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# Is there something special about the self? A neuropsychological case study

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**Abstract**

One of the most exciting trends in psychology has been the increasing use of data and conceptual tools derived from the study of patients with neuropsychological syndromes to address questions about normal mental function. To date, however, personality theorists seldom have considered neuropsychological case material (Klein & Kihlstrom, 1998). In this paper we show how neuropsychological evidence can afford new insights for personality theorists. In particular, we show how examination of persons suffering from amnesia and autism can shed light on the way in which knowledge about self is represented in memory. We first review the literature on clinical amnesia and then present evidence from a new case study exploring the relation between personal and nonpersonal knowledge in a patient with autism. We conclude that the mind may have learning systems that are specialized both for acquiring and retrieving information about one's own personality. © 2002 Elsevier Science (USA). All rights reserved.

## 1. Introduction

In one of the most famous statements in Western philosophy, Descartes (1637/1970) concluded "I think therefore I am." He might just as easily have said "I remember therefore I am." The fundamental connection between memory and self-knowledge has long been recognized by both philosophers

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(e.g., Locke, 1731) and psychologists (e.g., James, 1890). However, precise specification of this relation remains a point of continuing controversy (for reviews, see Kihlstrom & Klein, 1994; Klein, 2001; Neisser & Fivush, 1994; Perry, 1975).

Part of the reason for this is that self-theorists traditionally have failed to distinguish between two different, functionally isolable (though normally interacting) systems of memory that contribute to knowledge of self: Episodic and semantic (for review, see Tulving, 1983, 1985, 1995; Wheeler, Stuss, & Tulving, 1997). Episodic memory records events as having been experienced by the self at a particular (and unique) point in space and time; when retrieved, these events are re-experienced in a quasi-perceptual way, with conscious awareness that "this happened to *me*" (e.g., one's recollection of having dinner with a friend last Thursday). Semantic memory, by contrast, enables a person to have culturally shared knowledge, including word meanings and facts about the world, without having to recollect the specific experiences on which that knowledge was based (e.g., knowing that Sacramento is the capital of California).

Historically, psychological (e.g., James, 1890; Greenwald, 1981; Keenan, 1993) and philosophical (e.g., Grice, 1941; Locke, 1731; Quinton, 1962) treatments of the connection between self and memory have focused on the relation between self and episodic memory. This is because episodic recollection has a self-referential quality, which was thought to be missing from other types of memorial experiences (e.g., semantic). However, recent investigations from clinical neuropsychology suggest that semantic memory also contributes to one's conception of self.

Consider, for example, the case of W.J., who suffered a concussive blow to the head shortly after completing her first quarter in college, (Klein, Loftus, & Kihlstrom, 1996). Interviews conducted shortly after her accident revealed that W.J. had forgotten much of what had happened during the preceding 12 months—a period of time that included her first quarter at college. To document her deficit in episodic memory, Klein et al. (1996) used the autobiographical memory cueing task originated by Galton (1879) and popularized by Crovitz (e.g., Crovitz & Schiffman, 1974) and Robinson (1976). W.J. was asked to try to recall specific personal events related to each of a list of cue words (for example, car, sing, brave) and to provide for each recollection as precise a date as possible. This initial testing revealed that she was unable to recollect personal events from recent years. Over the next month, however, her amnesia remitted, and when she was retested four weeks later, her performance had improved to the point that it was indistinguishable from that of neurologically healthy women who served as controls.

Both during her amnesia and after its resolution, she was asked to provide personality ratings describing what she was like during her first quarter at college. In contrast to the change in episodic memory performance over the month following her accident, W.J.'s own personality ratings did not change at all over the same period: Her ratings made during her amnesic period agreed with those made afterward. Thus, while she was amnesic, W.J. knew what she had been like in college, despite the fact that she could not episodically recollect any personal events or experiences from that time period (for related findings, see Tulving, 1993, on patient K.C.).

Admittedly, it is possible that W.J.'s ratings were based not on semantic knowledge of her personality during her time at college but on her continued access to episodic recollections of high school (or earlier) that were not covered by her amnesia. However, other evidence suggests that accurate self-description can occur even with a total loss of episodic memory. For example, Klein, Rozendal, and Cosmides (2002) report the case of patient D.B., a 79-year-old man who was profoundly amnesic as a result of anoxia following cardiac arrest. Both informal questioning and psychological testing revealed that D.B. was unable to consciously recollect a single thing he had ever done or experienced from any period of his life. In addition to his dense retrograde episodic amnesia, he also suffered severe anterograde episodic memory impairment, rendering him incapable of recollecting events that transpired only minutes earlier.

To test D.B.'s semantic self-knowledge, Klein, Rozendal, and Cosmides (2002) asked him on two separate occasions to judge a list of personality traits for self-descriptiveness. They also asked D.B.'s daughter to rate D.B. on the same traits. Their findings revealed that D.B.'s ratings were both reliable ($r = .69$ across sessions) and consistent with the way he is perceived by others (the correlation between D.B.'s self-ratings and ratings of him provided by his daughter was $r = .64$; age-matched controls showed $r$s = .74 and .62 across sessions and raters, respectively).

D.B. thus appears to have accurate and detailed knowledge about his personality, despite the fact that he has no conscious access to any specific actions or experiences on which that knowledge was based. Considered together with the case of W.J., these findings suggest that people can maintain a sense of self supported by semantic knowledge of personal facts in the absence of direct access to the episodes on which the knowledge is based (for related findings, see Cermak & O'Connor, 1983; Evans, Wilson, Wraight, & Hodges, 1993; Kircher et al., 2000; Starkstein, Sabe, & Dorrego, 1997; Tulving, 1993; for review, see Klein, Cosmides, Tooby, & Chance, 2002).

## 2. A developmental dissociation between episodic and semantic self-knowledge

Episodic memory can be lost due to brain trauma (as with D.B.) or it can fail to develop in the first place (e.g., Ahern, Wood, & Mc Brien, 1998; Vargha-Khadem et al., 1997). Developmental dissociations are interesting because they permit inferences about the origins of knowledge that are not licensed by the discovery of dissociations caused by brain trauma in adults (e.g., Duchaine, 2001). Consider, for example, the hypothesis that semantic self-knowledge is derived from a database of episodic memories. This hypothesis cannot be ruled out by cases like D.B. and W.J.: Their semantic self-knowledge could have been derived from episodic memories, during the years prior to the brain trauma that caused their episodic loss as adults. But consider the implications of finding an individual who has never developed the ability to access episodic memories, yet has intact semantic self-knowledge. This developmental dissociation would suggest that building a semantic database of trait self-knowledge does not require access to a database of episodic memories. Some support for this contention comes from the case of patient K.C., who permanently lost his entire fund of episodic memory as a result of a severe head injury (and underwent a marked personality change), yet was able to describe his postmorbid personality with considerable accuracy (Tulving, 1993).

Autism is a heritable developmental disorder, which prevents the cognitive machinery that supports metarepresentations from developing normally (Baron-Cohen, Leslie, & Frith, 1985; Leslie, 1987; Baron-Cohen, 1995). It has been proposed that episodic memories are stored in and retrieved via metarepresentations (Cosmides & Tooby, 2000; Perner, 1991). [1] If this is so, then autism should prevent the normal development of episodic memory. To test this prediction, Klein, Chan, and Loftus (1999) assessed the episodic memory of R.J., a 21-year-old male with autism.

Compared with ability matched controls, R.J. was found to be severely impaired on a variety of tests of recall, especially when memory for personally experienced events was tested (e.g., the Galton–Crovitz task). Although his impairment was developmental in origin, his episodic performance was similar to that found in classic amnesia caused by brain trauma. (This is consistent with the hypothesis that episodic memory relies on metarepresentations; e.g., Gennaro, 1996; Perner, 1990, 1991; Suddendorf & Corballis, 1997; Tulving, 1985; Wheeler et al., 1997.) Similar findings have been reported by Boucher (1981), Boucher and Warrington (1976), Millward, Powell, Messer, and Jordan (2000), and Tager-Flusberg (1991).

Despite this deficit in episodic retrieval, R.J. demonstrated highly reliable and accurate knowledge of his personal characteristics. For example, the correlation between R.J.'s trait self-ratings and his mother's ratings of him was significant ($r = .56$) and did not differ reliably from that obtained from control mother–son pairs ($r = .50$). R.J.'s self-ratings were also compared with ratings of R.J. obtained from one of his teachers; the correlation

[1] A metarepresentation is a data format with slots for an agent, a proposition, and the agent's attitude toward that proposition (e.g., [Agent: Bill]-[Attitude: believed]-[Proposition: the world is flat]). Episodic memories may be filed with the same format (e.g., [I]-[remember]-[the day I went to the beach with Mom]).

again was reliable ($r = .49$) and comparable to those obtained between control mother–son pairs.

These findings suggest that R.J.'s knowledge of what he is like accurately reflects how he is perceived by people with whom he interacts. But how did he acquire this trait self-knowledge? His case suggests that conscious access to a database of episodic memories is unnecessary. R.J. cannot retrieve episodic memories now and, because his impairment is developmental in origin, he probably never developed this ability in the first place. All three cases—W.J., D.B., and R.J.—show that trait self-knowledge can *exist* independently of episodic access; but RJ.'s developmental dissociation suggests that the *acquisition* of trait self-knowledge does not require episodic access (as does the case of K.C.).

## 3. Is there something special about semantic knowledge of one's traits?

The previous results show that personal recollections exist independently of semantic self-knowledge. But is trait self-knowledge just one among many records in a unitary semantic memory? Or is semantic memory itself composed of a number of functionally isolable subsystems, one of which is specialized for the encoding, storage, and retrieval of trait self-knowledge?

This question can be addressed by seeing whether brain trauma or developmental disorders can cause dissociations between trait self-knowledge and other, content-defined domains of knowledge in semantic memory. In this regard, it is interesting to note that patient D.B.'s semantic memory also was affected by his illness, although this impairment was less severe than that affecting his episodic memory. For example, although he knew a variety of general facts about his life, he showed a number of striking gaps in his life story: He knew the name of the high school he attended and where he was born, but could not recall the names of any friends from his childhood or the year of his birth. He also showed spotty knowledge of facts in the public domain. For example, although he was able to accurately recount a number of details about certain historical events (e.g., the Civil War), his knowledge of other historical facts was seriously compromised (e.g., he claimed that America was discovered by the British in 1812). Additional testing revealed that D.B.'s semantic knowledge of social entities other than self also was far from normal. For example, the correlation between D.B.'s ratings of his daughter and her self-ratings was not statistically significant ($r = .23$) and was less than half that found between control parents' ratings of their child and the child's self-ratings ($r = .61$).

Taken together, these findings suggest that D.B.'s preserved trait self-knowledge is not simply a manifestation of preserved semantic memory;

rather, it appears to reflect something specific to the self. In particular, they raise the possibility that D.B.'s preserved trait self-knowledge may reflect the operation of a subsystem within semantic memory devoted to the representation of trait self-knowledge.

The idea of a specialized subsystem within semantic memory is consistent with recent findings suggesting that semantic memory can be fractionated into different components, each of which can be damaged independently (e.g., Cappa, Frugoni, Pasquali, Perani, & Zorat, 1998; Caramazza & Shelton, 1998; Hodges & Patterson, 1997; Mackenzie Ross & Hodges, 1997). There are many cases in which brain damage creates very content-specific patterns of nonretrieval from semantic memory—some patients cannot retrieve information about animals, but can retrieve information about inanimate objects, whereas others have the opposite pattern of impairment (e.g., Caramazza, 2000; Caramazza & Shelton, 1998); still others have a selective deficit in their ability to retrieve knowledge of types of food (e.g., Hart & Gordon, 1992; Hillis & Caramazza, 1991; Laiacona, Barbarotto, & Capitani, 1993); and so on. In all cases, the information that is selectively spared or impaired is a type of general world knowledge. It is therefore assumed that the inaccessible or missing information is all drawn from a semantic memory system and that category-specific impairments reflect subsystems within a more encompassing semantic system (e.g., Hodges & Patterson, 1997). From this perspective, D.B.'s normal performance on the trait self-knowledge questionnaire can be seen as reflecting the operation of a specialized subsystem within semantic memory that represents trait knowledge about the self and was not compromised by his cortical damage.

## 4. A further test of the hypothesis that a specialized semantic subsystem is devoted to trait self-knowledge

The idea that trait self-knowledge may be stored and accessed independently from other types of semantic knowledge is provocative, but the database on which this conclusion rests is limited. To address this concern, we conducted further tests with R.J., the individual with autism studied by Klein et al. (1999). These tests probed R.J.'s semantic memory in content domains that do not involve the self.

The suggestion that trait self-knowledge comprises a specialized subsystem within semantic memory raises the possibility that, like patient D.B., R.J. also might show selective impairments in semantic memory, despite his intact knowledge of facts about himself. Research has shown that certain conceptual or semantic domains may be compromised in patients with autism (e.g., Hobson, 1989; Klinger & Dawson, 1995). Unfortunately, the study by Klein et al. (1999) did not include tasks designed to assess this possibility. [2] In the present study we developed a questionnaire specifically designed to assess participants' knowledge in three broad semantic domains—animals, inanimate objects, and types of food. An abundance of literature on semantic memory impairment has documented deficits specific to each of these domains following brain damage, suggesting that each constitutes a separate taxonomic subsystem within the semantic system (e.g., Cappa et al., 1998; Caramazza, 1998; Caramazza & Shelton, 1998; Farah, Meyer, & McMullen, 1996; Hart & Gordon, 1992; Laws & Neve, 1999; Saffrna & Schwartz, 1994; Shelton, Fouch, & Caramazza, 1998; Warrington & Shallice, 1984). If trait self-knowledge also is a specialized subsystem within semantic memory, it would be interesting to test whether R.J., despite his normal performance on tests of semantic self-knowledge, shows impairments on tests of semantic knowledge not involving the self. Any dissociation between semantic domains—whether due to brain trauma or autism—suggests functionally isolable storage and retrieval systems. But finding a developmental dissociation in R.J. would suggest functionally isolable *acquisition systems:* It would suggest that the learning mechanisms that govern trait self-knowledge are different from those that govern acquisition of general cultural knowledge.

## 5. Method

### 5.1. Participants

*R.J.* At the time the study was conducted, R.J., a Caucasion male with a history of autistic symptoms dating back to approximately 8 months of age, was 21 years old. His symptoms included disturbances in socialization, communication, and imagination (for details, see Klein et al., 1999). Psychiatric evaluation resulted in a diagnosis of autism, although he also has been described as fitting the criteria for Pervasive Developmental Disorder, Not Otherwise Specified.

In contrast to his social and interpersonal deficits, R.J. showed competence in a variety of academic domains, including reading, spelling, and math. In conversation, he showed good vocabulary and grammar and answered questions willingly. On the Wechsler Intelligence Scale for Children,

[2] In the Klein et al. (1999) study, R.J.'s semantic memory was assessed using a verbal fluency task. His performance on that task was approximately one standard deviation below that of ability-matched controls. However, because verbal fluency is highly sensitive to frontal lobe dysfunction (e.g., Boone, 1999; Levin, Eisenberg, & Benton, 1991; for review, see Ruff, Light, Parker, & Levin, 1997), the Klein et al. (1999) data are ambiguous with respect to whether R.J.'s performance reflected a problem with his semantic memory, a disruption of frontal lobe function, or both.

Revised (Wechsler, 1981), he achieved a verbal IQ of 67, a performance IQ of 64, and a full scale IQ of 63—which placed him in the mildly retarded range of intellectual functions. These scores indicate that R.J. is a high-functioning autistic person with only moderate intellectual impairment.

*Control participants*. The control group consisted of three medically and psychologically healthy males whose chronological age ($M = 11$ years, 6 months) was closely matched to R.J.'s mental age (12 years, 1 month). Controls were not acquainted with one another.

### *5.2. Procedure*

To investigate participants' access to nonpersonal semantic knowledge, they were provided with a questionnaire consisting of 10 questions about animals, 10 questions about inanimate objects, and 6 questions about types of food. For each question, the participant was asked to decide the extent to which the subject of the sentence possessed the stated property (e.g., "Is a horse a large animal?," "Is a lemon a sweet fruit?"). Beside each question were three choices: *not at all*, *somewhat*, and *definitely*. Participants were instructed to indicate, by circling the appropriate choice, their responses to the questions posed. Participants were given as much time as they required to complete the survey. No participant took longer than 10 min. A copy of the semantic properties questionnaire is presented in Appendix A.

## 6. Results

Pearson's correlation coefficients among participants for property ratings are presented in Table 1. An inspection of the correlations reveals that control participants were in good agreement about properties associated with animals, inanimate objects, and foods (correlations ranged from .78 to .81). By contrast, R.J.'s responses showed considerably less agreement with those provided by controls (correlations ranged from .18 to .33). These observations were confirmed by statistical analysis: A test of the difference between the mean intercorrelations among controls and the mean

Table 1
Correlations between R.J. and control paricipants ($C$) on the semantic properties questionnaire (full data set)

| | R.J. | $C_1$ | $C_2$ | $C_3$ |
|---|---|---|---|---|
| R.J. | | .330 | .180 | .214 |
| $C_1$ | | | .791 | .810 |
| $C_2$ | | | | .784 |
| $C_3$ | | | | |

intercorrelations between R.J. and the controls was significant ($Z = 2.85$, $p < .05$).

Tables 2–4 present correlations between participants segregated by semantic domain (i.e., animals, inanimate objects, and foods). As can be seen, the intercorrelations among the controls again were high, ranging from .82 to .95 for animals, .78 to .87 for inanimate objects, and .40 to .89 for foods. By contrast, the correlations between R.J. and controls were consistently low, ranging from .09 to .29 for animals, .00 to .28 for inanimate objects, and −.48 to −.22 for foods. For each of these three domains, the difference between the mean intercorrelations among controls and the mean intrercorrelations between R.J. and the controls was reliable ($Z$s $= 4.25$, 3.41, and 3.40, $p < .05$, for animals, objects, and foods, respectively). When it comes to generic, nonpersonal world knowledge, R.J. would seem to share much less in common with control participants than control participants share with each other (for example, in response to the question "Is a lemon a sweet fruit?," R.J. answered "definitely," while to the question "Is a cow a large animal?," he answered "not at all").

Table 2
Correlations between R.J. and control paricipants ($C$) on the semantic properties questionnaire (animals)

| | R.J. | $C_1$ | $C_2$ | $C_3$ |
|---|---|---|---|---|
| R.J. | | .295 | .111 | .094 |
| $C_1$ | | | .816 | .901 |
| $C_2$ | | | | .946 |
| $C_3$ | | | | |

Table 3
Correlations between R.J. and control paricipants ($C$) on the semantic properties questionnaire (inanimate objects)

| | R.J. | $C_1$ | $C_2$ | $C_3$ |
|---|---|---|---|---|
| R.J. | | .229 | .000 | .280 |
| $C_1$ | | | .845 | .869 |
| $C_2$ | | | | .784 |
| $C_3$ | | | | |

Table 4
Correlations between R.J. and control paricipants ($C$) on the semantic properties questionnaire (foods)

| | R.J. | $C_1$ | $C_2$ | $C_3$ |
|---|---|---|---|---|
| R.J. | | −.476 | −.218 | −.293 |
| $C_1$ | | | .894 | .400 |
| $C_2$ | | | | .447 |
| $C_3$ | | | | |

It is worth noting that R.J.'s impaired performance on the semantic properties task was not simply a result of difficulties comprehending and responding to questionnaire items. For example, in an earlier study (Klein et al., 1999), R.J. was administered a questionnaire identical in format to the semantic properties questionnaire (e.g., same number of questions, same response selection categories), but different in focus (questions about personality traits rather than about animals and objects), and his performance on that task was statistically indistinguishable from that of both ability- and age-matched controls. Moreover, R.J.'s responses to the semantic properties questionnaire, though quite different from those of control participants, were far from random: When administered a second version of the questionnaire (same questions, different ordering) approximately 3 weeks after the first version, R.J.'s ratings showed considerable consistency across sessions ($r = .77,\ p < .05$). It thus would seem that difficulties understanding and responding to requests for information were not responsible for R.J.'s atypical performance on the semantic properties questionnaire.

## 7. Discussion

Like many patients with memory deficits, R.J. was found to have impaired episodic memory combined with spared knowledge of his own personality traits (Klein et al., 1999; see also Bachna, Sieggreen, Cermak, Penk, & O'Connor, 1998; Klein, Rozendal, & Cosmides, 2002; Klein et al., 1996; Reinvang & Gjerstad, 1998; Tulving, 1993). Yet what may be more interesting about R.J. is his pattern of performance in content areas that usually fall under the rubric of semantic memory. Semantic memory enables its owner to acquire, and internally represent, culturally shared information concerning language and facts about the world (e.g., Tulving, 1993, 1995). The finding that R.J. has consensually validated knowledge of his own personality traits (with control participant ratings serving as the criterion; Klein et al., 1999), but that his knowledge of facts not involving the self departs radically from that of controls, suggests a dissociation between personal and nonpersonal semantic knowledge in exactly the same sense used to discuss selective impairments of semantic memory in domains such as living and nonliving things (e.g., Caramazza & Shelton, 1998).

The dissociations within semantic memory exhibited by R.J. are interesting to consider in conjunction with those shown by patient D.B. (Klein, Rozendal, & Cosmides, 2002). Recall that D.B. had highly accurate knowledge of his personality traits, despite serious impairments to other aspects of semantic memory (e.g., historical facts). Taken together, these two case studies raise the possibility that trait self-knowledge may be subsystem functionally independent of other subsystems within semantic memory (for discussion, see Klein, 2001). They suggest that there is a subsystem of semantic memory that is functionally specialized for the storage and retrieval of trait self-knowledge.

But what about acquisition? D.B. could have acquired his (intact) trait knowledge and his (damaged) historical knowledge via the same learning mechanisms; adult onset brain trauma can selectively impair access to a specialized storage and retrieval system, without illuminating how the information therein was acquired. This is where the case of R.J. adds a new dimension to previous studies. Because his dissociations are developmental in origin, they not only illuminate storage and retrieval, but also acquisition and encoding. More specifically, R.J.'s dissociation between episodic and trait self-knowledge suggests that knowledge of one's own personality can be acquired normally without ever having conscious access to memories that encode specific behavioral episodes.

R.J.'s semantic dissociation—between knowledge of his own personality and knowledge of other domains—suggests that trait self-knowledge is acquired via learning mechanisms that are functionally distinct from those that cause the acquisition of knowledge about animals, objects, and foods.

If this second finding is confirmed by further case studies, it would raise many interesting questions about the nature of learning itself. Domain-general learning theories—whether connectionist or otherwise—presume that the same learning mechanisms account for knowledge acquisition across content domains. A developmental dissociation that impairs the acquisition of knowledge about animals, objects, and foods, while having no effect on the acquisition of trait knowledge, is difficult to reconcile with such learning theories.

R.J.'s semantic dissociations should be especially puzzling for theorists who view all learning as caused by equipotential mechanisms that compute correlations between elementary perceptual or conceptual dimensions. If learning were limited to such mechanisms, then surely the evidence of one's senses would be sufficient for R.J. and others to end up concuring that apples are sweet, lemons are not, rocks are hard, and giraffes are tall (see the semantic inventory in Appendix A). Yet R.J. and others do *not* concur in their judgments of easily observable properties of foods, animals, and objects. At the same time, R.J.'s judgments about his own personality are consistent with those of others who know him—even though R.J.' s judgments are those of an autistic individual with *social* deficits. [3]

[3] The hypothesis that learning is equipotential and based on correlations among personally experienced dimensions of the world is particularly undermined by R.J.'s widely divergent food judgments: Although tastes differ, there is no obvious reason why R.J.'s experience of basic sensory dimensions such as sweet, sour, salty, and juicy should differ *more* from the control subjects' than their tastes differ from one another. This discrepancy is even more puzzling in light of the consistency of his judgements about his own personality.

Semantic memory is sometimes defined as the store of culturally shared general world knowledge. Seen in this light, one could interpret the semantic inventory as asking for the consensus view, rather than for one's own opinion (e.g., I might know others think cherries are sweet, even though I find them sour).

It has recently been proposed that culturally shared knowledge results when domain-specific inference systems interact with linguistically transmitted information which the hearer stores—at least temporarily—in metarepresentations (e.g., Sperber, 1985, 1994; Boyer, 2001). Deciding which part of the message is relevant requires one to make inferences about the speaker's background beliefs and communicative intent—which also depends on metarepresentations (Sperber & Wilson, 1995). This kind of proposal could explain why a person with autism—whose ability to form metarepresentations is very limited—would have difficulty figuring out which knowledge is shared by those around him. Lacking metarepresentational abilities, a person with autism would have difficulty inferring a speaker's beliefs and communicative intent (Baron-Cohen, 1995). Without being able to store people's utterances in metarepresentations, apart from semantic memory, he would take everything said to him at face value: other people's false beliefs, lies, ironic remarks, and metaphors would be stored in semantic memory as if they were true. Eventually this would corrupt his database of world knowledge (Leslie, 1987).

On this account, R.J.'s inability to retrieve episodic memories and the atypical content of his culturally shared knowledge have the same root: a deficit in forming metarepresentations. But it also implies that trait knowledge does *not* depend on metarepresentations: that it is learned via mechanisms that are not needed for learning about other domains of semantic knowledge. Perhaps this should not be surprising. Primate studies suggest that the ability to extract accurate personality information and use it to predict behavior is phylogenetically ancient: Chimpanzees and bonobos can adjust their social behavior in ways that reflect the personalities of different interactants (e.g., De Waal, 1982; De Waal & Lanting, 1997), and if one counts subtle knowledge of dominance and alliance, so can many species of monkey. In contrast, the ability to metarepresent beliefs is thought to have evolved relatively recently (monkeys seem to lack it e.g., Cheney & Seyfarth, 1990) and the jury is still out on chimpanzees and bonobos (e.g., Povinelli, Bering, & Giambrone, 2000; Povinelli, Rulf, & Bierschwale, 1994; Suddendorf & Whiten, 2001) If so, then mechanisms for learning about one's own personality and that of others predates the metarepresentational compentences on which the acquisition of cultural knowledge is thought to depend.

## 8. Conclusion

For many years psychologists have debated whether there is something "special" about the self as a structure in memory (for review, see Greenwald

& Pratkanis, 1984; Kihlstom & Cantor, 1984; Kihlstrom & Klein, 1994; Linville & Carlston, 1994), but an answer to this question has proven elusive. We believe the evidence presented in this case study makes a modest contribution to this debate by suggesting that the storage and retrieval of self-knowledge (e.g., personality characteristics) may be functionally independent of other types of knowledge contained in semantic memory (e.g., animals, inanimate objects, types of foods). There may, after all, be something special about the self as a structure in memory.

The fact that R.J.'s semantic dissociation was developmental in origin suggests something more: There may be a cognitive system specialized for *acquiring* semantic knowledge about the self. This trait-learning system can operate properly—thereby generating R.J.'s accurate trait self-knowledge—even when systems crucial for acquiring knowledge about other content domains are impaired (causing his deficits in those domains). In other words, the human mind may have learning systems that are specialized for acquiring information about one's own personality. If so, then the self may be special when it comes to learning as well.

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## Appendix A

| | | | | |
|---|---|---|---|---|
| 1. | Is a rock a hard object? | not at all | somewhat | definitely |
| 2. | Is a giraffe a tall animal? | not at all | somewhat | definitely |
| 3. | Is a lemon a sweet fruit? | not at all | somewhat | definitely |
| 4. | Is a beaver a fast animal? | not at all | somewhat | definitely |
| 5. | Is a balloon a round object? | not at all | somewhat | definitely |
| 6. | Is a cow a large animal? | not at all | somewhat | definitely |
| 7. | Is an apple a sweet fruit? | not at all | somewhat | definitely |
| 8. | Is a bear a strong animal? | not at all | somewhat | definitely |
| 9. | Is potato a juicy vegetable? | not at all | somewhat | definitely |
| 10. | Is a football a round object? | not at all | somewhat | definitely |
| 11. | Is sandpaper a smooth object? | not at all | somewhat | definitely |
| 12. | Is popcorn salty? | not at all | somewhat | definitely |
| 13. | Is a pencil a heavy object? | not at all | somewhat | definitely |
| 14. | Is clay a soft object? | not at all | somewhat | definitely |
| 15. | Is a pig a smelly animal? | not at all | somewhat | definitely |
| 16. | Is a crayon a pointy object? | not at all | somewhat | definitely |
| 17. | Is a mouse a large animal? | not at all | somewhat | definitely |

**Appendix A** (*continued*)

| | | | | |
|---|---|---|---|---|
| 18. | Is pizza a salty food? | not at all | somewhat | definitely |
| 19. | Is a cherry a sour fruit? | not at all | somewhat | definitely |
| 20. | Is a baseball a hard object? | not at all | somewhat | definitely |
| 21. | Is a deer a fast animal? | not at all | somewhat | definitely |
| 22. | Is an elephant a colorful animal? | not at all | somewhat | definitely |
| 23. | Is a light bulb an oval object? | not at all | somewhat | definitely |
| 24. | Is cardboard a smooth object? | not at all | somewhat | definitely |
| 25. | Is a horse a large animal? | not at all | somewhat | definitely |
| 26. | Is a peacock a colorful animal? | not at all | somewhat | definitely |

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