‘I remember therefore I am, and I am therefore I remember’: Exploring the contributions of episodic and semantic self-knowledge to strength of identity

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The present research explores the relationship between the two components of autobiographical memory – episodic and semantic self-knowledge – and identity strength in older adults living in the community and residential care. Participants (N = 32) completed the autobiographical memory interview and measures of personal identity strength and multiple group memberships. Contrary to previous research, autobiographical memory for all time periods (childhood, early adulthood, and recent life) in the semantic domain was associated with greater strength in personal identity. Further, we obtained support for the hypothesis that the relationship between episodic self-knowledge and identity strength would be mediated by knowledge of personal semantic facts. However, there was also support for a reverse mediation model indicating that a strong sense of identity is associated with semantic self-knowledge and through this may enhance self-relevant recollection. The discussion elaborates on these findings and we propose a self-knowledge and identity model (SKIM) whereby semantic self-knowledge mediates a bidirectional relationship between episodic self-knowledge and identity.

The relationship between autobiographical memory and identity has been the source of considerable interest and debate among philosophers and researchers in cognitive and social psychology. Traditionally, researchers have emphasized the importance of episodic self-knowledge (i.e., one’s experiences over time) for the maintenance of self (e.g., Schacter, 1996; Tulving, 2002). However, as Klein (2001) argues, this may simply reflect a failure to investigate the contribution of personal semantic memory (i.e., factual knowledge about the self). In fact, there is evidence that extensive loss of episodic self-knowledge, as occurs in amnesia, need not result in identity loss (e.g., Klein, Rozendal, & Cosmides, 2002; Rosenbaum et al., 2005). This has led researchers to suggest that
Semantic self-knowledge may also have an important role to play in maintaining the integrity of self (see Klein, 2001; Klein Cosmides, Tooby, & Chance, 2002; Klein & Loftus, 1993). In this paper, we extend this argument by examining the relationships between these two forms of self-knowledge and identity strength. Specifically, based on previous findings, our analysis starts from the proposition that knowledge of personal semantic facts mediates the relationship between episodic self-knowledge and identity and we test this empirically in a sample of older adults living in the community and residential care.

Memory and identity

Most researchers agree that autobiographical memory has two components – episodic and semantic self-knowledge (e.g., Addis & Tippett, 2004; Baddeley, 1992; Kopelman, Wilson, & Baddeley, 1989, 1990). The former comprises knowledge of personally experienced events contextualized in time and place (Tulving, 1972). It supports our capacity to re-experience past events (i.e., to mentally time travel; Corballis, 2008; Suddendorf & Corballis, 2007; Tulving, 2002) and is a system that researchers believe is unique to humans, emerging comparatively recently in evolutionary terms from semantic memory. Semantic self-knowledge comprises facts and details about oneself (e.g., where you attended school, your first job) in the absence of the personal experiences from which they were abstracted and there is evidence that it is distinct from more generic semantic knowledge (i.e., general knowledge about the world, objects, words, etc; Klein, Cosmides, Costabile, & Mei, 2002; Klein, Rozendal, et al., 2002; Levine et al., 2004). Although all semantic self-knowledge is episodic in origin (e.g., remembering the time you fell from your bike during a race), over time personal facts from these episodes may be recalled in the absence of the original memory experience (e.g., I am a cyclist; see Squire & Zola, 1998).¹

There is perhaps greater debate regarding definitions of self or identity, as researchers tend to differ in their conceptualization of this construct as a function of their (meta)theoretical orientation. Some researchers focus on the importance of personal representations of self, focusing on aspects that are unique to a person (e.g., emphasizing notions of individuality, personality traits; e.g., Allport, 1924; Eysenck, 1953) to index personal identity strength (or knowing ‘who I am’). Such approaches, however, often fail to explain how knowledge about the self is derived. The approach advocated in the present paper emphasizes the social dimensions of identity, whereby personal identity strength and personally relevant knowledge is derived from the relationships we have with important social groups (e.g., family, community groups). This perspective asserts that we come to understand ourselves (e.g., to know that we are kind, friendly, but also irritable at times) primarily through our relationships with others. This reasoning is drawn from the social identity perspective (comprised of social identity and self-categorization theories; Tajfel & Turner, 1979; Turner, 1982; Turner, Oakes, Haslam, & McGarty, 1994), which emphasizes the importance of social groups in providing content and meaning to the self. According to this view, membership in social groups informs individual

¹It is important to highlight the fact that this process – via which semantic memories are abstracted and emerge from episodic memory – is different to that proposed in episodic memory theory in which it is claimed that episodic memory evolved from semantic memory at some point in human evolution (Tulving, 1985, 2001, 2002). The latter theory addresses the development of memory systems in an evolutionary context, whereas our focus in the present paper is on the interaction between these systems as they are played out within the minds of humans on a day-to-day basis.
cognition, emotion, and behaviour and group life is a primary source of self-knowledge (Jetten, Haslam, Pugliese, Tonks, & Haslam, 2010).

Interestingly, the former view, with its focus on personal trait knowledge, has tended to dominate research investigating relationships between autobiographical memory and identity in clinical populations (see Table 1). Aside from the fact that generating traits can be problematic in populations whose fluency is compromised (e.g., dementia sufferers), we argue that it is important to examine the multi-level nature of identity and, in that way, encourage a more comprehensive conceptualization of identity. Accordingly, we extend upon previous research by incorporating measures that tap a broader representation, or theory, of self, assessing both the strength of personal identity (see Iyer, Jetten, Tsivrikos, Postmes, & Haslam, 2009; Jetten et al., 2010) and the extent to which this is informed by social identity, or the affiliation that a person has with multiple social groups (see Brook, Garcia, & Fleming, 2008; Haslam et al., 2008; Iyer et al., 2009; Jetten et al., 2010).

**Episodic self-knowledge, semantic self-knowledge, and identity: Implications of their loss**

Philosophers (e.g., Grice, 1942; Locke, 1970) and psychologists (e.g., Addis & Tippett, 2004, 2008; Bluck & Alea, 2008; Klein, 2001) have argued that having an understanding of who one is requires access to memories and, in particular, those relevant to our personal experiences (i.e., episodic self-knowledge). Based on this view, one would predict that loss of episodic self-knowledge should result in loss of self. Yet clinical evidence does not support this prediction (also see Klein, 2001). As summarized in Table 1, there are numerous reports of individual patients who present with extensive loss of episodic self-knowledge, but still retain knowledge of who they are.

The findings from amnesic patients suggest that identity can be maintained provided there is some preservation of semantic self-knowledge. An example is provided by K. C. who was unable to recall a single episode from his past, but was able to recall some personal facts from earlier lifetime periods which may have supported his capacity to accurately rate past and present personality traits (Rosenbaum et al., 2005). Similarly, the data from Alzheimer patients suggests that identity loss occurs in the later stages of the disease when knowledge of personally relevant facts is compromised in addition to that for personally relevant experiences. This is illustrated by K. R. (Klein, Cosmides, & Costabile, 2003) and D. B. (Hehman, German, & Klein, 2005), both of whom showed preservation of trait knowledge but only for the period prior to disease onset.

Together, the body of patient data suggests that access to episodic knowledge may not be critical for the integrity of identity and that some semblance of self remains to the extent that semantic self-knowledge is preserved. Importantly, these findings do not alter the contribution of episodic self-knowledge, but merely highlight a role for personal semantics in identity maintenance.

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2While it is the case that some tests of personality traits, involving responses to ‘I am . . .’ statements (e.g., the Twenty Statements Test; Kuhn & McPartland, 1954), have been used to access the multi-level nature of identity, responses are difficult to code as it is not always clear whether the self provided is personal or social. More problematic for memory-impaired populations is the possibility that the measure taps aspects of the distant, and not current, self. Accordingly, for these populations, the measure is confounded by general cognitive ability and, more specifically, memory ability.
Table 1. Summary of research investigating relationships between episodic self-knowledge, semantic self-knowledge, and identity in patients with amnesia and dementia

<table>
<thead>
<tr>
<th>Authors</th>
<th>Case(s), pathology</th>
<th>Semantic self-knowledge: Measures and outcome</th>
<th>Episodic self-knowledge: Measures and outcome</th>
<th>Identity: Measures and outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCarthy and Hodges (1995)</td>
<td>PS, thalamic stroke</td>
<td>Ability to recall some personal semantic memories from earlier lifetime periods using AMI</td>
<td>Unable to recall a single autobiographical incident using AMI</td>
<td>Intact self-description from wartime navy-period</td>
</tr>
<tr>
<td>Klein, Loftus, and Kihlstrom (1996)</td>
<td>WJ, head injury</td>
<td>Not assessed</td>
<td>Impaired on the modified Crovitz-Schiffman cue word task</td>
<td>Preserved knowledge of personal traits using self-descriptive adjective ratings</td>
</tr>
<tr>
<td>Klein, Loftus, and Kihlstrom (2002) and Klein, Rozental, et al. (2002)</td>
<td>DB, anoxia due to cardiac arrest</td>
<td>Impaired recall of personal facts from the AMI</td>
<td>Unable to recollect any experience in response to Modified Crovitz-Schiffman task</td>
<td>Intact knowledge of personal traits in response to personality questionnaire</td>
</tr>
<tr>
<td>Klein et al. (2003)</td>
<td>KR, Alzheimer’s disease</td>
<td>Not assessed</td>
<td>Impaired, based on anecdotal report that ‘knowledge of her personal past is at best sketchy’</td>
<td>Preserved knowledge of personal traits using self-descriptive adjective ratings</td>
</tr>
<tr>
<td>Addis and Tippett (2004)</td>
<td>N = 20 early stage Alzheimer’s disease</td>
<td>Impaired knowledge of personal semantic memories, using AMI, relative to controls</td>
<td>Impaired knowledge of autobiographical incidents, using AMI, relative to controls</td>
<td>Significantly fewer trait judgments and responses to Twenty Statements Test (i.e., ‘I am…’) relative to controls</td>
</tr>
<tr>
<td>Authors</td>
<td>Case(s), pathology</td>
<td>Semantic self-knowledge: Measures and outcome</td>
<td>Episodic self-knowledge: Measures and outcome</td>
<td>Identity: Measures and outcome</td>
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<tr>
<td>Rosenbaum et al. (2005)</td>
<td>KC, head injury</td>
<td>Preserved knowledge of personal semantics from childhood and early adult life using AMI</td>
<td>Impaired knowledge of autobiographical incidents from all time periods using AMI</td>
<td>Preserved knowledge of past and present self-traits using self-descriptive adjective ratings</td>
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<tr>
<td></td>
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<td></td>
<td>Impaired recollection of past memories in response to Galton–Crovitz cue word task</td>
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<tr>
<td>Hehman et al. (2005)</td>
<td>PH, Alzheimer’s disease</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Self-recognition from photographs taken in period prior to disease onset</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Impaired recollection of past memories using the modified Crovitz–Schiffman cue word task</td>
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</tbody>
</table>

Note. AMI, Autobiographical Memory Interview.
Self-knowledge and identity

Models of memory and identity

So how are we to understand the interrelationships between identity and the two aspects of self-knowledge? Klein and colleagues (Klein, Cosmides, Tooby, et al., 2002; Klein & Loftus, 1993) offer one framework in their scope hypothesis. There are two critical aspects to their model – that knowledge about the self is represented in abstract form and may be functionally independent of the experiences that helped to embed them. In support of this, the authors have shown that inconsistent trait behaviours are more critical when it comes to understanding the scope of generalizations from which we base our trait summaries (Klein, Cosmides, Costabile, et al., 2002; Klein, Cosmides, Tooby, et al., 2002). Specifically, when asked to judge whether you are friendly, you draw on a trait summary and the extent to which this is truly representative will be determined by experiences that are inconsistent with this trait. There are also various sources of support for the functional independence of trait knowledge from episodic self-knowledge, most notably from KC, who was able to acquire trait summaries post-injury despite an inability to access episodic memories (Tulving, 1993).

In this way, the scope hypothesis essentially defines identity in terms of personality traits. However, there are two limitations with such an approach. First, there are other components of identity (see Klein, 2004; Klein, Rozendal, et al., 2002), including semantic self-knowledge, that require investigation. Second, in the course of collapsing these constructs it is difficult to investigate the interrelationships between them. To address this issue, Conway and colleagues (Conway, 2005; Conway & Pleydell-Pearce, 2000) offer another framework, the self-memory system (SMS), that separates episodic and semantic self-knowledge. The SMS has two components. The first is the working self, responsible for tracking and maintaining coherence between, short- and long-term goals. This is achieved through reference to the second component, the autobiographical memory knowledge base, which is a hierarchy of conceptual knowledge (from broad themes to lifetime periods to general events) that terminate in episodic memories. Conway (2005) argues these two components of the SMS interact in the process of remembering, but that they can also operate independently. The main aim of the SMS is to specify the processes involved in constructing and retrieving autobiographical memories regulated by the goal-driven working self.

Importantly, the interaction between the working self and autobiographical memory is predicted to be reciprocal, in line with the schematic model presented in a recent paper by Rathbone, Moulin, and Conway (2009). This model posits a bidirectional relationship between episodic autobiographical memory and the working self and between conceptual autobiographical knowledge and the working self. Unfortunately, though, the data on which the model is based do not speak to the issue of directionality and the model provides no explanation for the interrelationships between the constructs linking the two pathways. Nevertheless, the general view that self-influences memory and memory shapes our understanding of self is consistent with the wider cognitive literature. In particular, we know that reference to a person’s self-concept can influence, or cue, the personal experiences recalled (e.g., Humphreys & Kashima, 2002; Ross & Buehler, 1994; Sanitioso, Kunda, & Fong, 1990) but at the same time that personal experiences can alter a person’s self-concept (e.g., Wilson, 2000). Indeed, this interdependence between self and memory has been acknowledged for some time (e.g., Fivush, 1988; Schank & Abelson, 1994; Wilson & Ross, 2003; but also see the review by Libby & Eibach, 2007) and the dynamics of this relationship are coherently summarized by Tessler and Nelson (1994) who argue that ‘self and memory organize, construct and give meaning to each
other in a way so intimate that we can truly say that we are what we remember and that our memories are ourselves’ (p. 321). A more complete model therefore needs to account for the interrelationships between episodic self-knowledge, semantic self-knowledge and identity to establish how best to represent the bidirectionality.

**The self-knowledge and identity model**

As we have seen, existing models of the relationship between self and memory are either based on a limited conceptualization of identity (i.e., knowledge of traits largely to the exclusion of other components of self) or fail to adequately explain the interrelationships between variables and therefore do not help to articulate a testable model of bidirectionality. We address these limitations in the present research and offer a model that incorporates what we know about the basic relationships between episodic and semantic self-knowledge and identity. First, we hypothesize that the accumulation of personal experience (or episodic self-knowledge) supports integrity of self (H1). Second, as knowledge of personal semantics is abstracted from these experiences, we hypothesize that episodic self-knowledge supports semantic self-knowledge (H2). Third, we hypothesize that personal semantic memories will also enhance a person’s sense of identity (H3). The resulting model is represented schematically in Figure 1 and incorporates the additional hypothesis that the relationship between episodic self-knowledge and identity is mediated by semantic self-knowledge (H4). Put another way, this model suggests (a) that episodic self-knowledge supports a strong sense of self because it is the basis for the acquisition of personal semantic knowledge and (b) that it is development of this latter knowledge base that supports a sense of identity. Accordingly, it may not be knowledge of events from their past, but the factual knowledge that these events give rise to that allows people to know themselves.

Yet on its own, this mediation model fails to capture the previously reported bidirectional relationship between episodic self-knowledge and identity (e.g., Barclay & DeCooke, 1988; Conway, 2005; Rathbone et al., 2009; Robinson & Taylor, 1998). That is, while it is generally agreed that our experiences influence what we understand about the self, it is also the case that knowledge about the self can shape memory retrieval (e.g., Ross, 1989). Relating this to the above model, it could be argued that integrity of identity is associated with semantic self-knowledge (see Klein, 2001; Klein, Cosmides,

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**Figure 1.** The self-knowledge and identity model. Note. This figure presents a schematic representation of hypothesized relationships between episodic self-knowledge, semantic self-knowledge, and identity strength. In the primary model, episodic self-knowledge is a basis for semantic self-knowledge which supports identity strength. Lines in grey relate to a secondary mediational model in which these associations are reversed.
Tooby, et al., 2002), and through the latter mechanism, aids recollection of experiential (i.e., episodic) memories. Based on this reasoning, a person’s understanding of self (or their identity strength) might facilitate memories for particular events. This sequence is the reverse of the primary mediational model presented in Figure 1 and is indicated by the light grey arrows (where identity strength is the predictor variable and episodic self-knowledge is the outcome variable). These two paths are brought together in the self-knowledge and identity model (SKIM). This suggests a bidirectional relationship between identity and episodic self-knowledge within which semantic self-knowledge plays a key mediating role.

The present research
To examine this model, we conducted a study to test both the primary mediational model and the secondary reverse mediational model (together encapsulated in the SKIM) in a clinical sample. To this end, we assessed episodic self-knowledge, semantic self-knowledge, and identity strength in a sample of older adults living in the community and in residential care. Our measures of episodic and semantic self-knowledge were comprised, respectively, of the personal semantic and autobiographical incident components of the autobiographical memory interview (AMI; Kopelman et al., 1990). This allowed comparison with previous research that has explored the three constructs in which we were interested (see Table 1). However, our measures of identity differed in seeking (a) to capture a broader conceptualization of personal identity that goes beyond knowledge of personality traits, (b) to supplement measures of personal identity strength with measures that explored the social dimension of identity by assessing a person’s affiliation with multiple social groups, and (c) to avoid reliance on self-generation of responses which has been noted as a potential limitation in studies involving older adults with dementia (Addis & Tippett, 2004).

Our rationale for testing the mediational model with older adults was driven by two factors. First, memories from different lifetime periods (i.e., childhood, early adulthood, and recent life) are more extensive in older adults. Second, inclusion of older adults from the community and from residential care allows consideration of the model’s generalizability to participants with a range of cognitive abilities. Based on previous findings, we predict that greater integrity in episodic and semantic self-knowledge will be associated with greater identity strength. In testing the relationships between these three constructs, we predict that semantic self-knowledge will mediate both the relationship between episodic self-knowledge and identity strength and the relationship between identity strength and episodic self-knowledge. We also examined the correlates of memory and personal identity strength and of memory and multiple group membership. Here, we predict positive associations between variables whereby both aspects of identity (i.e., personal and social) would allow for, and be strengthened by, episodic and semantic self-knowledge.

Method
Participants
A total of 32 older adults residing in the south-west of England were recruited for this study. Seventeen were living in the community (9 male and 8 females, mean age = 81.18 years, range = 65–97 years) and 15 were living in residential care (6 male and 9 female,
mean age = 85.39 years, range = 74–99 years). These participants were recruited as part of a larger study investigating the effects of autobiographical memory and identity loss on well-being (see Jetten et al., 2010). Exclusion criteria included prior history of any psychiatric illness, significant language impairment, and poor comprehension.

**Procedure**

Ethical approval for the study was provided by the Psychology Ethics Committee at the researchers’ university. All participants were interviewed individually. During interview their general cognitive ability and memory was tested and additional information concerning identity was collected. Those residing in the community were recruited via the School of Psychology participant panel and interviewed in their home. Participants in residential care were recruited during coffee mornings with an advocate present (if required) and were interviewed in their own rooms. Allowing for regular breaks, the total duration of interviews was between 1 and 3 h, though only a portion of the data collected are reported in the present paper.

**Materials**

The AMI (Kopelman et al., 1990) was used to assess retrieval of semantic and episodic self-knowledge. Questions relevant to personal semantic memories involved retrieval of personal facts from a person’s past life (e.g., names of teachers, friends, school location). Those relevant to episodic memory (i.e., referred to as ‘autobiographical incidents’ in the test) involved retrieval of events or incidents from the past (e.g., recalling an incident from college or from a first job, with prompts such as ‘your first day at work’). In each domain, participants were required to retrieve memories from three lifetime periods – childhood, early adulthood, and recent life – with questions and prompts used to tap a range of memories across each period (e.g., for childhood memories, respondents were asked to recall memories from before school, their first school, and their main/secondary school). Responses were scored by two raters using the standard criteria and examples offered in the test, and this was also used to resolve any discrepancy between raters. This was particularly important for autobiographical incidents which were scored on a four-point scale. A score of 3 was assigned to memories that were specific in time and place; a score of 2 to less specific events in which either time or place was not recalled; a score of 1 for vague personal memories; and a score of 0 for either non-responses or a response based on general semantic knowledge. Data obtained from the overall measure included individual scores for each time period in each domain (score range = 0–21 for personal semantic memories and 0–9 for autobiographical incidents) and a total score for personal semantic memories (max = 63) and autobiographical incidents (max = 27). In both domains, a higher score indicates superior memory retrieval.

A questionnaire was administered in order to measure personal identity and social identity - the latter indexed through membership of multiple social groups. Items were read aloud by the interviewer and participants were asked to respond using a five-point scale ranging from 1 ‘do not agree at all’, to 5 ‘agree completely’. The five-point response scale was also presented visually on an A4 sheet to facilitate responding. Five items (α = .65) were used to assess the extent to which participants had a clear understanding of who they were, providing a index of personal identity strength (from Jetten et al., 2010). These items were adapted from the self-clarity scale developed by Campbell et al. (1996) and the personal identity strength scale employed by Baray, Postmes, and Jetten
(2009). These items were: ‘I know what I like and what I don’t like’, ‘I know what my morals are’, ‘I have strong beliefs’, ‘I know what I want from life’, and ‘I am aware of the roles and responsibilities I have in my life’. Three items assessed the extent to which participants belonged to multiple social groups, providing an index into their social networks. For each scale, responses were totalled and the average score recorded. These scales have been used widely in previous research (e.g., Jetten et al., 2010) and were found to have good reliability in a sample of stroke sufferers (Haslam et al., 2008) and among students entering university (Iyer et al., 2009). These items were: ‘I am a member of lots of different groups’, ‘I am active in lots of different social groups’, and ‘I have friends who are in lots of different groups’ (α = .84).

The Addenbrooke’s Cognitive Examination – Revised (ACE-R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006) was administered to provide a brief measure of general cognitive ability. It has previously been used to detect early stage dementia and examines five cognitive domains: attention/orientation, memory, verbal fluency, language, and visuospatial ability. The maximum score is 100 with higher scores indicating superior cognitive function. A cut-off score of 82/100 has been shown to have 84% sensitivity and 100% specificity in diagnosing dementia (Mioshi et al., 2006).

**Results**

Preliminary analysis revealed no differences between the community and residential care samples in age (t(30) = 1.3, p = .21) or gender (χ²(1) = 0.54, p = .46). However, as would be expected, there were differences in ACE-R scores (t(30) = −3.27, p = .003), such that those residing in care (M = 60.33, SD = 20.49) scored lower than those living in the community (M = 79.59, SD = 12.25).

Mean data for the autobiographical memory and identity measures are presented in Table 2. Analysis indicated that people residing in care retrieved fewer personal semantic and episodic (i.e., autobiographical incident) memories than those living in the community (semantic self-knowledge: F(1,30) = 35.91, p < .001; episodic self-knowledge: F(1,30) = 13.97, p = .001). There were no effects for time period, with

<table>
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<tr>
<th>Table 2. Mean scores and standard deviations for autobiographical memory and identity measures for participants (N = 32) residing in the community and in care</th>
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<tbody>
<tr>
<td><strong>Community</strong></td>
</tr>
<tr>
<td><strong>Autobiographical memory</strong></td>
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<tr>
<td>Personal semantic memories</td>
</tr>
<tr>
<td>Childhood</td>
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<tr>
<td>Early adulthood</td>
</tr>
<tr>
<td>Recent life</td>
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<tr>
<td>Autobiographical (i.e., episodic) incidents</td>
</tr>
<tr>
<td>Childhood</td>
</tr>
<tr>
<td>Early adulthood</td>
</tr>
<tr>
<td>Recent life</td>
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<tr>
<td><strong>Identity</strong></td>
</tr>
<tr>
<td>Personal identity strength</td>
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<td>Multiple group membership</td>
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</table>
recall being similar across childhood, early adulthood, and recent life periods (semantic self-knowledge: $F(2,29) = 2.4, p = .11$; episodic self-knowledge: $F(2,29) = 0.16, p = .86$). There were also no interactions between care level and time period (semantic self-knowledge: $F(2,29) = 0.70, p = .51$; episodic self-knowledge: $F(2,29) = 2.25, p = .12$). In the case of identity measures, we found differences in personal identity strength, with those in the community reporting a stronger self of self than those in care ($t(30) = 2.93, p = .006$), but no differences in social identity ($t(30) = 1.83, p = .08$).

**Correlations**

Partial correlations, controlling for general cognitive performance (i.e., ACE-R), were computed in order to explore relationships between memory and identity. First, we examined relationships between the personal semantic memories and autobiographical incident total scores and the two measures of identity, controlling for general cognitive ability (i.e., ACE-R scores). All variables were positively correlated, and the strength of all correlations was either moderate or strong as indicated in Table 3. This is particularly noteworthy in light of the different measures used to index each construct. Importantly, the relationship we predicted between personal identity and multiple (or social) group membership was significant and of moderate strength.

We were most interested in relationships between the particular lifetime periods and identity measures and for this reason we also report the correlations between memory and identity measures broken down as a function of childhood, early adulthood, and recent life (see Table 4). Of the two identity measures, personal identity strength was more strongly associated with autobiographical memory retrieval ($0.31 < r < 0.70$). Importantly, these associations emerged for knowledge of personal facts as well as for past events and involved all time periods, with the exception of recent episodic (i.e., autobiographical incident) memories. Previous research has only found an association between particular time periods (i.e., childhood and early adulthood; Addis & Tippett, 2004). In contrast, our findings indicate that the integrity of personal identity is related to the ability to retrieve semantic self-knowledge irrespective of the time period in which they were originally experienced. The relationships between social identity measures and autobiographical memory were weaker in comparison ($-0.03 < r < 0.43$), but again it was in the personal semantic domain that all time periods contributed to integrity of self as defined by multiple group membership.

As the correlational data showed that knowledge of personal semantics was more strongly associated with identity measures, we extended our analysis and conducted hierarchical regression to determine whether particular time periods, namely childhood

<table>
<thead>
<tr>
<th>Autobiographical incidents (total)</th>
<th>Personal identity strength</th>
<th>Personal identity strength</th>
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</thead>
<tbody>
<tr>
<td>.76**</td>
<td>.50**</td>
<td>.44**</td>
</tr>
<tr>
<td>Personal identity</td>
<td>.70**</td>
<td></td>
</tr>
<tr>
<td>Multiple group membership</td>
<td>.43**</td>
<td></td>
</tr>
<tr>
<td>Autobiographical incidents (total)</td>
<td></td>
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</tbody>
</table>

**p < .01; *p < .05 (two-tailed), N = 32.
Table 4. Partial correlations between autobiographical memory lifetime periods and identity measures, controlling for general cognitive performance (ACE-R)

<table>
<thead>
<tr>
<th></th>
<th>Personal identity strength</th>
<th>Multiple group membership</th>
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<tbody>
<tr>
<td><strong>Personal semantic memories</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childhood</td>
<td>.52*</td>
<td>.39*</td>
</tr>
<tr>
<td>Early adulthood</td>
<td>.62**</td>
<td>.41*</td>
</tr>
<tr>
<td>Recent life</td>
<td>.62**</td>
<td>.31*</td>
</tr>
<tr>
<td>Total</td>
<td>.70**</td>
<td>.43*</td>
</tr>
<tr>
<td><strong>Autobiographical (i.e., episodic) Incidents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childhood</td>
<td>.46*</td>
<td>.44*</td>
</tr>
<tr>
<td>Early adulthood</td>
<td>.41*</td>
<td>.30</td>
</tr>
<tr>
<td>Recent life</td>
<td>.31</td>
<td>-.003</td>
</tr>
<tr>
<td>Total</td>
<td>.50*</td>
<td>.30*</td>
</tr>
</tbody>
</table>

**p ≤ .01; *p ≤ .05 (two-tailed), N = 32.

and early adulthood – as suggested by previous research – were more critical to identity (Addis & Tippett, 2004). Using the procedure reported in Addis and Tippett (2004), ACE-R scores were entered into the first block to control for cognitive decline. This was followed by childhood and early adulthood components of personal semantic memories from the AMI in the second block. In the third block, the recent life component of personal semantic memories from the AMI was entered. These analyses were conducted separately for personal identity strength and multiple group membership. In the case of personal identity strength, we found that inclusion of the ACE-R produced a significant changeover a model containing the constant ($R^2_{change} = .32, F(1,30) = 13.83, p = .001$). The addition of childhood and early adulthood components resulted in a significant improvement in the model ($R^2_{change} = .27, F(3,28) = 13.17, p < .001$), as did inclusion of the recent life component ($R^2_{change} = .07, F(4,27) = 12.64, p = .03$). Hence, all time periods made a significant contribution to prediction of personal identity strength. In the case of multiple group membership, however, no time period made a significant contribution over and above the initial constant model. The model containing the ACE-R did not produce a significant change over that based on a constant ($R^2_{change} = .04, F(1,30) = 1.3, p = .256$), nor was there a significant change with inclusion of childhood and early adulthood components ($R^2_{change} = .18, F(3,28) = 2.63, p = .06$) or the recent life component ($R^2_{change} = .006, F(4,27) = 1.97, p = .13$).

Mediational analyses

To test the SKIM model proposed in Figure 1, in which the relationship between episodic self-knowledge (i.e., recall of autobiographical incidents) and identity is mediated by knowledge of personal facts (i.e., personal semantics), a series of regression analyses were conducted along lines recommended by Baron and Kenny (1986). Given its stronger association with the different components of the AMI, all analyses were undertaken including only the personal identity strength measure.

First, we found that episodic self-knowledge predicted personal identity strength, $\beta = 0.62, t = 4.35, p < .001$, suggesting that retrieval of more autobiographical incidents was associated with greater personal identity strength. Second, we examined the relationship between the predictor variable (episodic self-knowledge) and the mediator (semantic
self-knowledge). Again there was a significant positive relationship between these variables, $\beta = 0.78, t = 6.9, p < .001$; participants who retrieved more autobiographical incidents also recalled more personally relevant facts. A final step involved regressing identity strength on both the predictor variable and mediator. Results are presented in Figure 2a. In line with the requirements for mediation, we found that the previously significant relationship between episodic knowledge and identity strength (a) was rendered non-significant ($\beta = -0.013, t = -0.07, p = .94$) and (b) was significantly reduced (Sobel’s test $z = 3.12, p = .002$), while (c) the influence of personal semantics on identity strength was significant ($\beta = 0.81, t = 4.56, p < .001$). This finding is consistent with the suggestion that episodic knowledge contributes to identity strength because it provides the basis for the development of knowledge of personal facts from which a theory of self is formed.

We then tested the reverse mediation model in which episodic self-knowledge was regressed on both identity strength (the predictor) and semantic self-knowledge (the mediator; see Figure 2b). The regression revealed that the previously significant relationship between personal identity strength and autobiographical incidents was no longer significant ($\beta = -0.014, t = -0.07, p = .94$) and was also significantly reduced (Sobel’s test $z = 2.67, p = .007$). Thus, consistent with the second path outlined in the proposed bidirectional SKIM, semantic self-knowledge was found to mediate the relationship between personal identity strength and knowledge of past events. This finding is consistent with the suggestion that a strong sense of personal identity predicts superior recollection of episodic self-knowledge because it is associated with superior recall of personal facts.

In summary, our analysis suggests that knowledge of personal episodes leads to a strong sense of personal identity because that knowledge is a basis for awareness of personal facts (i.e., I have a strong sense of self because I remember what I did and therefore know facts about myself). Intriguingly, though, there is equally compelling evidence that a strong sense of personal identity leads to recall of personal episodes because it is associated with awareness of personal facts (i.e., I remember what I did because I have a strong sense of self and therefore know facts about myself).

**Discussion**

This study explored the relationship between episodic self-knowledge, semantic self-knowledge, and identity in older adults residing in the community and in care. Extending previous research, we incorporated measures that tapped both personal and social

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3Theoretically, there is no reason to expect that the predicted relationships between episodic self-knowledge, semantic self-knowledge, and identity strength would differ for the two populations. However, to explore this issue, we repeated the primary and reverse mediation analyses for each group separately. While some of the relationships were only marginally significant (due to low power) the same pattern of relationships emerged. Essentially, when personal identity strength was regressed on both episodic and semantic self-knowledge the previous relationship between episodic memory and identity was reduced (standard care: $\beta = 0.19, t = 99, p = .34$; community: $\beta = 0.37, t = 1.54, p = .14$) and the influence of semantic self-knowledge on identity strength was significant (standard care: $\beta = 0.74, t = 3.97, p = .002$; community: $\beta = 0.81, t = 7.88, p = .001$). Similar results emerged when examining evidence for reversed mediation. When episodic self-knowledge was regressed on both personal identity strength and semantic self-knowledge the relationship between identity strength and episodic self-knowledge was reduced in strength (standard care: $\beta = 0.44, t = 1.31, p = .18$; community: $\beta = 0.08, t = -0.302, p = .78$) and the influence of identity strength on episodic self-knowledge remained strong (standard care: $\beta = 0.38, t = 1.6, p = .06$; community: $\beta = 0.47, t = 2.06, p = .055$). For this reason, we report the collapsed data in the main text.
dimensions of identity. Results of correlational analysis revealed highly significant positive associations between semantic measures of autobiographical memory and personal identity strength. More interestingly, though, we found that semantic self-knowledge mediated the relationship between episodic self-knowledge and personal identity strength. This pattern is consistent with the suggestion that episodic self-knowledge contributes to personal identity strength because it provides the basis for semantic self-knowledge. At the same time, though, there was also support for a second mediational model in which these associations were reversed. This suggests that a strong sense of personal identity predicts enhanced episodic self-knowledge because it is the basis for superior semantic self-knowledge.

**Autobiographical memory and identity**

As reported in previous research, we found that both autobiographical memory components were associated with integrity of self (as indexed by personal and social identity measures), but mainly for personal semantic memories. Thus, poorer retrieval of semantic self-knowledge was associated with reduced identity strength. Extending previous findings, we found that this relationship emerged consistently across all time periods - childhood, early adulthood, and recent life - though results of hierarchical regression only confirmed this finding in the case of our personal identity strength measure. This finding is consistent with evidence that people experience a range of important identity-related transitions throughout the course of their lives, each of which has a significant bearing upon self-definition (e.g., Iyer, Jetten, & Tsivrikos, 2008; Sani, 2008). Nevertheless, it is at odds with previous claims that memories from childhood and early adulthood periods are distinctly self-defining (e.g., Addis &
Tippett, 2004; Fitzgerald, 1988, 1996, 1999; Holmes & Conway, 1999). Researchers have previously suggested that this time period (often referred to as the ‘reminiscence bump’) is when more stable identities are developed (Fitzgerald, 1988, 1996, 1999) and the interdependence between memory and identity seems to support the increased accessibility of autobiographical memories associated with these time periods.

It may be the case, of course, that the inconsistency between our findings, and those of previous studies reflects differences in samples and measures. In particular, some of the previous studies that investigated the reminiscence bump account were conducted with younger adults for whom recent memories were more temporally proximal to those from early adulthood. Such proximity also makes it more difficult to distinguish the contribution of memories from different time periods. In the particular case of Addis and Tippett’s (2004) sample (which had a similar age profile to ours), it is possible that the challenge of generating self-statements was responsible for the failure to observe stronger relationships between memory and identity across the life-span. This suggestion is lent some credibility by the results of a recent study reported by Rathbone et al. (2009). As with the present study, this indicated that self-defining memories were not isolated to the reminiscence bump period, but occurred across the life-span. These data, together with our own, suggest that identity processes (and not just temporal context) are critical to the organization of autobiographical memories.

Having found that all time periods in the personal semantic domain were associated with integrity of self, it is important to note that these patterns emerged on measures of both personal identity strength and multiple group membership. This confirms the value of exploring different levels of the self by examining not only personal identity, but also the social identities that inform and strengthen it. Accordingly, and in line with social identity reasoning, it would appear that memory is related to both personal and social aspects of the self. However, we need to acknowledge that while results of hierarchical regression supported the contribution of all time periods when predicting personal identity strength, lifetime period did not contribute to predicting social identity (or multiple group membership). It is likely that this reflects the different aspects of identity that these measures tapped and, even though multiple group membership seemed to inform personal identity, its association with the semantic components of autobiographical memory was clearly weaker.

**Semantic and episodic self-knowledge and identity**

Mediation analysis focused on the relationships between the components of autobiographical memory and personal identity strength. Results of this analysis showed that knowledge of personal semantics mediated the relationship between episodic self-knowledge and identity. Theoretically, this pattern is consistent with the suggestion (a) that episodic memories contribute to identity strength because they provide the foundation from which knowledge of personal facts are abstracted and (b) that it is this factual base from which a theory of self is supported. Importantly, this finding does not diminish the contribution of episodic self-knowledge to a person’s sense of self, as semantic self-knowledge is based on this. Thus, the analysis highlights the nature of the personal semantic contribution to identity in the context of accounting for knowledge of past events and episodes.

However, in addition to evidence that supported our primary mediation model, we also found that personal semantic memory mediated the reverse relationship between identity strength and episodic self-knowledge. This reverse model supports claims that
identity is a basis for memory as much as memory is a basis for identity (see Klein, 2001). Thus, results of the primary mediational analysis are consistent with the suggestion that one’s conscious memories of the past (i.e., autobiographical incidents) support one’s sense (or theory) of self (i.e., I know who I am because of what I remember); yet results of the second reversed mediational analysis suggest that one’s theory of self may also determine what one remembers (i.e., knowing who I am determines what I remember).

The fact that there was evidence for both primary and secondary mediational models therefore supports claims that there is a bidirectional relationship between episodic self-knowledge and identity. Along the lines of the SKIM presented in Figure 1, this suggest that these processes are cyclical in nature or involve feedback loops such that memory both shapes, and is shaped by, identity. This possibility has been alluded to in previous research (e.g., Barclay & DeCooke, 1988; Conway & Pleydell-Pearce, 2000; Robinson & Taylor, 1998) but has typically only been captured in simple bivariate correlations, not in mediation analysis of the form undertaken here. Having said this, there are limitations with an analysis of this form. While the analysis allowed us to test mechanisms through which episodic self-knowledge influenced identity, the data are correlational and cross-sectional and thus cannot inform us about causality. This should be addressed through experimental and longitudinal investigation of autobiographical memory and identity in dementia populations, and this sets an important agenda for future work in this area.

**Conclusion**

The present paper makes several important contributions to our understanding of the relationship between autobiographical memory and identity. First, it highlights the important contribution that *all* time periods (childhood, early adulthood, and recent life) make to integrity of self, and thereby challenges the suggestion that only particular developmental periods are self-defining. Second, it offers a novel perspective from which to understand the contribution that the two components of autobiographical memory make to identity – suggesting that semantic self-knowledge might play a mediating role in the relationship between memory for autobiographical incidents and a strong sense of self. At the same time, though, there was also evidence of a bidirectional relationship between episodic self-knowledge and identity. This suggests not only that memory influences what one understands about the self and hence the strength of one’s sense of identity, but also that a strong sense of identity is associated with enhanced understanding of the self and thereby shapes memory retrieval. To be is to know and therefore to remember; to remember is to know and therefore to be.

**Acknowledgements**

We are grateful to the staff and residents of Somerset Care Limited and to Age Concern for their help with this study. This research was supported by a grant from the Economic and Social Research Council (RES-062-23-0135).

**References**


*Received 27 October 2009; revised version received 24 March 2010*