminished sense of self and identity in people with AD [3].

In a pioneering study on the relationship between autobiographical decline and diminished sense of self, Addis and Tippett [24] have invited people with AD to provide responses to the question "Who am I?" and to rate self-related statements (e.g., I'm a kind person). Results demonstrated a diminished ability of people with AD to process these self-

related information, suggesting a diminished sense of self in this disease; interestingly, a diminished sense of self was associated with a diminished ability of people with AD to retrieve autobiographical memories. The association between autobiographical memory and self in AD can also be highlighted with a study in which people with AD were invited to retrieve autobiographical memories after a self-related condition, consisting of providing responses to the question "Who am I?, and after a control condition consisting of reading a general text [25]. Results demonstrated better autobiographical retrieval after the "Who am I?" statements than after text reading, suggesting an intimate relationship between autobiographical retrieval and self in AD. This relationship can be further illustrated by considering research on self-defining memories, that is, those vivid and emotionally intense memories that help maintain self-images and self-continuity [26-29]. Along these lines, research has also demonstrated a production of self-defining memories in people with AD, suggesting a diminished ability to retrieve memories supporting self-images and self-continuity in AD [30-32]. Taken together, research has demonstrated an intimate relationship between autobiographical memory and self in AD; however, prior research did not investigate how people with AD use autobiographical memories to reflect on their sense of self.

Our attempt to investigate how people with AD use autobiographical memories to reflect on their sense of self relies on prior models emphasizing how autobiographical memory is related to self and identity. For example, our sense of self depends on memories of our life experiences [33]. As is true for all memory systems, autobiographical memory is not stored in the brain as static and holistic representations, but is reconstructed from abstract representations of past experiences in accordance with our current goals and needs [1, 34]. In other words, autobiographical memory is functional and closely associated with goals and sense of self [35-37]. This view is rooted in a larger theoretical background emphasizing the

relationship between autobiographical memory and self [38]. For instance, Neisser [39] emphasized the concept of extended self which depends on memory. The concept of the extended self, as proposed by Neisser [39], has opened the door for theoretical accounts of a life story construct, that is, the narrative record of our personal past that forms a central aspect of identity [40]; this narrative ability has been considered as a process allowing the maintenance of self-continuity [29]. In a similar vein, Conway [1] suggests that the organization and construction of autobiographical memory largely depends on its ability to promote and support continuity and development of self. Together, these theoretical accounts emphasize the involvement of autobiographical memory in the maintenance and continuity of self. Building on these theoretical accounts, in the current study, we investigated how people with AD retrieve autobiographical memories to reflect on changes related to their self.

In our attempt to investigate how people with AD may retrieve autobiographical memories to reflect on changes related to their self, we built on prior work of Bluck and colleagues [36, 41] who emphasized how autobiographical remembering serves to forge and maintain self-continuity. More specifically, Bluck et al. [36] have constructed a questionnaire (TALE: The Thinking about Life Experiences Scale) evaluating, among other aspects, how accessing autobiographical memory allows the construction and maintenance of life story as well as self-continuity over time. In their scale, Bluck, et al. [36] developed 10 items assessing self-continuity. In a follow-up study, Bluck and Alea [41] used a confirmatory factor analysis in a large population (n = 106 young adults and 150 older adults) to construct a brief scale (five items assessing self-continuity) with high internal consistency as well as convergent validity. According to Bluck and Alea [41], the brief version of the TALE questionnaire is a useful tool for empirical investigation of autobiographical remembering. In our view, this brief version is also useful for coping with the limited cognitive resources of people with AD.

To summarize, most research on autobiographical memory has focused on understanding the decline of cognitive function in AD. Critically, prior research has also focused on the relationship between autobiographical decline and diminished sense of self in people with AD. While this research has provided a valuable insight into this relationship, it did not focus on how people with AD may be able to construct their memories to support their sense of self. Therefore, and in contrast to the mainstream approach that focuses on the characteristics of autobiographical decline, or even cognitive mechanisms underlying this decline, we adopted a functional approach that holds a more naturalistic view by evaluating how people with AD may construct their memories to support their self-continuity. In our view, research on autobiographical memory in AD must not be solely concerned with the cognitive characteristics of autobiographical decline in AD, but also, provide a functional perspective, on how people with AD may construct their memories and remember their life stories. Examining this function may provide a different and potentially complementary view of autobiographical functioning in AD (e.g., how people with AD retrieve their past experiences to deal with current concerns or to sustain and optimize their sense of self). Toward this ecological, clinical, and ethical approach, we used the TALE scale [41] to investigate how people with AD retrieve autobiographical memories to reflect on their continuity of their self.

Method

Participants

We recruited 32 participants with a clinical diagnosis of probable mild AD and 35 healthy controls. Demographic characteristics are provided in Table 1. All participants were native French speakers and exclusion criteria were significant psychiatric or neurological illness and major visual or auditory acuity difficulties that could prevent adequate

assessment. We recruited the individuals with AD from local retirement homes and diagnosis of mild AD dementia was made by experienced neurologists or geriatricians based on the NINCDS-ADRDA clinical criteria [42]. The mild stage of AD was also confirmed by scores on the Mini Mental State Exam (see below). Regarding control participants, they were often spouses or companions of AD participants and were living independently at home. The normal cognitive functioning of the control participants was confirmed by their performance on other cognitive tests (see below). As shown in Table 1, while no significant differences were observed between people with AD and control participants in terms of sex, age, and educational level, people with AD had lower cognitive ability than control participants. This study was designed and conducted in accordance with the Declaration of Helsinki and approved by the ethical board of the university of Lille. All participants consented freely to participate in the study and were given the opportunity to withdraw whenever they wished.

Procedures and materials

We assessed cognitive performance (as well as the TALE scale) of people with AD and controls.

Cognitive performances.

We evaluated general cognitive functioning, working memory, and episodic memory. This assessment was based on reliable, brief and valid instruments. Being brief, these tests are also suitable for the limited cognitive resources of patients. We evaluated general cognitive functioning with the Mini Mental State Exam in which the maximum score was 30 points [43]. We evaluated the phonological loop system of working memory using the span tasks, in which participants had to repeat a string of single digits in the same order (i.e., forward spans) or in reverse order (i.e., backward spans). The score was the number of correctly repeated digits. We evaluated verbal episodic memory with the task of Grober and

Buschke [44] on which participants were invited to retain 16 words, each of which described an item that belongs to a different semantic category. After immediate cued recall, participants proceeded to a distraction phase, during which they were invited to count backwards from 374 in 20 s. The distraction phase was immediately followed by two minutes of free recall and the score/16 from this phase provided a measure of episodic recall.

[INSERT TABLE 1 APPROXIMATELY HERE]

The TALE questionnaire.

We used the TALE questionnaire to assess how people with AD, and control participants, retrieve autobiographical memories to reflect on their self-continuity. As mentioned in the introduction, we used the brief version of the TALE questionnaire [41] because, compared with the full version of the questionnaire [36], the brief version is more suitable for the limited cognitive resources of people with AD. Further, the brief version has been found to be characterized by high internal consistency and convergent validity. Following the procedures of Bluck and Alea [41], we informed participants that the questionnaire focuses not only on remembering specific memories and events but, critically, on how personal memories and larger life periods are connected with the present. We also provided these instructions: "*Sometimes people think back over their life or talk to other people about their life story—it may be about events that happened quite a long time ago or more recently. For this questionnaire, we are not so interested in the times that you think back over specific personal events as in how and when you bring together and connect the events and periods of your life*". Afterward, participants were presented with five items and responses were made on a five-point Likert-type scale, with one = almost never and five = very frequently. The five items were "*when I want to feel that I am the same person that I was before", "when I am concerned about whether I am still the same type of person that I*

was earlier", "when I am concerned about whether my values have changed over time", "when I am concerned about whether my beliefs have changed over time", "when I want to understand how I have changed from who I was before".

Note that we translated these five items from their original language (i.e., English) into French by an expert in both English and French. The validity of the translation was verified via reverse translation using a different specialist translation to ensure its conceptual and functional equivalences (Cohen Kappa between the original and reverse "English" version of the questionnaire = .91).

Results

The scores on the TALE scale are provided in Table 2. We investigated differences between AD participants and controls in each of the five items on the TALE Scale. We also investigated, for each population, the differences between the five items (e.g., scores in Item1 vs. Item2…). Because data were not distributed normally as observed by Kolmogorov-Smirnov tests, Mann-Whitney U-test was used for inter-groups comparisons and Wilcoxon's signed-rank test was used for within-groups comparisons. We provided effect sizes using Cohen's *d* [45]: 0.20 = small, 0.50 = medium, 0.80 = large. Cohen's *d* was calculated for non-parametric tests according to the recommendations of Rosenthal and DiMatteo [46] and Ellis [47]. For all tests, the level of significance was set as $p \leq 0.05$; *p* values between 0.051 and 0.10 were considered as trends.

Higher scores in people with AD than in control participants in item 1.

Analysis showed significantly higher scores in people with AD than in control participants on item 1 ($Z = 2.96$, $p < .01$, Cohen's $d = .77$). However, no significant differences were observed between people with AD and control participants on item 2 ($Z =$

.31, $p > .10$, Cohen's $d = .07$), item 3 ($Z = 1.54$, $p > .10$), item 4 ($Z = .26$, $p > .10$), and item 5 ($Z = .07$, $p > .10$). Further, no significant differences were observed between people with AD ($M = 3.03$, $SD = .57$) and control participants ($M = 2.99$, $SD = .45$) on the mean score of the TALE scale ($Z = .45$, $p > .10$).

In people with AD, scores in item 1 were significantly higher than scores on item 2 ($Z = 3.71$, $p < .001$, Cohen's $d = 1.73$), item 3 ($Z = 3.36$, $p < .001$, Cohen's $d = 1.47$), item 4 ($Z = 2.60$, $p < .01$, Cohen's $d = 1.03$), and item 5 ($Z = 2.91$, $p < .01$, Cohen's $d = 1.19$). All remaining within-items comparisons were not significant: item 2 vs. item 3 ($Z = .17$, $p > .10$), item 2 vs. item 4 ($Z = .22$, $p > .10$), item 2 vs. item 5 ($Z = .33$, $p > .10$), item 3 vs. item 4 ($Z = .34$, $p > .10$), item 3 vs. item 5 ($Z = .19$, $p > .10$), item 4 vs. item 5 ($Z = .09$, $p > .10$). In control participants, all within-items comparisons were not significant: item 1 vs. item 2 ($Z = .61$, $p > .10$, Cohen's $d = .21$), item 1 vs. item 3 ($Z = .48$, $p > .10$, Cohen's $d = .16$), item 1 vs. item 4 ($Z = .27$, $p > .10$, Cohen's $d = .09$), item 1 vs. item 5 ($Z = .67$, $p > .10$, Cohen's $d = .23$), item 2 vs. item 3 ($Z = 1.27$, $p > .10$), item 2 vs. item 4 ($Z = .15$, $p > .10$), item 2 vs. item 5 ($Z = .08$, $p > .10$), item 3 vs. item 4 ($Z = .97$, $p > .10$), item 3 vs. item 5 ($Z = .70$, $p > .10$), item 4 vs. item 5 ($Z = .33$, $p > .10$).

Taken together, these results suggest similar scores of people with AD and control participants on the items of the TALE scale, except for the first item in which AD participants provided higher scores than control participants. In other words, AD participants reported that they retrieve autobiographical memories when "they want to feel that they are the same person that they were before" than did control participants.

[INSERT TABLE 2 APPROXIMATELY HERE]

Discussion

Using the TALE scale, we investigated how people with mild AD reflect on continuity of their self. Results showed no significant differences between the scores of people with AD and those of control participants on the items of the TALE scale, except for the first item on which people with AD provided higher scores than did control participants.

In our view, while our findings demonstrate no significant differences between scores of people with AD and those of control participants on most of the TALE scale items, these findings are of particular interest for the clinical understanding of the mechanism of autobiographical memory in AD. Our findings demonstrate that people with AD are able to retrieve memories to reflect on their self-continuity. In other words, people with AD are able to draw on their personal and meaningful events to create a biographical sense of identity or to maintain a continuous sense of self. More specifically, people with AD are able to retrieve autobiographical memories to reflect on situations in which they are concerned about whether they still the same person that they were earlier, whether their values have changed over time, whether their beliefs have changed over time, and/or whether they have changed from who they were before. Critically, and as demonstrated by scores on item 1, people with AD can retrieve autobiographical memories to reflect on situations in which they want to feel that they are the same person that they were before more than healthy older adults tend to do. These findings demonstrate that, compared with healthy older adults, people with mild AD can be more concerned with changes in their self-continuity.

We argue that people with AD may demonstrate a significant ability to retrieve autobiographical memory to reflect on situations in which they are concerned about their self-continuity. These findings can be discussed in light of research demonstrating a decline in some characteristics of autobiographical memory, such as a decline in specificity of memories [8-14] and the subjective experience of memories [17-21]. Compared with prior research, our findings demonstrate that, despite a decline in some characteristics of

autobiographical memory, people with mild AD are able to retrieve memories to reflect on their self-continuity. This finding is interesting because research has long focused on the deterioration of self in AD. For instance, research has demonstrated that people in the advanced stage of AD are less likely to recognize themselves in the mirror compared to people in the mild stage of AD [48-50]. In a similar vein, Caddell and Clare [51] have suggested that people with AD do often show difficulties with self-recognition, especially in advanced stages. Research has also reported that of people with AD fail to update their self-knowledge [52-54]. In our view, basic aspects of the self-such as self-knowledge (as evaluated with Item 1 in TALE) can be preserved in AD. This assumption can be supported by a study by Tippett, et al. [55] who reported that despite difficulties to construct life narratives from semantic memory, people with AD may demonstrate strong subjective beliefs of self-persistence. Our findings add to the literature of the self by demonstrating that people with mild AD may not only demonstrate awareness about changes in their self, but may also reflect on changes in their sense of self.

By emphasizing how people with AD can draw on their past experiences to reflect on their self-continuity, our study can be considered as an attempt to emphasize positive aspects of memory functioning as well as positive aspects of self-functioning in AD. As emphasized throughout this manuscript, research has long focused on the decline of both autobiographical memory and self in AD. Research has even long focused on anosognosia and denial in AD, that is, failure of people with AD to acknowledge a particular cognitive deficit. While this research shows how people with AD estimate their own cognitive functioning, it runs the risk of completely denying people with AD any level of awareness of this functioning. To counter this risk, it is crucial to emphasize any positive aspect of cognitive, including autobiographical, functioning in AD. Our study contributes to the positive view by emphasizing how people with AD may use autobiographical knowledge to convey a sense of

self-continuity. Our attempt can be considered as a contribution to a larger endeavor towards the study of positive aspects of autobiographical functioning in AD. For instance, our prior research has attempted to unveil how, despite a compromise in specificity of autobiographical retrieval, people with mild AD may enjoy a potential genuine consciousness experience of the past [18, 21].

Our current study can be discussed in light of research on reminiscence. Generally speaking, both reminiscence and autobiographical memory involve thinking about the past [56, 57]. However, reminiscence differs from autobiographical retrieval in that it involves recollecting personal memories to think, tell, or teach about past experiences [58]. Further, reminiscence may serve problem solving, death preparation, boredom reduction, and bitterness revival and intimacy maintenance [58-60]. While research on reminiscence in AD has been concerned with all these functions [61], little attempt has been made to address how patients reminiscence to cope with self-related changes. Our study addresses this gap by evaluating how AD patients retrieve personal memory to cope with these changes.

Because our study involves healthy older adults, it would be of interest to emphasize self-continuity in normal aging. Compared with younger adults, older adults are less likely to use autobiographical memory to serve a self-continuity function. This finding is reported by research demonstrating that, compared with older adults, younger adults are better at remembering past events to serve the self [62, 63]. These findings suggest a greater need to develop self-concept and self-continuity in younger adults, compared with older adults. These findings also mirror developmental theories suggesting that older adults, even in late life stages, enjoy a well-defined, stable, and resilient self [64-66]. Compared with younger adults, older adults find the maintenance of self-continuity less challenging as they typically seek to sustain and optimize existing self-related knowledge [40]. Furthermore, older adults maintain

a limited but well-defined and well-rehearsed set of meaningful autobiographical memories that create a clear and stable sense of self [67].

While the TALE scale has been widely considered as a tool for assessing autobiographical memory and the construction and maintenance of self-continuity over time, one limitation of our study was be the lack of a direct assessment of autobiographical memory. Future research should assess the relationship between performances of people with AD on TALE scale and autobiographical performances. Another suggestion for future research is to consider the order effect of items of the TALE scale as differences between people with AD and control participants on Item 1 may be influenced by the order effect.

To summarize, the study of the function of remembering the personal past in AD can be considered an ecological approach which encourages researchers to examine positive aspects of autobiographical functioning in AD. This approach provides a complementary view of autobiographical functioning in AD. Research has mainly focused on the cognitive characteristics of autobiographical decline in AD while, as emphasized throughout this paper, research can emphasize adaptive significance or even real-world usefulness of autobiographical retrieval in AD.

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Declaration of Conflicting Interests

The author(s) declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Table 1.

Demographic and cognitive characteristics of Alzheimer's disease (AD) and control participants

		AD *n* = 32	**Controls** *n* = 35	
Women/Men		20/12	20/15	X^2 (1, N = 67) = .20, p > .10
Age in years		73.25 (6.56)	70.31 (8.26)	t(65) = 1.63, p > .10
Education in years		8.54 (2.69)	9.29 (2.10)	t(65) = 1.33, p > .10
General Cognitive functioning	Mini-Mental State Examination	23.13 (1.45)	27.77 (1.41)	t(65) = 13.24, p < .001
Episodic memory	Grober and Buschke	6.09 (2.31)	11.21 (3.11)	t(65) = 7.32, p < .001
Working memory	Forward span	4.69 (1.22)	6.11 (1.58)	t(65) = 5.00, p < .001
	Backward span	3.59 (1.13)	5.34 (1.71)	t(65) = 5.14, p < .001

Note. Standard deviations are given between brackets; performance on the Mini-Mental State Examination was correct responses (out of 30); performance on the Grober and Buschke task were correct responses (out of 16); performance on the forward and backward spans were number of correctly repeated digits;

Table 2.

Scores of Alzheimer's disease (AD) participants and control participants on the Thinking about Life Experiences Scale

Item	AD	Controls
1. When I want to feel that I am the same person that I was before	*Mean* = 3.75, *Median* = 4.00 (.95)**	*Mean* = 3.03, *Median* = 3.00 (.98)
2. When I am concerned about whether I am still the same type of person that I was earlier	*Mean* = 2.81, *Median* = 3.00 (1.14) **n/s**	*Mean* = 2.91, *Median* = 3.00 (.92)
3. When I am concerned about whether my values have changed over time	*Mean* = 2.78, *Median* = 3.00 (1.01) **n/s**	*Mean* = 3.14, *Median* = 3.00 (1.03)
4. When I am concerned about whether my beliefs have changed over time	*Mean* = 2.91, *Median* = 3.00 (1.03) **n/s**	*Mean* = 2.97, *Median* = 3.00 (.95)
5. When I want to understand how I have changed from who I was before	*Mean* = 2.88, *Median* = 3.00 (1.36) **n/s**	*Mean* = 2.89, *Median* = 3.00 (1.34)

Note. Items were filled in by participants on a five-point Likert-type scale ranging from almost never (one point) to very frequently (five points); Standard deviations are given between brackets; differences between groups were significant at: $^{**}p < .01$; **n/s** differences between groups were not significant.