

## Memory and Awareness in a Patient with Multiple Personality Disorder

MARY JO NISSEN

*Department of Psychology, University of Minnesota*

JAMES L. ROSS

*Department of Psychiatry, University of Minnesota*

DANIEL B. WILLINGHAM

*Department of Psychology, Harvard University*

THOMAS B. MACKENZIE

*Department of Psychiatry, University of Minnesota*

AND

DANIEL L. SCHACTER

*Department of Psychology, University of Arizona*

We studied an individual with multiple personality disorder in whom each of several personalities claimed to have no direct awareness of the others and to be unable to consciously remember the experiences of other personalities. A broad selection of implicit and explicit memory tests was used to determine the extent to which one personality had access to knowledge acquired by another and the circumstances in which that knowledge would be expressed. The implicit assessment of memory was a necessary but not sufficient condition for demonstrating interpersonality access. The degree of compartmentalization of knowledge

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in this patient depended largely on whether the interpretation of presented information was likely to differ across personalities. © 1988 Academic Press, Inc.

Multiple personality disorder is an uncommon but "by no means rare" syndrome (Coons, 1980) in which an individual possesses two or more distinct and complex personalities. The individual's behavior at any time depends upon which one of the personalities is dominant at that time. Although these are the major criteria for the diagnosis of multiple personality disorder (MPD) given in DSM-III (American Psychiatric Association, 1980), they do not provide a full reflection of the enormous complexity of this clinical syndrome. In a recent survey of 100 cases of MPD (Putnam, Guroff, Silberman, Barban, & Post, 1986), the mean number of distinct and separate alternate personalities existing in a patient was 13. More than half of the cases had alternate personalities claiming to be of the opposite gender from the biological sex of the patient, and 85% of the cases had alternate personalities claiming to be children.

Although amnesia is not a DSM-III criterion for the diagnosis of MPD, it is one of its hallmarks. Episodes of amnesia were reported in 98% of the cases surveyed by Putnam et al. (1986). Most of these involved interpersonality amnesia, in which one personality had no direct awareness of the existence of another personality. Even though such personalities are able to recall events that happened to them, they appear unable to consciously remember the experiences of other personalities or events occurring during alternate personality states. Thus, a disorder of memory is central to this syndrome. Indeed, Hilgard (1977) suggested that Pierre Janet's introduction of the term dissociation, which refers to several clinical phenomena including MPD, derived from associationist views of memory. In dissociative disorders some aspects of cognition that are normally integrated are instead dissociated or separated from each other. In MPD this includes the dissociation of normally associated memories.

The interpersonality amnesia that occurs in MPD can be characterized as a deficit in explicit or conscious remembering: One personality is unable to explicitly recollect information presented to another. However, many recent studies of individuals with normal memory and patients with organic amnesia show that memory can also be expressed with neither the intention to remember nor the awareness that one is remembering; the performance of a task can be affected by prior experience even in the absence of the ability to recall that experience. We shall refer to this kind of memory as implicit memory (Schacter, 1987). One source of evidence for implicit memory comes from studies of the repetition priming effect (see Shimamura, 1986, for a review). Amnesic patients can also learn and retain some skills (Cohen & Squire, 1980; Corkin, 1968; Milner, 1962; Nissen, Cohen, & Corkin, 1981), and they can show by their performance that they have acquired specific new associations (Knopman

& Nissen, 1987; Moscovitch, Winocur, & McLachlan, 1986; Nissen & Bullemer, 1987; Nissen, Knopman, & Schacter, 1987; Nissen, Willingham, & Hartman, in press).

These developments in the study of organic amnesia raise the question of whether interpersonality amnesia in MPD is also limited to explicit forms of remembering. Is there complete compartmentalization of knowledge in MPD, such that information acquired by one personality is entirely inaccessible to another? Or can it be shown through implicit measures of memory that the dissociation of memory is incomplete, that experiences of one personality can affect the performance of another? These questions are obviously similar to those raised with respect to organic amnesia, but the answers may yield different implications. In multiple personality disorder the fact that one personality can explicitly remember the information in question indicates that the knowledge is available and that it is represented in a way that allows it to be remembered with awareness. Attempts to understand the failure of another personality to consciously remember this same information may provide insight into the question of what, at a psychological level of analysis, allows conscious remembering. Consideration of multiple personality disorder also dramatically emphasizes the consequences of being unable to gain conscious access to parts of memory.

It may be noted that the terms "explicit" and "implicit" can be used in different ways in considering multiple personality disorder. These terms are typically used as labels for types of memory tests, such that if a test requires explicit remembering it is an explicit memory test (e.g., free recall), and if it does not it is an implicit memory test (e.g., tasks such as word fragment completion that can yield repetition priming effects). In studying a patient with MPD, however, explicit memory tests such as free recall might allow the implicit expression of knowledge acquired by personalities other than the one being tested. The ability of one personality to learn a set of items might be impaired if another personality previously learned a different set of items, such that there would be proactive interference across personalities (Silberman, Putnam, Weingartner, Braun, & Post, 1985). Similarly, one personality might be better able to recall material presented to it if another previously learned the same material (Ludwig, Brandsma, Wilbur, Bendfeldt, & Jameson, 1972). In both examples, explicit memory tests are used to assess implicitly the extent to which one personality has access to knowledge acquired by another. In a given patient, there may be a failure to access knowledge across personalities only if one personality is asked explicitly to recollect an experience of another personality. Alternatively, failure of access might be revealed any time an explicit memory test is used, regardless of whether the instruction is to recollect the experience of another personality.

We had the opportunity to address these and other issues by studying a patient with multiple personality disorder. Our strategy was to use a broad selection of implicit and explicit memory tests to determine the extent to which one personality had access to the knowledge of another, the circumstances allowing the expression of that knowledge, and the basis of the failure of direct awareness between personalities.

### CASE REPORT

The patient is a 45-year-old right-handed Caucasian woman, five times divorced, currently unemployed, and living alone. She is the mother of two daughters. She has been hospitalized on the psychiatry service at the University of Minnesota Hospital on five occasions since 1983. Since January 1986 she has been treated as an outpatient. She satisfies DSM-III criteria for multiple personality disorder.

The patient was adopted at birth by her great aunt, who had two older foster sons. According to family members unaware of the current diagnosis, the patient's behavior prior to the age of 5 was quiet and compliant. The family noted the onset of episodic aggressive and violent behavior at the age of 5 to 6 years. They recall that the patient would refer to herself by different names when such deviant behavior occurred. The patient attended parochial schools through the 11th grade. Erratic classroom behavior and irregular school attendance led to medical assessments that were said by members of the family, including the biological mother, to be unremarkable.

The patient suffers from no significant medical conditions and reports no history of head trauma or neurological problems. An alternate personality reports a history of alcohol abuse for the past 15 years, coupled with episodic abuse of marijuana and several episodes of LSD abuse.

Neurological evaluations, including EEG and CAT scans, that were conducted during her psychiatric admissions were normal. Evaluation in August 1983 indicated a prorated verbal IQ of 81, a prorated Performance IQ of 100, and an estimated Full Scale IQ of 89. Results from MMPI tests completed during her hospitalizations have been consistent with a severe and mixed personality disorder.

To date the patient has shown 22 distinctly different personalities ranging in age from 5 to 45 years. Three identify themselves as being male, and three maintain that they are left-handed. Most of the personalities have no direct awareness of the others and are amnesic for the experiences of the others. However, three of the younger personalities (ages 5, 12, and 13) report that they hear advice and instructions from several of the older personalities. Furthermore, one personality claims to have direct awareness of all of the others; she reports being capable of "listening to" and "observing" the others. Hypnotism has not been used to induce the patient to reveal alternate personalities.

Testing focused on the eight personalities described below. All of them were amnesic for the others in this group. Except where noted otherwise, they were right-handed and neither drank nor smoked. We have changed the names of these personalities.

1. *Alice*, age 39, has been studying to be a ministerial counselor and volunteers weekly as a nurses' aide in a nursing home. Her hobbies are Bible reading and oil painting of religious subjects. She is the most organized personality and is one of the few who gets along with the patient's older daughter.

2. *Bonnie*, age 36, is very social, optimistic, and verbal. Her main interests lie in the theater. She is involved in several acting groups as well as craft making, particularly jewelry design.

3. *Charles*, age 45, is an aggressive and profane male personality. He smokes, is a heavy drinker, is asocial, and prefers to drink alone. He is the "protector" and sometimes speaks and acts violently. His hobbies include watching all-star wrestling, reading detective stories, and oil painting of wild animals. He held many odd jobs before receiving social security disability 3 years ago. In many ways he is the most innovative and resourceful personality.

4. *Donna*, age 28, is primarily interested in music. She plays the piano, guitar, and harmonica, and sings in choirs. She is not very social and has few acquaintances.

5. *Ellen*, age 39, has a self-important attitude and is highly ambitious and disciplined. Her hobbies include attending the theater, bird watching, and painting. She occasionally dates men, whereas the other female personalities in this group do not. She claims to be a widow.

6. *Faye*, age 45, is the "homemaker" of the group and does the cooking and housework. She is deferential and shy.

7. *Gloria*, age 32, is one of the three left-handed personalities. She also paints, but with a more abstract style than the others. She adopted a last name different from that of the others so that she could get a social security number of her own. Her manner is friendly, confident, and enthusiastic.

8. *Harriet*, age 24, is also left-handed. She smokes occasionally and is the only personality who takes drugs, typically marijuana. She claims to be an identical twin to another of the personalities (not one of this group), whom she dominates and physically abuses. She reports that she was beaten as a child and that she can self-anesthetize to block out painful stimuli. She is profane, aggressive, and irresponsible.

## METHODS AND RESULTS

The patient was tested in 10 sessions during a 3-month period. Successive sessions were separated by at least 4 days. Changes between personalities were made at the request of the patient's psychiatrist (JLR). The transition

between personalities took less than 1 min. On three occasions during testing sessions, a switch occurred spontaneously.

The experiments reported here involved presenting information to one personality and then, after a retention interval of 5 to 10 min (except where noted otherwise), giving another personality a task that would normally be sensitive to the prior presentation of the information. The first section below describes two experiments in which one personality was asked (but failed) to explicitly recall or recognize information presented to another. The second section describes tests that were designed to allow the implicit expression of knowledge and that did in fact produce evidence for access between personalities: four-alternative forced-choice recognition, repetition priming of perceptual identification, repetition priming of word fragment completion, sequence learning in a serial reaction time task, and proactive interference in paired-associate learning. There were also, however, implicit memory tests that failed to show evidence of access between personalities. These are described in the third section: successive story recall, repetition priming of stem completion, interpretation of ambiguous texts, and interpretation of ambiguous sentences.

#### *Explicit Access*

*Cued recall.* Alice was given three study-test trials on the paired-associate learning subtest of the Wechsler Memory Scale (Wechsler & Stone, 1945). Six of the pairs were "easy," consisting of highly associated words such as *NORTH-SOUTH*; the remaining four were "hard" (e.g., *SCHOOL-GROCERY*). On her third attempt to supply the second word when given the first word from each pair, Alice correctly reported all six easy items and two of four hard items. Ellen was then given the first item from each pair and was asked to recall the word that Alice had learned with that item. Ellen gave the correct response to five of six easy items but none of the hard items. It is important to note that she did not avoid the answers to easy items that Alice had learned.

*Yes-No recognition.* Alice saw a sequence of 50 words and rated each one according to how pleasant it seemed. Bonnie was then shown a list of 20 words that included 10 from Alice's list and 10 new words. She was asked to circle the words she thought Alice had seen. Even though she was strongly encouraged to guess, she circled none.

#### *Evidence for Access between Personalities*

*Four-alternative forced-choice recognition.* Alice was shown 54 faces taken from old high school yearbooks and was asked to judge the mood of each one (i.e., happy, sad, or neutral). Bonnie was then shown a different set of 54 faces and rated the attractiveness of each (i.e., attractive unattractive, or neutral). Immediately after this presentation, Bonnie was given a four-alternative forced-choice recognition test. On each of 49

trials she saw four faces and was asked to indicate which one she had seen before or seemed "most familiar." She was encouraged to guess. Three types of test trials were included:

(a) The alternatives on 25 trials included one face that Bonnie had seen previously and three new faces that neither personality had seen. Bonnie selected the face that she had seen on 13 of these trials (i.e., 52% of the time).

(b) The alternatives on 12 trials included one face that Alice had seen previously and three new faces. Bonnie selected the face that Alice had seen on 5 of these trials, or 42% of the time. If Bonnie had been uninfluenced by Alice's experience, one would have expected her to select the face Alice had seen on only 25% of these trials.

(c) The alternatives on the remaining 12 trials included one face that Alice had seen before, one face that Bonnie had seen before, and two new faces. Bonnie selected the face that she had seen on 4 of these trials, or 33% of the time. Her accuracy at selecting the face that she had seen was thus somewhat lower when that face appeared with one that Alice had seen than when it did not. As for the remaining 8 trials, Bonnie selected the face that Alice had seen five times. That is, given that Bonnie did not choose the face she had seen, she chose the face that Alice had seen 63% of the time. If Bonnie had been uninfluenced by Alice's experience, one would expect this value to be 33%.

*Repetition priming of perceptual identification.* On each trial in the perceptual identification task a word appeared briefly on a video monitor, preceded and followed by a masking stimulus. The patient was asked to read the word aloud, guessing when unsure of its identity. Of the 30 trials in each block, 15 involved the presentation of words that appeared in every block, and 15 involved nonrepeated words.

Donna completed four blocks of trials, then Charles completed four blocks, and finally Donna completed another two blocks. A calibration procedure was administered to each personality before these experimental blocks of trials were presented. The purpose of the calibration procedure was to determine a stimulus duration that would yield a response accuracy between 33 and 50%. Words that were presented on calibration trials were not repeated in any of the experimental blocks. The stimulus duration at which response accuracy met the specified criteria was 50 msec for both personalities. That duration was used in all experimental blocks.

Both personalities demonstrated a repetition priming effect (RPE): They responded more accurately to repeated than nonrepeated words (Fig. 1). What is of interest is that the size of the RPE demonstrated by Donna increased as a result of the experience Charles had on the task. Donna showed an average RPE of 10% during her first set of blocks, but following the training that Charles received, Donna's RPE increased to 34%. This increase is even more striking if one compares only the

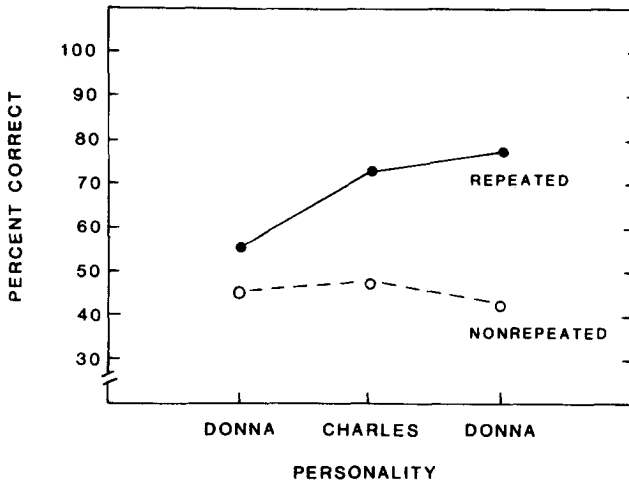


FIG. 1. Percentage correct responses in perceptual identification task.

last block of Donna's first set of four (an RPE of 0%) to the first block of her second set (an RPE of 53%).

*Repetition priming of word fragment completion.* Alice saw 50 low-frequency words on a video monitor and indicated whether she thought each word was pleasant, unpleasant, or neutral. Rate of presentation was self-paced. Then Bonnie was given a recognition memory test that included 10 of the words Alice saw and 10 new words. As indicated earlier, when she was asked to circle the words Alice had seen, she circled none. Immediately after this test, Bonnie was given a list of 90 fragments of words (e.g., A--A--IN) and was asked to try to complete each fragment with the first word that came to mind, working quickly and going on to the next item if she could not think of a completion. Materials for this test were taken from those used by Tulving, Schacter, and Stark (1982).

Of the 90 fragments, 10 were items that had been presented to Alice during the initial phase of the experiment, 10 were items that Bonnie had seen on the recognition test, 10 had appeared both in the initial phase and on the recognition test (i.e., both personalities had seen them), and 10 had not appeared before in the experiment. The remaining 50 were filler items. Bonnie successfully completed 4 of the 10 fragments that she had seen on the recognition test and 4 of the 10 fragments that both she and Alice had seen. She completed 2 of the 10 fragments that Alice had seen but that she (Bonnie) had not. Finally, she completed none of the 10 fragments that had not appeared before. In short, it appears that Bonnie's performance was facilitated somewhat by Alice's experience.

*Sequence learning in a serial reaction time task.* This task has been



used to assess the acquisition and retention of new procedural associations (Nissen & Bullemer, 1987; Nissen et al., 1987; Knopman & Nissen, 1987). On each trial a light appeared in one of four positions arranged horizontally on a video monitor. The patient rested the index and middle finger of each hand on four response buttons and was instructed to press the button that was directly below the light. She was asked to respond as fast as possible without making errors. After the correct key was pressed the light was extinguished and the next one appeared following a 500-msec delay. Brief rest periods occurred after each block of 100 trials.

Bonnie was given three blocks of trials in a random-sequence condition, in which the location of the stimulus on each trial was determined randomly, the only constraint being that the same position could not be used on successive trials. Alice was then given four blocks of trials in a repeating-sequence condition, in which the location of the stimulus followed a particular 10-trial sequence. Each block of 100 trials thus comprised 10 repetitions of the 10-trial sequence, but the end of one repetition and the beginning of the next was not marked in any way. The existence of the sequence was not mentioned to Alice; her task was simply to respond to each light as quickly as possible. In Alice's fifth block of trials she received a random sequence instead of the repeating sequence. Following Alice's training, Bonnie again performed the task, receiving three blocks of the repeating-sequence condition and then one random block.

To the extent that an individual learns the repeating 10-trial sequence, response latency should decrease during practice on the repeating sequence and should be faster on the repeating sequence than the random sequence. Previous studies (e.g., Nissen & Bullemer, 1987) have determined that healthy subjects show substantial learning of the sequence during four blocks. Alice's results (Fig. 2) also reflect some learning of the sequence. Our primary question was whether her acquisition of the sequence would facilitate Bonnie's performance. It did: Bonnie's initial response times in the repeating-sequence condition were approximately 75 msec faster than her previous responses in the random-sequence condition.

*Proactive interference.* The three experiments just described investigated positive transfer effects. They evaluated the positive or facilitative effects that the experience of one personality might have on the performance of another. We used an A-B, A-Br paradigm to assess negative transfer effects in a verbal learning task (Bower & Hilgard, 1981). Bonnie was given 10 study-test trials on a list of 10 pairs of unrelated words. On each trial the set of word pairs was read aloud to her, and then she was given each stimulus word and was asked to say the response word. She was corrected if wrong. Then Alice was given 4 study-test trials on a different set of 10 word pairs that was constructed by repairing the stimulus and response words from Bonnie's list. Finally, Bonnie was

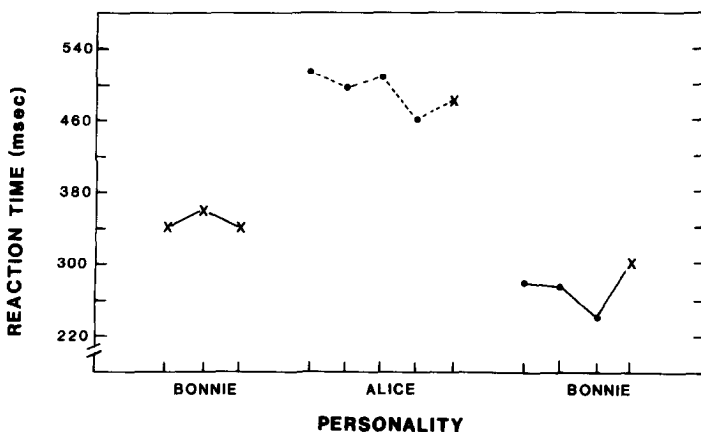


FIG. 2. Mean reaction time of Bonnie (solid lines) and Alice (dashed lines) in four-choice visual reaction time task. Filled circles represent results on repeating sequence; X's represent results on random sequence.

given a retest on the pairs she had learned. One week later, Alice completed 2 study-test trials on an entirely new set of 10 unrelated word pairs.

Bonnie had little trouble learning her set of word pairs. She made no errors on the last four study-test trials and recalled all items on the retest (Table 1). The finding of most interest, however, is that Alice had much more difficulty learning reparings of words that Bonnie had learned than in learning a new set. This negative transfer effect was evident in Alice's affect as well as her accuracy. During the four study-test trials with the

TABLE 1  
NUMBER OF CORRECT RESPONSES (OUT OF 10) ON PAIRED-ASSOCIATE LEARNING TEST

Trial	Personality and stimuli			
	Bonnie A-B	Alice A-Br	Bonnie A-B (retest)	Alice C-D (1 week later)
1	5	1	10	4
2	5	0		5
3	6	2		
4	6	1		
5	7			
6	9			
7	10			
8	10			
9	10			
10	10			

TABLE 2  
NUMBER OF SEGMENTS RECALLED FROM WECHSLER MEMORY SCALE STORIES

Personality	Story A		Story B	
	Presentation order	Number recalled	Presentation order	Number recalled
Alice	1	11.5	5	6
Bonnie	2	4	4	12.5
Donna	3	6.5	3	6
Charles	4	8.5	2	10
Harriet	5	4	1	4

repairings of Bonnie's words, Alice became increasingly frustrated and agitated until Charles (the protector) appeared suddenly and spontaneously, swore at the experimenter, and stormed out of the room.

#### *Lack of Evidence for Access across Personalities*

*Successive story recall.* Story A from Form I of the Wechsler memory Scale (Wechsler & Stone, 1945) was read to five personalities in turn, and each was asked to recall it immediately after hearing it. Twenty minutes intervened between each of these tests. During a separate session 11 days later, Story B from Form II of the Wechsler Memory Scale was presented to the same set of five personalities but in reverse order. Each one heard the story and tried to recall it. There were a total of 24 segments in the first story and 23 in the second.

Table 2 shows the number of segments that each personality recalled from the two stories. The question of most interest was whether there would be systematic improvement in performance as each personality attempted to recall a story. Would recall improve with the number of times the story had been presented previously to other personalities? This trend is not evident in the results. Furthermore, analyses of which segments were recalled revealed little tendency for one personality to recall the same segments that other personalities recalled. We determined for every pair of personalities the conditional probability that a story segment was recalled by both personalities given that it was recalled by at least one of the two personalities. The mean of these probabilities was 0.41.<sup>1</sup>

<sup>1</sup> These results differ from those of a group of 45 undergraduate students who were asked to simulate amnesia. The students initially recalled an average of 10.9 segments from Story B. After 20 min, they were told to pretend that they had not heard the story before. They recalled an average of 15.8 segments following the second presentation of the story. The average conditional probability, computed as for the patient, was 0.59.

*Repetition priming of stem completion.* Alice saw 24 words on a video monitor and judged the pleasantness of each word. Rate of presentation was self-paced. Bonnie was then given a printed list of 48 three-letter word stems and was asked to complete each one with the first word that came to mind. Each stem could be completed to form 10 English words. Of the 48 stems on the list, 24 could be completed to form a word that Alice had seen, but nine other completions were possible as well. Bonnie generated a word that Alice had seen for only 2 of these 24 items. Because the chance rate (i.e., the probability that a stem would be completed with a word from the set shown to Alice independent of the prior presentation) is approximately .10, this finding does not represent a repetition priming effect. After finishing the stem-completion test, Bonnie was asked to recall the words Alice had seen. She said she did not know what they were.

The procedure was repeated 5 days later in order to document that Bonnie would have demonstrated a repetition priming effect if the words had been presented to her instead of to Alice. Bonnie judged the pleasantness of 24 new words and then completed a new stem-completion test. Bonnie generated a word that she had seen for 7 of the 24 stems that allowed such a completion, thus demonstrating a within-personality repetition priming effect. After the stem-completion task Bonnie recalled 5 of the 24 words she had studied.

*Interpretation of ambiguous texts.* Donna was shown the "balloon drawing" taken from Bransford and Johnson (1973) (see Fig. 3) and was asked to describe the situation it depicted. Following a delay of 75 min, Charles was given a paragraph that provides an ambiguous description of the same situation and was asked to interpret it. The paragraph began in the following way:

If the balloons popped, the sound wouldn't be able to carry, since everything would be too far away from the correct floor. A closed window would also prevent the sound from carrying, since most buildings tend to be well insulated. Since the whole operation depends on a steady flow of electricity, a break in the middle of the wire would also cause problems . . . (Bransford & Johnson, 1973, p. 392).

Charles failed to provide an interpretation consistent with the drawing Donna had seen. He said instead that he thought the paragraph had "something to do with Marconi and electricity." It would appear that Donna's familiarity with the drawing did not affect Charles's interpretation of the passage. In a session conducted a month later, we showed Charles the drawing and after a delay of 90 min asked him again to interpret the passage. In this case he provided an interpretation that corresponded to the drawing.

In a similar experiment, we investigated whether Donna's interpretation of an ambiguous passage would be affected by a task given previously

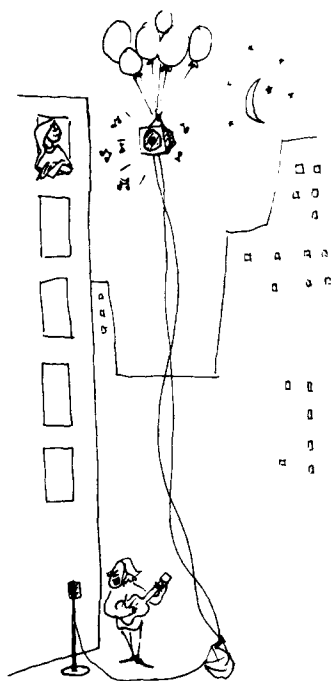


FIG. 3. Drawing corresponding to the ambiguous "balloon" passage. (From Bransford & Johnson, 1973, with permission of the authors and Academic Press.)

to Charles. We asked Charles to describe in some detail the procedures involved in doing laundry, and then we gave Donna a passage that provides an ambiguous description of doing laundry, also taken from Bransford and Johnson (1973). Her interpretation was unrelated to laundry procedures and was as ambiguous as the text itself. When we asked Donna to describe laundry procedures a month later and then gave her the same passage, she provided the appropriate interpretation.

*Interpretation of ambiguous sentences.* This experiment followed the procedure used by McAndrews, Glisky, and Schacter (1987) to assess the effect of a previous experience on the ability to interpret ambiguous sentences. Alice read a critical set of 10 ambiguous sentences such as "The smell began because the signs went up." After reading each one, she was given a word or phrase that was intended to clarify the meaning of the sentence (e.g., "garbage strike"), and then she interpreted the sentence. Bonnie was then given these same 10 sentences along with 10 filler sentences that were somewhat less ambiguous and was asked to provide a word or phrase that would make the sentence more understandable. She provided the correct response to only 1 of the 10 critical sentences that Alice had seen.

These results can be contrasted with Bonnie's performance on sentences that she (Bonnie) had seen previously. In the next session, conducted 5 days later, Bonnie was given a new set of 10 critical sentences and a clarifying phrase for each. When she was given these sentences 20 min later together with 10 filler sentences, she provided the correct response to 8 of the 10 critical sentences.

Finally, 35 min later, we determined how well Charles could interpret the 10 critical sentences that Alice had studied 5 days previously and the 10 critical sentences that Bonnie had just studied. Charles provided the correct response to only 1 sentence.

In short, the ability of one personality to interpret ambiguous texts and sentences was not facilitated by the previous experience that other personalities had in interpreting the same or highly related material.

## DISCUSSION

What is the most appropriate way to characterize the conditions allowing knowledge acquired by one personality to be accessed and expressed by another? We found that in this patient, as in most other patients with multiple personality disorder, one personality was unable or unwilling to explicitly recall or recognize stimuli presented to another personality. Thus, the implicit assessment of memory was a necessary condition for demonstrating interpersonality effects. It was not, however, a sufficient condition. Some of the experiments designed to determine whether the experience of one personality affected the performance of another in fact did not show evidence of access between personalities. In short, the distinction between explicit and implicit memory does not fully capture the conditions of compartmentalization of memory in this patient.

Instead, our findings suggest that the accessibility of knowledge across personalities depends on the nature of material presented and the extent to which the encoding and retrieval of that material are susceptible to personality-specific factors. The experiments showing compartmentalization employed, for the most part, semantically rich materials: stories, a drawing depicting a relatively complex episode, ambiguous paragraphs, and ambiguous sentences. These are materials that might be interpreted in different ways by different people—or different personalities. The Wechsler Memory Scale stories induce affective interpretation that might vary across personalities. The ambiguous paragraphs and sentences, by virtue of their ambiguity, are materials that invite embellishment, the nature of which is likely to differ across personalities.

In contrast, the experiments in which the experience of one personality either facilitated or interfered with the performance of another employed material that was relatively spare in terms of the variety of interpretations

it would be likely to elicit: single words or pairs of words, photographs of faces presented in isolation, and a sequence of lights. In our view, personality-specific interpretations and thus personality-specific encodings were less likely with this relatively simple stimulus material.

A comparison of the results from two experiments—fragment completion and stem completion—indicates that the nature of the stimulus material was not the only determinant of interpersonality effects. These two tasks are formally very similar, involving the presentation of a set of words to one personality and the completion of parts of words by another personality. An important difference between the tasks, however, is that there is a single correct response on each trial of the fragment-completion test, but there are 10 possible responses on the stem-completion test. The former thus has the character of a problem-solving task, whereas the latter is more similar to a free association task. Alternate personalities would be likely to give different free associations, and any priming effects might not be strong enough to overcome these associative biases.

In summary, the degree of compartmentalization of knowledge in this patient appears to depend on the extent to which that knowledge is interpreted in ways that are unique to a personality as well as the extent to which processes operating at the time of retrieval are strongly personality-dependent. Material that allows a variety of different interpretations, whose encoding is significantly guided by strategic processing, or whose interpretation might be expected to depend on one's mood and beliefs and biases is relatively inaccessible across personalities. When the material does not demand a level of embellishment at which personality-specific factors might operate or when its encoding is less dependent on strategic processing there is greater access across personalities. Our findings lead to the prediction that state-dependent learning and mood-congruity effects in normal subjects as well might be stronger for material that allows richly different interpretations.

As others (e.g., Bower, 1981) have suggested, multiple personality disorder can be viewed as an extreme version of a normally occurring phenomenon. All of us experience changes in state as our roles, environments, and moods change. There is much overlap among the states experienced by normal individuals; certainly there is commonality of personal identity across states. Thus, the interpretations that are applied to events and the associations they draw upon may not differ sharply across states, and state-dependent learning effects are relatively small. In contrast, multiple personality disorder involves alternate states that are often narrowly defined, that differ from each other on many more dimensions than mood, and that are characterized by sets of attributes that are, to an extent, mutually exclusive. One might also suppose, within Bower's (1981) associative network theory of state-dependent learning,

that there is exceptionally strong mutual inhibition between representations associated with the alternate states in multiple personality disorder. In short, it may be the case that one personality lacks awareness of another because of a lack of access to information about events encoded by that personality, which in turn results from personality-specific aspects of encoding and from inhibition between representations of emotion and other attributes that characterize the alternate personalities.

In any study of multiple personality disorder the question of malingering inevitably arises, perhaps because this syndrome violates the most human of qualities—the unity of personal identity—and thus seems so unlikely. Our research project does not address the issue of malingering, nor was it intended to. With regard to the results from this patient, however, a few comments are appropriate. First, if she had been feigning interpersonality amnesia, one might have expected her to *avoid* responses corresponding to material that had been presented previously to an alternate personality. Her performance on several tests, including cued recall of paired associates from the Wechsler Memory Scale, forced-choice face recognition, and word fragment completion, gave no evidence of such a tendency. Second, the purpose of the experiments in which results indicated a failure of access to knowledge across personalities was no more transparent than that of the experiments in which there was evidence of interpersonality access. Third, the authenticity of MPD has been most questioned when the patient has been implicated in a crime (Orne, Dinges, & Orne, 1984; Schacter, 1986) and is considered to be highly creative and brilliant. None of those characteristics applies to this patient, however. Finally, this issue ultimately comes down to the question of whether the patient could have stopped experiencing these changes in state had she chosen to. We do not believe that she could have, but in any case the fact that she underwent these dramatic changes in state allowed the investigation of the limits of state-dependent learning and the other issues we have addressed.

It is not clear how representative our findings from this single case will prove to be of most patients with multiple personality disorder. Her results on successive story recall differed from those of a patient reported by Ludwig et al. (1972), whose accuracy increased with repeated presentations of the story. It would not be especially surprising if there proved to be greater variability among patients with functional amnesia than among those with organic amnesia of a particular etiology. Although the interpretation of the results from any of our experiments considered alone cannot be made with certainty, we believe we have established a pattern of performance in this patient that suggests useful hypotheses for additional studies of multiple personality disorder and of state-dependent learning in normal subjects.



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