

**Memory of Myself:**  
**Autobiographical Memory and Identity**  
**in Alzheimer's Disease**

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A thesis submitted in partial fulfilment of a Master of Arts.

University of Auckland

February 2001

## **ABSTRACT**

Impairments of autobiographical memory (AM), both for personal incident memory (memory for personally experienced incidents) and personal semantic memory (memory for facts about oneself), have been documented in a small number of studies involving individuals with Alzheimer's disease (AD). Despite theories positing a role of AM in an individual's identity, there have been very few studies which have investigated the status of identity in AD, and as yet, none which have directly investigated the relation between AM loss and changes in identity in AD, or in other populations experiencing AM impairments. Accordingly, this study investigated three questions: (1) Whether AM is impaired in AD compared with healthy elderly controls; (2) Whether the strength, quality, complexity and direction of identity of individuals with AD differs from that of healthy elderly controls; and (3) Whether the loss of AM is related to changes in the strength, quality, complexity and direction of identity in individuals with AD.

Twenty AD participants and 20 age-matched controls completed two tests of AM (the Autobiographical Memory Interview and autobiographical fluency) and two measures of identity (the Twenty Statements Test and the identity items of the Tennessee Self Concept Scale). AD participants exhibited significant impairments on both tests of AM. A temporal gradient was found on the personal semantic component of the AMI, such that the AD group exhibited poorer recall for recent and early adulthood compared with childhood. This contrasts with previous findings of a temporal gradient for personal incident memory. The AD group exhibited changes in identity relative to controls: The strength of identity was significantly weaker in AD; the quality of identity was significantly more abstract and vague, and significantly less extreme in AD; and the direction of identity was significantly more negative. The two groups did not differ significantly on measures of the complexity of identity. These results identify the specific aspects of identity affected in AD, and quantitatively support the change in identity previously reported in qualitative studies of identity in AD. Lastly, it was found that some components of AM that were measured, particularly AM for childhood and early adulthood, were related to the strength, quality and complexity of identity. This provides tentative support for the relation between AM loss and identity in AD, and for the role of early adulthood AM's (16 – 25 years) in identity.

## ACKNOWLEDGEMENTS

I would sincerely like to thank all the people who have provided me with time, help, and advice, without whom I would not have been able to complete this thesis. I wish to acknowledge and thank the University of Auckland, Bank of New Zealand and the Grand Lodge of New Zealand Freemasons for their financial support of this thesis. Of course this study would not at all been possible without the generosity of all the participants who gave up their time to participate. Thank you for being so welcoming and good-humoured, and for being so open and willing to talk about your personal memories and life experiences.

I would like to thank Dr. Phil Wood, head of the Memory Clinic at North Shore Hospital for his support and advice, and also to all the members of the Memory Clinic, including Dr. Gavin Pilkington, Linda Whitehouse and Sandra Latchford, for help in recruiting participants. Thank you also to Aunty Kay and John and Thelma Mason for so generously giving your time and help in obtaining participants.

I am very grateful to family and friends for their support and patience over the past year: My friends at varsity, Christina, James, Donna, Angela, and especially Gabriella; Marie (kia kaha), Kim, Lisa, Atsushi, and especially Christian and Catherine for your love and support. Thank you also Uncle Lawrence and Aunty Kay for your support. I thank Chris Williams for his mentorship. Thank you also Dr. Niki Harre` and Dr. John Duckitt for your comments and advice on the identity section of this thesis.

I extend great appreciation and thanks to my supervisor, Dr. Lynette Tippett, who has encouraged and inspired me to pursue a research career. Thank you for sharing your knowledge and experience with me, for encouraging me to pursue this research idea, for offering so much help and advice, and for teaching me so much about research.

Finally, I would like to thank my family who have always supported me so very much. Thank you, Dad and Brenda, for your love, support and encouragement. Thank you to Nanna, Claudia, Rich, Tammy, and especially Mum, for always believing in me, helping me through the more frustrating moments of my studies (and sharing the good ones), and for all your love and support. Fa'afetai tele. ✨

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You have to begin to lose your memory, if only in bits and pieces, to realise that memory is what makes our lives. Life without memory is no life at all ... Our memory is our coherence, our reason, our feeling, even our action. Without it, we are nothing. (Buñuel, 1983, pp. 4 - 5)

The study of autobiographical memory (AM), memories of personally-experienced incidents and facts about oneself, began in the 1880's with the work of scientists such as Galton and Ribot. A recent resurgence of interest in the past three decades has seen the development of tests of AM, and ultimately more comprehensive theories of the organisation of both AM and memory in general (Conway, 1990; Kapur, 1999). AM provides an intersection between many of the subdisciplines in psychology, including neuropsychology, cognitive psychology, personality and social psychology and clinical psychology, particularly because of the personal relevance of AM and importance of AM in identity and self-definition. Although many researchers and philosophers refer to the existence of this relationship between AM and identity, empirical investigations have been few. The following study investigates this relationship in individuals with Alzheimer's disease (AD), examining the status of AM and identity in AD, and whether any changes in the strength, quality, complexity and direction of identity are associated with an impairment of AM. In the following introduction, the concepts of AM and identity will be introduced, including evidence supporting these concepts. This will be followed by evidence for a relationship between these concepts, in an integration of social and cognitive neuropsychology. The impetus and rationale behind the present study will also be outlined.

## **WHAT IS AUTOBIOGRAPHICAL MEMORY?**

### **Characteristics of Autobiographical Memory**

AM is viewed most often as memory for personally-relevant information, including memory for both personally-experienced episodes (personal episodic or incident memory) and facts about oneself (personal semantic memory). Neuropsychological and cognitive research have identified certain characteristics of AM, including its basic components, the effects of age and I.Q. on recall, and the temporal distribution of AM's in both healthy and neurological populations. It is important to note that while anterograde memory deficits

can impair all forms of memory, including AM, the neuropsychological study of AM has traditionally focussed on retrograde AM, that is, AM's formed before the impairment onset.

### Personal semantic and personal incident memory

Current neuropsychological views of AM typically involve two relatively independent components labelled personal incident memory and personal semantic memory (e.g., Baddeley, 1992; Dritschel, Williams, Baddeley, & Nimmo-Smith, 1992; Kopelman, Wilson, & Baddeley, 1989, 1990). Personal incident memory refers to the episodic memory component of AM, that is, memory for a specific personal event, including detailed contextual information such as time and place. Personal semantic memory is memory for personal information which is not event-based. This includes all personal information that is not part of personal incident memory, such as names of friends, and facts such as where one went to school. Semantic information about personally-experienced incidents is also part of personal semantic memory. Baddeley (1992) explains that the repeated recollection of personal incident memories may result in the loss of their experiential, episodic qualities, and become facts about the events in one's life. Thus, personal incident and personal semantic memory contain overlapping areas of information.

In the study of AM, however, many researchers have defined AM as only personal incident memory, and have not studied personal semantic memory (e.g., Dall'Ora, Della Sala, & Spinnler, 1989; Dalla Barba, Cipolotti, & Denes, 1990; De Renzi, Liotti, & Nichelli, 1987; Della Sala, Laiacona, Spinnler, & Trivelli, 1993). This tendency is probably due to the similarity of this breakdown of AM to Enel Tulving's (1972, 1983) widely accepted division of memory as either semantic or episodic. In this division, semantic memory is viewed as generic knowledge, while episodic memory consists of personally-experienced events. Consequently, many researchers have defined AM, which is memory for personal information, as equivalent with episodic memory, and have not considered personal semantic memory in their experimental designs. An additional factor contributing to the focus on episodic memory is that until recently, the primary tool used in the investigation of AM was Crovitz and Schiffman's (1974) technique, a method which only probes personal incident memory. Derived from Galton's (1879, 1883) cuing technique, this

method requires individuals to retrieve and date personal incident memories in response to a list of cue words (e.g., high frequency nouns).

Recently, however, there has been a move to consider both personal incident and personal semantic memory. Researchers such as Sagar, Cohen, Sullivan, Corkin and Growden (1988) and Kopelman (1989) assert that viewing AM as only personal incident memory is too simplistic. Accordingly, a number of researchers have developed what they view as more appropriate tools to assess AM. The Autobiographical Memory Interview (AMI), for example, is a semi-structured interview which samples both personal semantic and personal incident memories over three lifetime periods: childhood, early and recent adult life (Kopelman et al., 1989, 1990). The autobiographical fluency task measures fluency for personally-relevant names (personal semantic memory) and personal events (personal incident memory) over these same lifetime periods (Dritschel et al., 1992). The generative aspect of the autobiographical fluency task means that ceiling performances by healthy individuals are avoided, unlike the AMI.

There is empirical support for the distinction between personal semantic and personal incident components of AM, with differential impairments of personal semantic and personal incident memory documented in a number of cases. K.C. provides a clear example of a differential impairment of personal incident memory (Tulving, Schacter, McLachlan, & Moscovitch, 1988). Following damage to left frontal-parietal and right parieto-occipital regions, K.C. was unable to recall a single personal event. In contrast, his personal semantic memory was relatively spared, and, for example, he was able to relate facts about his work history. Kitchener, Hodges and McCarthy (1998) describe a similar case. A densely amnesic patient could identify the names of people he knew personally, but was unable to recall any episodes involving those individuals. Differential impairments of personal semantic memory have also been reported. Eslinger (1998), for example, reported a case where extensive left temporal lobe damage impaired personal semantic memory as measured by the AMI, while recall of personal incident memories was in the normal range.

Dritschel and colleagues (1992) have found further support for the distinction between personal semantic and personal incident memory. A cluster analysis of the personal

memories retrieved in the autobiographical fluency task by individuals with normal memory functioning found two distinct components of AM: names and events. Additionally, a separation was also found between memories recalled in this fluency task and fluency tasks for public information, supporting the distinction of personal memory from public memory.

#### AM recall in healthy elderly individuals: Age and I.Q. effects

A series of studies by Rabbitt and colleagues (Holland & Rabbitt, 1989; Rabbitt & Winthorpe, 1988) investigated the status of AM in healthy elderly individuals and looked at whether the number and quality of AM's recalled changes with age and IQ levels of the recaller. 'Young' and 'old' groups (mean ages 65.7 and 73.5 years, respectively) were further divided into high and low ability groups on the basis of IQ scores. Subjects recalled AM's for a 40-minute period and these were then scored for specificity. It was found that the high ability groups of both age divisions were able to recall more specific and detailed AM's than low ability groups. Also, an age effect was found within the low ability groups, with the memories of the lower ability 'old' subjects being less detailed than those of the lower ability 'young' subjects. However, the lower ability 'old' subjects did have access to thematic information such as life periods, prompting the authors to conclude that low ability elderly individuals tend to have some decline in their ability to integrate thematic information with specific details.

#### Temporal distributions of AM's over the lifespan

A major focus of cognitive-based research of AM in healthy individuals has been the investigation of the temporal distribution of recalled AM's over the lifespan. These investigations have revealed two distinct distributions. Cohen and Faulkner (1988) asked young, middle-aged and elderly subjects to recall six vivid AM's, and rate these for vividness and frequency of rehearsal. They found that most AM's were recalled from earlier life decades, and that the proportion of AM's declined with decreasing age of the memories, with fewest memories being recalled from the most recent decades. However, they explain their result in terms of the strategies used by subjects in a free recall situation: memories tended to be recalled in chronological order from early childhood. Thus without systematically sampling all life periods, the six memories may be recalled from early life periods without subjects considering later life periods.

A more typical temporal distribution is that found by Rubin, Wetzler and Nebes (1986) in a meta-analysis of studies of temporal distributions. This distribution is typical for individuals over 35 years of age, and although it may differ between individuals in this age group, three distinct patterns over one's life span are always present (see Figure 1): (a) a period of childhood amnesia, where the recall of AM's from 0 to 10 years of age decreases with the increasing age of memories; (b) an increase leading to a "reminiscence bump" for memories from 10 to 30 years of age; and (c) a retention function for the most recent few decades, where recall for AM's decreases with the increasing age of memories. The distribution is different for individuals who are under 35 years of age: memories from all periods of their life are equally recalled, instead of a distribution where AM's from certain periods are more or less likely to be recalled.

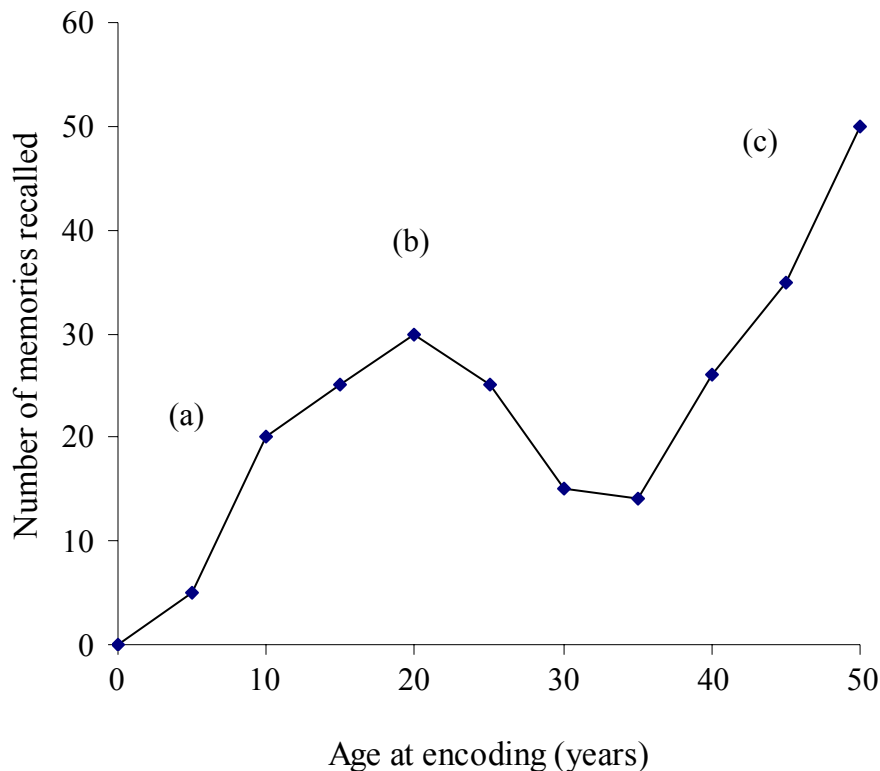


Figure 1. An idealised temporal distribution of the AM recall of a 50 year old, showing (a) childhood amnesia; (b) a reminiscence bump; and (c) a retention function for recent decades (from Anderson & Conway, 1997, p. 220).

### The reminiscence bump

The reminiscence bump, the peak in memories recalled from the period of 16 to 25 years of age, is a well-documented and well-replicated phenomenon. The explanation of why this ‘bump’ exists, however, remains a topic of debate. Little support has been found for explanations claiming differential encoding based on an increase in life events in youth (Rubin et al., 1986). For example, in a categorical analysis of reported memories, Fitzgerald (1988) found that life events only constituted 14% of reported memories from this period. Rather, he argues that the memories encoded in youth may differ in quality, being more vivid in nature (Fitzgerald, 1996). When recall of AM’s is unconstrained (i.e., there are no criteria), 50% of memories are from the most recent decade (e.g., Conway & Rubin, 1993), or, as Cohen and Faulkner (1988) found, predominantly from childhood. When required to recall “highly vivid memories”, however, 25% of memories recalled were from youth and only 10% were from the most recent decade (Fitzgerald, 1988). Fitzgerald (1988, 1996) argues that in order to understand why there is a departure from the standard retention function during this life period, noncognitive mechanisms must also be considered. Fitzgerald draws on the work of Erikson (1968), explaining that adolescence and early adulthood is a period of self-definition and identity formation. He describes identity as including life narratives, which are coherent story-like summaries of one’s life and experiences. He proposes that during this period of identity formation, the intense self-oriented activity leads to the development of highly vivid ‘self-narrative’ AM’s. The high levels of cognitive activity associated with these AM’s makes them more available for recall.

Fitzgerald (1996) investigated this ‘self-narrative hypothesis’ in young and elderly subjects, who were asked to recall AM’s in response to life story instructions (e.g., “tell us four stories about four events from your life”). Participants were then asked to rate these memories in terms of rehearsal levels and how preoccupying they were. For both the young and elderly groups, the largest proportion of AM’s recalled was from the 16 to 25 age period (34% and 32%, respectively). AM’s recalled in response to life story instructions were consistently correlated with high levels of rehearsal and preoccupation, indicating high levels of cognitive activity. Fitzgerald argues that this supports his self-narrative hypothesis: self-defining memories appear to be concentrated in this youth period, and are associated with higher levels of cognitive activity, no doubt contributing to

their apparent vividness. In conflict with Fitzgerald's theory, Jansari and Parkin (1996) found that participants did not rate memories from this period as significantly more vivid than memories from other life periods. In their explanation of the reminiscence bump they proposed that fewer memories are retained from midlife onwards due to attenuation in cognitive abilities necessary for memory processes such as integration and encoding. McAdams (1988), and Robinson and Taylor (1998) also point out that youth is not the only pivotal point of self-definition in one's life. Major life changes that typically occur later in life (e.g., through experiences of separation, death, etc) result in the need for self-redefinition and the development of new self-narratives. Thus, these time periods may also contain AM's that are vivid in terms of self-definition and identity. Consistently, the retention function for events occurring later in life is high, which may reflect self-redefinition.

Another explanation of the reminiscence bump is based on the emergence of personal themes (Conway & Rubin, 1993). According to this account, a set of personal themes emerges in adolescence in addition to stable identity and self-narratives. These personal themes are more abstract and general than self-narratives, and are thought to remain stable through an individual's life. Conway and Rubin (1993) suggest that as the personal themes present during encoding should still be present in the older rememberer, there is a match between retrieval and encoding environments. Thus, the reminiscence bump can be explained according to Tulving and Thomson's (1973) theory of encoding specificity, whereby enduring personal themes facilitate retrieval of AM's encoded while these themes were being formed. Access to AM's not directly related to these themes will be more effortful. This would explain the presence of the reminiscence bump in experimental tasks: more accessible memories corresponding with personal themes, such as those from the age period of 16 - 25 years, are more readily recalled.

#### Temporal gradients of AM impairment

A major focus of the neuropsychological study of AM has been the temporal gradient of AM impairment, that is, the differing levels of impairment of AM over different time periods with respect to healthy controls. Both the AMI (Kopelman et al., 1989, 1990) and the autobiographical fluency task (Dritschel et al., 1992) have enabled the establishment of temporal gradients of AM loss by systematically sampling both personal semantic and

personal incident memories over three lifetime periods: childhood, early adulthood and recent adulthood.

The typical temporal gradient reported in neurological populations with impairments in AM is one where the recall of AM's from recent adulthood is significantly poorer than from early adulthood and childhood. For example, Greene, Hodges, and Baddeley (1995) found such a gradient for personal incident memory in AD. Healthy, age-matched controls did not exhibit a temporal gradient, that is, there were no significant differences in AM recall between any of the three lifetime periods. Although personal semantic memory was also significantly impaired in AD subjects, no temporal gradient was evident. Other researchers have found a temporal gradient for personal incident memory in other neurological populations, including Parkinson's disease (Sagar et al., 1988), and Korsakoff's disease (Kopelman, 1989). Temporal gradients for personal semantic memory have also been reported, for example, in Korsakoff's disease (Kopelman, 1989), in cases of bilateral medial temporal damage (Eslinger, 1998), and, in contrast to Greene and colleagues, in AD (Kopelman, 1989). Less frequently documented are reverse temporal gradients, where recall of AM's is significantly poorer for childhood and early adulthood, compared with recent adulthood. Eslinger found a reverse temporal gradient for both personal semantic and personal incident memory in an individual with extensive left temporal and limited right temporal damage. Similar 'reverse' gradients have been reported in studies of semantic dementia (e.g., Graham & Hodges, 1997). In some cases, the impairment of AM may be temporally extensive, where AM for all lifetime periods are equally affected (Kapur, 1999).

There are a number of reasonable explanations for the greater impairment of more recent AM's and relative sparing of remote AM's in neurological populations. Firstly, the difficulty of reliably pinpointing the onset of the neurological event which has caused the memory deficit, particularly where onset is gradual (e.g., AD), makes it possible that the greater impairment of recent memories reflects a global impairment of anterograde abilities rather than a retrograde impairment for recent AM's. In other words, damage to medial temporal regions would be expected to disrupt the formation of new memories and recently formed memories which have not yet been fully consolidated and are still dependent on medial temporal structures, and spare more distant memories stored diffusely through the

cortex. This can be clearly seen in Eslinger's (1998) study, where cases of bilateral medial temporal damage experienced significant temporal gradients of the form described. Despite this focus on the temporal gradients of AM recall in neurological populations, neuropsychological research has not typically considered the influence of temporal distributions found in both healthy populations, such as the reminiscence bump, on the temporal patterns of impairment of AM. Although some studies of AM in neurological populations have found temporal gradients that clearly show a reminiscence bump, this pattern, which is an important finding in the cognitive literature, is typically not discussed (e.g., Sagar et al., 1988).

### **Theoretical Conceptualisations of Autobiographical Memory**

The complex question of how AM is organised has produced different theoretical conceptualisations of AM. Many of the recent theories reflect the view that AM consists of personal semantic and personal incident components, yet they differ with regard to the specifics of how information is organised. Any investigation of AM requires some discussion of these theories.

#### Brewer's autobiographical memory

Brewer (1986) argues that AM concerns all "information related to the self" (p. 26). He understands AM to consist of four major components. These components are either based on single or repeated episodes, and are either semantic or episodic in nature. He describes the episodic components as 'imaginal' because recall involves the reconstruction of an image of the incident. 'Personal memory' is an episodic AM for a single, personally experienced incident (e.g., a memory of a particular job interview). 'Autobiographical facts' are the personal semantic memories for facts abstracted from a particular personal incident, which lack contextual and temporal information (e.g., the name of the interviewer). 'Generic personal memory' is an episodic AM constructed from repeated episodes (e.g., a generic imaginal AM of what one's interviews have been like). Although it is episodic in nature, the contextual details and images are not specific to any one episode but are rather an integration over multiple episodes. 'Semantic memory' as a component of AM refers to the non-experiential product of multiple episodes, and includes information about self, such as traits (e.g., being nervous at interviews).

### Conway's hierarchical model of autobiographical memory

Conway's (1990, 1996; Conway & Bekerian, 1987; Conway & Rubin, 1993) conceptualisation of AM has been the most influential in the study of AM. Like Brewer (1986), Conway breaks AM down into multiple components, but these components form a hierarchically-organised autobiographical knowledge base. Three levels exist within this structure, as illustrated in Figure 2. 'Lifetime periods' are an abstract level of autobiographical knowledge organised by theme and specific time periods (e.g., working at company X). Conway and Berkerian (1987) found lifetime periods were the most effective cue for AM retrieval, suggesting an important role in AM. 'General events' are more specific summaries of repeated events. These repeated events may be either similar types of events, perhaps linked together by a theme (e.g., all promotions while working at company X) or extended events (e.g., an event over a certain period such as the duration of a specific work project). 'Event specific knowledge' is more specific still, involving the details, images, feelings and sensory details of discrete events (e.g., how I felt at particular job interview). Event specific knowledge is stored in a fragmentary manner and retrieved via thematic frameworks. Within this hierarchical memory system, each level indexes the next level, that is, cues in the lifetime period level access general events, and cues at this level access event specific knowledge.

### **Processes of Autobiographical Memory**

Discussion of the processes of AM has centred on the retrieval of personal incident memories. The retrieval of personal semantic memories is considered to be similar to the retrieval of a general semantic memory, and is not discussed in the AM literature. It is generally agreed that personal incident memories are stored as incomplete, unstructured fragments rather than as complete whole. For example, Conway (1996) states, "there is no such thing as AM's...in the sense of discrete, holistic units in long term memory. Rather, AM's are conceived as temporary mental representations constructed and maintained by a set of central processes" (p. 67). The retrieval of AM's involves the reintegration of the appropriate memory fragments containing temporal, contextual, and sensory information. The two most influential theories of AM retrieval are Damasio's (1989) 'time-locked multiregional retroactivation' and Conway's (1990) 'thematic retrieval frameworks'. Although these theories describe different cognitive mechanisms underlying the stages of

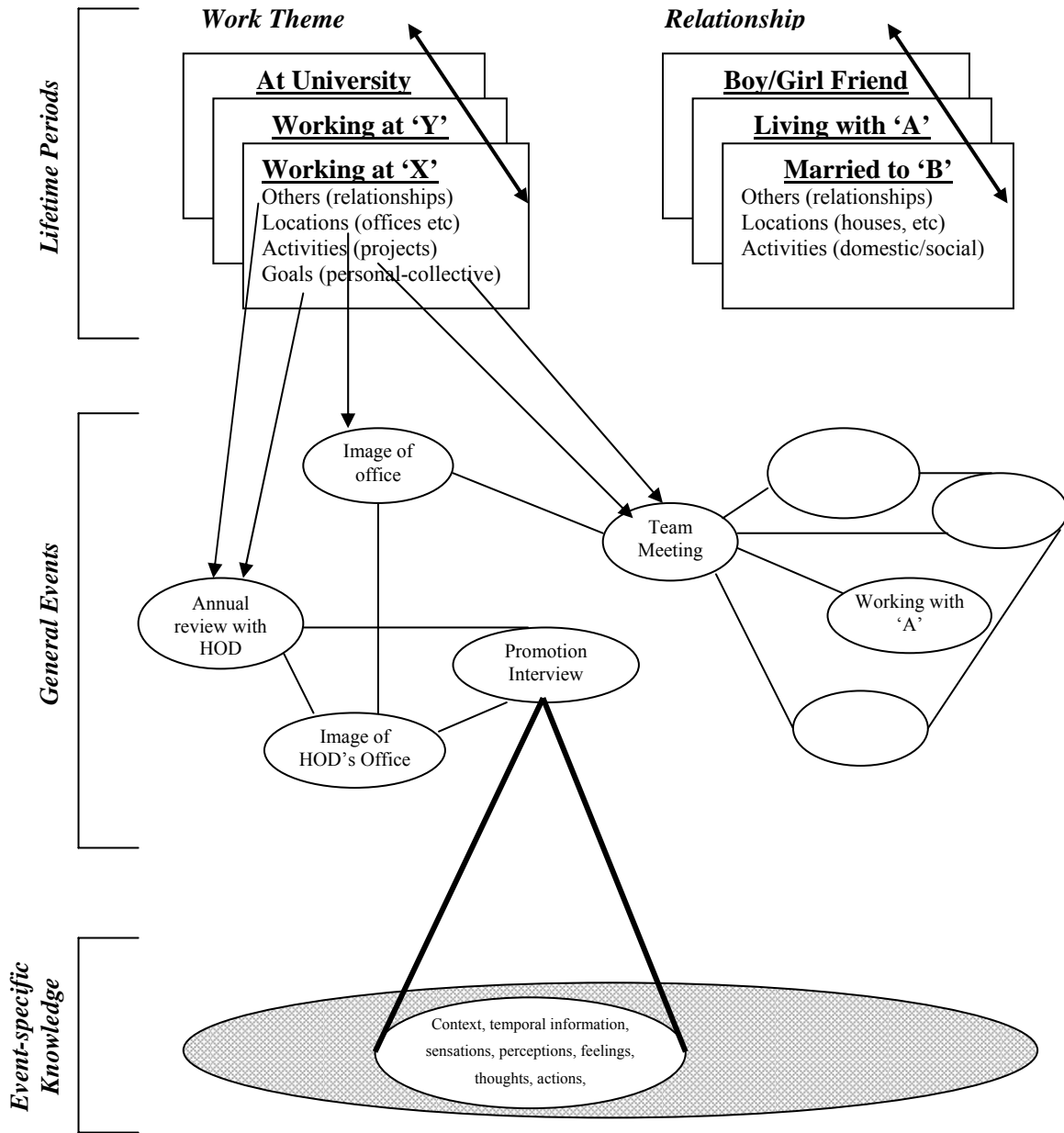


Figure 2. Lifetime period, general event and event specific knowledge in the autobiographical knowledge base (adapted from Conway et al., 1999, p. 681).

retrieval, they make similar predictions about the neural regions supporting these mechanisms.

Time-locked Multiregional Retroactivation

Damasio (1989; Damasio & Damasio, 1994) asserts that memories for events are multimodal, comprised of different sensory representations. These representations are

thought to be stored in the posterior regions of the brain in which they are originally processed, thus necessitating their reintegration in recall. Damasio argues that this reintegration depends on time-locked, synchronous neural activity within the different association cortices, which is controlled by abstract, amodal 'binding codes'. This results in the apparent recombination of the various unimodal representations of the memory and the experience of recall. The binding codes are stored in amodal 'convergence zones' located in brain regions that have rich connections with association cortices, such as the frontal cortex and the anterior poles of the temporal lobes.

### Thematic retrieval frameworks

Conway's (1990; 1992; 1996) model of AM retrieval also centres on the reintegration of fragments of event-specific knowledge stored in posterior regions of the brain. Again, the random and undifferentiated storage of the fragments necessitates that the retrieval of AM's is supported by some mechanism. However, by this account, thematic retrieval frameworks are the mechanism thought to guide the search for, and integration of, memory fragments. These frameworks, supported by the frontal regions, contain abstract thematic and lifetime period information. They act to index and cue the memories, enabling efficient searches and reintegration of AM's.

Conway and colleagues (1999; Conway, Pleydell-Pearce, & Whitecross, 2000) propose retrieval of AM's may occur either via direct retrieval or via the more complex process of generation retrieval. Direct retrieval occurs when a specific cue accesses event-specific knowledge directly and activates associated general events and lifetime periods. When event-specific knowledge is not directly accessed by a cue, generative retrieval occurs. This involves the execution of a series of search-evaluate-elaborate retrieval cycles. The search phase involves a spreading activation from lifetime period cues to general events and event-specific knowledge. The accessed memory fragments are cross-checked and verified against a 'retrieval verification model', which is temporally generated by the central executive processes using the working self (i.e., the currently active goals of the self) (Conway et al., 2000). If the retrieved information is unsatisfactory, it is used as a cue for the next retrieval cycle. This process continues until an effectively complete memory, which meets the criteria of the central executive's retrieval model, is retrieved. Conway (1996) proposes that the thematic retrieval frameworks and retrieval verification models

are supported by frontal executive functions, such as the supervisory attentional system (Shallice, 1988). Current research is attempting to investigate further the neural correlates of retrieval frameworks and retrieval verification models (e.g., Conway et al., 2000).

#### Evidence consistent with theories of AM retrieval

Both theories posit that fragments of AM's are stored in posterior regions and that reintegration is guided by frontally-supported mechanisms. These indistinguishable neural predictions mean that these theories are difficult to evaluate comparatively, as evidence is often consistent with both. For example, cases M.H. (Ogden, 1993) and L.D. (Butters, O'Connor, & Verfaellie, 1995) are adequately explained by these two theories. In these cases, damage to the sensory-motor cortices resulted in an impairment in recalling personal incident memories. According to Damasio's (1989; Damasio & Damasio, 1994) theory, damage to these regions would disrupt the storage of unimodal representations and, consequently, the input to the convergence zones. However, the retrieval framework models can also interpret this pattern of damage and impairment as a disruption of the storage of event-specific knowledge. Cases of AM impairment where posterior and anterior regions have been effectively disconnected by lesions can be interpreted by both theories as the result of disconnection of the posterior unimodal representations or event-specific knowledge from the anterior convergence zones or retrieval frameworks and verification models (e.g., Hodges & McCarthy, 1993). While these two theories are neurally indistinguishable, there have been a number of lesion and neuroimaging studies which have directly investigated the role of these anterior and posterior regions in AM retrieval.

#### Lesion studies of the role of frontal cortices in AM

Lesion studies of AM retrieval have focussed primarily on the role of frontal regions in AM retrieval, although there are lesion studies which look at the role of posterior regions (e.g., Hunkin et al., 1995; Ogden, 1993). Della Sala and colleagues (1993) investigated AM in 16 patients with frontal lobe lesions. They found a significant correlation between impairment of AM, tests of executive function, and bilateral frontal lesions, supporting the involvement of frontal processes and regions in AM retrieval. Similarly, Greene et al. (1995) investigated executive functions and AM in AD. Regression analyses indicated that processes used in divided attention tasks are involved in the retrieval of personal semantic

memories, while processes involved in verbal fluency are involved in the retrieval of personal incident memories. This again suggests that executive function does play a role in the search and retrieval of AM's.

Some patients with frontal lobe damage exhibit what Baddeley and Wilson (1986) term a "clouding" of AM, such that they can access lifetime period and general events, but cannot recall specific and detailed AM's. Additionally, these individuals may produce confabulatory memories. On this basis, Baddeley and Wilson concluded that a damaged supervisory system that is not disconnected from event specific knowledge could result in a working, yet inefficient, AM retrieval process: An individual can fail both to access detailed AM's, consistent with an inability to use retrieval frameworks effectively, and fail to verify the accuracy of those memories recalled, resulting in confabulation.

Other researchers, however, argue that the role of frontal regions and executive processes in the retrieval of AM's may actually be rather limited. Kapur, Ellison, Smith, McLellan and Burrows (1992) assert there is a lack of substantial evidence implicating such a role. Rather, they hypothesise that an impairment of AM is more likely as a result of bilateral damage to the temporal lobes rather than frontal lobe damage. Dall'Ora et al. (1989), for example, found no evidence of frontal impairment or frontal atrophy in individuals with severe AM impairments. Furthermore, despite finding an involvement of frontal processes in AM retrieval, Greene et al. (1995) also found that some individuals with minimal AD and impaired AM actually had relatively preserved executive functioning. They also cautioned that the role of executive function in the retrieval of AM's may, therefore, be rather limited.

#### Neuroimaging studies of AM retrieval and frontal involvement

A number of neuroimaging studies have focused on the role of frontal regions in the retrieval of AM's. Conway and colleagues (2000) investigated the neuroanatomy of AM retrieval by analysing slow cortical potentials during a task involving these processes. Following the presentation of a cue word, subjects had to recall an AM, hold it in mind for five seconds and then attempt to inhibit the memory. Subjects were taught to indicate as soon as the memory had come to mind, and to then hold it in mind for the duration of a presented fixation stimulus (five seconds). During the initial phase (retrieval), they found

negative activation in the left anterior temporal and frontal regions, and a weaker negative activation in right frontal regions. It was argued that this pattern of negative activation reflected the process of generating a retrieval framework and a retrieval verification model. When the memory was reconstructed, the pattern of negative activation shifted to bilateral posterior regions such as the occipital region, and when held in mind, the negative activation shifted to the right frontal, temporal and occipital regions. The authors argue that this relates to activation of all three levels of Conway's hierarchy of AM: thematic frameworks (supported by frontal regions), general event knowledge (temporal) and event-specific knowledge (occipital). These patterns of activity are, however, also consistent with the predicted neural activation of the mechanisms described by Damasio (1989; Damasio & Damasio, 1994).

Conway and colleagues (1999) also investigated the neural correlates of AM retrieval using positron emission tomography. Cues for AM retrieval were non-personal cues (e.g., common nouns and verbs) which do not directly access AM's and therefore were expected to result in the use of frameworks in AM retrieval (i.e., generative recall). Subjects had to read a cue word and then retrieve an AM within 5 seconds or the trial timed out. Cued paired-associates recall was used as a control condition. Generative AM recall resulted in an increased activation of the left frontal lobes compared with the cued recall of paired associates. In contrast, paired associates recall showed an increase in activation of the right temporal, parietal and occipital lobes. Left frontal activation is concluded to be a distinct feature of AM recall, arguably because of the use of retrieval frameworks.

There are studies which also implicate right frontal activation in AM recall, specifically in direct retrieval. Fink et al. (1996) found that when AM's were directly cued with sentences naming events in the person's life (direct retrieval), right prefrontal and temporal regions were activated. There was no evidence of left frontal activation, consistent with the absence of frameworks in such direct retrieval. It may be that, while the left frontal regions support retrieval frameworks necessary for accessing the appropriate fragments of event-specific knowledge, the right frontal regions support the processes of reconstructing the memory directly from these records.

Although there is evidence that does support the involvement of frontal regions in the retrieval of AM's, this is somewhat contradictory and indirect. As yet, these studies do not adequately explain how frontal regions support these 'retrieval frameworks', 'retrieval verification models', or 'binding codes'. Some supporting framework is necessary, however, as retrieval of AM's is a complex procedure involving many processes such as retrieving, verifying and reintegrating fragments of event-specific knowledge into an AM.

In summary, studies of AM have focused on describing the characteristics of AM, such as its basic components, the effects of age and I.Q. on recall, and the temporal distributions and gradients of AM; the conceptualisation of AM; and the complex process of AM retrieval. Although there is a small literature suggesting that AM and a sense of identity may be related, for example, Fitzgerald's (1988) self-narrative hypothesis, to date there have been no empirical investigations of whether a loss of AM affects an individual's sense of self and identity. A relation of this sort could potentially have wide and important implications for both the individual themselves and their functioning in the family.

### **AUTOBIOGRAPHICAL MEMORY AND IDENTITY**

The relation between AM and identity is far from understood. There have, however, been theoretical conceptualisations about how these two constructs may be related. Before a meaningful discussion of these theories or hypotheses can be attempted, it is necessary to outline what is meant by identity. A task fraught with definitional problems, it has been likened to "traversing a battle field" (Breakwell, 1986, p. 10).

#### **What is Identity?**

After a century of scientific investigation and changing definitions of what constitutes identity, there still is no consensus of definition. A major difficulty is that many conceptually similar terms have been used interchangeably, particularly the terms 'self' and 'identity'. Some researchers do not differentiate between these terms. For example, in their book, *Self and Identity: Fundamental Issues*, Ashmore and Jussim (1997) did not 'impose' definitions on these terms. Rather, they describe the many ways these terms are used by various researchers. Some researchers use the term 'self' to refer to a reflexive consciousness, a sense of knowing oneself, which essentially is equivalent to identity. This

is particularly common in writings on identity by researchers from disciplines other than social psychology. For example, neurologist Antonio Damasio (1999) refers to identity as the ‘extended self’, while philosopher Marya Schechtman (1996) uses the term ‘narrative self’. In this review, the terminology used by particular theorists will be used when referring to their work. Thus, where an alternative term, such as ‘self’, appears, it is in reference to the concept of identity.

‘Self-concept’ is another term often used as an equivalent of ‘identity’, with a lack of consensus about the differentiation of these two particular concepts. Self-concept can be thought of as the concept one has of oneself. This concept includes identifications, perceptions and beliefs about oneself, and an individual’s thoughts and feelings about themselves (e.g., Rosenberg, 1986, cited in Breakwell, 1992). Self-concept can be broken down into an “Aristotelian division” of three core components: an identity component, consisting of self-perceptions and identifications; an evaluative, self-esteem component, that is, the value attached to identifications; and a behavioural component, based on how one perceives themselves as actually behaving (George 1990, cited in Furchtgott, 1999). Within this formulation, identity is not therefore interchangeable with self-concept, but is the subcomponent of the self-concept which consists of identifications, beliefs and perceptions about oneself. Though still a contentious issue, identity is often thought of as consisting of two distinct forms: personal and social identity (Hogg & Abrams, 1988). Personal identity refers to the part of self-concept that is unique to that person, the self-perceptions of unique personal features and characteristics that differentiate one from others. This includes, for example, traits, personality characteristics, personal tastes and bodily attributes (Turner, 1982). Social identity is a collective term for those identities derived from group memberships, that is, from being similar to group members while distinct from out-group members, and from role identities, that is, the roles one has in certain contexts. This structural delineation implies that personal and social identities coexist within the same self-concept, but that one’s personal identity may be more salient than one’s social identity in certain contexts, and vice versa (Hogg & Abrams, 1988).

Not all researchers, however, accept this dichotomy. Breakwell (1986) argues against sharp demarcations between personal and social identity. She suggests that the distinction is more temporal than content based, and, “personal identity could be considered the

relatively permanent residue of each assimilation to and accommodation of a social identity” (Breakwell, 1986, p. 17). Thus, she asserts that the dichotomous view of the structure of identity is problematic as it focuses on the structure at a fixed moment in time rather than considering the processes that produce these identities. Breakwell (1992) identifies two ‘processual’ ways of viewing identity. In ‘processual interactionism’ (Blumer, 1969) identities are conceptualised as transient entities within the self-concept, transient as they are situated in, and change between, contexts. Within the symbolic interactionism viewpoint (Stryker, 1979) identities are seen as developing within a system of reciprocal role relationships. Thus, the basis of identities is the internalisation of roles, and self-concept is a product of the hierarchical organisation of these role identities.

Deaux (1992) argues that personal and social identities are interconnected and that a multiplicity of identities characterises an individual. She proposes that social and personal identities can be conceptualised as a hierarchically-structured individual identity system. Generally, each social identity is associated with personal identities or attributes. This is illustrated in Figure 3, which, using a mirror imagery principle, shows social identities in the upper portion of each identity system and associated personal identities in the mirror-opposite box in the lower portion of each identity system. The structure of the identity system may, however, vary between individuals. There may be a superordinate identity, under which exist other identities at second and third levels, depending on the importance and salience of particular identities in the individual’s life. For example, Figure 3a shows an identity structure where the social identities of wife and mother, and the associated personal identifications of being accepting and reliable are superordinate. However, for other individuals there may be no superordinate identity but rather a number of identities coexisting at “a middle level of generality”. For example, Figure 3b shows an identity structure that has no superordinate identity. Instead the social identities of man, uncle and son, and the corresponding personal identities of independent, intelligent, caring and feeling, coexist on the same level. There may be social identities that are not associated with any particular personal identities, such as the social identity of son in Figure 3b. Additionally, there are certain aspects of personal identity that are not linked with any particular social identity, but rather describe the individual in an abstract, general way (e.g., honest and respectful, in Figure 3b).

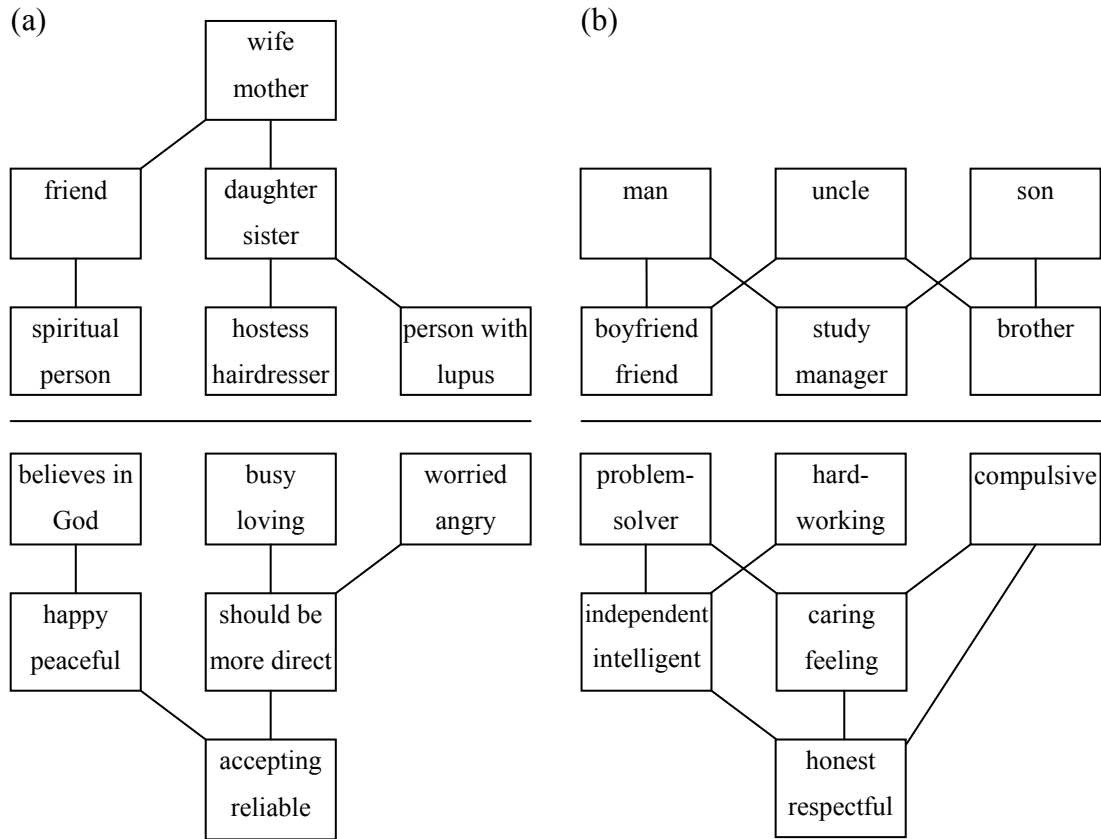


Figure 3. Representation of individual identity structures: (a) subject 128, and (b) subject 147 (adapted from Deaux, 1992, p. 22 & p. 24).

This approach allows for the consideration of both the distinctiveness and interconnectedness of personal and social identity. Linking particular aspects of personal identity with particular social roles allows for contextual, social constructions of personal identities and thus does not ignore the importance of context, as do many theories. It also recognises that personal identity develops out of interactions and social contexts as well as personal reflections and internal contexts. The interconnectedness of social and personal identities may allow for their simultaneous salience: through a spreading activation, personal identities associated with a salient social identity may also become salient, a hypothesis not supported by social identity theory. For the purpose of this research, identity will be conceptualised in this way, as a component of the self-concept which consists of interconnected personal and social identities.

### Multidimensionality of identity

One prominent debate within the field of identity is unity versus multiplicity (e.g., Ashmore & Jussim, 1997; Baumeister, 1998). Many investigators take these qualities as mutually exclusive, viewing identity as either unified or multidimensional. However, other researchers argue that with reference to identity, unity and multiplicity are not necessarily opposing ideas; it is possible that both multiplicity and unity of identity exist within an individual.

According to some theories, identity is a complex, multidimensional construct (e.g., Kelly, 1955). Various aspects of identity have been specified by researchers as being of importance, covering domains such as personal, social, moral, physical, family, and actual and ideal selves (e.g., Bosma, 1995; Fitts, 1965). The dimensionality of identity, however, does not rule out unity, and in order to achieve the sense of a unified identity, a process of integration of the multiple dimensions of identity is required. In Rosenberg's (1997) conceptualisation of identity, the multiple dimensions of identity are inter-related, and it is the inter-relations that constitute the unity of identity. Along similar lines, Turner (1982) notes that identity has an "overall coherence and organisation which produces a sense of unity and consistency and yet structurally and functionally, its parts are highly differentiated" (p. 19).

### Continuity of identity

The quality of continuity is essential to identity. Erikson (1963) claims that "inner sameness and continuity" are essentially the sense of identity (p. 261). Identity cannot merely be a "sum" of its parts, because then any change in one's self-knowledge, as a result of learning or forgetting, would essentially alter one's identity (Hulme, 1739, cited in Baumeister, 1998). A sense of continuity allows an individual to understand that despite changes they are essentially the same person they were in the past, "alternative expressions of one and the same continuous individual" (Chandler & Lalonde, 1995, p. 47). It is generally agreed that this sense of continuity is produced through the integration of past, present and future identities. The process of creating a life story or a self-narrative is one way in which these links between past and present are made. Typically in a self-narrative, the individual remains essentially the same person despite changes in life situations or roles. For example, while one's roles may change from daughter to mother, one perceives

oneself to be essentially the same person. Markus and Nurius (1986) propose a different process through which changes in one's life and identities can be integrated to produce a sense of continuity. They hypothesise that any changes are integrated into one's identity as being a "possible self". Thus as this 'change' was always essentially part of one's identity, the individual has a sense of continuity despite change. Robinson and Taylor (1998), however, assert that a continuous identity is the product of a continuity bias, which allows for the reconstruction or re-editing of events and memories so that they form a smooth, uninterrupted story.

### **What is the Relationship between Identity and Autobiographical Memory?**

AM is an important source of knowledge about oneself and one's past experiences. Although identity cannot be reduced to AM alone, this type of memory provides the medium from which identity is constructed (Fitzgerald, 1992). For example, Barclay (1996; Barclay & Smith, 1993) proposed that a sense of identity can be achieved through the process of recalling AM's and "self-composition" – using and reinterpreting AM's in the construction of personal narratives and the emergent self (Barclay & Smith, 1993). It has also been suggested that the relationship between AM and identity may be bi-directional (e.g., Barclay & DeCooke, 1988; Spence, 1982). For example, identity may influence the specific AM's that one recalls and how they are interpreted, so that "what is remembered is accurate in the sense that narrative truth is preserved" (Barclay & Smith, 1993, p. 236). Robinson and Taylor (1998), however, point out that narratives do not constitute the whole of one's AM or identity. It is one aspect which must be considered in conjunction with other aspects of identity, such as self-knowledge. The similarity of self-knowledge and personal semantic memory, and of narratives and personal incident memory, makes the existence of a relationship between AM and identity seem a plausible hypothesis to be studied. To date there are three theories which conceptualise the relationship between AM and identity: the 'extended self', 'psychological continuity theory', and the 'narrative self'. Additionally, neuropsychological studies have begun to investigate the relationship between AM and trait self-knowledge.

#### The extended self

Many theories of consciousness, self and identity include at least two distinct forms of self: a minimal self and an extended self (Gallagher, 2000). The minimal self, or what Damasio

(1999) refers to as core self, is a transient awareness of oneself at the present moment in time. The extended self, however, is one's sense of identity extended over time, and involves an integration of past experiences and selves with anticipated selves (Gallagher, 2000). Neisser (1988) discusses the ways in which the extended self draws on different forms of AM, which, as records of participation in past events or activities, indicate that one's existence transcends the present and is extended over time. Personal incident memory gives a definite impression of past selves by establishing "what I did". Personal semantic memory of routines or repeated events establishes the concept of "what I do". This links past selves with present selves, in the sense that present selves are currently participating in the same activities of past selves. Damasio (1999) similarly discusses AM as creating an extended consciousness and a sense of identity. He argues that identity is dependent on systemised memories and a "non-transient collection of unique facts and ways of being which characterize a person" (Damasio, 1999, p. 17).

#### Psychological continuity theory

Psychological continuity theory also views identity as a product of connections between past and present enabled by AM. However, these connections are not between past and present selves, but rather between discrete moments in the past and the present. This theory builds upon Locke's (1694/1970) hypothesis that "as far as this consciousness can be extended backwards to any past action or thought, so far reaches the identity of that person" (p. 181). Contemporary theorists such as Parfit (1984) have expanded this claim into a more elaborate theory. Identity is a product of psychological continuity and connectedness, which in turn is a product of links between the self in the past ( $t_1$ ) and the self in the present ( $t_2$ ). AM is clearly necessary for enabling connections between discrete moments in consciousness. Direct connections which produce psychological continuity include when one remembers past experiences, has psychological traits or features that persist over time, or when one fulfils an intention formed at an earlier time (Shoemaker, 1997). Thus, according to this theory, AM has a clear role in the constitution of identity, and, if lost, it would follow that one's identity would also be lost or significantly changed.

#### The narrative self

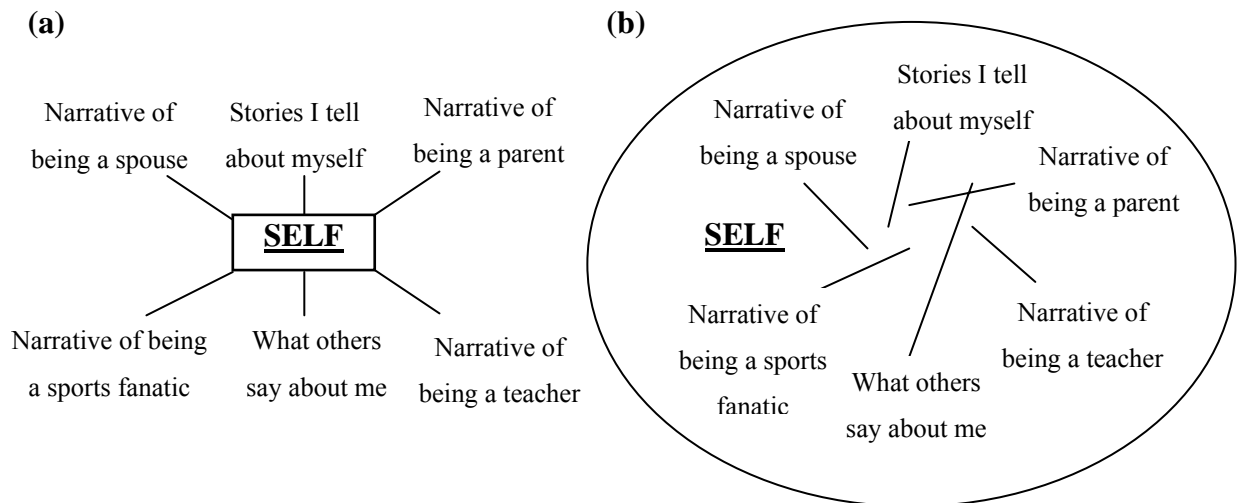
Schechtman (1994, 1996) critiques psychological continuity theory, questioning whether simple connections between discrete experiences could underlie identity. She argues that

psychological continuity theory only considers memories for experiences, i.e., personal incident memories. Recognising that many AM's are more semantic in nature, e.g., summarised event memories, she points out that psychological continuity theory does not account for these AM's. When recalling experiences, individuals frequently recall the summarised versions of that life period: a narrative composed of the essential features. According to this viewpoint, identity is constructed through the process of narrating. Individuals subjectively perceive and interpret their AM's, integrating and condensing both personal semantic and personal incident memories into a coherent life narrative (Barclay & Smith, 1993; Schechtman, 1994, 1996). This allows individuals to see particular AM's as part of an integrated whole. The coherence of a narrative contributes to the sense of continuity - continuing interests, life themes, traits, experiences - and identity.

The narrative theory has become a powerful and influential explanation of the construction of identity. McAdams (1988) has focused solely on the roles of narratives in the construction of identity, claiming, "identity is a life story" (p. 29). Erikson (1959, cited in McAdams, 1988) states that successful identity awareness and integration necessitates the understanding of past, present and future selves. McAdams argues that this is achieved through a life narrative: integrating one's different selves, identifications, self-images and experiences, providing a sense of unity, sameness and continuity. He posits that life narratives are thematized; they do not represent all experiences but rather those that relate to life-themes and self-images.

More specifically, McAdams (1988) identifies themes of power and intimacy as being dominant in life-narratives. Within these themes, a person's identity consists of four components: ideological setting (the value and belief systems in which one's narrative is grounded), 'imagoes' (personifications of self or self-images), nuclear episodes (specific autobiographical events) and generativity scripts (scripts for future self-narratives). Thus, the importance of AM in this model of identity is obvious: personal semantic memory and personal incident memory provide the content of these components of identity, such as nuclear episodes, self-images, and knowledge about one's belief and value systems. Additionally, the knowledge of past selves provided from AM is necessary to produce images or scripts of future selves and narratives.

The sense of identity produced through the process of narratives is referred to as the narrative self. The narrative self is similar to the extended self, but is specifically constructed through the richer process of narratives rather than only links between past and present selves. Dennett (1991) states that although the narrative self is the product of “spinning” stories (p. 418), the narrative self is not something that is actually real, but rather an abstract centre of gravity (see figure 4a). This abstraction is defined by the various self-narratives, which intersect at this point. Dennett terms the ‘self’ a centre of gravity because essentially an individual’s representation of self is always located within the individual. Interestingly, Dennett points out that although counter-intuitive, individuals do not consciously spin these life-stories; an individual is not the source of the narrative but the product. Ricoeur’s (1992) model, however, conceptualises the narrative self as a more concrete concept. Although seemingly counter-intuitive to the sense of continuity and sameness of identity, all narratives about the self, even those that are contradictory, are included. This produces a more diverse, multifaceted narrative self, which “reconciles the same categories that Locke took as contraries: identity and diversity” (Ricoeur, 1992, p. 143) (see Figure 4b).



**Figure 4.** Two models of the narrative self: (a) Dennett’s Centre of Narrative Gravity; and (b) Ricoeur’s diverse, multifaceted model of self (Gallagher, 2000, p. 19)

### **The Neuropsychology of Identity and Self-Knowledge**

The postulation that AM contributes to identity has led to the hypothesis that a loss of AM will affect one’s identity. Hirst (1994) surmised that individuals with retrograde memory impairments effectively lose their “pre-onset autobiographies”. Thus he states it is logical

to hypothesise that they would experience great changes in their identity. Although many theorists have proposed a role of AM in the construction of identity, there has been little empirical investigation of this hypothesis.

The recent empirical research of Klein and Loftus (1993) is an example of one of the few investigations of the relationship between AM and trait self-knowledge, one aspect of identity. Klein and Loftus investigate the exemplar model (e.g., Bower & Gilligan, 1979), which focuses on the role of personal incident memory in the construction of trait self-knowledge. This model posits that trait self-knowledge is based directly on, and inseparable from, exemplars of behaviour in personal incident memories. Indeed, it has been observed that individuals often refer to specific incidents when discussing trait self-knowledge (Bower & Gilligan, 1979).

Klein and Loftus (1993) investigated the exemplar model using a conceptual priming paradigm. Three tasks were involved: (1) a 'descriptiveness task', where a trait was rated for self-descriptiveness; (2) an 'autobiographical task', where a personal incident memory was recalled; and (3) a 'semantic task', which involved defining a trait. In each trial, two of the tasks were completed in succession, with the same trait being used in both tasks. The latencies of task completion were measured. If trait self-knowledge requires exemplars, then the time taken to complete the descriptiveness task (a task of trait self-knowledge) should be less when preceded by the autobiographical task (which makes exemplars more readily available) than a semantic task. Klein and Loftus found no difference between the latencies of the descriptiveness task when preceded by the autobiographical task or the semantic task. When preceded by the descriptive task, the latencies for the descriptive task dramatically decreased, demonstrating that the task is amenable to priming effects. These results indicate that behavioural exemplars do not have a role in trait self-knowledge as previously argued, particularly in the exemplar theory. Rather, they propose a new model, stating that trait self-knowledge is based only on the abstract summaries of traits represented in personal semantic memory.

Neuropsychological evidence supports this view. Tulving (1993) and Klein, Loftus and Kihlstrom (1996) looked at the trait self-knowledge of individuals with an impairment of personal incident memory. Case K.C. (Tulving, 1993) could not retrieve any personal

incident memories, while W.J.'s (Klein et al., 1996) impairment in personal incident memory extended back 6 to 7 months. In both case studies, they were required to complete a trait-descriptiveness task. This was correlated with the responses from a close family member or partner, who responded as if they were the case individuals. It was found that an impairment in personal incident memory did not significantly impair the ability to complete these trait self-knowledge tasks. Thus, the authors of both studies concluded that personal incident memory does not have a significant role in the construction of trait self-knowledge. On the basis of these results, Klein, Chan, and Loftus (1993) state that self-knowledge is derived from personal semantic memory.

The interpretation of these results, however, may not be straightforward. Firstly, W.J.'s impairment of personal incident memory was not total or even extensive; the amnesia only affected a 6 to 7 month period. Thus, personal incident memories formed prior to this period may still be involved in the construction of trait self-knowledge. Additionally, the sparing of personal semantic memory, evident in both cases, can allow for the relearning of a factual knowledge of past experiences, albeit without experiential qualities (e.g., O'Connor, Butters, Miliotis, Eslinger, & Cermak, 1992; Stuss & Guzman, 1988). Thus, although semantic in nature, knowledge of personal incidents and behavioural exemplars (i.e., a semantic account of how one behaved in the incident as opposed to an episodic memory of how one behaved) could still be involved in the construction of trait self-knowledge. Furthermore, K.C. was not required to rate how these traits applied to him for a specified lifetime period. His mother, however, rated K.C.'s traits for the period prior to and after the accident. Thus with the preservation of personal semantic memory, it would be difficult to know whether he rated the descriptiveness of traits for the period prior to or after the brain insult, or some combination of both.

These studies draw the conclusion that as AM, or rather personal incident memory, was not found to have a role in the construction of trait self-knowledge, it does not have a role in identity. This extension of their results to the role of AM in the construction of identity is perhaps too broad a conclusion and is not substantiated by these studies for the following reason. This evidence can only be used to exclude the role of personal incident memory from the processes of constructing trait self-knowledge, not necessarily all aspects of

identity. Personal incident memory may not have a major role in the construction of trait self-knowledge, but may not be redundant in other aspects of identity, such as narratives.

Gazzaniga (1998; Gazzaniga & Gallagher, 1998) has identified what he claims are the neuronal processes underlying narrative identity: the processes of the left hemisphere, or what he terms the “interpreter”. According to this theory, the role of the interpreter is to integrate information and experiences and to construct or reconstruct both the past and narrative identity. “The self is not self-constituting but is the outcome of a self-organising neuronal process that creatively incorporates biases and even errors, in perception, memory and judgement” (Gazzaniga & Gallagher, 1998, p. 709). Gazzaniga based the idea of a left hemisphere interpreter and its role in the construction of narrative identity on evidence from split-brain research. When presented two related sets of images, the right hemisphere is unable to integrate the two sets of images. The left hemisphere, however, relates the two sets by reconstructing the original storyline to incorporate the new information. Gazzaniga asserts that the interpreter effectively produces narratives and identity by building upon and interpreting past and new information to create self-stories.

These studies represent the beginning of the empirical study of the neuropsychology of identity. To date, investigations have focused on the impact of impaired personal incident memory on identity, particularly trait self-knowledge. In the study conducted in this thesis, AM and identity in AD are investigated. This line of research presents an opportunity to directly study the role of both personal semantic and personal incident memory in identity, and the impact of the loss of one or both of these components of AM on identity.

### **AUTOBIOGRAPHICAL MEMORY AND IDENTITY IN ALZHEIMER’S DISEASE**

To date, there is only a small body of research investigating AM in AD. Similarly, there is very little empirical research which investigates identity in neurological populations, let alone the effect of AM loss on the strength, quality, complexity and direction of identity, both generally, or more specifically, in AD populations. Part of the reason for the lack of study in this area is due to the methodological and definition difficulties associated with

the study of identity, and also a lack of academic crossover between neuropsychology and social psychology.

### **Studies of Autobiographical Memory in Alzheimer's Disease**

Impairments of AM have not been extensively studied in AD. A few studies have focused on the temporal gradients of impairment in personal semantic and personal incident memory, a focus which is typical of AM research in general. For example, significant impairments of AM have been documented in all major studies of AM in AD (Dall'Ora et al., 1989; Dorrego et al., 1999; Graham & Hodges, 1997; Greene & Hodges, 1996; Greene et al., 1995; Kopelman, 1989; Sagar et al., 1988). Additionally, temporal gradients of impairment have been found for personal incident memory (Dorrego et al., 1999; Graham & Hodges, 1997; Greene et al., 1995; Kopelman, 1989; Sagar et al., 1988). Dall'Ora and colleagues did not find a temporal gradient for personal incident memory. Although personal semantic memory has been found to be significantly impaired in AD only one study has reported a temporal gradient of impairment (Kopelman, 1989). As yet, the impacts of a loss of AM, for example, on identity, have not been investigated.

### **The Study of Identity in Alzheimer's Disease**

There have been very few studies which look at identity in AD, possibly due to a lack of integration between neuropsychology and social psychology. Another factor may be the additional considerations necessary when investigating identity in AD. Firstly, identity issues associated more generally with elderly populations must be considered. A number of changes and issues can impact upon an elderly individual's identity, including changes in living arrangements, autonomy, marital status, occupational status, abilities, health status, physical appearance, and sexual function (e.g., Charmaz, 1997; Heidrich, 1998; Whitbourne, 1998). Secondly, any study involving individuals with AD must also consider additional changes associated with AD which may affect an individual's identity independently of AM, such as changes in cognitive abilities which are in conflict with self-expectations and previous abilities and which also may affect evaluative and reflective abilities.

### The study of identity: Methodology

Another reason for the small number of studies investigating identity in AD may be the lack of a clear methodology for measuring identity. Many investigations into identity employ semi-structured interviews and qualitative techniques (e.g., Orona, 1990, 1997), particularly when there is a focus on narratives. A more widely used technique, however, is based on a quantitative measure, the Twenty Statements Test (Kuhn & McPartland, 1954). This measure of identity has been employed to investigate differences in identity between groups, such as different cultures, and has been used with elderly populations (e.g., Lund, Caserta, Dimond, & Gray, 1986). Individuals are required to write 20 statements in response to the question, "Who am I?". The responses are coded according to specific criteria. Although the criteria vary between studies, an adaptation of the criteria developed by Kuhn (1960) and McPartland, Cumming, and Garretson (1961) is commonly used. This covers many aspects of identity and codes responses according to categories including social identities (roles), traits, attributes, and physical descriptions, which all include various subcategories. Rhee, Uleman, Lee, and Roman (1995) also code responses along an abstract-specific dimension, where responses coded as abstract are general, and specific responses are concrete and relate to specific situations or examples. Thus, the Twenty Statements Test allows for the assessment of the strength of identity, that is, the number of responses generated; the quality of identity, that is, the abstractness of responses; and the complexity of identity, that is, the number of categories and subcategories sample and the relative concentrations of responses in these categories.

The Tennessee Self Concept Scale (Fitts, 1965; Fitts & Warren, 1996) is another measure that has been widely used in the study of identity with a variety of populations, including the elderly (e.g., Gaber, 1984). This scale is comprised of 82 statements that are rated for self-descriptiveness on a five-point true-false scale. The Tennessee Self Concept Scale measures three aspects of self concept: identity, self-satisfaction and behaviour. The measurement of these three aspects is structured into five domains: moral, personal, physical, social, and family. The Tennessee Self Concept Scale allows for the assessment of the quality of identity, that is, the number of responses that are vague (responses of three) or extreme (responses of one or five). It also measures the direction of identity, that is, the degree to which one's identity is positive or negative, as indicated by the Total Identity Score as well as the Identity Subscores for each of the five domains.

### Studies of identity in Alzheimer's Disease

One of the very few studies of identity in AD was conducted by Orano (1990, 1997), in which loss of identity emerged as a major theme in a qualitative analysis of interviews with family members of AD sufferers. Relatives often perceived the individual's identity, personality and behaviours as having dramatically changed over the course of AD. Family members often felt these changes and behaviours were signs that the individual's identity had been lost, that "the Alzheimer's person has ceased to be the person he/she once was" (Orona, 1990, p. 1252). The use of relatives' perceptions avoided any self-report difficulties, but excluded collecting information and perceptions directly from the individuals with AD. Furthermore, although Orano did find qualitative evidence of identity loss in AD, there was no discussion of the mechanisms that were at least associated with, if not the cause of, the loss of identity. As AM is hypothesised to contribute to identity, one possible mechanism of this apparent loss of identity in AD may be AM loss. Mills (1998) investigated narrative identity in dementia, with a focus on the links between emotions and AM, and the application of reminiscence therapy. All eight subjects experienced some loss of narrative identity, and while she suggests that this is linked to a loss of AM, this was not directly investigated. As yet, the relationship between AM loss and the strength, quality, complexity and direction of identity in AD has not been empirically investigated.

### **The Present Study**

The aims of this study are threefold. The first aim is to investigate the status of AM in an AD sample compared to age and education matched healthy elderly individuals. The second aim is to investigate the strength, quality, complexity and direction of identity, in individuals with AD and elderly controls. The third aim is to investigate the relationship between loss of AM and identity within the AD group. AM will be assessed using the AMI (Kopelman et al., 1990) and the autobiographical fluency tasks (Dritschel et al., 1992). Identity will be measured using the Twenty Statements Test (Kuhn & McPartland, 1954) and the Tennessee Self Concept Scale: Second Edition (Fitts & Warren, 1996).

With regard to the first aim, consistent with previous studies of AM in AD (e.g., Greene et al., 1995), it is predicted that individuals with AD will exhibit impairments in both personal semantic and personal incident memory compared with healthy elderly controls on both the AMI and autobiographical fluency. It is also predicted that these deficits will

be evident across the three lifetime periods assessed, and that a temporal gradient will be evident for personal semantic and personal incident memory, such that recall for recent adulthood is poorer than recall for childhood and early adulthood.

With regards to the second aim, there are four experimental hypotheses. First, it is predicted that the strength of identity will differ between the AD and control group. Strength of identity, that is, the magnitude of the construct which an individual has access to, will be measured by the number of responses generated on the Twenty Statements Test, thus, it is predicted that individuals with AD will generate fewer responses than controls.

Second, it is hypothesised that the quality of identity will differ between the AD and control groups, such that the AD group will generate a higher proportion of abstract responses on the Twenty Statements Test, and more vague responses on the Tennessee Self-Concept Scale, compared with healthy controls. This prediction is based on the assumption that the responses of individuals with AD who have impaired AM will be more vague and abstract as they have fewer AM's and detail to draw on. It is also predicted that the AD group will give less extreme responses (i.e., responses of one and five). This prediction is based on the assumption that an impairment in AM will affect the ability to make definite statements about one's identity and is consistent with having a vague and abstract identity.

Third, it is hypothesised that the identity of individuals in the AD group will be less complex than elderly controls. The complexity of identity, that is, the range of different aspects of identity an individual accesses, will be assessed using the Twenty Statements Test. The responses on the Twenty Statements Test will be coded according to four categories: personal attributes, social identities, physical descriptions, and evaluative descriptions (Rhee et al., 1995); and the subcategories within each of these. It is predicted that less categories and subcategories will be sampled by the AD group compared with elderly controls. Additionally, it is predicted that the responses of the AD group will be less equally distributed over the four categories, leading to a concentration of responses in one of the four categories.

The fourth hypothesis related to the investigation of identity is that the direction of identity will differ between the AD and control groups, with the AD group predicted to have more negative identities. Accordingly the Total Identity Score and five Identity Subscores on the Tennessee Self Concept Scale will be lower in the AD group compared to the elderly control group.

With regards to the third aim of this thesis, it is hypothesised that there will be a significant correlation between the status of AM in AD participants and the strength, quality, complexity and direction of identity in the same participants, based on the hypothesis that AM contributes to identity.

## **METHODS**

### **Participants**

#### **AD Group**

AD group participants were recruited from the Memory Clinic at the Day Ward, North Shore Hospital. The AD group consisted of twenty individuals (13 females and 7 males) ranging in age from 66 to 90 years ( $M = 75.45$ ,  $SD = 7.06$ ). All participants had a diagnosis of probable AD according to the criteria developed by the National Institute of Neurological and Communicative Disorder and Stroke and AD and Related Disorders Association (NINCDS-ADRDA) (McKhann et al., 1984) (see Appendix A for these guidelines).

To ensure that any impairments in performance were due to AD and not some other neurological impairment, the following exclusionary criteria were employed: A history of major head injury, stroke or cerebrovascular disease, acquired language impairments, or neurological abnormality other than AD, history of alcoholism, drug dependence, psychiatric illness or prolonged use of psychiatric medication. Participants were also required to be fluent in English. Only individuals with mild to moderate dementia were invited to participate in this study. Severity of dementia was assessed by scores on the Mini Mental State Exam (MMSE) (Folstein, Folstein & McHugh, 1975), with a score less than 10 used as the cut-off for exclusion. The MMSE scores of AD group participants in this study ranged from 13 – 24, with a mean score of 19.85 ( $SD = 3.15$ ). Of the 21 AD participants originally recruited, one was excluded because of aphasia.

#### **Control Group**

Control group participants were independent-living members of the community recruited through contacts with elderly groups in the community, and one participant was the spouse of an AD group participant. The control group consisted of twenty individuals (13 females and 7 males), ranging in age from 65 to 88 years ( $M = 75.20$ ,  $SD = 6.81$ ). Again, the following exclusionary criteria were employed: A history of major head injury, stroke or cerebrovascular disease, acquired language impairments, or neurological abnormality, history of alcoholism, drug dependence, psychiatric illness or prolonged use of psychiatric medication. Participants were also required to be fluent in English. In addition, the MMSE

was used to screen for any undetected dementia, with a score of 24 or less used as the cut-off for exclusion. This cut-off score is generally used for dementia screening (Folstein et al., 1975), based on the assumption that 24 is the lowest score achieved by healthy elderly individuals (e.g., Cullum, Smernoff, & Lord, 1991). The MMSE scores of control group individuals in this study ranged from 25 – 30, with a mean score of 28.15 ( $SD = 1.57$ ). Of the 24 control group participants originally recruited, two were excluded because of a history of stroke, and two were excluded because of MMSE scores of 23.

The demographic characteristics of the AD and control participants are shown in Table 1. Level of education was assessed using two educative measures. Firstly, the total number of years an individual spent in education was ascertained. It is difficult, however, to determine and interpret accurately the level of education of elderly New Zealanders solely on the basis of total years of education, for a number of reasons. The social and economic circumstances of this generation meant that many individuals left school early before gaining any secondary qualifications. Additionally, circumstances such as the Second World War meant that much education, particularly at a tertiary level, was completed on a part-time basis, or while in military service. Training in the military services and trades were not always recognised officially as formal certified training, as is the case now. To account for these difficulties, the second educative measure provides an estimate of the years needed to attain specific qualifications, regardless of the actual number of years an individual spent gaining the qualification. This estimation is based on New Zealand educative data, compiled by Statistics New Zealand (Davis, McLeod, Ransom, & Ongley, 1997) (see Appendix B).

The AD and control group did not differ significantly in terms of sex,  $\chi^2(1, N = 40) = 0, p = 1.000$ , age,  $t(38) = .11, p = .910$ , years of education,  $t(38) = -.90, p = .380$ , or educational achievement,  $t(38) = -.08, p = .936$ . The AD and control groups differed significantly on the MMSE,  $t(38) = -9.44, p < .001$ .

Table 1  
Demographic Characteristics of AD and Control Group Participants

Characteristic	AD participants	Control participants
Sex (males/females)	13 / 7	13 / 7
Mean age (years)	75.45, <i>SD</i> = 7.06 Range = 66-90	<i>M</i> = 75.20, <i>SD</i> = 6.81 Range = 65-88
Mean years of education	12.35, <i>SD</i> = 3.28 Range = 6-19	13.45, <i>SD</i> = 4.46 Range = 7-26
Educational achievement	13.25, <i>SD</i> = 2.76 Range = 10-19	13.33, <i>SD</i> = 3.08 Range = 10-19
Mean MMSE score (maximum score 30)	<i>M</i> = 19.85 <i>SD</i> = 3.15 Range = 13-24	<i>M</i> = 28.15 <i>SD</i> = 1.57 Range = 25-30

## **Materials / Apparatus**

### Screening Tasks

#### *Background Interview*

Each participant was asked a brief series of questions to collect demographic information about age and educative level (see Appendix C for this interview schedule). Questions to assess medical history relevant to the exclusionary criteria were also included, for example, whether the participant had a history of stroke, head injury, psychiatric illness, and so on. As memory deficits may interfere with the recall of such information for members of the AD group, background information was checked with a family member who was also present. This interview also served as an opportunity to build rapport with each participant before the assessment began.

#### *Mini Mental State Examination (MMSE)* (Folstein et al., 1975)

The MMSE, a test of general cognitive functioning, is a widely used screening test for dementia. The brief assessment covers orientation to time and place, attention and concentration, praxis and visuospatial abilities, recall, and language abilities, including naming objects, repeating a sentence, following written and spoken instructions, and writing a sentence (see Appendix D). The maximum score obtainable is 30, with 24 widely

used as a cut-off score for dementia screening (Cullum et al., 1991). Folstein and colleagues report that the MMSE has both a high 24-hour reliability and inter-rater reliability.

### Experimental Tasks

#### *Autobiographical Memory*

##### The Autobiographical Memory Interview (AMI) (Kopelman et al., 1989, 1990).

The AMI is a widely used measure of AM, principally because it samples systematically both personal semantic and personal incident memory. The personal semantic schedule assesses participants' recall of personal facts (e.g., name of secondary school), over three lifetime periods: childhood, early adult life and recent adult life. The autobiographical incidents schedule assesses participants' recall of specific personally-experienced incidents from childhood, early adulthood and recent adulthood (Appendix E provides a breakdown of the interview schedules). Memories are scored for specificity according to criteria published with the AMI (See Appendix F for scoring criteria). The total possible scores for the personal semantic and personal incidents sections per lifetime period are 21 and 9, respectively. The scores for each memory component are summed across the three lifetime periods, giving a total personal semantic and total autobiographical incident score. Cut-off scores for normal and abnormal performances are provided by Kopelman and colleagues (1990) (see Appendix G).

Kopelman and colleagues (1989, 1990) report that the AM's recalled can be rated reliably ( $r = .83$ ). Furthermore, they found that both the autobiographical incidents schedule and the personal semantic schedule show concurrent validity, correlating positively with other tests of retrograde memory, such as the Prices test ( $r = .63$  and  $.76$ , respectively). Their data also show that the AMI discriminated significantly between individuals with amnesia ( $n = 23$ ) and healthy controls ( $n = 16$ ), demonstrating its differential validity. Kopelman and colleagues investigated the accuracy of answers on the personal semantic schedule, and reported that 94.2% of answers from individuals with AD were accurate. The structure of the AMI into lifetime periods allows for the establishment of temporal gradients of AM loss.

The AMI was administered according to the instructions in the AMI Manual (Kopelman et al., 1990). Participants were asked the questions from the personal semantic and autobiographical incidents schedules for each time period, and where necessary, the suggested prompts were used. The researcher recorded responses verbatim on the AMI scoring sheet. Additionally, even though answers on the AMI have been found to have a high level of accuracy, and confabulation is rarely an issue in AD, any inconsistencies evident in responding were checked with a family member. One modification was made to the AMI. Questions in the ‘recent adult life’ section were adapted to sample memories from the past five years rather than the past year, with the aim of assessing the period prior to the onset of AD (e.g., a holiday in the past five years rather than the past year). This was to control for the confounding effects of any possible anterograde memory impairment which typically occurs in AD, and which may impair responses to these questions.

Autobiographical Fluency (Dritschel et al., 1989). Autobiographical fluency assesses the ability to generate both personal semantic and personal incident memories. For the personal semantic fluency section, participants are required to produce as many examples as possible of names of people known to them in a 90-second period. This task is repeated for three lifetime periods: childhood, early and recent adult life. No details are required regarding the names, and participants are required to produce as many names, even if surnames are not known. Names that are repeated within or between lifetime periods are only scored the first time they are given.

For the personal incidents fluency section, participants are required to produce as many personally experienced events as possible in a 90-second period. This task is repeated for the three lifetime periods. No great detail is required for each reported event; only a brief description is required so as to distinguish it from other reported events. Participants are encouraged to report any memory of an event even if vague. If the description given is of a non-specific event that may have occurred a number of times (e.g., “going hunting with Dad”) it is only scored as one event. The researcher timed all of the autobiographical fluency tasks, and recorded all responses.

*Identity*

Twenty Statements Test (Kuhn & McPartland, 1954). The Twenty Statements Test requires participants to give 20 statements in response to the question “Who am I?”. It was developed by Kuhn and McPartland (1954) as a method of eliciting self-statements about an individual’s identity. Spitzer and Parker (1976) report that it has high ‘perceived’ validity: a significant number of participants who completed the Twenty Statements Test, among other measures of self-concept, claimed the Twenty Statements Test permitted them to give the most accurate descriptions of their identities.

Traditionally, this test is administered in a written format, where participants write twenty “I am” statements in response to the following instructions: “There are 20 numbered blanks on the page below. Please write 20 answers to the simple question, “Who am I?” in the blanks. Answer as if you are giving the answers to yourself, not to somebody else. Write the answers in the order they occur to you. Don’t worry about logic or importance. Go along fairly fast for time is limited.” For the purpose of this research, the Twenty Statements Test was adapted in a number of ways to accommodate for individuals with AD. Instead of a written format, the Twenty Statements Test was administered verbally, and therefore the instructions were adapted for verbal administration. Prompts indicating the type of responses required (e.g., characteristics, roles, abilities) were added to the instructions to facilitate the use of this instrument with individuals with AD. Responses were recorded verbatim by the researcher until 20 responses were recorded.

There are a variety of coding schemes used to code responses on the Twenty Statements Test, and the majority are based on the scheme devised by McPartland and colleagues (1961). In the present study, each response was coded according to a modified version of the coding scheme used by Rhee et al. (1995) (see Appendix H). The modified scheme codes responses according to four categories of identity: Attributes, social identities, evaluative descriptions and physical descriptions. Each category is further divided into subcategories. These categories and subcategories have high inter-rater reliabilities, ranging from .95 to 1.00 (Rhee et al., 1995).

Each subcategory is classified as either specific or abstract. Responses classified as specific are those that are qualified with some specific detail. This could be in terms of reference to specific social roles (e.g., “I am a mother”), specific activities (e.g., “I go swimming”) or preferences (e.g., “I like nature”), all which exhibit reference to specific details about one’s identity. Specific responses also includes traits, emotions or self-evaluations qualified with specific details, including temporal details (e.g., “Sometimes I am a kind person”), or contextual details, both social (e.g., “I am kind to my mother”) and locale details (e.g., “I am kind at home”). In contrast, abstract responses are those that transcend specific situations and are pure self-descriptions free from contextual or specific details, such as traits (e.g., “I am kind”). Such a response is abstracted from various specific contexts or situations where one is, or was, kind. Other types of abstract responses include: emotional states with no contextual details (e.g., “I am worried”); global descriptions, that is, very general descriptions (e.g., “I am me”); global evaluations where no specific ability or belief is evaluated (e.g., “I have good abilities”); and reflective evaluations, where one reflects on or evaluates the past in some vague or general way (e.g., “I have had a good life”). Rhee and colleagues report that the coding of responses as specific or abstract has high inter-rater reliabilities ( $r = .96$  for specific,  $.97$  for abstract).

In some cases, a response may actually contain more than one distinct meaning. Only one code is given for each statement, and therefore only one of the meanings is coded rather than the full response. Clear guidelines for determining which meaning is to be coded are necessary. The guidelines used in this study were based on those used by Rhee and colleagues (1995). Where a response contains a social identity and an evaluative description (e.g., “I am a good mother”), the more distinctive social identity (“I am a mother”) is taken as the principal unit of meaning, rather than the evaluation (“I am good”), which is in reference to the role. This rule applies unless another response referred to the social identity without the evaluation (e.g., “I am a mother”), in which case the combination response is coded as an evaluation. This guideline was followed for all similar combination responses, such as responses consisting of a preference and an activity (e.g., “I like to do my knitting”), which is coded for the activity (“I do my knitting”). Again, if another response refers to the activity without the statement of a preference (“I do my knitting”), then the combination response is coded for the preference (“I like knitting”).

When responses contain several closely related meanings (e.g., “I am kind and caring”), only the first meaning is coded. Nonsense responses and repeated responses are not coded.

The following scores were calculated from the coded responses of each individual: The total number of responses; the percentage of responses that were coded as abstract; the number of categories and subcategories covered in the responses of an individual; and the percentage of responses in each of the four categories.

Tennessee Self Concept Scale: Second Edition (Fitts & Warren, 1996). The Tennessee Self Concept Scale: Second Edition is an updated version of the scale developed originally by Fitts (1965). This version consists of 82 descriptive statements which are rated for self-descriptiveness on a five-point true-false scale (always false, mostly false, partly false and partly true, mostly true, always true). Sixty-two of these items measure three components of self-concept: identity, self-satisfaction and behaviour. Each of these components is measured over five domains: moral, physical, family, personal and social. In this version of the Tennessee Self Concept Scale, there are an additional 12 items covering academic/work self-concept, and eight items measuring self-criticism. Half of the items are negatively scored to reduce bias. These are then reversed before summing item scores to form the various scale scores.

The scales of the Tennessee Self Concept Scale: Second Edition have been found to have acceptable internal reliabilities, ranging from .47 to .93 over a number of studies (e.g., Fitts & Warren, 1996; Marsh & Richards, 1988). Factor analysis has provided support for both the domains and components of self-concept, indicating high construct validity (Fitts & Warren, 1996). The Tennessee Self Concept Scale has been found to have concurrent validity scales such as the Self-Descriptions Questionnaires III, with correlations ranging from .53 to .71 (Marsh & Richards, 1988).

Only 29 items from the Tennessee Self Concept Scale: Second Edition were used in the present study. This was because the full scale was too long for use with AD participants (in combination with the other tests) for whom sustained attention and concentration often poses a problem. The items selected were all of those measuring the identity component of self-concept (21 items, covering five domains), which enabled the following scores to be

calculated: The Total Identity Score (total of all items measuring identity); and five Identity Subscores – personal, family, social, moral and physical (total of identity items in each domain). The number of vague responses (i.e., a response of “three”) and the number of extreme responses (i.e., a response of “one” or “five; the Response Distribution score) were also calculated. An additional eight items that enabled the calculation of seven of the nine Inconsistent Responding pairs were also included (see Appendix I for a breakdown of the included items and scales). The cut-off score of 11 recommended by Fitts and Warren (1996) was adjusted for this shorter version of the Inconsistent Responding scale, resulting in a cut-off score of seven or more being used.

The Tennessee Self Concept Scale: Second Edition is typically administered in a written format. In the present study, however, the administration was modified to accommodate individuals with AD. The items were administered serially, using laminated cards consisting of a self-descriptive statement and the five-point true-false scale (see Appendix J). Each participant was told that the statement is a way in which one might describe oneself, and that they had to rate how well the statement described them on the five-point true-false scale. Every statement was also read out, and when necessary the task instructions were repeated. Responses were recorded by the researcher.

## **Procedure**

Ethics approval was obtained from the Auckland Ethics Committee and the University of Auckland Human Subjects Ethics Committee prior to the commencement of the study. Potential AD participants were identified through the Memory Clinic at North Shore Hospital and were sent a letter by their Memory Clinic clinician which briefly introduced the study (see Appendix K). They were told that the researcher, Donna Addis, would contact them to further explain the study, but that if they did not wish to be contacted, they could leave a message with the secretary of the Memory Clinic at North Shore Hospital. If no contact was made, Donna Addis phoned potential participants, and explained the purpose of the study, what their participation would involve, and answered any questions about the study. Where appropriate, this was also discussed with the spouse or caregiver. If they expressed interest in the study, further details were provided via an information sheet which was mailed to them (see Appendix L for the information sheet for the AD group). In

addition to further explanation of the study, the rights of participants were explained. If potential participants then wished to participate, an appointment time was arranged. Informed consent was gained from each AD group participant and a witness other than the researcher (e.g., a spouse, relative or caregiver) (see Appendix M for the consent form).

Control participants were community members interested in supporting research, and were recruited through contacts with elderly groups in the community. The same procedure was followed: the study was explained over the phone, an information sheet was sent out (see Appendix N for the information sheet for the control group), and if interested, an appointment time was arranged. Informed consent was obtained from each control group participant (see Appendix M for the consent form).

Testing took approximately two to three hours for AD group participants, and one to two hours for control group participants. Participants were offered the option of breaking the testing into two sessions, and one control group participant chose to do so. Most participants chose to be tested in their homes, with one requesting to be tested at the Memory Clinic. In this case, transport was provided for the participant.

All testing sessions for participants of both groups followed the same format. During the administration of all tests, participants were able to go at their own pace, except for autobiographical fluency, which was timed. There were many times during the testing session when participants were able to rest. Each session began with the background interview, which helped to build rapport and relax participants before testing began. This was followed by the administration of the MMSE. The experimental tasks were then administered in the following order: (1) the AMI; (2) the autobiographical fluency tasks; (3) the Tennessee Self Concept Scale; and (4) the Twenty Statements Test.

### **Data Analyses**

The results of this study were analysed using StatSoft STATISTICA, a statistical package for personal computers.

## **RESULTS**

The alpha level for significance used in all statistical tests is .050. Exact  $p$ -values are reported except where the  $p$ -value is smaller than .001, in which case the  $p$ -value is reported as  $< .001$ .

### **Mini-Mental State Examination**

In order to test whether the MMSE scores of the AD and control groups differed, an independent samples  $t$ -test was used. A significant difference between the two groups was found,  $t(38) = -10.55$ ,  $p < .001$ , with significantly lower MMSE scores for the AD group ( $M = 19.85$ ,  $SD = 3.15$ ) than the control group ( $M = 28.15$ ,  $SD = 1.57$ ).

### **Autobiographical Memory**

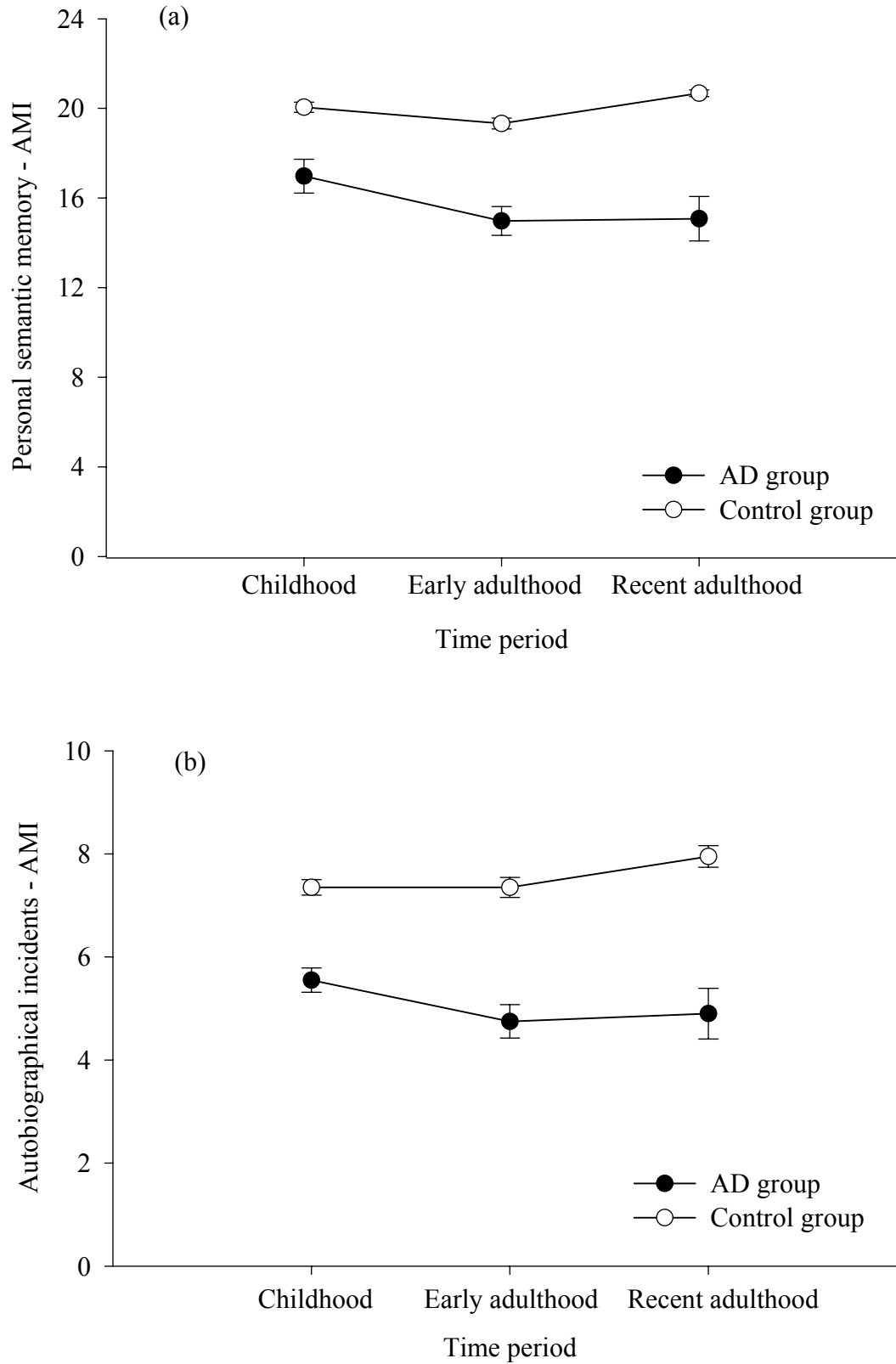
To investigate whether individuals with AD exhibited impairments in the personal semantic and personal incident components of AM, and whether a temporal gradient of impairment was evident for these components, performances on these two components of both AM tests were analysed using repeated measures analysis of variance (ANOVA), with group a between subjects factor, and time period a within subjects factor. Additionally, the numbers of participants in each group whose performances on the AMI fell in the normal and abnormal range were compared using Fisher exact tests.

#### Autobiographical Memory Interview

Data from the personal semantic and autobiographical incidents components of the AMI were analysed separately.

##### *Personal semantic memory.*

Figure 5a illustrates the performance of the two groups on the personal semantic schedule across the three lifetime periods. To test whether the two groups differed on this measure, a repeated measures ANOVA, with group (AD, control) a between-subjects factor, and time period (childhood, early adulthood and recent adulthood) a within-subjects factor was used. This revealed a significant main effect of group,  $F(1, 38) = 38.73$ ,  $p < .001$ , with the control group producing significantly more responses overall ( $M = 20.02$ ,  $SD = 1.07$ ) than the AD group ( $M = 15.68$ ,  $SD = 3.68$ ). There was also a significant main effect of time



**Figure 5.** Performances of the AD and control groups across three lifetime periods on the (a) personal semantic and (b) autobiographical incidents schedules of the AMI. Note the bars indicate the standard error for each group at each time period.

period,  $F(2, 38) = 5.84, p = .004$ , with more responses produced for childhood ( $M = 18.51, SD = 2.92$ ) than early adulthood ( $M = 17.15, SD = 3.08$ ) and recent adulthood ( $M = 17.88, SD = 4.21$ ). Post-hoc Tukey HSD tests revealed that recall for early adulthood was significantly lower than for childhood ( $p = .003$ ), but there was no significant difference between recall for recent adulthood and childhood ( $p = .253$ ) or early adulthood ( $p = .171$ ).

A significant group by time period interaction was also found,  $F(2, 38) = 5.01, p = .009$ . Post-hoc Tukey HSD tests revealed that the recall of AD group participants was significantly poorer for recent adulthood ( $p = .015$ ) and early adulthood ( $p = .009$ ) compared with childhood, but there was no significant difference in recall for recent adulthood and early adulthood ( $p = 1.000$ ). This is consistent with a temporal gradient of impairment (i.e., poorer recall for recent AM's compared with remote AM's). Controls showed no significant differences for recall between any of the time periods.

Table 2 shows the number of participants in each group whose performance on the personal semantic schedule fell into the normal and abnormal range using the criteria published with the AMI (Kopelman et al., 1990). Fisher exact tests were used to determine whether significantly more AD group participants performed abnormally than control participants in each of the time periods, and also on the overall score. Significant differences were found between the AD and control group for each of the four comparisons. In other words, significantly more AD group participants fell in the abnormal range for personal semantic memory of childhood ( $p = .002$ ), early adulthood ( $p = < .001$ ), recent adulthood ( $p = < .001$ ) and also for the total personal semantic score ( $p = < .001$ ).

Table 2

The Number of AD and Control Group Participants Falling in the Normal and Abnormal Range of Performance on the Personal Semantic Schedule of the AMI

	AD Group		Control group	
	Normal	Abnormal	Normal	Abnormal
Childhood	12	8	20	0
Early adulthood	8	12	20	0
Recent adulthood	4	16	20	0
Total score	7	13	20	0

*Autobiographical incident memory.*

Figure 5b illustrates the performance of the two groups on the autobiographical incidents schedule across the three time periods. To test whether the two groups differed on this measure, a repeated measures ANOVA, with group (AD, control) a between-subjects factor, and time period (childhood, early and recent adulthood) a within-subjects factor was used. This revealed a significant main effect of group,  $F(1, 38) = 78.77, p < .001$ , with the control group producing significantly more responses overall ( $M = 7.55, SD = .87$ ) than the AD group ( $M = 5.07, SD = 1.65$ ). There was no significant effect of time period,  $F(2, 38) = 1.48, p = .235$ , nor a significant interaction between group and time period,  $F(2, 38) = 2.95, p = .058$ , even though there was a trend towards a difference between the relative number of responses in the three time periods of the two groups consistent with a temporal gradient of impairment in the AD group.

Table 3 shows the number of participants in each group whose performance on the autobiographical incidents schedule fell in the normal and abnormal range using the criteria published with the AMI (Kopelman et al., 1990). Fisher exact tests were used to determine whether significantly more AD group participants performed abnormally than control participants in each of the time periods, and also on the overall score. Significant differences were found between the AD and control group for each of the four comparisons. In other words, significantly more AD group participants fell in the abnormal range for personal incident memory of childhood ( $p = .002$ ), early adulthood ( $p < .001$ ), recent adulthood ( $p < .001$ ) and also for the total personal semantic score ( $p < .001$ ).

Table 3

The Number of AD and Control Group Participants Falling in the Normal and Abnormal Range of Performance on the Autobiographical Incidents Schedule of the AMI

	AD Group		Control group	
	Normal	Abnormal	Normal	Abnormal
Childhood	12	8	20	0
Early adulthood	3	17	18	2
Recent adulthood	6	14	18	2
Total score	2	18	20	0

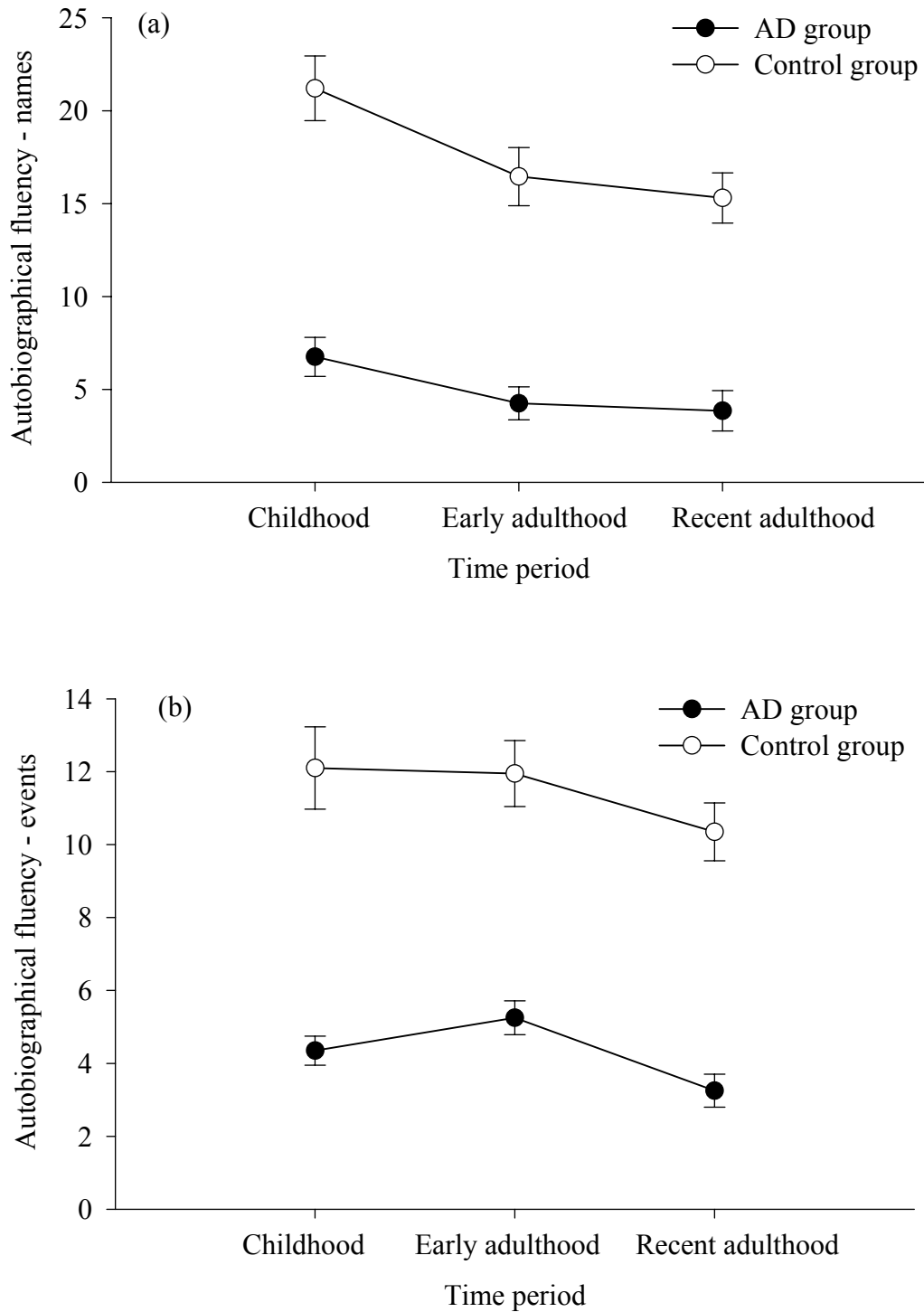
### Autobiographical fluency

#### *Fluency for names.*

Figure 6a illustrates the mean group scores on autobiographical fluency for names in each time period. To test whether the performance of the two groups differed on this measure, a repeated measures ANOVA, with group (AD, control) a between-subjects factor, and time period (childhood, early and recent adulthood) a within-subjects factor was conducted. This revealed a significant main effect of group,  $F(1, 38) = 64.70, p < .001$ , with the control group producing significantly more responses overall ( $M = 17.65, SD = 7.33$ ) than the AD group ( $M = 4.95, SD = 4.63$ ). A significant main effect of time period was also found,  $F(2, 38) = 15.21, p < .001$ , with more responses produced for childhood ( $M = 13.98, SD = 9.69$ ) than early adulthood ( $M = 10.35, SD = 8.36$ ) and recent adulthood ( $M = 9.58, SD = 7.92$ ). Post-hoc Tukey HSD tests revealed significantly more responses were produced for the childhood time period than for early adulthood ( $p < .001$ ) and recent adulthood ( $p < .001$ ), but there was no significance difference between the number of responses produced for the early adulthood and recent adulthood time periods ( $p = .636$ ). There was no significant interaction found between group and time period,  $F(2, 38) = 1.68, p = .193$ . In other words, although the AD group participants produced fewer names overall than the control group, there was no difference in the relative number of names produced in the three time periods between the two groups.

#### *Fluency for events.*

Figure 6b illustrates the mean group scores on autobiographical fluency for events in each time period. To test whether the performance of the two groups differed on this measure, once again a repeated measures ANOVA, with group (AD, control) a between-subjects factor, and time period (childhood, early and recent adulthood) a within-subjects factor was used. This revealed a significant main effect of group,  $F(1, 38) = 59.88, p < .001$ , with the control group producing significantly more responses overall ( $M = 11.47, SD = 4.26$ ) than the AD group ( $M = 4.28, SD = 2.10$ ). A significant main effect of time was also found,  $F(2, 38) = 10.12, p < .001$ , with more responses produced for early adulthood ( $M = 8.60, SD = 4.65$ ) than childhood ( $M = 8.23, SD = 5.42$ ) and recent adulthood ( $M = 6.80, SD = 4.59$ ). Post-hoc Tukey HSD tests revealed that the significantly less responses were produced for the recent adulthood time period than for childhood ( $p = .003$ ) and early adulthood ( $p < .001$ ), but that there was no significant difference between the number of



**Figure 6.** Performances of the AD and control groups across three lifetime periods on autobiographical fluency for (a) names and (b) events. Note the bars indicate the standard error for each group at each time period.

responses produced for the early adulthood and childhood time periods ( $p = .649$ ). There was no significant interaction between group and time period,  $F(2, 38) = .79, p = .458$ . In other words, although the AD group participants produced fewer events overall than the control group, there was no difference in the relative number of events produced in the three time periods between the two groups.

#### Consistency across tests of autobiographical memory

To investigate whether performances on the personal semantic and personal incident components were consistent across the two AM tests, Pearson's bivariate correlations were calculated (see Table 4). The overall scores for the personal semantic component of the AMI and autobiographical fluency for names were significantly correlated ( $r = .73, p < .001$ ). Similarly, the overall scores of the autobiographical incidents components of the AMI and autobiographical fluency for events were significantly correlated ( $r = .67, p < .001$ ).

Table 4

Correlation Matrix of Tests of AM for AD and Control Group Participants

	AMI – psem	AMI – ai	ABF – names
AMI – ai	.71***		
ABF – names	.73***	.75***	
ABF - events	.65***	.67***	.87***

Note. ABF = Autobiographical fluency; ai = autobiographical incidents schedule; AMI = Autobiographical Memory Interview; psem = personal semantic schedule.

\*\*\*  $p < .001$

In summary, the AD group exhibited impaired performances for both personal semantic and personal incident memory, on both the AMI and autobiographical fluency. A temporal gradient was found for the personal semantic component of the AMI for AD participants, such that recall for childhood was higher than for early adulthood and recent adulthood. There was a trend towards a temporal gradient on the autobiographical incidents component of the AMI. No temporal gradients were found for the names and events components of autobiographical fluency. Also, there were significant correlations between performances on the personal semantic and personal incident components of the two AM

tests, indicating that performances were consistent. For example, individuals who performed highly on one test of AM also performed highly on the other test of AM.

### **Identity**

The second aim of this study was to investigate whether the strength, quality, complexity and direction of identity of individuals with AD differs from that of healthy elderly controls. With regard to this aim, analyses were conducted to investigate four hypotheses: that the strength of identity will be weaker in AD compared with healthy controls; that the quality of identity will be more abstract and vague and less extreme in AD compared with healthy controls; that identity will be less complex in AD compared with healthy controls; and that the direction of identity will be more negative in AD than in healthy controls.

With reference to the analysis of data from the Tennessee Self Concept Scale, it was originally intended to remove from the analyses those participants who scored highly on the Inconsistent Responding scale. Five participants scored above the cut-off score for Inconsistent Responding, but they were not removed from the analyses for the following reason: The verbal presentation of the Tennessee Self Concept Scale allowed participants to explain their reasoning when rating the self-descriptive statements. This drew attention to the fact that, on closer examination, the items of the Inconsistent Responding pairs, supposedly identical in content, were, in fact, not identical. Indeed, some participants gave different responses to these pairs of items, but responses were logically explained and not contradictory. For example, one participant explained that her response of four (“mostly true”) to the statement, “I do not act the way my family thinks I should”, referred back to a particular period of time when her family did not agree with her actions. However, in her response of one (“always false”) to, “I quarrel with my family”, she explained that they do not fight or quarrel, even when their viewpoints are different. All five participants gave logical explanations of inconsistent responses. Consequently, the responses of all participants were included in the analyses.

### Strength of identity

In order to test whether strength of identity differs between the AD and control groups, an independent samples *t*-test was used to compare the number of responses generated on the Twenty Statements Test. The Levene’s test of homogeneity of variance indicated that the

variances of the two groups were not equal,  $F(1, 38) = 13.54, p < .001$ . Thus the variances were not pooled, and appropriate degrees of freedom were calculated, 25.92, then rounded to the nearest integer (Howell, 1997). The  $t$ -test revealed a significant difference between the number of responses of AD and control group participants,  $t(26) = -5.65, p < .001$ , with the AD group participants producing significantly fewer responses ( $M = 11.55, SD = 4.90$ ) than control group participants ( $M = 18.30, SD = 2.13$ ).

### Quality of identity

Assessment of quality of identity involved three measures: First, the proportion of abstract responses given on the Twenty Statements Test; second, the number of vague responses (responses of three, i.e., “partly false and partly true”) given by each individual on items of the Tennessee Self Concept Scale; and thirdly, the number of extreme responses (responses of one, i.e., “always false” and five, i.e., “always true”) given by each individual on items of the Tennessee Self Concept Scale. To test whether the proportion of abstract responses given on the Twenty Statements Test differed between the two groups, an independent samples  $t$ -test was used. This revealed a significant difference,  $t(38) = 2.67, p = .011$ , with AD group participants having a higher proportion of abstract responses ( $M = 39.00, SD = 21.18$ ) than control group participants ( $M = 24.48, SD = 11.87$ ).

In order to determine whether AD participants had more vague responses on the Tennessee Self Concept Scale than control participants, the Mann Whitney  $U$  test was used. There was a significant difference between the groups,  $p (U = 121, N_1 = N_2 = 20) = .033$ , with AD group participants having a significantly higher number of vague responses ( $Mdn = 4$ , interquartile range = 5) than control group participants ( $Mdn = 3$ , interquartile range = 3). Similarly, the Mann Whitney  $U$  was used to test whether AD group participants had less extreme responses on the Tennessee Self Concept Scale than control group participants. This revealed a significant difference between the groups,  $p (U = 95, N_1 = N_2 = 20) = .005$ , with the AD group participants having a smaller number of extreme responses ( $Mdn = 9$ , interquartile range = 7.5) than the control group participants ( $Mdn = 14.5$ , interquartile range = 10.5).

### Complexity of identity

Assessment of complexity of identity involved three measures derived from the Twenty Statements Test: First, the number of categories of identity sampled in the responses; second, the number of subcategories of identity sampled in the responses; and thirdly, the relative distribution of responses across the four categories. Table 5 shows the number of individuals in each group whose responses on the Twenty Statements Test involved one, two, three or four categories. In order to analyse whether the number of categories sampled by participants in the two groups differed, the four categories were collapsed into two: Those who sampled one or two categories of identity only were combined, and those who sampled three or four categories were combined. A chi-square test revealed that there were no significant differences in the number of AD and control group participants who sampled either one or two categories versus three or four categories,  $\chi^2(1, N = 40) = 1.03, p = .311$ .

Table 5

#### The Number of Categories Sampled in the Responses of AD and Control Group Participants on the Twenty Statements Test

	One	Two	Three	Four
AD group	0	8	12	0
Control group	0	5	12	3

Table 6 shows the number of individuals in each group whose responses on the Twenty Statements Test involved between one and eleven subcategories of identity. To determine whether the frequency of individuals whose responses sampled high numbers of subcategories differed between the two groups, the subcategories were collapsed in the following way: Individuals who sampled six or less subcategories were combined, and those who sampled more than six subcategories were combined. A chi-square test revealed that there was no significant difference between the number of AD and control group participants whose responses sampled six or less subcategories of identity versus those who sampled more than six subcategories,  $\chi^2(1, N = 40) = 2.51, p = .113$ .

Table 6

The Number of Subcategories Sampled in the Responses of AD and Control Group Participants on the Twenty Statements Test

	1	2	3	4	5	6	7	8	9	10	11
AD group	0	1	1	3	3	5	2	2	3	0	0
Control group	0	0	0	0	3	5	3	5	3	0	1

Another measure of complexity of identity was the relative distribution of responses on the Twenty Statements Test over the four categories of identity for individuals. In other words, whether there was a difference in the relative percentages of total responses falling into each of the four categories between individuals in the two groups was investigated. Unfortunately, there is no non-parametric test capable of analysing the relative distribution of percentages of responses within individuals across groups. Therefore, independent samples *t*-tests comparing the percentage of responses of individuals for each of the four categories were used. While this does not provide an assessment of the distribution of responses of individuals, it does compare the sizes of concentrations of responses of individuals within each of the four categories of identity. No significant differences were found for any of the four categories: Attributes,  $t(38) = .08, p = .936$ , social identities,  $t(38) = -.35, p = .730$ , evaluative descriptions,  $t(38) = .85, p = .400$ , or physical descriptions,  $t(38) = -1.61, p = .116$ .

Another way of looking at this question involved classifying participants according to whether they showed a marked concentration of responding in any one category, in this case, over 60% of responses falling in any one category. Table 7 shows the number of individuals in each group who showed such a concentration in any of the four categories. A chi-square test showed no significant differences in the frequency of individuals with such concentrations of responses between the two groups,  $\chi^2(1, N = 40) = .10, p = .749$ .

Table 7

The Number of Individuals who Showed a Concentration of Responding in any of the Four Categories of the Twenty Statements Test

	Category 1	Category 2	Category 3	Category 4	Total
AD group	6	0	2	0	8
Control group	7	1	1	0	9

Direction of identity

The direction of identity was measured by six scores from the Tennessee Self Concept Scale, the Total Identity Score and five Identity Subscores, where higher scores indicated a more positive identity. To test whether Total Identity Score differed between the two groups, an independent samples *t*-test was used. This revealed a significant difference between the AD and control group participants,  $t(38) = -3.68, p < .001$ , with significantly lower Total Identity Scores for AD group participants ( $M = 84.55, SD = 6.14$ ) than control group participants ( $M = 91.50, SD = 5.78$ )

Figure 7 illustrates the performance of the two groups on the five Identity Subscores (personal, family, social, moral, and physical) from the Tennessee Self Concept Scale. To test whether the two groups differed on this measure of Identity Subscores, a repeated measures ANOVA, with Group (AD, control) a between-subjects factor, and Subscore (personal, family, social, moral, and physical) a within-subjects factor, was used. A significant main effect of group,  $F(1, 38) = 12.78, p = .001$ , was found, with the control group having significantly higher Identity Subscores ( $M = 52.58, SD = 5.80$ ) than the AD group ( $M = 48.68, SD = 6.63$ ). A significant main effect of subscore was also found,  $F(4, 38) = 15.27, p < .001$ . Post-hoc Tukey HSD tests revealed that the Physical Identity Subscore was significantly lower than all four other identity subscores: Personal ( $p = .002$ ); Family ( $p < .001$ ); Social ( $p < .001$ ); and Moral ( $p < .001$ ). The Family Identity Subscore was also significantly higher than the Personal Identity Subscore ( $p = .005$ ). No other comparisons were significant. No significant interaction between group and subscore was found,  $F(4, 38) = 1.84, p = .123$ .

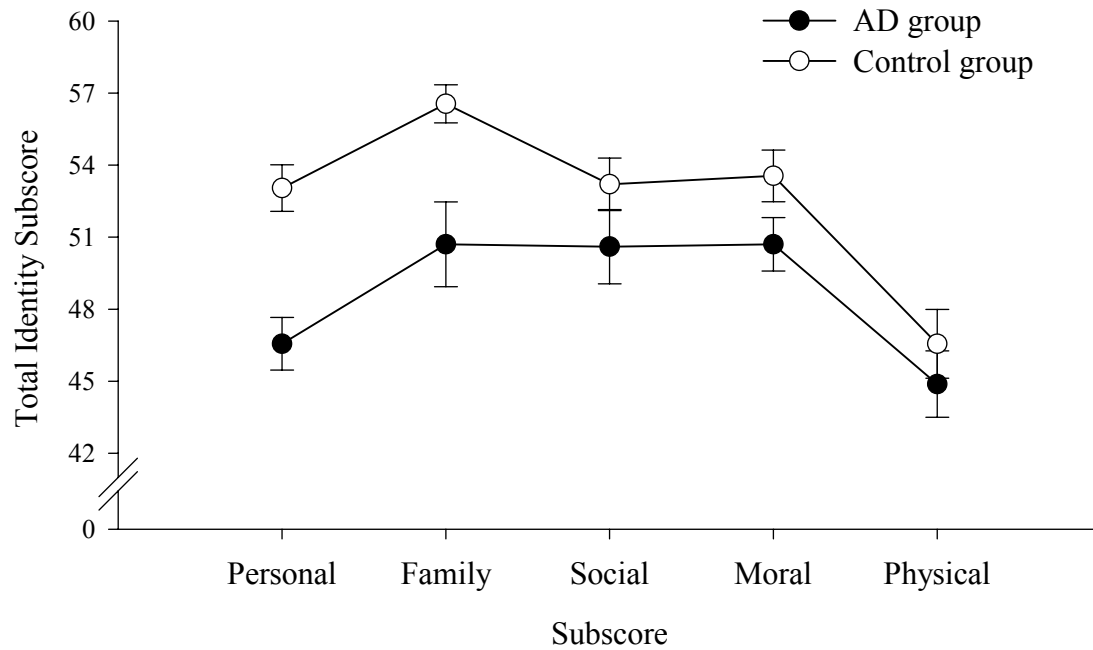


Figure 7. Identity Subscores on the Tennessee Self Concept Scale for the AD and control group participants. Note the bars indicate the standard error for each group at each subscore.

#### Consistency across measures of identity

To investigate whether the performances on the Total Identity Score and five Identity Subscores were consistent, Spearman rank order correlations were calculated (see Table 8). This revealed that all Identity Subscores showed a significant positive correlation with the Total Identity Score, with  $r_s$  ranging from .530 to .771. With the exception of the Physical Identity Subscore, all Identity Subscores were significantly correlated, with  $r_s$  ranging from .349 to .526. The Physical Identity Subscore was only significantly correlated with the Social Identity Subscore ( $r_s = .389, p = .013$ ).

Table 8

Tennessee Self Concept Scale – Correlation Matrix of the Total Identity Score and Five Identity Subscores of AD and Control Group Participants

	Total	Personal	Family	Social	Moral
Personal	.718***				
Family	.771***	.518***			
Social	.729***	.462**	.526***		
Moral	.631***	.482**	.442**	.349*	
Physical	.530***	.150	.125	.389*	.191

Note. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

To investigate whether performances on the different measures of identity derived from the Tennessee Self Concept Scale were consistent, Spearman rank order correlations were calculated (see Table 9). This revealed that the measures of identity taken from the Tennessee Self Concept Scale (i.e., Total Identity Score, the frequency of extreme and vague responses) were all significantly correlated with each other. Similarly, the measures of identity taken from the Twenty Statements Test were all significantly correlated with each other, and the total number of responses was also correlated with Total Identity Score from the Tennessee Self Concept Scale ( $r_s = .355, p = .024$ ).

Table 9

Correlation Matrix of Performances of the AD and Control Groups on Measures of Identity

	TSCS Total	TSCS Extreme	TSCS Vague	TST Total	TST Abstract	TST Cats
TSCS Extreme	.838***					
TSCS Vague	-.599***	-.551***				
TST Total	.355*	.290	-.249			
TST Abstract	-.060	.005	.024	-.398*		
TST Cats	-.138	-.144	.093	.218	-.356*	
TST Subcats	.063	.011	.208	.623***	-.403**	.456**

Note. Cats = Number of categories sampled; Subcats = Number of subcategories sampled; TSCS = Tennessee Self Concept Scale; TST = Twenty Statements Test.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

### Relation Between Autobiographical Memory and Identity

In order to test the hypothesis that impairment of AM and changes in identity are related, correlations between the performance on tests of AM and the strength, quality, complexity and direction of identity of the AD group were calculated. To check whether the changes in identity are related to general cognitive decline in AD rather than specific impairment of AM, performances on the MMSE were also correlated with the strength, quality, complexity and direction of identity.

#### Autobiographical memory and strength of identity

To investigate whether strength of identity (as measured by the number of responses on the Twenty Statements Test) is related to performances on tests of AM or the MMSE, Pearson's bivariate correlations were calculated (see Table 10). Strength of identity was not significantly correlated with MMSE ( $r = .152, p = .522$ ), but it was significantly correlated with autobiographical fluency for early adulthood names ( $r = .603, p = .005$ ) and childhood events ( $r = .452, p = .046$ ).

Table 10

#### Correlation Matrix of the Total Number of Responses of AD Participants on the Twenty Statements Test with Performances on the Mini-Mental State Examination, Autobiographical Memory Interview and Autobiographical Fluency

	MMSE	AMI – personal semantic			AMI – autobiographical incidents		
		Child	Early	Recent	Child	Early	Recent
TST Total	.152	.367	.135	.377	.204	.191	.323
		Autobiographical fluency - names			Autobiographical fluency - events		
		Child	Early	Recent	Child	Early	Recent
TST Total		.310	.603**	.393	.452*	.348	.421

Note. TST = Twenty Statements Test.

\*  $p < .05$ . \*\*  $p < .01$

### Autobiographical memory and quality of identity

To investigate whether quality of identity, as measured by the proportion of abstract responses on the Twenty Statements Test, was related to performances on tests of AM or the MMSE, Pearson's bivariate correlations were calculated (see Table 11). The proportion of abstract responses was significantly negatively correlated with one measure of AM, childhood autobiographical incidents on the AMI ( $r = -.613, p = .004$ ). In other words, the poorer the recall of childhood autobiographical incidents achieved by an individual the more abstract responses they gave on the Twenty Statements Test. Notably, however, the proportion of abstract responses was not significantly correlated with performance on the MMSE ( $r = -.107, p = .653$ ).

To investigate whether quality of identity, as measured by the number of vague and extreme responses on the Tennessee Self Concept Scale, was related to performances on the tests of AM and the MMSE, Spearman rank order correlations were calculated (see Table 11). The number of vague responses was not significantly correlated with any of the 12 measures of AM or the MMSE. The number of extreme responses on the Tennessee Self Concept Scale was significantly negatively correlated with childhood personal semantic memory on the AMI ( $r_s = -.451, p = .046$ ), and autobiographical fluency for childhood names ( $r_s = -.470, p = .036$ ), but not with performance on the MMSE ( $r_s = .026, p = .913$ ). Thus, although level of performance on the MMSE was not related to the number of extreme responses given on the Tennessee Self Concept Scale, the poorer an individual's performance on both measures of childhood personal semantic memory the higher the number of extreme responses.

Table 11

Correlation Matrix of Performances of AD Participants on Measures of Quality of Identity and Performances on the Mini-Mental State Examination, Autobiographical Memory Interview and Autobiographical Fluency

	MMSE	AMI – personal semantic			AMI – autobiographical incidents		
		Child	Early	Recent	Child	Early	Recent
TST Abstract <sup>a</sup>	-.107	-.043	.137	-.338	-.613**	.061	-.395
TSCS Extreme <sup>b</sup>	.026	-.451*	-.020	-.039	-.035	-.202	-.290
TSCS Vague <sup>b</sup>	-.223	-.039	-.287	-.036	.201	-.005	.140
		Autobiographical fluency - names			Autobiographical fluency - events		
		Child	Early	Recent	Child	Early	Recent
TST Abstract <sup>a</sup>		-.136	-.087	.005	.184	.064	-.146
TSCS Extreme <sup>b</sup>		-.470*	-.435	-.084	.132	-.395	-.318
TSCS Vague <sup>b</sup>		.187	.235	.055	-.042	-.052	.276

Note. TSCS = Tennessee Self Concept Scale; TST = Twenty Statements Test.

<sup>a</sup> = Pearson's bivariate correlations. <sup>b</sup> = Spearman rank order correlations.

\*  $p < .05$ . \*\*  $p < .01$ .

Autobiographical memory and complexity of identity

Spearman rank order correlations were calculated between the three measures of complexity of identity and the measures of AM and the MMSE (see Table 12). The three measures of identity were not significantly correlated with the MMSE. Three of the 36 correlations between the measures of identity complexity and the AM measures were significant: The number of categories sampled in the Twenty Statements Test and autobiographical fluency for childhood names ( $r_s = .524$ ,  $p = .018$ ); the number of subcategories sampled and autobiographical fluency for recent adulthood names ( $r_s = .445$ ,  $p = .050$ ) and recent adulthood events ( $r_s = .484$ ,  $p = .031$ ).

Table 12

Correlation Matrix of Performances of AD Participants on Measures of Complexity of Identity from the Twenty Statements Test with Mini-Mental State Examination, Autobiographical Memory Interview and Autobiographical Fluency

	MMSE	AMI – personal semantic			AMI – autobiographical incidents		
		Child	Early	Recent	Child	Early	Recent
TST Cats	.261	.420	.125	.009	-.113	.230	.018
TST Subcats	.081	.194	.007	.386	.314	.089	.353
TST Conc	-.081	.000	-.133	-.169	.131	-.037	.135
		Autobiographical fluency - names			Autobiographical fluency - events		
		Child	Early	Recent	Child	Early	Recent
TST Cats		.524*	.384	.119	-.037	.405	.332
TST Subcats		.190	.424	.445*	.334	.347	.484*
TST Conc		.107	.071	-.055	-.037	.369	.224

Note. TST Cats = Number of categories sampled on Twenty Statements Test; TST Subcats = Number of subcategories sampled on the Twenty Statements Test; TST Conc = Concentration of responding on the Twenty Statements Test.

\*  $p < .05$

Autobiographical memory and direction of identity

To investigate whether direction of identity, as measured by the Total Identity Score and Identity Subscores on the Tennessee Self Concept Scale, was related to performances on tests of AM and the MMSE, Pearson’s bivariate correlations were calculated (see Table 13). The Personal Identity Subscore was significantly positively correlated with performance on the MMSE ( $r = .494, p = .027$ ). Only two of the 60 correlations between the Identity Subscores and AM measures were significant: The Family Identity Subscore and personal semantic memory for childhood ( $r = -.487, p = .030$ ); the Social Identity Subscore and autobiographical fluency for early adulthood events ( $r = -.533, p = .015$ ). It should be noted, however, that the number of significant correlations is not above the level of chance.

Table 13

Correlation Matrix of Performances of AD Participants on Identity Subscores from the Tennessee Self Concept Scale with Performances on the Mini-Mental State Examination, Autobiographical Memory Interview and Autobiographical Fluency

	MMSE	AMI – personal semantic			AMI – autobiographical incidents		
		Child	Early	Recent	Child	Early	Recent
Personal	.494*	.079	.194	-.004	-.281	.232	-.332
Family	-.268	-.487*	-.274	-.241	.173	.035	.007
Social	-.001	-.398	-.012	-.231	.112	.216	-.260
Moral	.159	.004	.149	.348	.003	-.187	.229
Physical	.351	.038	.261	-.060	.006	.247	-.024
		Autobiographical fluency - names			Autobiographical fluency - events		
		Child	Early	Recent	Child	Early	Recent
Personal		.149	-.057	.188	.235	.224	.345
Family		-.360	-.229	.011	.243	.053	-.173
Social		-.303	-.371	.082	.196	-.533*	-.260
Moral		.010	-.004	.195	.173	-.146	-.024
Physical		-.041	-.198	-.059	.173	.143	-.227

Note. \*  $p < .05$

## **DISCUSSION**

This study sought to investigate three questions: First, whether retrograde AM was impaired in AD, and if so, the nature of this impairment; second, whether the strength, quality, complexity and direction of identity of individuals with AD differed from that of healthy elderly controls; and third, whether there was a relationship between the impairment of AM and any changes in identity. The results of this study will be interpreted in relation to these questions, including an evaluation of any limitations of this study. In addition, future directions for research emerging from this work will be discussed.

### **Autobiographical Memory in Alzheimer's Disease**

The AMI and autobiographical fluency tasks were used to assess the status of two components of AM, personal semantic and personal incident memory, in individuals with AD and healthy elderly controls. Performance on these two measures was found to be significantly correlated, indicating that individuals who performed highly on one measure of AM also performed highly on the other AM measure.

#### **Is autobiographical memory impaired in Alzheimer's disease?**

The prediction that individuals with AD would exhibit impairments for both personal semantic and personal incident memory was supported by the results of this study. Firstly, the AD group participants performed significantly more poorly than age-matched elderly controls on both the personal semantic and autobiographical incidents schedules of the AMI. Furthermore, the performance of significantly more AD group participants fell within the abnormal range on the AMI (as defined by Kopelman et al., 1990) compared with healthy elderly controls. The difference between the groups was substantial with control group participants performing at ceiling level. In other words, no control group participants fell within the abnormal range for total score on the personal semantic or autobiographical incidents schedules, whereas 13 and 18 out of 20 AD participants performed abnormally on the two components respectively. Similarly, the AD group performed significantly worse than the control group on both the personal semantic and personal incident components of the autobiographical fluency tasks. The maximum level of performance on the autobiographical fluency tasks is not restricted as it is in the AMI,

and notably the differences between the AD and control group participants on this task were even more striking than on the AMI.

These findings are consistent with the small number of previous studies of AM in AD, all of which have documented a significant impairment of personal incident memory (Dall'Ora et al., 1989; Dorrego et al., 1999; Graham & Hodges, 1997; Greene & Hodges, 1996; Greene et al., 1995; Kopelman, 1989; Sagar et al., 1988); and, where studied, personal semantic memory (e.g., Graham & Hodges, 1997; Greene et al., 1995; Kopelman, 1989). Greene and colleagues documented impairment in both components of AM, even in the very early stages of AD (i.e., individuals diagnosed with AD who have a MMSE score over 24). Thus, the impairments of AM in AD reported in this study add to the findings reported in the literature to date.

#### Is there evidence of temporal gradients for autobiographical memory?

In order to indicate the presence of a temporal gradient in the decline of AM in the AD group, that is, differing levels of impairment over the three lifetime periods relative to controls, a significant interaction between group and time period on the AM measures was necessary. On the AMI, there was a significant interaction of this sort on the personal semantic component. In other words, the AD group participants showed a temporal gradient of loss for personal semantic memories, with recall of recent adulthood and early adulthood memories significantly poorer than recall of childhood personal semantic memories. In contrast, the control group did not show any differences in recall of personal semantic memories over the three lifetime periods. There was no significant interaction between group and time period on the autobiographical incidents schedule, although there was a trend towards significance ( $p = .058$ ) consistent with a temporal gradient of impairment. There was no evidence of a temporal gradient on the autobiographical fluency tasks for either names or events.

The finding of a temporal gradient of decline of the personal semantic component of the AMI is consistent with one previous study (Kopelman, 1989). Other studies of personal semantic memory in AD have not, however, reported a gradient for this component of AM (Graham & Hodges, 1997; Greene et al., 1995). It is possible that these studies did not find evidence of such a temporal gradient because their AD group participants were more mild

than those in the present study. For example, the mean MMSE score of the AD group in the study by Graham and Hodges was 21.5 ( $SD = 1.4$ ) which is higher and has less variance than the MMSE scores of AD group in the present study ( $M = 19.85$ ,  $SD = 3.15$ ). All of the participants in Greene et al.'s minimal AD group had MMSE scores which were above the generally accepted cut-off score of 24 (range = 24 – 30), and the mean MMSE score was much higher than the present study ( $M = 26.2$ ,  $SD = 2.2$ ). Additionally, although the mean MMSE score of the mild AD group in Greene et al.'s study ( $M = 20.3$ ,  $SD = 3.3$ ) was closer to that of the present study, the most advanced case of AD had an MMSE score of 17, which is much higher than the most advanced case in the present study (MMSE = 13). In Kopelman's study, the only other which has documented a temporal gradient for personal semantic memory in AD, no MMSE data is given, so comparisons cannot be made. However, the differences in the severity of AD participants in the present study and those in studies which have found no temporal gradients for personal semantic memory, indicate that the temporal pattern of impairment of personal semantic memory may change as AD progresses. In other words, it may be that in milder AD personal semantic memory is equally impaired across the three time periods, and that as AD progresses, personal semantic memory for early and recent adulthood becomes more impaired relative to childhood. It is also possible that this pattern reflects the impact of an anterograde impairment, such that the longer the individual has had AD the more likely it is that the recent time period of the AMI actually probes memories affected by anterograde memory problems. This explanation, however, does not account for the temporal gradient found in the present study, in which not only is recall for recent adulthood significantly poorer than childhood, but also recall for early adulthood is significantly poorer.

If AM is impaired to the extent that a temporal gradient is evident for personal semantic memory, it would also be expected that a temporal gradient of impairment of personal incident memory would be evident. This was not the case; no temporal gradient was evident for the autobiographical incidents schedule of the AMI, although there was a non-significant trend towards a temporal gradient. The absence of a temporal gradient is consistent with the finding of Dall'Ora et al. (1989), but contrasts with several other studies of AM in AD, in which temporal gradients for personal incident memory were reported (e.g., Dorrego et al., 1999; Greene et al., 1995; Kopelman, 1989; Sagar et al., 1988).

One possible reason for the lack of temporal gradient for the autobiographical incidents schedule in this study may be the modifications made to the AMI. In order to ensure that the AM's being assessed were encoded before the onset of the AD (and hence did not reflect anterograde learning impairments), the recent adulthood section of the interview was altered to probe memories from the past five years instead of the past year. This is an important consideration in the study of retrograde memory impairments, particularly in disorders with an insidious onset, such as AD. If this is not taken into account, AM may appear disproportionately impaired for recent adulthood as a result of an anterograde learning impairment in AM, resulting in the finding of a spurious temporal gradient. Although Greene et al. (1995) altered the AMI for a similar reason in their study, their participants were asked to give AM's from "before the onset of memory problems" (p. 1652). This requires individuals with AD to "remember" when they started to have memory problems, a judgement likely to be hard for participants to make. It may be, therefore, that the modification to the AMI made by Greene et al., or the lack of modification in other studies, was not adequate to control the effects of anterograde memory impairments, and thus the temporal gradients evident were, in fact, spurious.

On the other hand, it may be that the lack of a temporal gradient for the autobiographical incidents schedule in this study reflects the grouping of AD participants together, irrespective of severity of AD. As Greene and colleagues (1995) point out, there may be considerable heterogeneity within the AD group in terms of the progression of AD and the distribution of neuropathology. Thus, the grouping of participants with mild AD and participants with more advanced AD may mean that important patterns, such as temporal gradients, are obscured. In other words, if in the milder stages of AD recent memories are less impaired than in more advanced AD, combining subjects may obscure the temporal gradient evident in later stages of AD. An additional possibility is that the association of the researcher and the study with the Memory Clinic may have provided a prompt for AD participants on the 'recent hospital visit' question. This may have resulted in the AD group participants being more readily able to access their memories of their recent Memory Clinic visit for this question. If this were the case, the scores of the AD group for the recent adulthood section may have been artificially inflated, obscuring any temporal gradient of impairment of personal incident memory.

There were no significant interactions between group and time period on the autobiographical fluency tasks for either names or events, indicating that there were no temporal gradients in AM decline. This finding is consistent with other studies which have used autobiographical fluency to assess AM in AD. For example, Greene and colleagues (1995) did not find a temporal gradient for either task. These authors attributed this finding to the greater speed of cognition required in fluency tasks, a task-demand which would affect performances for all three lifetime periods and hence mask any temporal gradient. Thus, they conclude that the AMI may be a more sensitive measure of AM in AD. While the timed nature and fluency demands of these tasks undoubtedly affect AD performance, it can also be argued that autobiographical fluency is likely to be the more sensitive measure of AM, as these tasks do not limit the retrieval of recent AM's to the past year, or past five years (as in the AMI). Instead, recent adulthood is assessed as a period spanning two decades. This definition of recent adulthood is more likely to control for, or avoid, the presence of any anterograde memory impairments, and interestingly, in these tasks which employ this definition of recent adulthood, no temporal gradients were seen, either in the present study, or in Greene et al. If this interpretation is accurate, modifying the recent adulthood section of the AMI to include the past five years may not be extending back far enough back to rule out the influence of anterograde memory impairments. Thus it is possible that the temporal gradients found on the AMI may be somewhat unreliable, and that the recent adulthood section of the AMI may need to be further modified.

It is interesting to consider what the presence of a temporal gradient for personal semantic memory in AD suggests about the structure of AM. Firstly, the presence of a temporal gradient for personal semantic memory and the lack of one for personal incident memory does lend some support to the distinction between the personal semantic and personal incident components of AM. Secondly, the presence of temporal gradients for either personal semantic memory, as found in this study, and for personal incident memory, as found in other studies, can be explained by, and further support theories of long-term memory which posit a time-limited role of the hippocampal complex. These theories, such as Squire's (1992) neocortical consolidation hypothesis, posit that memories are temporarily supported by the hippocampus. Eventually, through a consolidation process, memories become independent of the hippocampal structures and the neocortex alone becomes responsible for their storage and retrieval. Accordingly, in diseases such as AD

where the hippocampal structures and adjacent cortex are neuropathologically involved, it would be expected that a temporal gradient for retrograde memory is present. More recent memories, which are still dependent on the hippocampal structures, would be more greatly impaired than older memories.

By this account, a temporal gradient of AM decline would be expected for both personal semantic and personal incident memory. However, this was not the case in the present study nor other studies which have also found a temporal gradient for only one component of AM, personal incident memory (e.g., Graham & Hodges, 1997; Greene et al., 1995). The latter was explained in terms of the independence of personal semantic and personal incident memory, such that personal incident memory is more vulnerable to a temporal gradient of impairment as it requires more complex retrieval processes and is more dependent on the hippocampal complex than personal semantic memories. This, however, implies that personal semantic memory does not require this time-limited dependence on the hippocampal complex, which is contrary to the finding of a temporal gradient for personal semantic memory in the present study and that of Kopelman (1989). In fact, the lack of consistent findings of temporal gradients for these two components of AM does raise the possibility that temporal gradients evident in studies of AM are artefacts due to the impact of anterograde memory impairments. If this were the case, this kind of evidence derived from populations with an insidious onset of anterograde memory impairments could not be used confidently as support for the time-limited role of the hippocampal complex in the formation of long term AM's.

Additionally, it is not yet known how long memories are dependent on the hippocampal complex. When testing AM in populations where the onset of impairment is insidious, such as AD, the use of tests such as the AMI, where the recent adulthood period is ill-defined and possibly probes memories impaired by anterograde memory deficits, complicate the matter. In these studies it is necessary that tests of AM have a well-defined recent adulthood period which assesses more of the period between early and recent adulthood in a fine-graded way (e.g., assessing each decade). This would not only better enable the establishment of temporal gradients but also allow for further investigation of a time-limited role of the hippocampal complex in AM. An additional consideration in the further development of tests of AM is the clarity of scoring criteria for personal incident

memories. Scoring of personal incident memories given by participants was based upon the guidelines published with the AMI. Unfortunately, however, these guidelines are somewhat vague, and this may affect the accuracy and consistency of scoring across studies. In this study, scoring may have been more accurate if scored by independent raters, with these scores averaged (e.g., Kopelman et al., 1989), but unfortunately this was beyond the scope of this thesis. However, clearer guidelines may ensure greater consistency across studies employing the AMI.

#### Is there evidence of a reminiscence bump?

Cognitive studies of normal populations have consistently reported the presence of a reminiscence bump in the free recall of personal incident memories from early adulthood (i.e., 16 - 25 years). In the present study, the temporal pattern exhibited on autobiographical fluency for events, a task similar to that used in the cognitive literature, does not resemble a reminiscence bump. Although there was a main effect of time period, with significantly more responses produced for early adulthood compared with recent adulthood, there was no significant difference between childhood and early adulthood. This temporal pattern is not consistent with the presence of a reminiscence bump, in which there would be significantly more responses for early adulthood compared with childhood and recent adulthood. Additionally, there was no interaction between group and time period, indicating that the temporal patterns of the two groups are not significantly different. Thus neither group exhibited a reminiscence bump.

When considering the findings of the cognitive literature, it would be expected that in a task such as autobiographical fluency, in which the recall of events is unconstrained within three time periods which each span two decades, a reminiscence bump would be evident, at least in the control group. For example, Fitzgerald (1988, 1996) reported that memories from early adulthood are considered by participants to be the most vivid AM's, and that they are associated with high levels of rehearsal since the AM was encoded, and current preoccupation about the theme of the memory. Additionally, a temporal pattern resembling a reminiscence bump was found for AD and Parkinson's disease in a study employing the Crovitz Schiffman technique (Sagar et al., 1988). Thus, it might be expected that the AD group would also show a reminiscence bump. However, it was not the case that either the AD or control groups in the present study exhibited such a temporal pattern.

One possible factor contributing to this is the structure of the autobiographical fluency tasks into three lifetime periods, in which recall is constrained within three time periods. This is in contrast to the free recall tasks used in the cognitive literature and the Crovitz Schiffman Technique, which allow free recall for AM's from over the whole lifespan without any constraints of time period. It may be that structuring recall into time periods results in individuals performing at a similar level for all three time periods. If the autobiographical fluency tasks were not structured into three distinct time periods, instead allowing free recall over the lifespan, it would be expected that AD and control participants would show the well-documented reminiscence bump. In addition, both the childhood (0 – 20 years) and early adulthood (20 – 30 years) time periods sample the ages in which the reminiscence bump is reported to occur, that is, the period between 16 and 25 years of age. This overlap effectively means that higher numbers of responses will be produced for both time periods. Indeed, this is the temporal pattern exhibited by both groups in this study, in which there was no significant difference between childhood and early adulthood, and recall for these two time periods was significantly higher than for recent adulthood. It is expected that a reminiscence bump would be evident if the time periods of autobiographical fluency were modified so that childhood sampled the period between 0 and 15 years of age, and early adulthood sampled the period between 16 and 25 years of age. This again highlights the need for measures of AM which assess memories over the entire lifespan in a more finely graded manner.

The results of autobiographical fluency for personal semantic memory also do not show a reminiscence bump for either AD or control group participants. The temporal patterns exhibited by the two groups were similar to the temporal gradients often found in studies of AM: more names were recalled from childhood than from early and recent adulthood. These temporal patterns are consistent with those found by Greene et al. (1995) for autobiographical fluency for names.

### **Identity in Alzheimer's disease**

The Tennessee Self Concept Scale and the Twenty Statements Test were used to assess the strength, quality, complexity, and direction of identity in AD compared with healthy elderly controls. Significant intercorrelations of the measures derived from the Tennessee

Self Concept Scale and of the measures derived from the Twenty Statements Test indicate that there was consistency of performances on measures of identity derived from these two tests. For example, those who performed highly on one measure of identity derived from the Twenty Statements Test also performed highly on the other measures of identity derived from this test.

#### Is there evidence of a change in the strength of identity in AD?

The results of this study support the hypothesis that there is a change in the strength of identity in individuals with AD. Strength of identity was measured by the number of responses generated on the Twenty Statements Test and, as predicted, AD group participants generated significantly fewer responses than control participants. Very few studies have investigated the status of identity in AD, and none have specifically measured the strength of identity in AD in comparison to healthy age-matched control subjects. The decreased strength of identity found in this study could be considered consistent with findings in Orona's (1990, 1997) qualitative study of identity in AD. Loss of identity emerged as a major theme in the analysis of interviews with caregivers of individuals with AD, with many reporting that their relative with AD was "gone" (Orona, 1997, p. 191) or that they "ceased" to be who they once were (Orona, 1990, p. 1252).

There are a number of possible explanations as to why strength of identity, as measured in this study, is impaired in individuals with AD. Firstly, this impairment may actually reflect an impairment of fluency abilities, or the ability to generate responses, which would directly impact on the ability to generate "I am ..." statements on the Twenty Statements Test independently of the integrity of identity itself. Secondly, as hypothesised in this study, the apparent decline in the strength of identity may truly reflect a weakening of identity, and may be related to impairment of AM which is thought to underlie identity. Both of these possibilities will be considered in detail when the relation between AM and identity is discussed.

#### Is there evidence of a change in the quality of identity in AD?

To test the hypothesis that there would be a change in the quality of identity in AD, more specifically, that individuals with AD would have a more abstract identity, comparisons between the AD group and elderly controls on the number of abstract responses generated

on the Twenty Statements Test and the frequency of vague responses (responses of three) and extreme responses (responses of one or five) on the Tennessee Self Concept Scale were conducted. The hypothesis was supported by these analyses. On the Twenty Statements Test, a significantly higher proportion of the responses of AD participants were abstract compared to controls. Similarly, on the Tennessee Self Concept Scale, AD group participants gave a significantly higher frequency of vague responses and a significantly lower frequency of extreme responses compared to controls. Thus, the results on all measures of quality of identity indicate that the quality of identity becomes more abstract in individuals with AD.

No other studies have investigated the quality of identity in AD, specifically the abstract nature of identity. However, the hypothesis that the quality of identity would become more abstract in AD was based upon the theories of identity which posit that AM is crucial to identity. For example, Klein and Loftus (1993) argue that identity is based on personal semantic memory, while exemplar theories (e.g., Bower & Gilligan, 1979) posit that identity is based on access to behaviour exemplars in personal incident memory. Both models infer that if one has difficulty accessing personal semantic and personal incident memories, references to one's identity will be more vague and abstract, lacking in the specific detail which AM provides. Similarly, degraded AM is likely to affect the ability to make definite statements about one's identity resulting in a less extreme identity, which is consistent with the notion of a more vague, or abstract identity. This will be further considered in the discussion of the relation between AM and the quality of identity.

#### Is there evidence of a change in the complexity of identity in AD?

The hypothesis that identity becomes less complex in AD was not supported by the results of this study. There were no significant differences in the number of categories or subcategories sampled on the Twenty Statements Test by AD and control group participants. Thus, even though AD group participants produced fewer responses on the Twenty Statements Test overall and these responses were more abstract in nature, they still sampled the same range of content, including personal attributes, social identities, evaluative descriptions and physical descriptions. One factor that may have influenced this outcome relates to the modification of the Twenty Statements Test used in this study, in which prompts suggesting the general types of responses required were added to the

instructions. The purpose of this was to facilitate the use of this instrument with AD participants by providing some idea of the types of responses required as a means to start them thinking about their identity. The prompts referred to some of the possible categories of responses, and may have had the effect of artificially activating the same categories of identity in both AD and control groups participants, resulting in the lack of difference in the number of categories sampled by the groups. In conflict with this explanation, however, is the finding that the responses of AD and control group participants sampled the same number of subcategories even though the prompts did not include subcategories. Overall, therefore, these findings are likely to reflect a preservation of the complexity of identity in AD.

This conclusion is supported by the lack of significant differences between the two groups on analyses targeting the relative distribution of responses of individuals in the two groups. In particular, individuals in the AD and control groups did not differ in percentage of total responses that fell into each category on the Twenty Statements Test, nor on the frequency of concentrations of responses over the four categories. It had been predicted that as identity may be more simplified in AD, these participants might have a tendency to focus on one aspect of their identity, neglecting to talk about other aspects. This change in distribution of responses and complexity would not necessarily be evident by only measuring number of categories and subcategories sampled, as a single response would count as sampling a category. This prediction was not supported. It is interesting to note that the data showed a tendency of both AD and controls group participants to focus primarily on one or two aspects of their identity. For example, all participants tended to focus more on either personal attributes and personal evaluations (a subcategory of the evaluative descriptions category), or, on social identities and social evaluations. This corresponds with social identity theory, which posits that at any point in time either the social or personal aspects of one's identity are salient (Hogg and Abrams, 1988).

#### Is there evidence of a change in the direction of identity in AD?

It was predicted that the identities of individuals with AD would become more negative. This prediction was supported as the AD group had significantly lower scores than the control group on the Total Identity Score and the Identity Subscores (personal, family, social, moral and physical) of the Tennessee Self Concept Scale, indicating a more

negative identity. The changes and impairments experienced in AD affect many aspects of one's life and identity, including cognitive abilities, daily living skills, activities, social relations, self-perceptions and self-esteem. Thus, more negative assessments of all aspects of identity are not surprising. Additionally, coming to terms with any chronic or terminal disease causes what Charmaz (1997) describes as an identity dilemma. Individuals experience an "awakening to death" as their own death becomes more possible to them. Heidrich (1998) points out that illness makes one aware that they have less time left. This lessens one's orientation to the future or future goals, which is theorised by Markus & Nurius (1986) to be an important aspect of identity. Interestingly, one AD group participant still exhibited a future orientation on the Twenty Statements Test, but rather than it being of a positive nature, it was an intense fear of what she would be like in the near future as the disease progressed. The reality of having a disease such as AD, particularly when insight is still relatively preserved, along with the global decline of many aspects of oneself and life, are all likely contributors to the more negative sense of identity experienced in AD.

Although it was expected that the identity of individuals with AD would become more negative, the striking similarity of the structure of identity over the five Identity Subscores found between AD and control group participants (see Figure 16) was less expected. The scores of the two groups on the five aspects of identity essentially showed the same relative peaks and troughs (verified by the lack of interaction of group and subcategory). Thus, on the whole the relative structure of the subcomponents of identity was preserved in AD and paralleled age-associated changes in identity seen in the control group. Personal and physical identity was lower than the Family, Social and Moral Identity Subscores, for both AD and control group participants. Whitbourne (1998) states that many types of age-associated physical change seen in the elderly are associated with changes in identity. This includes changes in appearance, sensory functioning (e.g., sight), cardiac functioning, respiratory functioning, regulatory functioning, decreased mobility and increased pain. Additionally, she notes that even minor age-associated changes in cognitive functioning can cause a more negative sense of personal identity. Consistently, many AD and control group participants reported on the Twenty Statements Test that they felt their abilities were inadequate or that they felt they had no particular abilities.

### **The Relation Between Autobiographical Memory and Identity**

The relation between changes in AM and identity was investigated by correlating the measures of strength, quality, complexity and direction of identity with each measure of AM for the AD group, and with MMSE scores, in order to check whether changes in identity were more highly related to level of dementia in general, rather than specifically to impairments of AM. It must be acknowledged that large numbers of correlations were calculated, which increases the possibility that significant correlations are due to chance (a Type one error). For example, on measures of direction of identity, only two of the 60 correlations between the five Identity Subscores and the AM measures were significant, which is not greater than chance (at  $p = .050$ , you could expect 3 out of 60 correlations to be significant by chance). Because of this, these two correlations will not be treated as significant findings and therefore not discussed. Of the other 84 correlations between measures of AM and identity, 8 were significant which is above chance. In addition, the specific correlations which were significant do make sense when related to the literature. Nevertheless, the relatively small number of significant correlations found does mean that these results and their interpretations must be treated cautiously.

#### Autobiographical memory and strength of identity

The hypothesis that strength of identity would be significantly correlated with performances on measures of AM found some support in the present study, as there was a significant positive correlation between strength of identity and autobiographical fluency for childhood events and early adulthood names. Importantly, there was no significant correlation between strength of identity and MMSE scores, indicating that weakening of identity was not simply related to general cognitive decline. Instead, these results suggest there may be a relation between impairments in these components of AM and a decreased strength of identity.

The finding that AM for early adulthood names is related to the strength of identity is consistent with the typical explanation of the reminiscence bump in recall of AM's, which posits that AM's from early adulthood are remembered more vividly than others because of their connection with the formation of identity at this age (Fitzgerald, 1988, 1996). It may be that this relationship is bi-directional and that AM's from early adulthood facilitate the self-report of identity (Spence, 1982). Additionally, this theory may also explain the

significant correlation between AM for childhood events and strength of identity as both the childhood (0 – 20 years) and early adulthood (20 – 30 years) lifetime periods used in the AM measures sample the ages in which the reminiscence bump is reported to occur, that is, the period between 16 and 25 years of age. The limitations of interpretation resulting from the coarseness of the measures again highlights the need for measures of AM which are more finely graded in terms of sampling AM's over the lifespan so that such hypotheses can be checked.

An alternative explanation for the significant correlations between strength of identity and autobiographical fluency for childhood events and early adulthood names is that it relates to the generative aspects involved in all of these tasks. It may be that impaired fluency abilities (i.e., an impairment in the ability to generate responses) rather than impairments in these components of AM per se, underlie the correlations with strength of identity. However, if this were the case, it would be expected that strength of identity would be significantly correlated with all six autobiographical fluency tasks rather than just childhood events and early adulthood names. Thus, while it is likely that the fluency demands of the tasks may be contributing to the correlations, this is not sufficient to explain the specific pattern of significant correlations found and leaves open the alternative explanation that these two components of AM are related to strength of identity, perhaps in a causal manner.

#### Autobiographical memory and quality of identity

The prediction that quality of identity would be significantly correlated with performances on measures of AM found some support in this study. Firstly, there was a significant negative correlation between performance on the childhood autobiographical incidents component of the AMI and the proportion of abstract responses on the Twenty Statements Test. In other words, poorer recall of childhood personal incident memories was associated with a higher proportion of abstract responses. Additionally, performance on the MMSE was not significantly correlated with the proportion of abstract responses, indicating that this quality of identity was not simply related to the level of general cognitive decline in AD. Thus AM for childhood events appears to have a role not only in the strength of identity, but also in the quality of identity. As previously mentioned, this may be because of the importance of the late childhood – early adulthood period (16 – 25 years) in identity

formation. In this case, poorer AM performance is related to more abstract identity responses, suggesting a role of AM of childhood events in providing the details needed for specific identity statements. This is consistent with the behavioural exemplars theory (Bower & Gilligan, 1979), which posits that personal incident memories provide the details of one's identity, e.g., how one acted in a particular situation. This role that personal incident memories may play in providing the details of one's identity has implications for the model of trait self-knowledge proposed by Klein and Loftus (1993). Their theory posits that one's trait self-knowledge is represented in abstract summaries in personal semantic memory. However, the correlation with childhood personal incident memories suggests that identity is represented in personal incident memory. Additionally, references to traits by participants were not likely to be abstract when AM was preserved, suggesting that trait self-knowledge may not be represented as an abstract summary as Klein and Loftus propose, but rather in more detailed behavioural exemplars.

There were also significant negative correlations between the frequency of extreme responses and childhood personal semantic memory on the AMI and on autobiographical fluency for childhood names. This indicates that even though on average the AD group had a lower frequency of extreme responses compared with controls, within the AD group the poorer recall of childhood personal semantic memories the higher the frequency of extreme responses. Yet the frequency of extreme responses was not significantly correlated with performance on the MMSE, indicating that this quality of identity was not related to the general cognitive decline in AD. Again, this result indicates a significant role of childhood AM's in the quality of identity, but it suggests that personal semantic memory is important in this aspect of the quality of identity. Rather than providing the specific details of one's identity, as does personal incident memory, personal semantic memory provides the overview of oneself in a variety of incidents, and eliminates "always" or "never" self-descriptions based on one incident. This would be akin to the abstract summary that Klein and Loftus (1993) propose in their theory. Therefore, when personal semantic memory is impaired, these extreme responses increase. In light of this and the finding that the abstract quality of identity is related to personal incident memory, it is possible to suggest that behavioural exemplars (Bower & Gilligan, 1979) and abstract summaries (Kihlstrom et al., 1988; Klein & Loftus, 1993) are not mutually exclusive theories of identity. Rather, these results suggest that both representations of identity may exist.

### Autobiographical memory and complexity of identity

The prediction that measures of complexity of identity would be significantly correlated with performances on measures of AM found some support in the present study, as there was a significant positive correlation between the number of categories sampled on the Twenty Statements Test and autobiographical fluency for childhood names. This suggests that impairment of this component of AM is related to a less complex identity at the category level. Additionally, there was a significant positive correlation between the number of subcategories sampled on the Twenty Statements Test and autobiographical fluency for recent names and recent events, suggesting that impairment of these components of AM are related to a less complex identity at the subcategory level. The frequency of concentrations of responses over the four categories of the Twenty Statements Test did not correlate significantly with any measure of AM. Also, performance on the MMSE did not correlate significantly with measures of complexity of identity, indicating that the complexity of identity is not related to general cognitive decline in AD.

One explanation of these results is that they reflect the generative component common to all of these tasks. Impaired fluency abilities in general would reduce an individual's ability to generate responses. Thus, individuals with better fluency-related abilities would have a greater chance of sampling more categories and subcategories on the Twenty Statements Test. Additionally, the ability to use strategies to facilitate retrieval, a key component of fluency performance, may allow an individual to ensure they cover a variety of aspects when describing themselves in twenty statements. However, if the abilities required for fluency performance were underlying the three significant correlations, it would be expected all six autobiographical fluency tasks would correlate significantly with the number of categories and subcategories sampled. Thus while fluency-related abilities may be contributing to the correlations, it is likely that the three specific components of AM are also likely to be related to complexity of identity.

The positive correlation of autobiographical fluency for childhood names with the number of categories sampled on the Twenty Statements Test suggests that childhood personal semantic memory (i.e., autobiographical fluency for childhood names) is again implicated as a component of AM involved in identity, in this case, complexity of identity. As

aforementioned, childhood AM's, particularly those from later childhood, may play an important role in the construction of identity, and that when impaired, complexity of identity is affected. There may however, be some similarity between this measure of complexity of identity and childhood personal semantic memory in that they both are relatively spared in early AD. The number of categories sampled appears to be a fairly robust characteristic of identity, with no significant difference found between the AD and control groups. Additionally, childhood AM's tend to be less impaired in AD compared with early and recent adulthood AM's. While the fact that both these measures may not be impaired until AD is quite severe may explain the correlation, there is no correlation between the number of categories and performance on the MMSE, which would be expected if the number of categories sampled was simply related to the severity of AD. Thus, it is more likely that childhood personal semantic memory does have a role in the complexity of identity.

The positive correlations between autobiographical fluency for recent adulthood names and events and the number of subcategories sampled are difficult to explain. On the one hand, they do suggest that when recent AM's are impaired the individual has less variety of details about their identity, resulting in the sampling of fewer subcategories. There was, however, no evidence of a temporal gradient of impairment on the measures of autobiographical fluency, for both names and events, which is not completely consistent with this explanation.

#### Autobiographical memory and direction of identity

The prediction that measures of direction of identity would be significantly correlated with measures of AM did not find support in this study. As previously mentioned, only 2 of the 60 correlations between the five Identity Subscores and the AM measures were significant. The number of significant correlations is not above the level of chance and therefore will not be discussed. Of interest, however, is the significant positive correlation between performance on the MMSE and the Personal Identity Subscore, a result which was not expected. Of the 12 correlations between measures of identity and performances on MMSE, this was the only significant correlation. It does, however, make sense when considering the impact of AD on one's personal abilities and self-esteem. These impacts would increase with the advancement of AD, therefore resulting in a more negative

personal identity. While the effects of AD can reach all aspects of one's life and identity, perhaps it is the loss of personal abilities, such as the ability to carry out activities of daily living and self-care, that impact most upon the positiveness of one's personal identity.

### **Conclusions, Wider Implications and Future Directions**

The first aim of this study was to investigate the status of AM in AD, and the nature of any impairment. The results of the present study have confirmed that both components of AM are significantly impaired in AD. Additionally, a temporal gradient was only evident for personal semantic memory on the AMI. This finding of impaired AM in AD has important implications. The focus of research and clinical practice has tended to be on the anterograde memory impairments associated with AD, presumably because these have more obvious impacts on the daily lives of individuals with AD (Kapur, 1999). However, deficits of remote memory have been shown to be present in AD, and thus it is important to consider how these deficits impact upon individuals. Indeed, as this study has shown, AM loss is associated with changes in the strength, quality and complexity of identity, and these changes may have wider impacts upon psychological well-being. Additionally, AM impairment may affect not only the individual, but also the family. For example, AM loss may particularly have an impact on the family when the individual cannot recall memories of family events or family information, such as names. More research investigating the wider impacts of AM loss on individuals, and also their families, would add considerably to this beginning literature.

Issues around the assessment of AM were also raised in the present study. In particular, further research and development of the measures of AM with respect to the assessment of recent adulthood is needed to ensure that the effects of anterograde memory impairments are controlled for and that temporal gradients are reliable. Additionally, more finely-graded tests of AM in terms of the sampling of AM's over the whole lifespan, possibly decade by decade, would be of benefit not only to the establishment of temporal gradients of AM impairment, but also the investigation of temporal patterns of AM recall, particularly the reminiscence bump.

The second aim of this study was to investigate the strength, quality, complexity and direction of identity in individuals with AD compared with healthy age-matched controls.

Changes in identity were evident in AD group participants: The strength of identity decreased; the quality of identity became more abstract and vague, and less extreme; and the direction of all aspects of identity became more negative. Interesting findings were that the complexity and structure of identity remained impervious to AD and AM loss.

It is interesting to consider whether the changes in identity measured in the present study actually reflect a subjective change in identity. Given that some aspects of identity appear to be preserved in AD, such as the complexity and structure of identity, it is possible that even though other aspects of identity quantitatively measured in this study have changed, the identity that the individual with AD subjectively experiences is essentially unchanged. In future studies of identity, the inclusion of a qualitative component which specifically investigates whether individuals with AD actually report a change in their sense of identity, would allow the investigation of this question.

Another important question is whether there are wider implications of changes in identity on the individual's functioning within the family. It is possible that changes in identity create conflicts within the family (and within the individual), and may underlie some aspects of behavioural difficulties. Changes in identity would have an impact not just on individuals with AD but also on family members. Family members in Orona's (1990, 1997) study poignantly discuss the changes in their relative with AD, and their realisation that their relative had changed and were no longer who they once were. This may be a source of some conflict if the family members are aware of this change but the relative with AD, lacking insight, is not. The opposite scenario may also occur, where the individual with AD may be aware of changes in their identity, but family members focus on the aspects which have remained stable.

Quantitative and qualitative research investigating the impacts of AM loss and identity change on the individual with AD, their behavioural functioning in the family, and the family's perception of their relative's status of identity would see the beginning of an important literature, particularly for informing clinical practice. It may be important that the individual with AD and their families understand what changes in AM and identity may be experienced in AD as this may enable them to better cope with the situation. It would also be interesting to investigate the impacts on family functioning experienced by

those AD participants whose identity was more negative. Additionally, the progression of identity changes through AD could be investigated by looking at the strength, quality, complexity and direction of identity in individuals with mild and moderate AD, for example, to establish whether individuals have a more negative identity in the early stages of AD, and whether it progressively gets more negative or positive as the AD advances.

The third aim of this study was to investigate the relation between loss of AM and changes in the strength, quality, complexity and direction of identity. The data provided tentative support for such a relation, with the impairment of certain components of AM associated with changes in the strength, quality and complexity of identity. In particular, the importance of the childhood and early adulthood components of AM in identity was supported in this study, with a relation being found between these components of AM and the strength, quality and complexity of identity. This provides support for the importance of the period between 16 and 25 years of age in identity formation. Further research investigating the relationship between AM and identity could focus on the role AM from this lifetime period plays in different aspects of identity.

The fact that there were many correlations between the components of AM and the strength, quality, complexity and direction of identity which did not reach significance indicates that the relation between the impairment of AM and changes in identity is not a simple, one-to-one relationship. In other words, although there is some relation between AM and identity, they do not map directly onto each other. Perhaps very specific aspects of AM are related to identity, for example, childhood and early adulthood components of AM, as found in this study. There may also be other variables which influence changes of identity, which are yet to be identified. Performance on the MMSE and measures of identity were, in general, not significantly correlated, indicating that changes in identity are not simply related to general cognitive decline in AD. It may be, however, that there is some specific cognitive process other than, or in addition to, AM loss which underlies the changes in identity evident in AD. For example, it may be that the awareness of cognitive deficits rather than the deficits themselves has an important role in changing identity, a variable which is related to AD (i.e., the deficits are caused by AD) but it is not related directly to cognitive measures. Future research needs to clarify whether AM loss has a

causal role in the changes in identity evident in AD, and possibly identify other causal variables in these identity changes, questions which will be difficult to answer.

Finally, one of the most important issues when investigating the relation between AM and identity is the challenge of disentangling the changes in identity from the effects of cognitive impairments. It is difficult to ascertain whether the changes in the strength, quality, and direction of identity are the result of a direct change to the construct of identity, or whether these changes are the result of an impairment of the cognitive processes underlying identity, which may be similar to those processes underlying AM. For example, impaired retrieval of information about oneself may affect one's ability to access their identity, particularly if identity is represented in the components of AM. Another possibility is that frontal dysfunction, which can underlie impairments in fluency, generation of responses, and retrieval processes, may affect both the access and articulation of one's identity on measures such as those used in this study. The question of whether it is the construct of identity or its underlying processes which have changed, along with the question of whether these cognitive processes are the same as those supporting AM, cannot be answered by the present study. First, research is needed to identify the specific processes underlying the different aspects of identity. This, however, is a difficult task. For example, using functional neuroimaging to investigate the processes underlying AM and identity may not answer these questions if both AM and identity tasks activate similar brain regions. This is possible as, for example, both AM recall and identity tasks do have similarities, such as a retrieval component. Hopefully research will begin to provide more information about the processes underlying AM and identity, which will enable more specific theorising about the representation and access of identity, and may also further clarify the relation between AM and identity.

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**APPENDIX A****Criteria for the Diagnosis of Alzheimer's Disease.**

Table A1.

**NINCDS-ADRDA Criteria for the Diagnosis of Definite, Probable and Possible Alzheimer's Disease (adapted from McKhann et al., 1984)**

Diagnosis	Criteria for diagnosis
Possible AD	<ol style="list-style-type: none"> <li>1. There are variations in the onset, presentation, or clinical course of a dementing illness that are unusual in AD but for which there is no alternative explanation.</li> <li>2. There is a second systemic or brain disease capable of producing a dementia syndrome that is not considered to be the cause of the dementia in this case.</li> <li>3. There is a single gradually progressive deficit.</li> </ol>
Probable AD	<ol style="list-style-type: none"> <li>1. Dementia is established by a standardized mental test status questionnaire and confirmed by neuropsychological testing.</li> <li>2. There are deficits in two or more areas of cognition.</li> <li>3. There is progressive worsening of memory and other cognitive functions.</li> <li>4. There is no disturbance of consciousness (delirium).</li> <li>5. The onset of the illness is between 40 and 90 years of age.</li> <li>6. There is no systematic illness or brain disease that could account for the progressive mental status changes.</li> <li>7. The diagnosis of Probable AD is supported by the following: <ol style="list-style-type: none"> <li>a. Progressive deterioration of specific skills such as language (aphasia), motor skills (apraxia), or perceptual recognition (agnosia).</li> <li>b. Impaired activities of daily living and altered patterns behaviour.</li> <li>c. Family history of similar disorders, particularly if confirmed to be AD neuropathologically.</li> <li>d. Laboratory results such as: <ol style="list-style-type: none"> <li>i. Normal standard lumbar puncture.</li> <li>ii. Normal or non-specific slowing on EEG.</li> <li>iii. Cerebral atrophy on neuroimaging procedures with progression on serial documentation.</li> </ol> </li> </ol> </li> </ol>
Definite AD	<ol style="list-style-type: none"> <li>1. Patient meets clinical criteria for Probable AD.</li> <li>2. There is biopsy or autopsy evidence of compatible with AD.</li> </ol>

**APPENDIX B****Educational Measures - Years of Education Based on Qualifications.**

Table B1.

New Zealand Socioeconomic Index of Occupational Status: Years of Education Based on Highest Qualification Achieved (Davis et al., 1997)

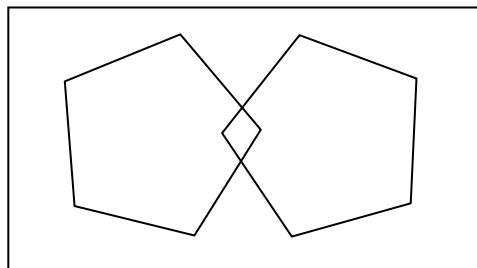
Highest Qualification	Years of Education
Postgraduate degree	19
Bachelor's degree	16
Undergraduate certificate /diploma	15.5
Technician's certificate/NZ Certificate	15.5
Teaching/nursing certificate/diploma	15.5
Trade certificate	13.5
Other tertiary certificate	12.5
Bursary/Scholarship/Higher School Certificate	13
Sixth Form Certificate/University Entrance	12
School Certificate/Matriculation	11
Other school qualifications	12
No qualifications	10

**APPENDIX C****Background Information - Interview Schedule.**

- 1. How old are you?**
  
- 2. Educational attainment**
  - What age did you leave school?
  - Did you gain any further education? If so, where? And for how long?
  - What were your occupations?
  
- 3. Drug and alcohol use**
  - How much alcohol do you drink a week, units/week maximum?
  - Were you ever a heavy drinker?
  - Have you ever had any drink related problem?
  - Have you ever had a drug dependency problem?
  
- 4. Past psychiatric history**
  - Have you ever required treatment for an emotional / nervous or psychiatric illness?
  
- 5. Relevant medical history (if yes, details and an indication of severity were obtained)**
  - Head injuries? Y/N
  - Stroke? Y/N
  - Any major heart problems? Y/N
  - Any major surgery? (e.g., heart bypass surgery) Y/N
  - Seizures / fits? Y/N
  
- 6. Medications**
  - What medications are you currently on?
  
- 7. History of memory problems / Alzheimer's disease (if relevant)**
  - How long have you noticed these problems?
  - How long has it been since the diagnosis of problems?

**APPENDIX D****Mini Mental State Examination – Schedule of Tasks (Folstein et al., 1975).**

<b>Orientation to time</b>	What is the day?	0 1 9
	What is the date?	0 1 9
	What is the month?	0 1 9
	What is the year?	0 1 9
	What is the season?	0 1 9
<b>Orientation to place</b>	What is this place called?	0 1 9
	(If at a private residence, what is the street?)	
	What part of the hospital (street number?)	0 1 9
	What town/city is this? (town/city?)	0 1 9
	What floor are we on? (suburb?)	0 1 9
	What country is this? (country)	0 1 9
<b>Naming</b>	What is this? (A pencil is presented)	0 1 9
	What is this? (A watch is presented)	0 1 9
<b>Sentence repetition</b>	No ifs, ands or buts	0 1 9
<b>Registration</b>	Apple, Table, Penny	0 1 2 3 9
<b>Attention, concentration</b>	Serial subtraction of seven from 100	0 1 2 3 4 5
<b>Recall</b>	Apple, Table, Penny	0 1 2 3 9
<b>Written instructions</b>	Please read this and do what it says	
	(Close your eyes)	0 1 9
<b>Spoken instructions</b>	Take this piece of paper in your right hand	
	Fold it in half	
	Place it on your lap	0 1 2 3 9
<b>Writing</b>	Write any complete sentence	0 1 9
<b>Praxis</b>	Copying overlapping pentagon	0 1 9



**APPENDIX E**

**The Autobiographical Memory Interview – Interview Schedules.**

Table E1.

The Personal Semantic Schedule of the Autobiographical Memory Interview (Kopelman, et al., 1990)

Time period	Item	Examples of individual questions
i. Childhood	1. Before school	Addresses where living, names of friends?
	2. First school (kindergarten or primary)	Name, where, age at starting, own address, names of teachers, friends?
	3. Secondary school (at age 13)	Name, where, level of exams passed, own address, names of teachers, friends?
ii. Early Adult Life	1. First job or tertiary education	Name of firm / university, qualifications, own address, names of boss, colleagues?
	2. Wedding: own or others during twenties	Whose? Where? When? Address before / after? Names of best man, bridesmaid?
	3. Children (own or niece / nephew or close friend's)	Names of two children, when and where born?
iii. Recent Adult Life	1. Hospital or other institution (within the past five years)	Name and place, when first came, names of staff / clients / patients, own address? When and where last in hospital, where living then?  Where last Christmas spent? Who with?
	2. Christmas or other (within the past five years)	Names of other visitors / relatives seen in last five years?
	3. Holidays or other journeys (within the past five years)	Where, when who with?

Table E2.

The Autobiographical Incidents Schedule of the Autobiographical Memory Interview  
(Kopelman, et al., 1990)

Time period	Incident to be recalled	Suggested prompts
i. Childhood	1. Before school	First memory? Involving brother or sister?
	2. At primary school (i.e., 5 - 11 years)	Involving friend? Involving teacher?
	3. At secondary school (i.e., 11-16/18 years)	Involving friend? Involving teacher?
ii. Early Adult Life	1. First job or tertiary education	First day at job / university? Episode with friend / girl/boy friend?
	2. Wedding: own or other's during 20's	The guests? The reception?
	3. Meeting someone during 20's	e.g., an interview? On holiday or at work?
iii. Recent Adult Life	1. A relative or visitor in the last year (or before onset of AD)	Visit by / to a relative? News about a relative?
	2. An event in this or another hospital or institution within the last year (or before the onset of AD)	Involving other patients / clients? Involving staff / doctors / nurses?
	3. A journey in the last year (or before the onset of AD)	Place visited? Someone met?

**APPENDIX F****The Autobiographical Memory Interview – Scoring Criteria.**

Table F1.

Scoring criteria for the Autobiographical Incidents Schedule of the Autobiographical Memory Interview (Kopelman, et al., 1990)

<b>Score</b>	<b>Example</b>
<p><b>Score 3</b> Episodic memory, specific in time and place</p>	<p><b>Subject:</b> “I can remember being taught how to use a hand grenade. I had to throw it, then duck very quickly.”</p> <p><b>Interviewer:</b> “Can you remember any incident that happened during learning to throw the hand grenade?”</p> <p><b>Subject:</b> “Yes I can. There was a Welshman in the squad who was a very nervous man; he pulled the pin out and dropped the hand grenade in the trench where we were. Sergeant Adams, the instructor, picked it up very quickly and threw it out.” (Time and place also given)</p>
<p><b>Score 2</b> Personal but non-specific event, or specific event but time and place not recalled</p>	<p><b>Subject:</b> “I played a lot of cricket – kept wickets for the lab team. The ground was in Bushey Park. I scored a century one year. We used to travel to Barnes and places on the Thames. I scored a lot of runs one year. I can’t remember anything more about it.”</p>
<p><b>Score 1</b> Vague personal memory</p>	<p><b>Subject:</b> I quite likes a game of chess.”</p> <p><b>Interviewer:</b> “Tell me about a particular game.”</p> <p><b>Subject:</b> “It’s hard to remember a particular game. I’ve played so many times I can’t say that one stands out.”</p>
<p><b>Score 0</b> No response, or a response based on semantic memory</p>	<p><b>Subject:</b> I went to school, nothing much happened.”</p>

**APPENDIX G****The Autobiographical Memory Interview – Cut-off Scores.**

Table G1.

Cut-off scores for the personal semantic and autobiographical incidents components of the Autobiographical Memory Interview (Kopelman et al., 1990)

	Personal semantic schedule				Autobiographical incidents schedule			
	Child	Young adult	Recent adult	Total	Child	Young adult	Recent adult	Total
Normal Range	16 - 21	17 - 21	19 - 21	54 - 63	6 - 9	7 - 9	7 - 9	19 - 27
Abnormal Range								
Borderline	14 - 15	16	18	50 - 52	5	5 - 6	6	16 - 18
Prob. abnormal	12 - 13	15	-	48 - 49	4	4	-	13 - 15
Def. abnormal	≤ 11	≤ 14	≤ 17	≤ 47	≤ 3	≤ 3	≤ 5	≤ 12

Note. Prob. abnormal = probably abnormal; Def. abnormal = definitely abnormal

**APPENDIX H****The Twenty Statements Test – Coding Scheme.**

Table H1.

Coding Scheme for the Twenty Statements Test (adapted from Rhee, et al., 1995)

Categories	Abstract or specific
<b>Attributes</b>	
Preferences (interests, likes, dislikes, fond of)	Specific
Aspirations (wishes, hopes, dreams)	Specific
Activities (activities, habits)	Specific
<b>Traits</b>	
Pure (kind)	Abstract
Qualified - contextualised (with someone, at home)	Specific
Qualified - temporal (sometimes, a little)	Specific
<b>Emotional states</b>	
Autonomous (worried, afraid)	Abstract
Social (in love)	Specific
<b>Social identities</b>	
Role status (student)	Specific
Family information (sister, father)	Specific
Ethnicity, race, nationality	Specific
Gender	Specific
Self-ascribed identities (musician, dancer)	Specific
Origin (from Hong Kong)	Specific
Religion (Christian, child of God)	Specific
Occupation (salesperson, retired)	Specific
Negation (not a Christian)	Specific
Name	Specific
<b>Global descriptions</b>	
Universal descriptions (human being)	Abstract
Existential descriptions (me, myself)	Abstract
<b>Evaluative descriptions (abilities, beliefs, evaluations)</b>	
General / Reflective (good abilities, good life)	Abstract
Autonomous (good in math)	Specific
Social (good listener, have many friends)	Specific
<b>Physical descriptions</b>	
Descriptive (short, pretty)	Specific
Age	Specific
Factual (height, weight, eye colour)	Specific
Physical condition (near sighted)	Specific

**APPENDIX I****Items and Scales from the Tennessee Self Concept Scale: Second Edition.**

Table I1.

Items Selected from the Tennessee Self Concept Scale: Second Edition (Fitts & Warren, 1996)

Self-Descriptive Statement	Aspect of Self Concept
<b>Physical</b>	
1. I am an attractive person.	Identity
9. I have a healthy body.	Identity
10. I consider myself a sloppy person. (R)	Identity
15. I am full of aches and pains. (R)	Identity
16. I am a sick person. (R)	Identity
24. I take good care of myself physically.	Behaviour
26. I look fine just the way I am.	Satisfaction
<b>Moral</b>	
2. I am a moral person.	Identity
11. I am a decent sort of person.	Identity
17. I am a morally weak person. (R)	Identity
27. I am a bad person. (R)	Identity
<b>Personal</b>	
12. I am a cheerful person.	Identity
13. I am a nobody. (R)	Identity
18. I am a hateful person. (R)	Identity
19. I am losing my mind. (R)	Identity
29. I have a lot of self-control.	Identity
<b>Family</b>	
3. I am a member of a happy family.	Identity
5. I do not act the way my family thinks I should. (R)	Behaviour
6. I am satisfied with my family relationships.	Satisfaction
7. I understand my family as well as I should.	Satisfaction
14. My family would always help me with any kind of trouble.	Identity
20. I am not loved by my family. (R)	Identity
21. I feel that my family doesn't trust me. (R)	Identity
25. I take a real interest in my family.	Behaviour
28. I quarrel with my family. (R)	Behaviour
<b>Social</b>	
4. I am a friendly person.	Identity
8. I get along with other people.	Behaviour
22. I am mad at the whole world. (R)	Identity
23. I am hard to be friendly with. (R)	Identity

Note. (R) = reversed items

Table I2.

Inconsistent Responding Scale Item Pairs from the Tennessee Self Concept Scale: Second Edition (Fitts & Warren, 1996)

Self-Descriptive Statement	Domain of Self Concept	Aspect of Self Concept
1. I am an attractive person.	Physical	Identity
27. I look fine just the way I am.	Physical	Satisfaction
9. I have a healthy body.	Physical	Identity
24. I take good care of myself physically.	Physical	Behaviour
15. I am full of aches and pains. (R)	Physical	Identity
16. I am a sick person. (R)	Physical	Identity
3. I am a member of a happy family.	Family	Identity
26. I take a real interest in my family.	Family	Behaviour
5. I do not act the way my family thinks I should. (R)	Family	Behaviour
29. I quarrel with my family. (R)	Family	Behaviour
6. I am satisfied with my family relationships.	Family	Satisfaction
7. I understand my family as well as I should.	Family	Satisfaction
4. I am a friendly person.	Social	Identity
8. I get along with other people.	Social	Behaviour

Note. (R) = reversed items

**APPENDIX J****Tennessee Self Concept Scale – Test Administration Example.**

1.

**I am an attractive person**

<b>1.</b>	<b>2.</b>	<b>3.</b>	<b>4.</b>	<b>5.</b>
<b>Always</b>	<b>Mostly</b>	<b>Partly</b>	<b>Mostly</b>	<b>Always</b>
<b>False</b>	<b>False</b>	<b>False</b>	<b>True</b>	<b>True</b>

**and**

**Partly**

**True**

**Figure J1.** An example of the laminated cards used for the modified administration of the Tennessee Self Concept Scale.

**APPENDIX K****Letter from Memory Clinic Clinicians Introducing Study to Potential AD Group Participants.**

(Date)

Dear \_\_\_\_\_,

The Memory Clinic at North Shore Hospital is involved in a number of ongoing research projects. These projects are thought to be important for increasing our understanding of memory problems.

As a former visitor to the Memory Clinic, you will soon be contacted by phone and invited to participate in a current research project. In this project, we will be looking at the memories individuals have of their lives and also at their personal sense of identity (how they describe themselves). It is thought that difficulty in recalling memories of life events and personal facts may affect how that person describes themselves.

People who take part in the study will be asked questions about their background, memories about their lives including events and facts, and how they describe themselves. This will take around three hours, but can be broken into two visits if desired. It will be carried out at the home of the participants or at the Memory Clinic, whichever is more convenient.

More details will be explained over the phone by the researcher, Donna Addis, who will talk about the study with you, and discuss whether or not you might be interested in taking part. If you do not want to be contacted at all, please ring Sandra at the Day Ward at North Shore Hospital (ph. 441-8941) and let her know.

Kind regards,

(Clinician's name and title)

## **APPENDIX L**

### **Information Sheet for Alzheimer's Disease Group Participants.**

#### **PARTICIPANT INFORMATION SHEET**

##### **Memory of myself and identity in Alzheimer's Disease**

#### **Principal Investigator**

This study is being carried out by Donna Addis, Dr. Lynette Tippett and Dr. Phil Wood. Donna Addis is a Master's student in the Department of Psychology at the University of Auckland, ph 373 7599 extn 3072. Dr Lynette Tippett is a senior lecturer in the Department of Psychology, University of Auckland, ph 373 7599 extn 8551. Dr. Phil Wood is a consultant physician, Health Service of Older People / Section of Geriatric Medicine, North Shore Hospital.

#### **Introduction**

You are invited to take part in a research study which will investigate memories individuals have of their life and the personal sense of identity (how you describe yourself) of individuals with Alzheimer's Disease. You are not obliged to take part in this study. However if you would like to participate, we would be grateful if you would let us know (by phone or letter), as soon as possible.

#### **About the study**

- Some people with Alzheimer's disease have trouble recalling memories of life events and facts about themselves. It is thought that this might affect how that person describes themselves. The aim of this study is to examine these memory problems and how individuals with Alzheimer's disease describe themselves to determine whether there is any relationship between the two.
- Participants in this study will either have a diagnosis of probable Alzheimer's disease (25 members) or will be healthy elderly people who have no history of neurological problems (comparison group, 25 members). All participants will be fluent in English. Only individuals who have not experienced major cardiovascular problems, neurological diseases (other than Alzheimer's Disease) such as head injury or psychiatric illness will be eligible to participate.
- You are being invited to take part in this study because you may have Alzheimer's disease.
- The study is expected to take one year to complete, however your participation will be required for two sessions only.
- This study will take place either in your own home or at North Shore Hospital, depending on which you prefer. The tasks will probably be completed during two visits, although if you wish and are not too tired, it may be possible to complete it in one session. The total time involved will be approximately 3 hours, with breaks.

- The first part of the visit will involve answering some questions about your background. The second part of the visit will involve you recalling memories about life events and facts about yourself. The third part (or the final session) will involve you describing yourself as well as deciding how well different statements describe you.
- With your permission responses to the tasks (parts two and three) will be audiotaped. The tapes will be transcribed within two weeks, and the tapes will be erased.

### **Benefits, risks and safety**

- There are no expected risks although completing the tasks may be a little tiring. You will be able to stop and have a break at any time.
- There are no direct benefits to you for your participation. However, the results may help you understand some of the difficulties or changes you may have noticed from time to time, such as problems recalling past events, and changes in how you describe or think of yourself.
- Indirect benefits of this study include furthering our knowledge of Alzheimer's disease, which may benefit others with similar problems in the future.
- Taking part in this study will not cost you anything. There is no payment or reimbursement for your time.

### **Compensation**

In the unlikely event of a physical injury as a result of your participation in this study, you will be covered by the accident compensation legislation (ACC) within its limitations. If you have any questions about ACC please feel free to ask the research for more information before you agree to take part in this research.

### **Participation**

1. Your participation is entirely voluntary (your choice). You do not have to take part in this study, and if you choose not to take part you will receive the usual healthcare.
2. If you do agree to take part, you are free to withdraw from the study at any time, without having to give a reason and this will in no way affect your future health care.
3. Participation in this study will be stopped should any harmful effects appear or if any health professional feels it is not in your best interests to continue.

### **General**

- Your GP will not be informed of your participation in the study. However you and your family will be able to discuss your results with your health professionals if you wish.
- At the end of the study you may discuss the outcomes of the study with the researcher and / or receive a copy of the results.

- If you, or a relative or friend, have any questions or wish to know more about the study, please phone Donna Addis or Dr. Lynette Tippett.

**Donna Addis Work: 373 7599 extn 3072**

**Dr. Lynette Tippett Work: 373 7599 extn 8551**

Alternatively you may contact Donna or Dr. Tippett at:

The Department of Psychology, University of Auckland, Private Bag 92019, Auckland.

**You are free to stop the testing at any time if you wish.**

If you have any queries or concerns about your rights as a participant in this study you may wish to contact the Health Advocates Trust, telephone 0800 205 555.

### **Confidentiality**

No material, which could personally identify you, will be used in any of the reports on this study. Any personal information, such as memories discussed in the sessions, will not be used in the reports; only summary scores of how much you can remember will be used. All data will be kept strictly confidential and your privacy protected. At the completion of the study all records will be locked away in filing cabinets within the Department of Psychology for up to 10 years.

### **Results**

The results of your performance will be available to you if you wish and a summary of the results from the thesis will be forwarded to all participants who request them.

### **Statement of Approval**

This study has received ethical approval from the HFA Auckland Ethics Committee.  
**Please feel free to contact the researcher if you have any questions about this study.**

**APPENDIX M****Consent form for Alzheimer's Disease and Control Group Participants.****CONSENT FORM  
Memory of myself and identity in Alzheimer's Disease**

Principal Investigator: Dr Lynette Tippett, Donna Addis

Name: \_\_\_\_\_ Age: \_\_\_\_\_ years

**REQUEST FOR INTERPRETER**

English	I wish to have an interpreter.	Yes	No
Maori	E hiahia ana ahau ki tetahi kaiwhakamaori/kaiwhaka pakeha korero.	Ae	Kao
Samoan	Oute mana'o ia iai se fa'amatala upu.	Ioe	Leai
Tongan	Oku ou fiema'u ha fakatonulea.	Io	Ikai
Cook Island	Ka inangaro au i tetai tangata uri reo.	Ae	Kare
Niuean	Fia manako au ke fakaaoga e taha tagata fakahokohoko kupu.	E	Nakai

I have read and I understand the information sheet dated \_\_\_\_\_ for volunteers taking part in the study designed to investigate memory and identity in Alzheimer's disease. I have had the opportunity to discuss this study. I am satisfied with the answers I have been given. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time and this will in no way affect my future health care.

I understand that my participation in this study is confidential and that no material that could identify me will be used in any reports on this study. I understand the compensation provisions for this study. I have had time to consider whether to take part. I know whom to contact if I have any side effects to the study. I know whom to contact if I have any questions the study.

I consent to my responses to the tasks being audio-taped YES/NO

I wish to receive a copy of the results YES/NO

I \_\_\_\_\_ (print name) hereby consent to take part as a participant in this study.

Signed \_\_\_\_\_ (Participant). Date \_\_\_\_\_

In my opinion, consent was given freely and with understanding.

Witness name: \_\_\_\_\_ Witness signature \_\_\_\_\_

If you have any concerns about the study, you may contact: Health Advocates Trust,  
ph 0800 205 555Researchers: Donna Addis, ph 373 7599 extn 3072  
Dr. Lynette Tippett, ph 373 7599, extn 8551

Project explained by:

Project role:

Version 1, 18/02/00

## APPENDIX N

### **Information Sheet for the Control Group Participants.**

#### **PARTICIPANT INFORMATION SHEET**

#### **Control Participants (healthy elderly without Alzheimer's Disease)**

#### **Memory of myself and identity in Alzheimer's Disease**

#### **Principal Investigator**

This study is being carried out by Donna Addis, Dr. Lynette Tippett and Dr. Phil Wood. Donna Addis is a Master's student in the Department of Psychology at the University of Auckland, ph 373 7599 extn 3072. Dr Lynette Tippett is a senior lecturer in the Department of Psychology, University of Auckland, ph 373 7599 extn 8551. Dr. Phil Wood is a consultant physician, Health Service of Older People / Section of Geriatric Medicine, North Shore Hospital.

#### **Introduction**

You are invited to take part in a research study which will investigate memories individuals have of their life and the personal sense of identity (how you describe yourself) of individuals with Alzheimer's Disease. You are not obliged to take part in this study. However if you would like to participate, we would be grateful if you would let us know (by phone or letter), as soon as possible.

#### **About the study**

- Some people with Alzheimer's disease have trouble recalling memories of life events and facts about themselves. It is thought that this might affect how that person describes themselves. The aim of this study is to examine these memory problems and how individuals with Alzheimer's disease describe themselves to determine whether there is any relationship between the two.
- Participants in this study will either have a diagnosis of probable Alzheimer's disease (25 members) or will be healthy elderly people who have no history of neurological problems (comparison group, 25 members). All participants will be fluent in English. Only individuals who have not experienced major cardiovascular problems, neurological diseases (other than Alzheimer's Disease) such as head injury or psychiatric illness will be eligible to participate.
- **You are being invited to take part in this study because you are a normal healthy individual not experiencing neurological problems. We need normal elderly individuals to participate, to provide us with information about normal performance on these tasks.**
- The study is expected to take one year to complete, however your participation will be required for two sessions only.

- This study will take place either in your own home or at North Shore Hospital, depending on which you prefer. The tasks will probably be completed during two visits, although if you wish and are not too tired, it may be possible to complete it in one session. The total time involved will be approximately 3 hours, with breaks.
- The first part of the visit will involve answering some questions about your background. The second part of the visit will involve you recalling memories about life events and facts about yourself. The third part (or the final session) will involve you describing yourself as well as deciding how well different statements describe you.
- With your permission responses to the tasks (parts two and three) will be audiotaped. The tapes will be transcribed within two weeks, and the tapes will be erased. **N/A**

### **Benefits, risks and safety**

- There are no expected risks although completing the tasks may be a little tiring. You will be able to stop and have a break at any time.
- There are no direct benefits to you for your participation. However, the results may help you understand some of the difficulties or changes you may have noticed from time to time, such as problems recalling past events, and changes in how you describe or think of yourself.
- Indirect benefits of this study include furthering our knowledge of Alzheimer's disease, which may benefit others with similar problems in the future.
- Taking part in this study will not cost you anything. There is no payment or reimbursement for your time.

### **Compensation**

In the unlikely event of a physical injury as a result of your participation in this study, you will be covered by the accident compensation legislation (ACC) within its limitations. If you have any questions about ACC please feel free to ask the research for more information before you agree to take part in this research.

### **Participation**

- Your participation is entirely voluntary (your choice). You do not have to take part in this study, and if you choose not to take part you will receive the usual healthcare.
- If you do agree to take part, you are free to withdraw from the study at any time, without having to give a reason and this will in no way affect your future health care.
- Participation in this study will be stopped should any harmful effects appear or if any health professional feels it is not in your best interests to continue.

### **General**

- Your GP will not be informed of your participation in the study. However you and your family will be able to discuss your results with your health professionals if you wish.
- At the end of the study you may discuss the outcomes of the study with the researcher and / or receive a copy of the results.

- If you, or a relative or friend, have any questions or wish to know more about the study, please phone Donna Addis or Dr. Lynette Tippett.  
**Donna Addis Work: 373 7599 extn 3072**  
**Dr. Lynette Tippett Work: 373 7599 extn 8551**

Alternatively you may contact Donna or Dr. Tippett at:  
The Department of Psychology, University of Auckland, Private Bag 92019, Auckland.

**You are free to stop the testing at any time if you wish.**

If you have any queries or concerns about your rights as a participant in this study you may wish to contact the Health Advocates Trust, telephone 0800 205 555.

### **Confidentiality**

No material, which could personally identify you, will be used in any of the reports on this study. Any personal information, such as memories discussed in the sessions, will not be used in the reports; only summary scores of how much you can remember will be used. All data will be kept strictly confidential and your privacy protected. At the completion of the study all records will be locked away in filing cabinets within the Department of Psychology for up to 10 years.

### **Results**

The results of your performance will be available to you if you wish and a summary of the results from the thesis will be forwarded to all participants who request them.

### **Statement of Approval**

This study has received ethical approval from the HFA Auckland Ethics Committee.  
**Please feel free to contact the researcher if you have any questions about this study.**