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The Contributions of Autobiographical Memory to the Content and Continuity of Identity *A Social-Cognitive Neuroscience Approach*

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We are what we remember. (Wilson & Ross, 2003, p. 137)

It has long been thought that accessing, remembering, and reflecting on personal memories are key to forming a coherent sense of identity¹ and personal continuity (e.g., Locke, 1694/1970). As such, autobiographical memory (AM) makes a critical contribution to content and continuity of identity. The complexities of the relation between AM and identity, however, are far from understood. With the advent of social cognitive neuroscience, there has been an upsurge of research employing neuropsychological and neuroimaging methodologies. Neuropsychological approaches enable examination of the effects of AM loss on identity and have enabled examination of the contributions of different aspects of AM to identity. Typically, AM is broken down into personal semantic and personal episodic components, with the former consisting of facts about oneself and one's life and the latter, recollective memories about temporally specific events. It is likely these components contribute differentially to identity. Recent neuroimaging studies have attempted to uncover the neural correlates of self-related processing, and interestingly, these results show striking overlap with those regions engaged by AM retrieval. It is likely that certain structures within this network are critical to the integration of AM and identity, as suggested by studies investigating specifically retrieval of personally significant memories. In this chapter we review theories and neuropsychological studies examining the contributions of personal

semantic and personal episodic memory to the content and continuity of identity and review relevant neuroimaging research.

IDENTITY AND AUTOBIOGRAPHICAL MEMORY: COMPONENTS AND CHARACTERISTICS

Many philosophical and psychological conceptualizations of identity recognize AM as an important source of information about oneself and one's experiences. Although identity cannot be reduced to AM alone, memories provide the raw material from which identity is constructed (e.g., Fitzgerald, 1992). It is likely that AM contributes to different aspects of identity, including self-knowledge and self-narratives. *Self-knowledge* consists of abstract, conceptual information about the self, including self-identifications and self-perceptions, such as traits, personal scripts, and schemas (Conway, Singer, & Tagini, 2004; Klein & Loftus, 1993). In contrast, *self-narratives* are coherent stories about one's life experiences, integrating discrete personal events and providing coherent links between past and present selves (e.g., McAdams, 2001).

The *content* of identity is considered multidimensional, comprising information about the self in various domains. Debate exists, however, as to what particular partitions of identity exist. Some theorists divide identity into personal and social aspects, with the former being the part of identity unique to that person (e.g., traits and personal tastes), and the latter referring to information about social roles and group memberships (e.g., Turner, 1982). Others have partitioned identity spatially, with different identities for different contexts, different social relationships, and different social categories (Deaux, 1992; Wyer & Srull, 1989). Furthermore, identity can be broken down temporally, with different identities existing over the lifespan. At any one time, an individual has a past self, a present self, and a future or possible self (e.g., Markus & Nurius, 1986). Despite this multidimensionality, identity is perceived as a unified whole, as a result of interrelations between the different aspects of identity (e.g., Turner, 1982). This unification may be produced by some superordinate identity structure integrating lower level components of identity (Deaux, 1992). McAdams (1997) proposes it is an outcome of a process he terms "selfing," in which the identification of different experiences as being "mine" integrates different context-based identities and creates a sense of unity.

The integration of temporally partitioned identities (e.g., past, present, and future identities) is necessary to achieve an essential characteristic of identity: *continuity*. Erikson (1963, p. 261) claims that "inner sameness and continuity" are the sense of identity. It allows an individual to understand that despite changes in life circumstances and roles, he or she is essentially the same person he or she was in the past (Chandler & Lalonde, 1995). There is some debate as to the specifics of how past and present selves are linked to give a sense of continuity. These divergent ideas may in fact reflect the presence of different types of continuity. First, it has been argued that a connection between the present self and a discrete moment in the past, occurring when one remembers, may be sufficient to produce continuity

(i.e., psychological continuity theory; Parfit, 1984). It is likely that this process supports one kind of continuity—a “*phenomenological*” continuity—where one consciously experiences the self over time through the mental time travel accompanying the re-experiencing of past events (Tulving, 1985). Additionally, the complex tapestries of connections between past events and present selves comprising one’s life stories (McAdams, 2001) may provide a sense of “*narrative*” continuity. This arises from integration of various events and personal changes occurring over one’s life into a coherent story or narrative.

There is some debate as to which components of AM contribute to the content and/or continuity of identity. AM is considered divisible into personal episodic and personal semantic components (e.g., Kopelman, Wilson, & Baddeley, 1990), in line with Tulving’s (1972) episodic-semantic distinction. *Personal episodic memory* refers to the event-based component of AM, that is, memory for specific personally experienced events, including detailed contextual information about time and place. The retrieval of rich details provides a sense of re-experiencing that involves mental time travel of the self (also known as auto-noetic consciousness; Tulving, 1985). In contrast, *personal semantic memory* refers to personal information that is not event based and, as such, is associated with a feeling of “knowing” rather than remembering. This *noetic* form of memory is comprised of conceptual and abstract knowledge about oneself and one’s life, including facts about the self (e.g., where one went to school, names of friends), facts about specific events (i.e., the gist of an event with no recollective component), general events (e.g., events that are repeated or extended over time and thus lack temporal specificity), lifetime periods, and life story schema (Conway & Pleydell-Pearce, 2000). Both personal episodic and personal semantic memory contribute to the *content* of identity, as well as the sense of *narrative continuity*. However, it is likely that only personal episodic memory, with its qualities of auto-noetic consciousness and mental time travel, contributes to the *phenomenological continuity* of identity.

THE ROLE OF IDENTITY IN AUTOBIOGRAPHICAL ENCODING AND RETRIEVAL

Various lines of research have indicated the presence of an interactive relationship between AM and identity during the encoding and retrieval of AMs. Conway and Pleydell-Pearce (2000) propose that AMs are encoded and retrieved within a self-memory system. This system is emergent; it only exists when an AM interacts with a temporarily active representation of identity, the “working self,” the subset of self-schemas represented within long-term memory that are active within working memory at any one time. When this conjunction occurs, AMs are encoded and/or retrieved. As such, identity may influence both the encoding and retrieval of AMs. With respect to encoding, there is evidence to suggest that AMs are encoded with reference to the goals of the working self. Examination of AMs retrieved across the lifespan suggests that the majority of AMs encoded within a particular lifetime period correspond with the Eriksonian identity goal relevant at that age (Holmes

& Conway, 1999). Additionally, it has been noted that self-defining experiences, typically those events related to goal achievement or goal failure, result in the formation of highly vivid AMs (e.g., Pillemer, 1998). This corresponds to one of the major functions ascribed to AM in the self-memory system: a record of goal success or failure (Barsalou, 1988; Conway & Pleydell-Pearce, 2000). The working self can also influence the retrieval of AMs. For example, an individual will likely recall AMs that are congruent with the current goals of the working self, so that “what is remembered is accurate in the sense that narrative truth [of the self] is preserved” (Barclay & Smith, 1993, p. 236). Thus, either selection of AMs is constrained to those that do not contradict the working self, or AMs are distorted during reconstruction to become consistent with the self.

AM can, in turn, shape the working self such that the goals of the working self are based on information stored within AM (Conway & Pleydell-Pearce, 2000). Thus, one cannot hold a goal that is incongruent with one’s AM (e.g., a memory of the goal being achieved). In addition to influencing the information held temporarily within the working self, AM also contributes to the content of more permanent identity representations, such as self-knowledge and self-narratives.

CONTRIBUTIONS OF AUTOBIOGRAPHICAL MEMORY TO THE CONTENT OF IDENTITY

Social Cognitive Studies of AM and Identity

Memory of oneself and one’s life provides information from which one can derive a sense of identity. Barclay and Smith (1993) proposed that identity can be achieved through the process of “self-composition”—using and reinterpreting AMs in the construction of personal narratives. Both the personal episodic and personal semantic components of AM likely contribute complementary information to identity, although in the case of trait self-knowledge, there is some debate as to whether one form of AM plays a dominant role. Behavioral exemplar theory (e.g., Bower & Gilligan, 1979) posits that trait self-knowledge depends on, and is inseparable from, specific “exemplars” of trait-related behavior stored in personal episodic memory. Indeed, it has been observed that individuals often refer to specific incidents when discussing trait self-knowledge (Bower & Gilligan, 1979). Accordingly, trait judgments (e.g., rating a trait for self-descriptiveness) would require one to retrieve relevant behavioral exemplars and evaluate how similar these are to the trait in question.

In contrast, Klein and colleagues (Klein, Babey, & Sherman, 1997; Klein & Loftus, 1993) propose that trait self-knowledge is independent of behavioral exemplars. Rather, information about traits is abstracted from such exemplars and stored in an abstract, summary form (Klein & Loftus, 1993), likely within personal semantic memory. Thus, making trait judgments should rely on trait summaries and not require retrieval of episodic memories exemplifying behavior. Access of trait self-knowledge can therefore be viewed as independent of personal episodic memory (Klein et al., 1997). Evidence supporting these hypotheses includes the finding that in a conceptual priming paradigm, rating a trait for self-descriptiveness did

not reduce response latencies in a subsequent behavioral exemplar retrieval task any more than simply defining the trait (Klein & Loftus, 1993). Thus, as the self-descriptiveness task did not provide additional priming for the exemplar retrieval task over and above the trait definition task, it was concluded that behavioral exemplars were not activated during, and are not necessary for, the completion of the self-descriptiveness task.

Neuropsychological Studies of AM and Identity

Although overall the findings of social cognitive studies suggest that accessing trait self-knowledge in personal semantic memory does not require activation of exemplars, it does not rule out interactions between personal semantic and personal episodic memory. Neuropsychological investigations of individuals with damage to either personal semantic or personal episodic memory, however, provide an opportunity to investigate the independent contributions of these memory systems to self-knowledge. There are a number of studies documenting changes or loss of identity, self-awareness, and self-recognition in patients experiencing AM deficits (e.g., Hehman, German, & Klein, 2005; Mills, 1998; Orona, 1990). Using this approach, it has been demonstrated that individuals with impaired personal episodic memory can still access trait self-knowledge. For instance, Klein, Loftus, and Kihlstrom (1996) obtained trait-descriptiveness ratings from patient W.J. during a period of amnesia for personal episodes from the previous 7 months. These ratings were highly consistent with W.J.'s later ratings made once the amnesia had resolved. This suggests that even though access to personal episodic memory was impaired during the amnesic period, W.J. could still access trait self-knowledge. It is possible, however, that the ratings made at both time points were based on earlier personal episodic memories not affected by the amnesia. Interestingly, Tulving (1993) found that K.C., a patient with lifelong amnesia for personal experiences, was able to make trait judgments that were highly consistent with how his mother rated him on the same task.

Another approach to this question is to investigate whether trait self-knowledge can be acquired in the absence of AM. Klein, Chan, and Loftus (1999) examined the ability to make trait judgments in patient R.J., a young adult with autism and a developmental episodic amnesia. Although his retrieval of personal episodes was significantly impaired, R.J.'s self-descriptiveness ratings for various traits correlated strongly with those made by his mother, indicating he was able to rate his traits reliably and accurately. This suggests that one does not need to be able to encode or access memories of behavioral exemplars in order to accrue abstract summaries of trait self-knowledge. Other patients appear unable to acquire and update their trait self-knowledge. For instance, Klein, Cosmides, and Costabile (2003, p. 157) report the case of a patient with personal semantic and personal episodic memory deficits whose trait self-knowledge is "out-of-date." Patient K.R.'s self-descriptiveness ratings of traits were strongly correlated with her daughter's ratings of her personality *before* the onset of dementia, but not her daughter's ratings of her *current* personality. This suggests that when AM is significantly impaired one may rely on premorbid trait self-knowledge for a sense of identity.

Klein, Rozendal, and Cosmides (2002) also investigated whether the ability to make trait judgments is affected by deficits in personal semantic memory. Patient D.B. showed preserved access to trait self-knowledge, despite significant deficits in personal episodic and personal semantic memory. Although Klein et al. argue this suggests that trait self-knowledge exists independently of personal semantic memory, perhaps as a special class of semantic memory, it is important to note this patient's personal semantic deficits affected primarily the past decade. As such, his preserved access to trait self-knowledge suggests that it may be possible to make fairly accurate trait judgments based on personal semantic memory from earlier lifetime periods.

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A recent study of the integrity of AM and identity in Alzheimer's disease provides further neuropsychological evidence to support the idea that the content of identity depends on *both* personal semantic and personal episodic memory (Addis & Tippett, 2004). This study examined whether changes in identity (e.g., the strength, quality, complexity, and direction of identity) correlated with the loss of personal episodic and personal semantic memory. In these correlational and hierarchical regression analyses, the level of global cognitive decline (i.e., performance on the Mini Mental State Examination) was partialled out, ensuring that significant correlations were not simply related to global changes affecting performance on both AM and identity tasks (e.g., attention). A number of changes in identity were found to be related with AM loss. First, patients generated fewer statements about their identity (on the Twenty Statements Test), indicative of a reduction in strength of identity. This aspect of identity correlated positively with, and was predicted by, the ability to recollect both personal semantic and personal episodic memories from childhood and early adulthood AMs, suggesting that both personal episodic and personal semantic memory contribute to identity. Additionally, the identity statements generated by patients were more abstract in quality than those produced by controls (Addis & Tippett, 2004), with patients providing fewer specific, qualifying details (e.g., "I am kind" versus "I am kind to my mother"). Retrieval of personal episodic memories from childhood correlated with, and predicted, this quality of identity. In other words, loss of personal episodic memory impaired the ability to access details about oneself and one's traits and resulted in a more abstract sense of identity. This finding is consistent with the major premise of the behavioral exemplar theory (Bower & Gilligan, 1979), that the content of identity is derived from personal episodic memories.

Data from the self-descriptiveness ratings on the Tennessee Self Concept Scale also suggested differences in the quality of identity (Addis & Tippett, 2004). Again, identity in patients was more abstract, with fewer definite responses (*always yes* and *always no*) and more vague responses (i.e., *partly false and partly true*) than controls. Interestingly, the use of definite responses correlated with performance on AM measures, although, unexpectedly, in a negative direction. That is, poorer recall of childhood and early adulthood personal semantic memory was related to a higher frequency of definite responses. Addis and Tippett speculated that this may reflect a change in the balance of the contributions of personal semantic and personal episodic memory to identity in AD. In an individual with intact AM, abstract summaries in personal semantic memory contribute to the overview of

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oneself in a variety of incidents, whereas personal episodic memory may provide the specific details of one's identity. Thus, one can make definite statements about him- or herself based on inspection of both personal semantic and personal episodic memories. If these abstract summaries are degraded, there will likely be an overall effect of reducing the number of definite (or certain) statements. However, if personal semantic deficits are severe such that abstract summaries are lost, it is possible that identity will be based on a single relevant personal episode, if available. This would result in the more frequent use of extreme "always" or "never" responses. In summary, this pattern of findings suggests that both behavioral exemplars and abstract summaries contribute to identity.

The Role of Early Adulthood AMs in Identity

When considering the aspects of AM contributing to identity, it may be that the most important distinction is not whether memorial information is personal semantic or personal episodic in nature, but rather the lifetime period from which it comes. Fitzgerald (1992) argues that AMs from late childhood and early adulthood are linked with identity. This is hypothesized to underlie the presence of a reminiscence bump, the overrepresentation of AMs recalled from early adulthood (i.e., 16–25 years) evident when retrieving AMs from across the lifespan. The intense self-oriented activity of forming a stable identity during early adulthood is thought to result in vivid AMs, which serve as benchmarks in the organization of one's identity. Moreover, if one's identity remains stable throughout adulthood and identity guides the recall of AMs (Conway & Pleydell-Pearce, 2000), it is possible that self-defining adolescent AMs may be more available for recall because they link directly with the identity representations influencing recall (Fitzgerald, 1996). Work from Conway and colleagues lends support to this hypothesis. Holmes and Conway (1999) investigated whether the lifespan distribution of AMs corresponds to specific Eriksonian identity stages. The major developmental "task" of adolescence is to form a sense of identity, in particular a "generational identity" where an individual becomes integrated with society. However, in early adulthood this is superseded by the need to form a personal relationship identity. Their study revealed that the reminiscence bump for AMs with generational content peaked in the 10 to 19 decade, while for AMs with relationship content the bump peaked in the 20 to 29 decade. This supports further the association between the reminiscence bump and identity goals (Fitzgerald, 1992).

By this account, loss of late childhood and early adulthood AMs should have a greater impact on the integrity of identity. Indeed, Addis and Tippett (2004) found evidence to support this hypothesis in their study of AM and identity in Alzheimer's disease. The strength of identity (i.e., the number of responses an individual could generate in response to the question "Who am I?") was significantly correlated with, and predicted by, the ability to retrieve personal episodic and semantic AMs from childhood and early adulthood. Thus, the more severely impaired childhood and early adulthood AMs, the weaker the strength of identity. Additionally, as previously discussed, AMs from childhood and early adulthood also predicted whether the quality of one's identity would become more abstract (i.e., lacking in

detail) or more extreme (i.e., expressed in terms of “always” or “never” responses). In light of the idea that AMs from late childhood and early adulthood make the most important contributions to identity, it is not surprising that impairments of AMs from this “bump” period weaken the strength of identity and deplete its richness of detail. In direct contrast, patients with episodic memory impairments that do not encompass early adulthood memories show remarkable sparing of the ability to access identity. For instance, amnesic patient D.B. remained able to make accurate and reliable self-descriptiveness ratings on a trait judgment task (Klein et al., 2002), likely on the basis of his preserved early adulthood AMs.

CONTRIBUTIONS OF AUTOBIOGRAPHICAL MEMORY TO THE CONTINUITY OF IDENTITY

Evidence from cognitive and neuropsychological studies suggests that both personal episodic and personal semantic memory contribute to the content of identity. Another role AM plays in identity is providing a sense of continuity of self over time (e.g., Parfit, 1984; Schechtman, 1994), an essential quality of identity. It is likely that continuity can be experienced in both a narrative and a phenomenological manner, and that personal episodic and personal semantic memory makes differential contributions to both types of continuity. First, a sense of the continuing self can be conveyed through personal narratives that highlight ongoing themes and related experiences (McAdams, 2001; Schechtman, 1994). As such, various forms of information represented in personal semantic memory are essential to the construction of narratives, including lifetime periods and themes, general events (repeated and extended events), and self-knowledge (Conway & Pleydell-Pearce, 2000). Further, narratives provide a coherent integration of the changes and developments that occur over the course of one’s life. Markus and Nurius (1986) propose that this is a function of changes being integrated into identity as a “possible self” that always existed as part of one’s identity. Habermas and Paha (2001) explain that various linguistic features used within self-narratives reveal the ways in which continuity and coherence are achieved. For instance, individuals typically compare their past and present selves, conveying information regarding development of a continuous self. Furthermore, individuals often make causal links between self-developments and personal experiences represented in their AM and narratives. Self-continuity is facilitated by information about personal developments and achievements and by viewing one’s past selves as less developed versions of the current self (Ross & Wilson, 2003; Skowronski, Walker, & Betz, 2004). Skowronski and colleagues propose that the temporal knowledge and organization of AMs, in particular, provide information about growth over time. Personal episodic memory may also contribute to this narrative form of continuity, not only by providing details regarding personal events, but also by enabling what Conway and colleagues (2004) term a “grounding” of the self. Retrieval of episodic memories allows one to contextualize various periods of one’s life story with the events comprising that lifetime period. Furthermore, interactions between the self and AMs enable one to exemplify a

belief held within self-knowledge with the original memorial data that contributed to this identity content. This grounding process enables a sense of the self over the span of one's autobiography.

Individuals can also have a phenomenological experience of their continuity. The act of retrieving a personal episodic memory produces a recollective experience, which is, inherently, the experience of the self over time. This kind of remembering involves mental time travel and the auto-noetic awareness that one is retrieving an AM of an event they themselves experienced in the past (Tulving, 1985). In particular, retrieval of sensory-perceptual details, feelings, and thoughts fosters an awareness that this event belongs to one's own past (Johnson, Foley, Suengas, & Raye, 1988). The rememberer can then confirm he or she is the same person who experienced the event in the past. Mental time travel not only allows the present to be perceived as a continuation of the past, but also facilitates projection of the self into the future: anticipation of future events and imagination of possible selves. Interestingly, Tulving (1985) observed that with dense autobiographical amnesia, patient K.C. was not only unable to recollect any personal episodes, but also completely incapable of imagining his future. This suggests that K.C. may also be unable to experience a phenomenological sense of continuity.

The consciousness of the self over time inherent in phenomenological continuity clearly distinguishes it from narrative continuity. Although it is argued that personal episodic memory may contribute to life stories and thus narrative continuity, for example, grounding the self in specific exemplars, it is unclear whether the creation of narratives *requires* the recollection of past experiences. The conceptual and story-like nature of narratives suggests their construction relies heavily on personal semantic memory, and that personal episodic memory may not be essential to this process. If this is the case, it can be predicted that individuals with personal episodic amnesia can still have a sense of personal continuity, on the basis of narratives comprised from personal semantic memory. However, if these individuals cannot access any personal episodic memories (e.g., K.C.; Tulving, 1985), it is then unlikely they will experience a phenomenological sense of personal continuity; the contribution of AM to this form of continuity rests with personal episodic memory. Oftentimes, however, deficits in these patients are not "all-or-none." Some patients can recollect a limited number of episodic memories (e.g., patient **Jon**; Maguire, Vargha-Khadem, & Mishkin, 2001) and therefore are likely to have some level of phenomenological continuity, although this may be temporally "patchy." Further research is needed to delineate empirically narrative and phenomenological continuity and the relevant contributions of personal semantic and personal episodic memory.

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NEURAL SUBSTRATES OF THE SELF AND AUTOBIOGRAPHICAL MEMORY

Recently, a number of studies have investigated the neural substrates of self-related processing, including self-reflection tasks, self-referential encoding, and trait judgments. Interestingly, the regions engaged by self-processing show remarkable

overlap with some of the regions activated consistently by AM retrieval (Addis, 2005). This is not entirely surprising, however, given the relation between AM and identity. In a recent review, Northoff and Bermpohl (2004) note that self-related processing tends to be mediated by cortical midline structures, including medial prefrontal cortex (PFC), dorsomedial PFC, and anterior and posterior cingulate. With respect to the representation of self and identity and the integration of this with memory, medial PFC and posterior cingulate are particularly relevant. Medial PFC is thought to mediate self-schemas and self-awareness (Conway & Pleydell-Pearce, 2000; Northoff & Bermpohl, 2004), and damage is associated with deficits in self-awareness (Stuss, 1991), self-schemas (Vogele, Kurthen, Falkai, & Maier, 1999), and the ability to make decisions in line with the goals of the self (Bechara, Damasio, Damasio, & Anderson, 1994). Neuroimaging studies show engagement of left medial PFC when recognizing one's own face (relative to seeing an unknown face), but not when recognizing one's partner's face (Kircher et al., 2001). Self-referential tasks, such as rating adjectives for self-descriptiveness, are associated with increased medial PFC activity relative to judgments about how adjectives describe others (Kelley et al., 2002), semantic judgments (e.g., semantic validity of statements; e.g., Johnson et al., 2002), or perceptual judgments (e.g., syllable judgments; Craik et al., 1999). Activation of the left medial PFC has been shown consistently during the retrieval of AMs, in contrast to retrieval of other types of episodic memory (e.g., laboratory-based episodic tasks such as word list retrieval; Gilboa, 2004). Additionally, directly contrasting activity associated with retrieval of personal semantic and personal episodic memory has revealed that the left medial PFC is preferentially engaged by personal episodic retrieval (Maguire et al., 2001). This may reflect the role of the PFC in auto-noetic awareness of the self over time (Wheeler, Stuss, & Tulving, 1997), a characteristic unique to the recollective retrieval of personal episodic memory rather than self-relevant information in general. Wheeler et al. argue that mental time travel depends on the PFC, and that development of this region in children parallels their development of auto-noetic awareness and AM.

The posterior cingulate is another region active during the performance of tasks involving self-related processing (e.g., Johnson et al., 2002; Kelley et al., 2002), and Northoff and Bermphol (2004) posit this may reflect integration of knowledge about the self with other information. This region (and the adjacent retrosplenial cortex) is thought to also integrate memory with other types of information, including emotional (Maddock, 1999) and visuospatial information (Maguire, 2001). Furthermore, this region is robustly active during the retrieval of AMs (Addis, 2005; Maguire et al., 2001). Johnson et al. (2002) attempted to isolate self-reflective processes during the retrieval of AMs. They required participants to judge statements for self-descriptiveness within 2 seconds, based on the assumption that this was too short a time window for successful retrieval of a specific AM. Thus, even though AMs were not likely fully retrieved during this time window, posterior cingulate cortex was strongly activated across all participants. Given the connectivity of the posterior cingulate/retrosplenial region with medial PFC and medial temporal lobes (Maguire, 2001), it is well positioned for integration of self and memory. Additionally, Fink and colleagues (1996) observed engagement of

the right temporal pole during the retrieval of emotional AMs. They posit that this activation is related to the representation of self and taking a self-perspective while remembering episodes.

Recently, Addis (2005) investigated the neural correlates of personally significant AMs, and notably, the level of personal significance correlated with the engagement of the left medial PFC, right temporal pole, and posterior cingulate/retrosplenial cortex. Additionally, connectivity analyses revealed that these regions are central to the neural network supporting the retrieval of personally significant AMs, and distinguish this network from those supporting retrieval of detailed and emotional AMs. These results, together with other relevant findings from the literature, suggest that the contributions of left medial PFC, right temporal pole, and posterior cingulate, and the interactions between these regions, are important to the integration of AM and self.

CONCLUSIONS

In this review, it is apparent that both personal semantic and personal episodic memory contribute to the content of identity. Although the picture is complex, these studies have elucidated some of the characteristics of this interaction, for example, that trait self-knowledge can be accessed even when personal episodic memory is deficient. Furthermore, both components of AM contribute to the sense of continuity of the self over time. However, narrative continuity depends more on personal semantic memory, while phenomenological continuity requires the recollective and auto-noetic remembering of the self in the past that accompanies retrieval of personal episodic memories. The social cognitive neuroscience approach can make unique contributions to understanding how AM and identity interact. First, neuropsychological cases enable examination the independent contributions of different AM components to the ability to form and access current information about identity. Second, neuroimaging studies have begun, and will continue, to highlight neural regions and networks recruited during completion of both AM retrieval and self-related processing.

NOTE

1. Note that although the terms “self” and “identity” are often used interchangeably in the literature, we define identity as one aspect of the broader concept of self (e.g., Fitts, 1965; George, 1990).

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