Published in final edited form as:
Cogn Behav Neurol. 2013 June ; 26(2): 85–92. doi:10.1097/WNN.0b013e31829c671d.

Suicidal Behavior and Loss of the Future Self in Semantic Dementia

Julia J. Hsiao, DO[1,2], **Natalie Kaiser, PhD**[2], **Sylvia Fong, MA**[2], and **Mario F. Mendez, MD, PhD**[1,2,3]

[1]Department of Neurology, David Geffen School of Medicine, University of California at Los Angeles

[2]Neurobehavior, V.A. Greater Los Angeles Healthcare Center, Los Angeles, California

[3]Department of Psychiatry & Biobehavioral Sciences, David Geffen School of Medicine, University of California at Los Angeles

Abstract

Semantic dementia impairs semantic autobiographical memory, but tends to spare its episodic components that are critical for the sense of self. Investigators have recently discovered disturbances in the "future self" in semantic dementia. We report a 63-year-old man with semantic dementia who was hospitalized after suicide attempts that he attributed to his loss of a sense of future self. He complained of a decreased sense of being human, because he could not imagine doing things in the future that he had done in the past. Suicidal thinking and inability to place himself in future tasks persisted despite resolution of depression. Clinical assessment revealed a crossmodal loss of semantic knowledge, and neuroimaging showed bilateral anterior temporal atrophy and hypometabolism. On specific tests of autobiographical memory, identity, attribute knowledge, and future projection, the patient could return to the past and visualize himself in familiar scenarios, but he could not visualize himself even passively in these scenarios in the future. His future self was impaired not from seeing himself disabled; it was from an absence of semantic details of potential experiences, associated with impaired semantic autobiographical memory. His self-representations were concrete and specific rather than abstract and generalizable. This patient and recent publications indicate that semantic dementia impairs the ability to imagine oneself as capable in the future, leading some patients to suicidal behavior. We discuss possible mechanisms for these findings, including the potential role of abstract construals for future thinking.

Keywords

semantic dementia; memory; autobiographical memory; self; identity

Correspondence and reprint requests: Mario F. Mendez, MD, PhD Neurobehavior, Building 401 VA Greater Los Angeles Healthcare Los Angeles, CA 90073 phone 310 794-1195 mmendez@UCLA.edu.

The authors declare no conflicts of interest.

After reading this article, the reader will understand the role of future projection in the concept of "self," using semantic dementia as the model.

Semantic dementia (SD) is a neurodegenerative disorder characterized by a progressive loss of the meaning of words, perceptions, and concepts. SD is caused by disease in the anterior temporal lobes, and is 1 of the frontotemporal lobar degenerations with ubiquitin-positive pathology on autopsy (Hodges et al, 2010; Kertesz et al, 2010). [1,2] Clinically, patients with SD have fluent speech but impaired word comprehension and evidence of crossmodal impairment in semantic knowledge. Although SD impairs semantic aspects of autobiographical memory (ABM), some prior investigations suggested that patients with SD are not susceptible to impairments in the sense of self because of relative sparing of their episodic ABM (Bozeat et al, 2002; Giovannetti et al, 2006; Miller et al, 2001; Westmacott and Moscovitch, 2003). More recent investigations, however, indicate that the self is vulnerable in its future projection (Duval et al, 2012; Irish et al, 2012).

The concept of self is multifactorial. First, the sense of self depends on memory. It requires "identity," or self-representations that originate from both episodic and semantic ABM (Klein and Gangi, 2010). The sense of self is disturbed in individuals who have impaired episodic ABM, such as those with Alzheimer disease, who cannot recall the personal experiences that helped construct their identity (Addis and Tippett, 2004; Kalenzaga et al, 2012). [3,4] Second, the sense of self depends on a subjective feeling of continuity of one's identity over time, ie, "seeing" oneself as the agent both in the past and on into the future. The mental re-enactment of past personal events (autonoetic consciousness) depends on episodic ABM but is relatively independent of semantic ABM (Gardiner, 2001). In contrast, mental self-projection into the future appears to depend on both episodic and semantic ABM; hence, the future self could be particularly disturbed in SD, with its greater impairment of semantic memory (Duval et al, 2012).

We report a patient with SD who had made multiple suicide attempts, partly because he could not confidently project his identity— his "self"—into the future. In addition to routine neuropsychological testing, we gave the patient 5 tests to evaluate different aspects of the sense of self, including ABM, structured and unstructured assessments of identity, knowledge of attributes or traits, and future self-projection. This case report emphasizes the clinical significance of alterations of concepts such as self in neurologic disease.

CASE REPORT

A 63-year-old right-handed man was admitted to the psychiatry service at VA Greater Los Angeles Medical Center after attempting suicide by medication overdose. The patient had deliberately bought and swallowed bottles of acetaminophen and diphenhydramine, trying to kill himself.

The patient had at least a 5-year history of SD, with progressive difficulty comprehending words and understanding the meaning of things. His diagnosis of SD had been established through his primary loss of semantic knowledge despite otherwise intact memory and language testing, and through a finding of anterior temporal lobe atrophy on neuroimaging. He had been evaluated for difficulty naming objects and faces, and had become quite impaired in instrumental activities of daily living. He had previously served in the Air Force and worked as a sailor, bartender, and driver, living for a while in Hawaii. At the time of this admission, he had been unemployed for 4 years and had been living with his brother in Los Angeles.

The patient had come to feel that his disease had "robbed him of his brain." He described this as a loss of knowing how to do things in the future that he could do in the past. His inability to visualize himself participating in activities that he used to do left him feeling empty and unable to imagine his future. According to the patient, this inability to see himself

in the future caused him to feel hopeless and depressed. In fact, his Geriatric Depression Scale (short form) score—7 out of a possible 15—was in the depressed range (Yesavage et al, 1982). He had tried to end his life on several occasions. Past attempts had included other overdoses and 1 attempt to hang himself.

Throughout his hospitalization and despite successful treatment of his clinical depression, the patient remained consumed by his inability to place himself in future activities, and he continued to speak of this as the reason for wanting to end his life. During interviews, he made comments such, as “What can I do without a brain?,” “What am I going to do for the rest of my life?,” and “How would I live without a mind?” He was particularly distressed over his inability to see himself performing any of his prior jobs. Further, he could not picture himself continuing to do some things that he was still capable of doing, like taking walks and simple cooking, and he could not see himself in the future passively standing or watching familiar scenes or activities. Still, he could see himself performing other activities, particularly piecing together jigsaw puzzles and playing certain computer games. These were the main activities on which he spent his time during his hospital stay.

On neurologic examination on admission, his most prominent deficit was a severe anomia, including items such as “watch band,” “collar,” and “apple.” When asked about the words that he had missed on the test, he did not comprehend them. For example, he could not say what an apple is or looks like. Moreover, his deficits extended to difficulty with semantic knowledge of the subordinate aspects of items, ie, he generalized items into broad superordinate categories such as “something with 4 legs” for “horse.” The rest of his neurologic examination was normal, including cranial nerves, gait, motor, reflex, and sensory exam.

Magnetic resonance imaging showed anterior temporal atrophy (Figure 1), and positron emission tomography imaging confirmed corresponding anterior temporal hypometabolism.

The patient underwent neuropsychological mental status tests including the Mini-Mental State Examination (Folstein et al, 1975), the California Verbal Learning Test (Welsh et al, 1994), and tests from the Consortium to Establish a Registry in AD (Welsh et al, 1994). We gave him a speech fluency test modified from the Western Aphasia Battery (Shewan and Kertesz, 1980), and a calculations test modified from Kiernan’s (1987) Neurobehavioral Cognitive Status Examination. We gave him a visuospatial construction test evaluating his ability to copy a circle, rhombus, overlapping rectangles, and a cube; for the cube, we evaluated figure closure for 3-dimensionality, parallel opposite sides, correct internal lines, and frontal face orientation. A perfect score on this test is 12. We evaluated his limb praxis by testing his ability to perform 4 transitive and 4 intransitive ideomotor tasks with each of the right and left upper extremities. We gave him the Frontal Assessment Battery (Dubois et al, 2000), which assesses executive abilities.

In addition, we gave him these 5 specific tests of ABM, identity (structured and unstructured tests), knowledge of identity traits, and future self-projection:

Autobiographical Memory Interview

ABM—memory for personally relevant information—includes both episodic memories (personally experienced incidents) and semantic memories (knowledge of personal facts and their meaning). The Autobiographical Memory Interview (Kopelman et al, 1989) assesses both types of memory across 3 broad lifetime periods: childhood, early adult life, and recent adult life. The Interview includes 10 questions (3 for the Autobiographical Incidents Schedule and 7 for the Personal Semantic Schedule) for each of the 3 lifetime periods. Scores reflect how specifically the person can recall personal details of an experience, with 0

indicating no specificity and 3 indicating the ability to describe events from a discrete time and place. The Interview has high inter-rater reliability and validity.

Aspects of Identity Questionnaire-IV

This structured measure of identity assesses the characteristics that individuals value as being important to their "self" (Cheek et al, 2002). The Questionnaire is a 45-item objective inventory that measures 4 identity orientations in individuals' self-concepts: (1) personal psychological traits and values, (2) relational identity (how they see themselves in relationships with those close to them), (3) social or more general interpersonal contexts, and (4) collective or group identities.

Twenty Statements Test

Because people taking the Aspects of Identity Questionnaire-IV can have difficulty understanding concepts like "commitment" and "moral" (Cheek et al, 2002), we also gave our patient the less structured Twenty Statements Test measure of identity (Kuhn and McPartland, 1954). This test elicits people's statements about themselves. For this task, we give patients a sheet of paper labeled "Self-Description Task," on which the sentence stem "I am…" appears 20 times, followed by white space. We ask the patients to fill in each of the 20 blank spaces with a phrase that they think describes them. The descriptions can be either abstract (eg, personality traits, feeling states) or concrete (eg, occupations, past specific activities). We code responses as either Abstract (trait-like, reflective, and transcending specific situations or contexts) or Specific (concrete, specific, or contextual detail), and as either Autonomous (related to oneself) or Social (related to other people and situations).

Attribute Picture–Picture Matching Task

Because our patient's Twenty Statements responses focused on concrete detail, especially about the past, we gave him further tests of abstract attributes. We developed these tests specifically to evaluate this patient. In the Attribute Picture–Picture Matching Task, we asked him to match a stimulus picture depicting a specific trait, with a related picture showing a scene. For example, we showed him a stimulus picture of a person in a graduation cap and gown, representing "Proud." Then we showed him 4 multiple-choice pictures of scenes—receiving an award, talking on the phone, being stopped by a policeman, and mowing a lawn—and we asked him which scene best fit the trait picture. The test had 12 stimulus pictures. Normal performance on this section of the test was a perfect score of 12. Afterwards, in a self-reflection part of the task, we showed the patient a new set of 4 trait pictures and asked him to choose the image that best described himself.

Future Self-Projections Task

Because our patient complained of an inability to "see himself" projected into the future, we developed another test for him. We asked him to imagine himself in each of 10 hypothetical future scenarios. We had created the items specifically to reflect his past activities and experiences. For example, we asked him to imagine himself becoming a bartender again or getting a new sailboat, car, or apartment. We also asked him to imagine himself back in Hawaii, renewing his former habit of taking scenic walks along the beach. For comparison, we also asked him to imagine a few unfamiliar tasks, such as moving to a different place or winning a lot of money. For each scenario, we asked him to elaborate on what it was like, to describe himself in detail within the situation, and to specify what he could and could not do.

RESULTS

The patient's neuropsychological profile highlighted his semantic deficits with semantic anomia, prosopagnosia, and surface dyslexia, but showed that his attention, calculations, and visuospatial skills were relatively intact (Table 1). His episodic memory showed a retrieval pattern of decreased delayed recall but better recognition, and he was compromised in some of his executive functions but not others. He did relatively well at copying complicated pictures such as a dog and cat (Figure 2A). However, when asked to draw whatever he wanted, his pictures lacked specifics. For a picture that he described as a "cat, dog, and horse," he sketched 1 simple animal with a head, 2 legs, and a tail, without any other distinguishing characteristics (Figure 2B). He explained that a cat, dog, and horse were all like "this." His view reflected the characteristic loss of subordinate knowledge in SD.

Specialized Test Results

The patient's Autobiographical Memory Interview result was consistent with retained episodic ABM but impaired semantic ABM. He had Autobiographical Incidents Schedule scores of 3, 7, and 8 for Childhood, Early Adulthood, and Recent Adulthood, respectively (the maximum score for each period is 9). These results suggest a reverse temporal gradient, which is characteristic of SD, with strongest memories for the most recent events. On the Personal Semantic Schedule, his corresponding scores were 0, 1, and 3 (the maximum score for each period is 21). He showed episodic memory or "remembering" past events, but failed to name specific people (friends, teachers, workplace colleagues), places (previous addresses), or names of objects (eg, his boats, employers) (Table 2). When he could name prior jobs, he was unsure about the specific tasks or responsibilities that went with them.

On the structured identity task, the Aspects of Identity Questionnaire-IV, he endorsed all domains of identity when they were presented to him, with scores higher than the mean scores for normals. His scores were (1) personal traits and values: 49 (normal mean 41, standard deviation 5, range 36-46); (2) relational identity: 50 (normal mean 40, standard deviation 5, range 35-45); (3) social contexts: 30 (normal mean 24, standard deviation 4, range 20-28); and (4) collective identities: 40 (normal mean 24, standard 5, range 19-29).

In contrast, on the unstructured Twenty Statements identity task, for which he had to generate his own description of himself, he offered mainly concrete statements of identity rather than traits or abstract characteristics. For example, he did not describe himself with any personality traits (eg, kind, friendly) or feeling states (eg, hungry, tired), yet he listed 4 prior occupations and 5 prior hobbies or activities. His Abstract score was low at 1, and his Specific (Concrete) score was high at 19. His Autonomous (self) score was slightly low at 8, and his Social (others) score was moderate at 12.

Despite the patient's profound semantic deficits, on the Attribute Picture–Picture Matching Task he was aware of the meaning of most personal traits. He correctly recognized and matched 8 of the 12 stimulus "trait" pictures with their corresponding scenes: the traits proud, ashamed, caring, guilt/shame, arrogant, submissive, outgoing, and warm. The 4 traits that he missed—high self-esteem, jealous, domineering, and introverted—were the most complicated.

He had the greatest difficulty with the self-reflective items. Although he could recognize most attributes and understand that this was a test of his personality traits, he could not apply most of the attributes to himself. He chose only 1 personality trait for himself: a smiling face, because he described himself as having previously been a happy man. All of his other choices were concrete pictures of an occupation (eg, soldier, because "I was in Vietnam"),

activity (eg, fishing, a previously enjoyable activity), or scene (eg, an ocean background because he had been a sailor).

On the Future Self-Projections Task, the patient had difficulty seeing himself in the future or in new situations doing the same jobs or activities that he had done in the past (Table 3). He constantly remarked that he did not know how to do things, and he often said that he could not envision himself in the future. When he imagined himself in these new scenarios, however, he did not describe himself having specific problems executing tasks because of an impairment or disability. Instead, he said that he had difficulty placing himself doing his past activities of bartending, sailing, driving a truck, and even living alone. He could not give details about being in the future scenarios; he generally described them as blank or empty. On further questioning, he could not see himself experiencing future personality attributes or feelings.

DISCUSSION

Our patient with SD had made multiple suicide attempts because he could not imagine being able to do in the future the things that he had done in the past. SD impairs semantic memory, and this patient's semantic deficits prevented him from recasting his past self-schemas into the future (Miller et al, 2001). On specialized tests, he had adequate autonoetic consciousness of past experiences and could recognize general identity attributes and traits, but he could not project any of this forward (Duval et al, 2012). This unique patient illustrates how the inability to project a competent identity into the future can cause profound distress, a sense of loss about the future self, and, eventually, suicidal behavior.

Although people with SD have relatively well-preserved episodic ABM for recent events, they show a striking deficit in their ability to imagine future events, particularly potentially novel experiences (Adlam et al, 2009; Irish et al, 2012; Maguire et al, 2010a). We construct our sense of future self from self-representations originating in ABM that is both episodic (self-experienced incidents) and semantic (abstract knowledge and summary knowledge of traits) (Hou et al, 2005; Klein and Lax, 2010; Klein and Loftus, 1993). Self-representations from episodic ABM let us "time travel" mentally and re-experience the past (autonoetic consciousness) (Tulving, 2002). Deficits in episodic ABM impair autonoetic consciousness in Alzheimer disease and other dementias, but not in SD (Maguire et al, 2010a; Piolino et al, 2003). [5,6] Deficits in episodic ABM alone may not be sufficient to destroy the self, identity traits, and their projection into the future (Duval et al, 2012; Klein and Lax, 2010; Rathbone et al, 2009; Squire et al, 2010). [7-10] Although access to past episodic details is necessary for constructing future scenes (Schacter and Addis, 2007), semantic information is also required for personal future experiences (Binder and Desai, 201; Klein et al, 1996; Maguire et al, 2010b). Recent studies of patients with SD conclude that their loss of personal semantic knowledge is serious enough to disrupt the assembly of a framework for their future self (Duval et al, 2012; Irish et al, 2012).

The impairment that SD causes in patients' ability to think about the future correlates with atrophy in the left inferior temporal gyrus and bilateral temporal poles (Irish et al, 2012). Functional neuroimaging studies have shown overlapping activation in these brain areas for recollecting the past and envisioning the future, ie, for both retrospective and prospective time travel (Chiong, 2011). In addition to the anterior temporal lobes, this ability to time travel involves the medial prefrontal cortex, bilateral temporoparietal junction, and medial parietal cortex (Addis et al, 2007; Buckner and Carroll, 2007; Schacter et al, 2007; Szpunar et al, 2007).

Our patient also illustrates suicidal ideation accompanying SD. Dementia has been associated with an increased rate of suicide (Erlangsen et al, 2008; Purandare et al, 2009), [11,12]particularly for patients with depression, young age, a recent diagnosis of dementia, or retained insight (Haw et al, 2009; Lim et al, 2005; Purandare et al, 2009; Seyfried et al, 2007). Suicidal ideation may be more common with non-Alzheimer dementias than Alzheimer disease (Peisah et al, 2007). Most recently, frontotemporal dementia, a frontotemporal lobar degeneration like SD, has been implicated in a high rate of suicide (Alberici et al, 2012). Patients with SD may be moved to attempt suicide given their likelihood of depression (Rohrer and Warren, 2010; Thompson et al, 2003). Patients with SD who are prone to depression may arrive at the nihilistic belief that they, in effect, do not exist or are losing their self, and their belief leads them to attempt suicide (Mendez and Ramirez-Bermudez, 2011).

As for our patient's suicidal wishes, it is difficult to gauge the contribution of his SD-induced disability, which led to his sense of devaluation and demoralization and to his negative appraisals of his future prospects. It is noteworthy, however, that even after his depression resolved, he continued to report that loss of his future self made him want not to live.

His belief in his lack of future competence was more than just his appraisal of his disability. First, he did not see himself as disabled in the future, failing to execute tasks properly. Rather, he could not see himself in the act at all. He could not visualize himself doing future tasks or even being merely a passive observer of future activities. Second, because of his semantic ABM deficits, he lacked any specifics or semantic details about the future scenarios. Third, he could not imagine his future feelings or personality attributes related to a new situation. Fourth, he was focused on his difficulty doing things in the future, rather than on his disability in the present. He was obsessed with his lack of future competence. Finally, some of the tasks that he could do in the present, such as going for a walk, self-care, and cooking simple meals, he felt that he would be unable to do in a novel situation.

Yet, he did not foresee himself as being completely disabled. For example, in the hospital he continuously, compulsively worked on jigsaw puzzles and played computer games, which require retained eidetic and procedural memory. He expected to be able to continue playing these games into the future.

The reason for our patient's lack of a sense of future self may relate to his difficulty with abstract ideas. Consistent with studies challenging an "abstractness advantage" in SD (Jefferies et al, 2009), he tended to be concrete in his self-representations. As noted earlier, when asked to describe his "self," he mainly chose concrete nouns such as "sailor" and "soldier," and had trouble coming up with abstract descriptions of himself.

Yet, people need abstract self-representations when considering a future self. They must have concrete information to make certain decisions and envision themselves in the immediate future. But when projecting plans into the distant future, they lack essential information and must rely on more abstract self-concepts. The distant future requires abstract construals of self that are formed from the individual's essential attributes and prototypical traits (Trope and Liberman, 2003; Wakslak et al, 2008). [13,14] In other words, abstract construals may enable the self to transcend the here and now.

Our study had some limitations. First, it is a single case report. Still, other patients with SD have had similar difficulties with their sense of future self, as well as similar nihilistic reactions to "not knowing" (Mendez and Ramirez-Bermudez, 2011). Unlike these other people, our patient illustrates the clinical implications of "not knowing" in the form of suicidal behavior. Second, our need to tailor the psychometric assessment to this unique

patient led us to develop the Attribute Picture–Picture Matching Task and the Future Self-Projections Task—tests that lack rigorous psychometric validation. Finally, the patient had severe semantic deficits that often interfered with his testing. We partly overcame this barrier by tailoring the tests to him. Nevertheless, we cannot entirely exclude the possibility that his difficulties with word comprehension or frontal-executive abilities influenced his task performance.

In conclusion, in this patient with SD, the loss of the ability to project his identity into the future contributed to a sense of emptiness and to suicidal behavior. SD impairs semantic ABM, which is essential for creating a scaffolding for the self in the future (Irish et al, 2012). People need a consistent, stable sense of self throughout their lifetime, including when they self-project into future situations (Addis et al, 2007; Buckner and Carroll, 2007; Conway et al, 2003; Mitchell, 2009; Schacter et al, 2007). Further research involving patients with SD and related disorders can help clarify the neurocognitive mechanisms that underlie the self.

Acknowledgments

Supported by US National Institute of Aging #R01AG034499-03 (M.F.M.) and National Institute on Aging Alzheimer's Disease Research Center Grant P50 AG-16570 (M.F.M.).

Glossary

ABM	autobiographical memory
SD	semantic dementia

REFERENCES

Addis DR, Tippett LJ. Memory of myself: autobiographical memory and identity in Alzheimer's disease. Memory. 2004; 12:56–74. [PubMed: 15098621]

Addis DR, Wong AT, Schacter DL. Remembering the past and imagining the future: common and distinct neural substrates during event construction and elaboration. Neuropsychologia. 2007; 45:1363–1377. [PubMed: 17126370]

Adlam AL, Patterson K, Hodges JR. "I remember it as if it were yesterday": memory for recent events in patients with semantic dementia. Neuropsychologia. 2009; 47:1344–1351. [PubMed: 19428398]

Alberici A, Cottini E, Cosseddu M, Borroni B, Padovani A. Suicide risk in frontotemporal lobe degeneration: to be considered, to be prevented. Alzheimer Dis Assoc Disord. 2012; 26:194–196. [PubMed: 21666430]

Binder JR, Desai RH. The neurobiology of semantic memory. Trends Cogn Sci. 2011; 15:527–536. [PubMed: 22001867]

Bozeat S, Ralph MA, Patterson K, Hodges JR. The influence of personal familiarity and context on object use in semantic dementia. Neurocase. 2002; 8:127–134. [PubMed: 11997491]

Buckner RL, Carroll DC. Self-projection and the brain. Trends Cogn Sci. 2007; 11:49–57. [PubMed: 17188554]

Cheek, JM.; Smith, SM.; Tropp, LR. Relational identity orientation: a fourth scale for the AIQ. Paper presented at the 3rd Annual Convention of the Society for Personality and Social Psychology; Savannah, GA. Feb. 2002

Chiong W. The self: from philosophy to cognitive neuroscience. Neurocase. 2011; 17:190–200. [PubMed: 21506043]

Conway MA, Pleydell-Pearce CW, Whitecross SE, Sharpe H. Neurophysiological correlates of memory for experienced and imagined events. Neuropsychologia. 2003; 41:334–340. [PubMed: 12457758]

Dubois B, Slachevsky A, Litvan I, et al. The FAB: a Frontal Assessment Battery at bedside. Neurology. 2000; 12:1621–1626. [PubMed: 11113214]

Duval C, Desgranges B, de La Sayette V, et al. What happens to personal identity when semantic knowledge degrades? a study of the self and autobiographical memory in semantic dementia. Neuropsychologia. 2012; 50:254–265. [PubMed: 22155259]

Erlangsen A, Zarit SH, Conwell Y. Hospital-diagnosed dementia and suicide: a longitudinal study using prospective, nationwide register data. Am J Geriatr Psychiatry. 2008; 16:220–228. [PubMed: 18310552]

Folstein MF, Folstein SE, McHugh PR. "Mini-Mental State": a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975; 12:189–198. [PubMed: 1202204]

Gardiner JM. Episodic memory and autonoetic consciousness: a first-person approach. Philos Trans R Soc Lond B Biol Sci. 2001; 356:1351–1361. [PubMed: 11571027]

Giovannetti T, Sestito N, Libon DJ, et al. The influence of personal familiarity on object naming, knowledge, and use in dementia. Arch Clin Neuropsychol. 2006; 21:607–614. [PubMed: 16934432]

Haw C, Harwood D, Hawton K. Dementia and suicidal behavior: a review of the literature. Int Psychogeriatr. 2009; 21:440–453. [PubMed: 19368760]

Hodges JR, Mitchell J, Dawson K, et al. Semantic dementia: demography, familial factors and survival in a consecutive series of 100 cases. Brain. 2010; 133(Pt 1):300–306. [PubMed: 19805492]

Hou CE, Miller BL, Kramer JH. Patterns of autobiographical memory loss in dementia. Int J Geriatr Psychiatry. 2005; 20:809–815. [PubMed: 16116575]

Irish M, Addis DR, Hodges JR, et al. Considering the role of semantic memory in episodic future thinking: evidence from semantic dementia. Brain. 2012; 135:2178–2191. [PubMed: 22614246]

Jefferies E, Patterson K, Jones RW, et al. Comprehension of concrete and abstract words in semantic dementia. Neuropsychologia. 2009; 23:492–499.

Kalenzaga S, Bugaiska A, Clarys D. Self-reference effect and autonoetic consciousness in Alzheimer disease: evidence for a persistent affective self in dementia patients. Alzheimer Dis Assoc Disord. May 16.2012 [Epub ahead of print].

Kertesz A, Jesso S, Harciarek M, et al. What is semantic dementia?: a cohort study of diagnostic features and clinical boundaries. Arch Neurol. 2010; 67:483–489. [PubMed: 20385916]

Kiernan RJ, Mueller J, Langston JW, et al. The Neurobehavioral Cognitive Status Examination: a brief but quantitative approach to cognitive assessment. Ann Intern Med. 1987; 107:481–485. [PubMed: 3631786]

Klein SB, Gangi CE. The multiplicity of self: neuropsychological evidence and its implications for the self as a construct in psychological research. Ann NY Acad Sci. 2010; 1191:1–15. [PubMed: 20392272]

Klein SB, Lax ML. The unanticipated resilience of trait self-knowledge in the face of neural damage. Memory. 2010; 18:918–948. [PubMed: 21108109]

Klein SB, Loftus J. Behavioral experience and trait judgments about the self. Pers Soc Psychol Bul. 1993; 19:740–745.

Klein SB, Loftus J, Kihlstrom JF. Self-knowledge of an amnesic patient: toward a neuropsychology of personality and social psychology. J Exp Psychol Gen. 1996; 125:250–260. [PubMed: 8751820]

Kopelman MD, Wilson BA, Baddeley AD. The autobiographical memory interview: a new assessment of autobiographical and personal semantic memory in amnesic patients. J Clin Exp Neuropsychol. 1989; 11:724–744. [PubMed: 2808661]

Kuhn MH, McPartland TS. An empirical investigation of self-attitudes. US Sociological Review. 1954; 19:68–76.

Lim WS, Rubin EH, Coats M, et al. Early-stage Alzheimer disease represents increased suicidal risk in relation to later stages. Alzheimer Dis Assoc Disord. 2005; 19:214–219. [PubMed: 16327348]

Maguire EA, Kumaran D, Hassabis D, et al. Autobiographical memory in semantic dementia: a longitudinal fMRI study. Neuropsychologia. 2010a; 48:123–136. [PubMed: 19720072]

Maguire EA, Vargha-Khadem F, Hassabis D. Imagining fictitious and future experiences: evidence from developmental amnesia. Neuropsychologia. 2010b; 48:3187–3192. [PubMed: 20603137]

Mendez MF, Ramirez-Bermudez J. Cotard syndrome in semantic dementia. Psychosomatics. 2011; 52:571–574. [PubMed: 22054629]

Miller BL, Seeley WW, Mychack P, et al. Neuroanatomy of the self: evidence from patients with frontotemporal dementia. Neurology. 2001; 57:817–821. [PubMed: 11552010]

Mitchell JP. Inferences about mental states. Philos Trans R Soc Lond B Biol Sci. 2009; 364:1309–1316. [PubMed: 19528012]

Peisah C, Snowdon J, Kril J, et al. Clinicopathological findings of suicide in the elderly: three cases. Suicide Life Threat Behav. 2007; 37:648–658. [PubMed: 18275371]

Piolino P, Belliard S, Desgranges B, et al. Autobiographical memory and autonoetic consciousness in a case of semantic dementia. Cogn Neuropsychol. 2003; 20:619–639. [PubMed: 20957587]

Purandare N, Voshaar RC, Rodway C, et al. Suicide in dementia: 9-year national clinical survey in England and Wales. Br J Psychiatry. 2009; 194:175–180. [PubMed: 19182182]

Rathbone CJ, Moulin CJ, Conway MA. Autobiographical memory and amnesia: using conceptual knowledge to ground the self. Neurocase. 2009; 15:405–418. [PubMed: 19382038]

Rohrer JD, Warren JD. Phenomenology and anatomy of abnormal behaviours in primary progressive aphasia. J Neurol Sci. 2010; 293:35–38. [PubMed: 20400120]

Schacter DL, Addis DR. Constructive memory: the ghosts of past and future. Nature. 2007; 445(7123): 27. [PubMed: 17203045]

Schacter DL, Addis DR, Buckner RL. Remembering the past to imagine the future: the prospective brain. Nat Rev Neurosci. 2007; 8:657–661. [PubMed: 17700624]

Seyfried LS, Kales HC, Ignacio RV, et al. Predictors of suicide in patients with dementia. Alzheimers Dement. 2011; 7:567–573. [PubMed: 22055973]

Shewan CM, Kertesz A. Reliability and validity characteristics of the Western Aphasia Battery (WAB). J Speech Hear Disord. 1980; 45:308–324. [PubMed: 7412225]

Squire LR, van der Horst AS, McDuff SG, et al. Role of the hippocampus in remembering the past and imagining the future. Proc Natl Acad Sci USA. 2010; 107:19044–19048. [PubMed: 20956323]

Szpunar KK, Watson JM, McDermott KB. Neural substrates of envisioning the future. Proc Natl Acad Sci USA. 2007; 104:642–647. [PubMed: 17202254]

Thompson SA, Patterson K, Hodges JR. Left/right asymmetry of atrophy in semantic dementia: behavioral-cognitive implications. Neurology. 2003; 61:1196–1203. [PubMed: 14610120]

Trope Y, Liberman N. Temporal construal. Psychol Rev. 2003; 110:403–421. [PubMed: 12885109]

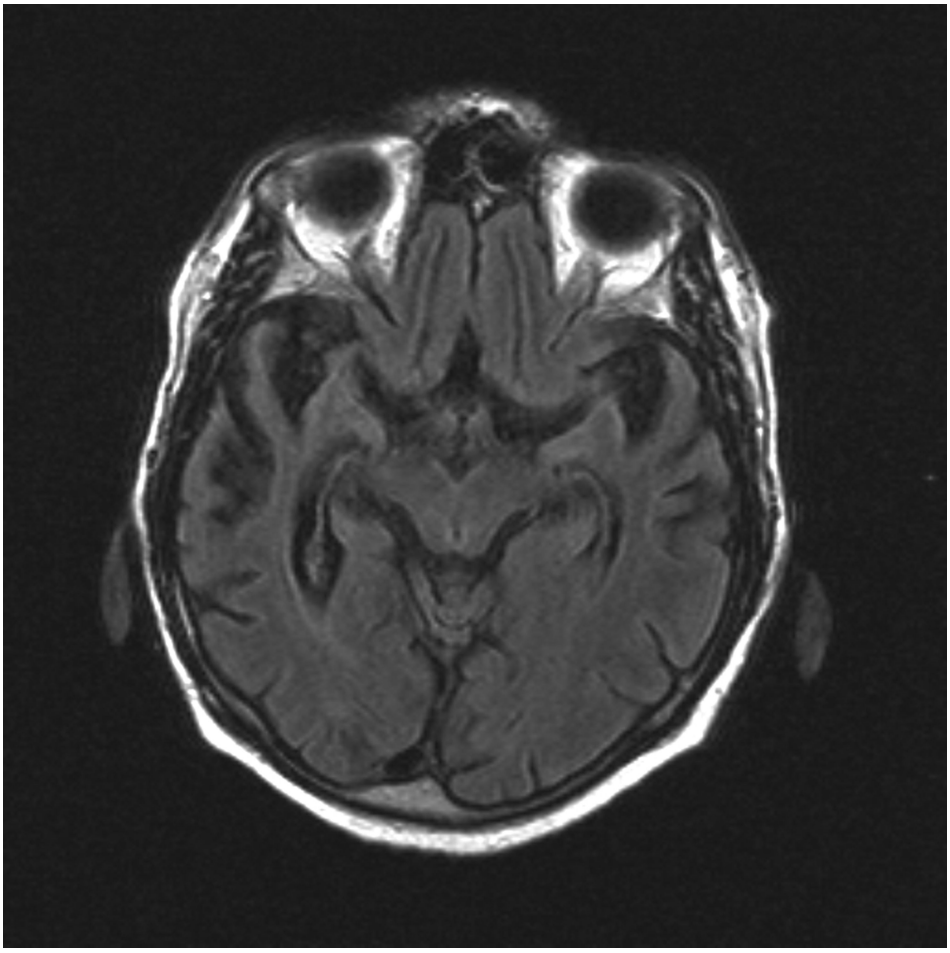
Tulving E. Episodic memory: from mind to brain. Annu Rev Psychol. 2002; 53:1–25. [PubMed: 11752477]

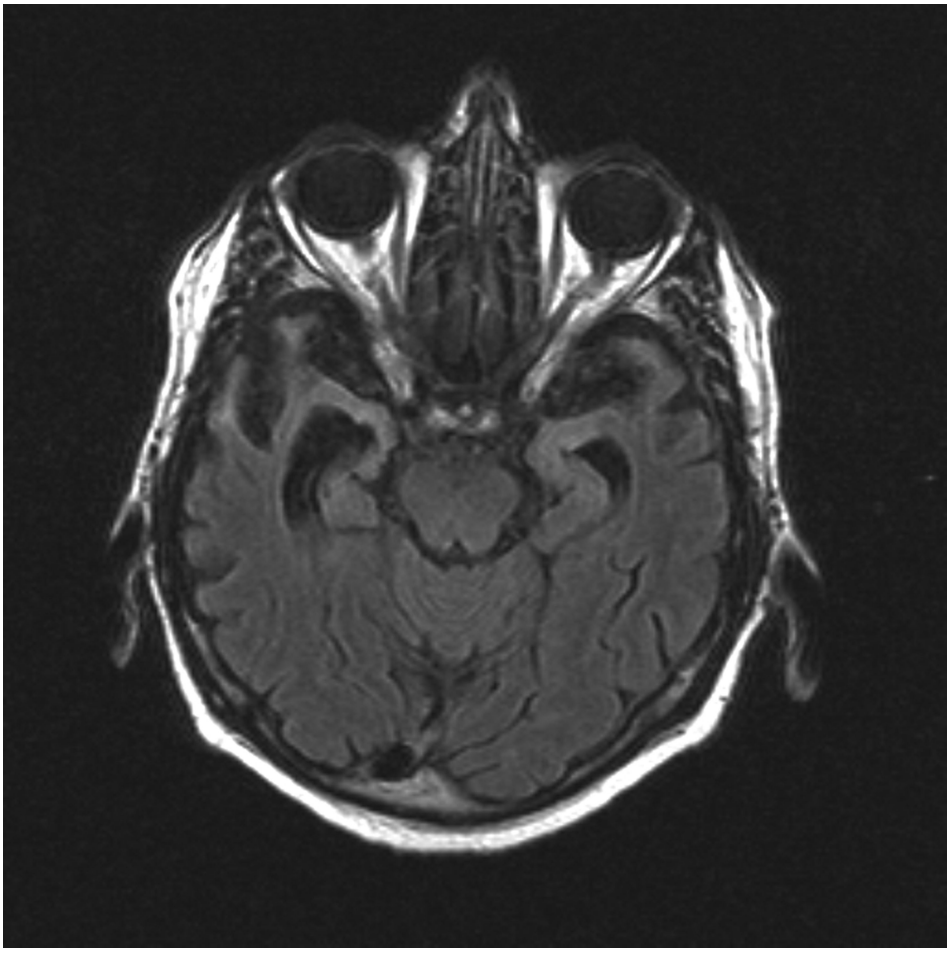
Wakslak CJ, Nussbaum S, Liberman N, et al. Representations of the self in the near and distant future. J Pers Soc Psychol. 2008; 95:757–773. [PubMed: 18808258]

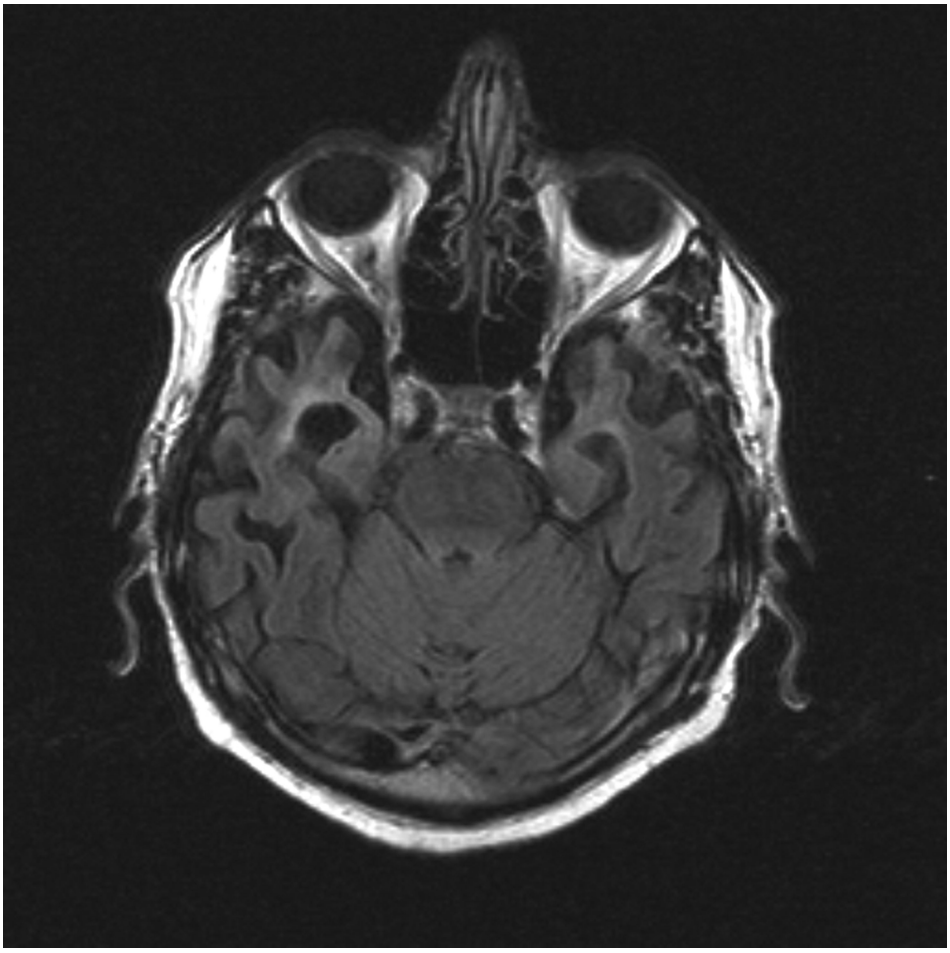
Welsh KA, Butters N, Mohs RC, et al. The Consortium to Establish a Registry for Alzheimer's Disease (CERAD). Part V. A normative study of the neuropsychological battery. Neurology. 1994; 44:609–614. [PubMed: 8164812]

Westmacott R, Moscovitch M. The contribution of autobiographical significance to semantic memory. Mem Cognit. 2003; 31:761–774.

Yesavage JA, Brink TL, Rose TL, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res. 1982; 17:37–49. [PubMed: 7183759]







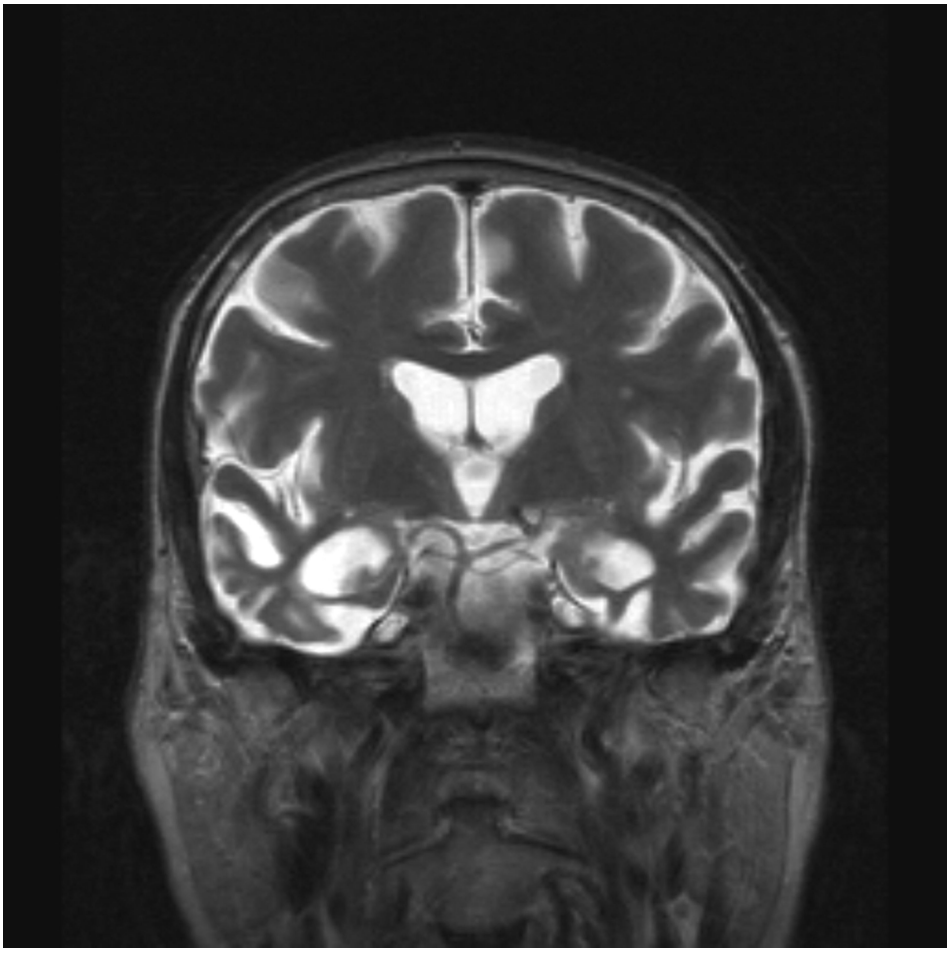


FIGURE 1.
Magnetic resonance imaging scan of this patient's brain. The 3 FLAIR, axial images at different levels, and the T2-weighted coronal image show significant bilateral anterior temporal lobe atrophy, slightly greater on the right, with compensatory enlargement of the temporal horns. The scan was done to document the location of the patient's disease, not to correlate precisely with his behavior.

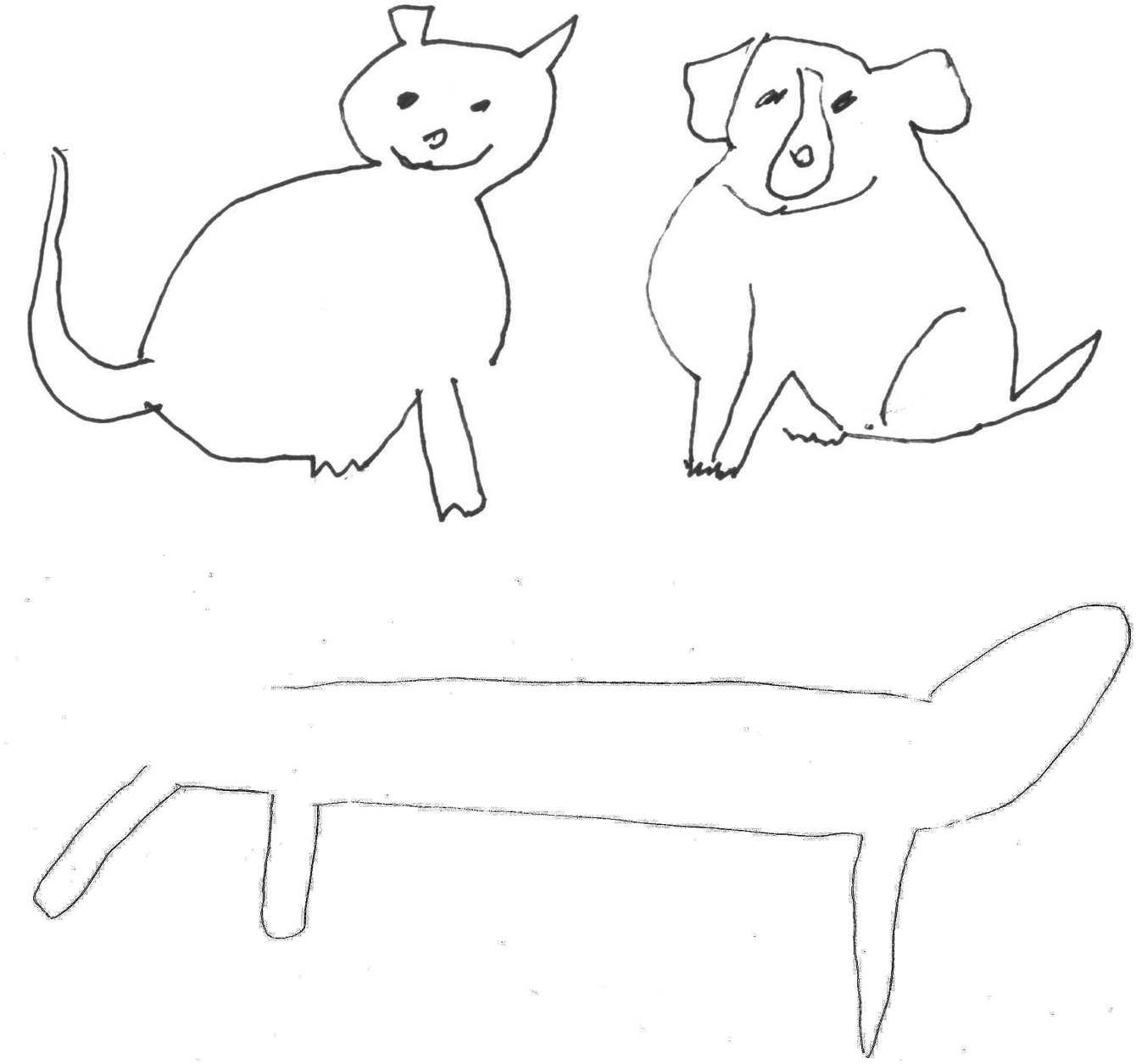


FIGURE 2.

Drawings by this patient. Panel A: He did relatively well at copying a presented picture of a cat and dog. Panel B: His free drawing of a “cat, dog, and horse” lacks details and shows generalization. He explained that this 1 drawing represented all 3 animals. The head and 1 front leg are on the right side of the drawing; the tail and 1 back leg are on the left.

TABLE 1

This Patient's Neuropsychological Profile

Test	Score	Score in Relation to Normal Range*
Mini Mental State Examination	21/30	<1st percentile
Digit Span (Forward, Backward)	5, 4	Within normal limits
"A" Vigilance Test	0 errors	Within normal limits
Verbal Fluency ("F" words/minute)	1	<1st percentile
Category Fluency (animals/minute)	1	<1st percentile
Mini-Boston Naming Test Semantic word recognition	3/15 0/12	<1st percentile <1st percentile
California Verbal Learning Test-II, Short Form Delayed Free Recall Recognition	 3/9 9/9	 <1st percentile Within normal limits
Reading Irregular Words	5/15	<1st percentile
Trail Making Test Part A	95 seconds	<1st percentile
Trail Making Test Part B	220 seconds	<1st percentile
Speech Fluency	8/8	Within normal limits
Limb Praxis	16/16	Within normal limits
Visuospatial Construction Test	12/12	Within normal limits
Famous Faces Recognition Test	0/22	<1st percentile
Calculations	8/8	Within normal limits
Frontal Assessment Battery	16/18	Within normal limits

*Based on available age-, sex-, and education-matched norms.

TABLE 2

Autobiographical Memory Interview: Examples of This Patient's Responses

Lifetime Period	Schedule	
	Autobiographical Incidents	**Personal Semantic**
Childhood	Kindergarten: "I was drinking milk." Elementary: "I did a sport. I do not remember the name." High school: "I played basketball. I forget what I said and felt about basketball."	He could not remember names of schools, teachers, or friends.
Early Adult Life	"I was 17 years old and was in the Air Force in Vietnam. I loaded airplanes. I got out of the Air Force at age 20 and was a manager of an apartment building." "There was an earthquake in Santa Monica. I was scared and almost jumped out of the building."	He could not name the military units or bases where he was stationed, or his employers, workplace colleagues, or addresses.
Recent Adult Life	"I used to have a sailboat in Maui. Sometimes I would sleep atop, watching the big animals in the water. I met Elvis Presley [in a casino]. I think I shook his hand. I became a second in command for a 300 passenger boat. I was a truck driver for 10 years. I drove all across the U.S. My brother would pick me up in his car and go to the pier. I would go, "Oh, look at the boats," and he would go, "Oh, look at the girls."	He could name his prior jobs ("sailor," "bartender," "driver"), but not the specific tasks that went with those jobs, eg, ship duties, mixing drinks, changing gears in a truck.

TABLE 3

Future Self-Projections Task: This Patient's Responses

All items begin with "Imagine that you…"

1. Become a bartender. "I can't see myself doing it. I was a bartender for 15 years but can't remember any drinks." [Could not place himself in the role, not even standing behind the bar.]
2. Get a new car. "Can't do it. I used to, kind of remember where I am at, where I am going. But now, what is that? What is going on?" [Could not describe getting into a car or driving.]
3. Get a new sailboat. "Can't do it…was first officer on [passenger] boat; watched whales. I remember pulling the thing but wouldn't remember what to do." [Unable to describe himself even getting into or standing on a new sailboat.]
4. Have a new job. "Working on a sailboat would be fun but couldn't do it…" [Could not give a visual image of having any future job.]
5. Live in your own apartment. "I couldn't make food; maybe clothes wash: put clothes in and turn it on." [Could not visualize just being in an apartment after leaving the hospital.]
6. Are on a beach in Hawaii. "What is Hawaii? Oh, Maui. That would be fun. The beach, the water is never cold. Lots of girls. But, I don't see that I could do it." [Could not generate any image or description of himself on a beach.]
7. Are taking a long and scenic walk."…loved to walk 1 mile to beach…to my brother's place…Can't do it now." [Could not give a picture of himself walking streets.]
8. Become a ship's officer. "I [would] talk…help people. I was really good with people… I might hurt people or not tell them the right thing to do: 'Who is that? Where are we going?'" [Could not describe specifics of any mistake or any aspects of the situation.]
9. Move to a different place. "Back to Maui; go to the beach." [Unable to give details.]
10. Won a lot of money. "Back to Maui and get a sailboat; take my brother…That would be fun. I like fun; good with ladies. But, I can't do it now." [Could not see himself in Maui, on a sailboat, or even the process of taking his brother to Maui.]