

16 *Designing Ecologically Valid Memory Interventions for Persons with Dementia*

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At an Alzheimer's disease (AD) support group meeting, an elderly caregiver presented a question about his wife. He said that an hour or so after he had fixed supper and they had eaten, she would begin to ask him, "When are you going to give me supper?" The caregiver would explain that they had already eaten, but she would not believe him and would become angry. He was afraid of feeding her again, and even if he did she would ask the same question an hour after he fixed a second meal. He wanted to know what he could do to avoid this problem.

This is a prototypical scenario for those who work with family caregivers, adult day care staff, or nursing home staff on a regular basis. The problem involves a specific behavior, and attempts to solve it by "reasoning" with the client who has dementia are often unsuccessful and frustrating for all concerned. The problem is based on a memory deficit, but the problem itself has ramifications for the caregiving support system in terms of time, energy, emotional cost, and so on. In the same vein, a solution to the problem will not only overcome a deficit in memory, but will have a positive impact on the general environment—social and emotional—of the person with dementia and that person's caregivers.

The first step in solving the problem was to ask the caregiver to describe their typical dining pattern. He answered that they would eat, he would clear away and do the dishes, put them up, then sit down with his wife to watch television. Shortly afterward her questioning would begin. The solution to the problem immediately presented itself: Don't clear away the

dirty dishes. Keep them on the table to remind the wife that supper had been served and eaten. As a final touch, it was suggested that the two of them do the dishes together just before going to bed. Preserved motor skills associated with doing the dishes were also assumed to be available to the wife. This solved his problem, but the solution only presented itself through an appreciation for the specific memory deficits associated with dementia—inability to preserve new episodic memories.

Loss of memory function over the course of a dementing illnesses such as AD is insidious and progressive. In the very early stage of AD, memory functioning resembles that of a nondemented older adult who is occasionally forgetful, with this forgetfulness not interfering with the person's abilities in employment or social situations. Hints or stimulus cues for memories of names and lost objects are sufficient to enhance memory performances for these individuals. As the disease progresses, measurable decline in memory and concentration is evidenced. There are recognizable patterns to the way the brain deteriorates. AD patients begin to exhibit difficulties in episodic memory, especially for delayed recall of new information, as well as in planning and perception. They know who they are, recognize familiar faces, and can even recall major recent events. But if asked, they are unable to recall any details of the events. These persons are unable to follow a map and therefore get lost driving to a new location. They misplace objects of value such as wedding rings or important papers, then often accuse caregivers or relatives of hiding or stealing the items. Word-finding deficits and common recall skills become impaired. Complex or multistep tasks are even more challenging. The inability to concentrate, retain new information, and follow through on directions become obvious impairments as the disease progresses.

Short-term memory and the ability to process new information are destroyed as the brain is further devastated. Deeply ingrained rote memory activities that require no thought, such as reading, counting forward, and motor skills like wiping table tops or sorting cards, however, remain intact until relatively late in the course of AD.

THE E-I-E-I-O MODEL: A BASIS FOR MEMORY INTERVENTIONS

To guide our attempts to design interventions for normal older adults and those with dementia, we have adopted a heuristic classification system called the "E-I-E-I-O" model (Camp, et al., 1993). A 2×2 matrix is used to enable interventions to be classified along two dimensions. One dimension involves the initial site of storage for target information, External (in the physical environment) versus Internal (within a person's memory). Not

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all information found in memory interventions needs to be stored internally. Notebooks, grocery lists, and so on are examples of external mnemonics. Today, computerized appointment books give audio reminders to their owners about meetings, anniversaries, and so forth. These external mnemonics are designed so that information will not have to be stored internally and yet the necessary information can be accessed at the appropriate time. Internal memory interventions refer to attempts to immediately put information into a person's memory through techniques such as mental imagery, active rehearsal, and so on.

In addition, recent theoretical work in neuroscience has led to the belief that multiple memory systems exist. A good overview of this literature is provided in a volume edited by Schacter and Tulving (1994a). Though there is some disagreement about the specific nature and number of human memory systems, a widely used classification is the distinction between explicit and implicit memory. This distinction serves as the other dimension of our classification matrix referring to the type of memory being targeted, Explicit versus Implicit. Schacter (1992; Schacter & Tulving, 1994b) described explicit memory as the conscious recollection of past experiences that is typically assessed through recall and recognition of information from past episodes. Implicit memory is an unconscious form of memory retrieval that does not require cognitive effort or recollection of a specific learning event. Squire (1992, 1994) described similar divisions of memory, termed *declarative* (or explicit) and *nondeclarative* (or implicit). He further described specific types of learning and memory within each of these divisions. For example, Squire listed facts and events as components of declarative or explicit memory. Priming, motor skills, and habits, as well as simple classical conditioning, are representative forms of nondeclarative or implicit memory.

The "O" of the E-I-E-I-O model refers to the fact that information initially stored externally can be learned without conscious awareness that learning is taking place, and thus becomes transformed into internally stored, consciously retrievable information. When an individual realizes that such information has become consciously available, it often produces a sudden "O!" or "aha" experience. This aspect of the model is not considered in this chapter, but the reader is referred to Camp et al., 1993 for examples of this phenomenon and how it can be induced in nondemented populations.

Most memory interventions with nondemented older adults have relied on explicit memory and conscious, usually effortful, learning. Descriptions and reviews of memory interventions for nondemented elderly populations are readily available (Kausler, 1994; Kotler-Cope & Camp, 1990; McEvoy & Moon, 1988; West, 1995). Explicit memory and effortful information processing are devastated in persons with dementia, and attempts to use conscious processing to store and retrieve information generally fail in this population. As a result, we have largely abandoned interventions which could

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be classified as accessing explicit memory and requiring internal storage of information in our model. Instead, we have come to focus our efforts on the remaining three categories of interventions. An overview of the four categories of memory interventions in this model as they pertain to interventions we discuss in this chapter is seen in Table 16.1.

EXTERNAL STORAGE—EXPLICIT MEMORY INTERVENTIONS

The intervention using dirty dishes described earlier is an example of external location of information that is meant to access explicit memory; the information can be consciously accessed and utilized by the person with dementia (as

TABLE 16.1
Overview of Memory Interventions by Type
of Memory Accessed and Site of Storage

Type of Memory	Intended Storage Site of Information or Cue	
	External	Internal
Explicit Memory	Leave out dirty dishes (visual cue to access semantic memory, which is still accessible in mild to moderate stages of dementia) Filing index cards Place card with name Labeling toilet paper & bag (reading; accessing semantic memory) Rosary; Group praying, singing, or both (social retrieval aids to induce socially appropriate behaviors) Creating environmental cues: Footprints, targets, photographs in bathrooms (allows correct recognition of environmental features) Changing environmental cues: "LADIES" room sign; Removing chaise lounge; "BEWARE OF DOG" sign (eliminates undesirable behavior)	Interventions requiring explicit memory and internal storage of information are generally not effective due to damage to explicit memory (hippocampal circuitry) seen early in the course of dementia.
Implicit Memory	Montessori map puzzles (motor learning; place learning) Unconscious self-recognition with mirrors	Spaced retrieval (priming; unconscious storage and retrieval of names; etc.)

Combinations (External-Internal, Explicit-Implicit)
Bulletin boards

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 Paper bag 1/2

long as they are in the room with the dishes). When memory of the dishes fades, the person can be taken back to the dining room (or placed in a chair in another room in a line of sight with the dishes). The intervention does not require internal storage of the critical information. Explicit memory requiring internal storage is devastated relatively early in the course of AD and related dementias, and interventions requiring such memory and storage generally fail. Several examples of external aids accessing explicit memory are presented next, followed by examples of interventions utilizing implicit memory.

A woman with dementia who was formerly a clerk was picking up files at a day care center and "filing" them, such that staff could not find them. Staff would ask her to stop, she would agree, and after a short time the problem would again occur. A set of index cards of varying colors was obtained, with names, phone numbers, and addresses of fictitious people typed on each. The cards were put in a random sequence, and given to the woman to be sorted. The intervention was designed such that cards could be sorted within colors, which she could manage. But as her dementia progressed, the task could be modified to simply sorting cards according to color.

The ability to read printed words, especially a person's own name, is maintained well into the course of dementing illnesses. This preserved ability can thus be used as a basis for designing interventions. One client would walk to the back of a dining area to the same table each day for lunch. On the way to her table she would have to negotiate a path between many other tables and chairs. If she brushed up against any other client, or sometimes simply came too close, she would try to attack the other client verbally and/or physically. To solve the problem, a place card was created with her name on laminated paper which was put on the front table of the dining area. Since this was "her" table, she sat there and no longer felt the need to negotiate a path (of destruction) through the other tables.

Another instance in which this preserved ability (i.e., name recognition) aided in designing an intervention was with a female client with dementia who was hoarding toilet paper at a center. She would go into a bathroom, roll off a large amount of toilet paper, and then stuff it into her blouse. This behavior was repeated many times during the day, such that she often was seen with an extremely overstuffed blouse from which strands of toilet paper extruded. The biggest problem was that the other clients at the center thought that she was stealing a valuable resource, and that as a result the center would go bankrupt and they would all be put out on the street. The other clients, therefore, began to verbally abuse her and ostracize her from their groups. Talking to the other clients, many of whom were also demented, and talking to her did nothing to change this pattern of behavior. The question posed by staff, again, was "What do we do?"

Clearly, memory deficits are present in this situation, but the ecology of the social setting demanded that a solution involve reinstating this woman

as a part of the center's community. In this instance, we used what might be called "The Tai Chi Defense." This approach involves going with the disorder rather than trying to stop it. We put whole rolls of toilet paper in the bathroom with the woman's name on them in big, bold letters. She could still read her name, and was encouraged to take "her" toilet paper with her. We also gave her a cloth shopping bag with her name on it in which to carry her rolls of toilet paper. She now could hoard more paper than ever, yet not have to stuff it in her blouse. Other clients saw her carrying around a bag with her name on it (a socially appropriate behavior), and if they looked inside the bag her name was clearly marked on the rolls—they were obviously her property. As a result, she was accepted once again into the day care center's social circle. She could take the rolls home, and her family later returned them for recycling.

It is widely acknowledged by staff that late afternoons are times of stress at adult day care centers. Clients see other clients leaving, and anxiety rises in staff and clients alike. Frequent staff complaints include the clients' repetitive question asking, usually involving leaving for home, which hits its peak at this time. Also, clients are likely to get into strangers' cars, get on the wrong buses, and so forth. One approach taken to deal with this is the use of group activities such as praying the rosary (for Roman Catholics) and the singing of gospel songs. With regard to the rosary, it is a nice external aid in that it accesses long-term memories of specific prayers that are said repetitively. Praying in a group also is a form of retrieval support. And the setting of a prayer group is antithetical to agitation, loud or inappropriate vocalizations, stress, or wandering. Similar benefits are derived from the use of gospel singing. Former church deacons or ministers who are center clients make good leaders for prayer groups and may also do some preaching once their congregation is seated. If they tend to give a similar sermon on each occasion, demented clients in the audience do not seem to mind.

Caregivers often report problems regarding the use of bathrooms. Putting footprints on the floor as guides for where to stand, hand prints for where to hold rails, and targets (literally) for where to aim inside of urinals can be beneficial. One problem that arose at an Alzheimer's day care center was that men were urinating in the paper towel receptacle. Upon observing the room, two things became apparent. First, urinals were behind partitions and could not be seen from the front door. Second, the dispenser was made of shiny aluminum and was of about the right shape and height to resemble a men's urinal at a public facility, such as a stadium. The intervention designed for this problem involved taking color photos of the urinals, enlarging them, and placing them at the edges of the partitions so that they could be seen immediately upon opening the door. Under the photos were printed signs saying "THIS WAY" with directional arrows attached to guide the men. In addition, decorative stickers were placed on the

dispenser to change its appearance and a sign stating "PAPER TOWELS ONLY" was placed on it. These environmental changes fixed the problem. Note that for the paper towel receptacle, it was important to change the appearance of a preexisting external cue. Two other examples of interventions involving environmental cue alteration follow.

After lunch at an adult day care center, women would line up to use the bathroom. Because the line was long and the female clients were often frail and slow, those at the back of the line were likely to become incontinent. Staff members said that they had tried to get some of the female clients to use the other bathroom, which had a "MEN" sign on it, but the women refused. They were ladies, not gentlemen. The solution was to cover the "MEN" sign with a "LADIES" sign, such that two rooms, one labeled "WOMEN" and one labeled "LADIES," were now available, and both were put to use. Male clients were directed to the bathroom at the other end of the center at this time (men being fewer in number, this also worked).

Along similar lines, staff members at the center noted that a female client with dementia had begun to strip off her clothes when she entered a small room at the back of the center to attend a reality orientation (RO) class. To prevent this inappropriate behavior, staff workers were keeping her in a large community room during RO classes where she would wait for her friends who were in class to finish and rejoin her. She was unable to attend the classes, but at least she was fully clothed. It was determined that the client had only recently begun to exhibit this behavior. Upon inquiry, the staff then reported that the classroom environment had been changed at about the same time that the client began stripping—a chaise lounge had been added. After interviewing the client's family, it was noted that the client generally went to her bedroom after coming home from the center, stripped, and took a nap. Here was an opportunity to discuss the concepts of hypotheses, main effects, and interactions in small-*n* research with staff.

Three hypotheses were generated as to the cause of her stripping at the center. One group of staff members proposed that the chaise lounge was the culprit, another group blamed the room, and a third group said that it was the combination of the lounge and the small room (an interaction). Bets (25 cents) were placed, and a means of testing the hypothesis (and determining a winner) was suggested. The chaise lounge was put into the large community room. An armchair replaced the chaise lounge in the small classroom. The client was then observed in the community room: She did not strip there. She was later taken to the small room to attend RO class with her friends: She no longer stripped there either. Staff members backing the interaction hypothesis (i.e., small room $\times$ chaise lounge) collected their money, though in reality the client was the winner.

It is possible to take advantage of the memory failures associated with dementia. For example, clients at one center began to go into the back

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yard and attempt to climb the chain-link fence to effect an escape. Even a client using a walker was attempting to lean his way over the fence. The staff needed to eliminate this behavior without having to allocate personnel to guard the fence constantly. For this situation, the intervention involved placing a weatherproof "BEWARE OF DOG" sign on the fence and the problem was solved. Following this, lively discussion among clients centered on whether the dog next door was a German Shepherd or a Doberman, when in reality no pet had ever lived in the yard. Lack of access to episodic (explicit, internally stored) memories about the vacancy of the yard coupled with access to semantic memory from the distant past regarding "BEWARE OF DOG" signs made this explicit, external intervention effective.

The key to designing ecologically valid interventions, then, is to apply knowledge of impaired and preserved cognitive functioning in dementia to specific problems encountered in everyday environments. We consider the interventions described thus far as accessing explicit memory in that they are designed to allow conscious recollection of facts and events—the criteria used by Squire (1994) to define declarative (explicit) memory. In the case of using footprints in a bathroom as a guide for where to stand, we are assuming that clients have had previous experience with placing their feet in such outlines. If this is not the case, or if they cannot remember such an episode, then they must be given extensive practice using such a cue. Fortunately, preserved skill learning is seen in mild to moderate stages of most cases of dementia. But skill learning accesses another form of memory which can serve as the basis of interventions: implicit memory. Use of spared abilities involving implicit memory is described next.

INTERNAL STORAGE—IMPLICIT MEMORY INTERVENTIONS

As we have noted in a variety of studies (Abrahams & Camp, 1993; Camp et al., 1993; Camp, Foss, O'Hanlon, & Stevens, in press; Camp, Foss, Stevens, & O'Hanlon, 1996; Camp & McKittrick, 1992; McKittrick, Camp, & Black, 1992), interventions based on implicit memory can be quite effective for persons with dementia. It is possible to almost immediately begin to store new information internally through the use of implicit memory. An example of such a technique is *spaced retrieval*, which is a shaping paradigm applied to memory. We have described this technique in detail elsewhere (Camp et al., 1993; Camp, Foss, O'Hanlon, et al., in press; Camp, Foss, Stevens, et al., 1995; McKittrick et al., 1992), but in brief it involves giving individuals practice at successfully remembering information at increasingly longer time intervals. It has been described as an example of priming, or the improved facility for detecting or processing stimuli on

the basis of recent experience, which may include learning of new information (Squire, 1994). Spaced retrieval has also been described as resembling priming found in natural settings, where salient stimuli are repeatedly encountered at varying intervals (McKittrick et al., 1992). And, as Schacter (1994) stated, "Priming can be thought of as a form of implicit memory in the sense that it can occur independently of any conscious or explicit recollection of a previous encounter with a stimulus" (p. 234). Anecdotally, we have seen that individuals learning information via spaced retrieval forget the original source or context of the information, and at retrieval state that the information simply "popped into my head."

Foss and Camp (1994) reported a study in which spaced retrieval was used to train AD patients to learn and remember face-name associations within a dual-task paradigm. In this study, a secondary task was used concurrently with spaced retrieval. The secondary task required conscious information processing, and the amount of cognitive effort needed to complete the secondary task was varied. Face-name learning and retrieval was successful, and was unaffected by the level of effort required by the secondary task. The authors concluded that learning via spaced retrieval seems to occur in an effortless, automatic, and unconscious way—characteristics often associated with nondeclarative or implicit memory. (But see Bird & Kinsella, *in press*, for a discussion of possible distinctions between effortful and automatic processes associated with spaced retrieval.)

As implemented, spaced retrieval is also a form of the general technique of "errorless learning" which has proven successful in neuropsychological rehabilitation for a variety of disorders (Wilson, Baddeley, Evans, & Shiel, 1994). Camp and his colleagues have used spaced retrieval to train AD patients to learn and retain new information over periods extending to weeks or months (Camp, 1989; Camp & Schaller, 1989; Camp & Stevens, 1990; McKittrick & Camp, 1993; Stevens, O'Hanlon, & Camp, 1993). The types of new information learned have included names of persons and objects, locations, and even a strategy for using an external memory aid—a calendar. An interesting case, in which spaced retrieval was chosen as an intervention and proved both successful and unsuccessful, follows.

A gentleman suffering from dementia was considered a troublemaker by the staff at a day care center. He would sit in a chair, call out "Hey, you!" or "Hey, nurse!" to staff members and demand attention. We thought that the nature of his social interactions with the staff (and the nature of their interactions with him) might change if he could learn their names. Spaced retrieval seemed an appropriate intervention, and initial training was begun to teach him the name of a staff person, a nurse, after first ascertaining that he truly did not know her name.

Training took place within 30-minute sessions held once a week. Test for retention of the target name was conducted at the beginning of each

session to determine if the target name was retrievable over long time periods (the days between the last training session and the current one). Training seemed to be going smoothly, and the client was able to give the nurse's name to the research assistant at the beginning of the fourth training session, indicating that he had retained the name over the days since the last session.

Had this been a lab-based study, victory would have been declared and the study ended. But we were interested in whether the client was calling the nurse by her name. The intervention was a means to this ecologically valid end. As you may have guessed, when we asked the nurse, she replied that he still addressed her as "Hey, nurse!" At that point, we initiated further spaced-retrieval training. For 3 weeks we continued to train him in weekly sessions, and all indications were that he knew the nurse's name, yet he did not change his behavior within the center. Finally, he was asked "Don't you know the nurse's name?" He responded, "Of course, it's ____." He was, indeed, correct. Then he was asked, "So why don't you call her by that name?" At that point he replied, "That would not be polite, to call a nurse by her name. It would show disrespect. So I call her 'Hey, nurse!'"

We next encouraged the nurse, at expanding intervals, to request that he use her name and to give him practice doing so successfully. After these exchanges with the nurse, the client was able to exhibit the desired behavior. But the experience was a lesson for us in the consequences of hubris. Real-world settings and social conventions may have a way of demanding different criteria of success than criteria used in labs for those who would improve memory.

EXTERNAL STORAGE—IMPLICIT MEMORY INTERVENTIONS

It is also possible to design external cues that access previously stored implicit memories and even allow creation of new memories. We have described elsewhere how Montessori teaching materials make use of automatic or unconscious learning to assist learning of new information, suggesting that adapting such materials for persons with dementia should prove fruitful (Camp et al., 1993). This line of work was inspired partly by a model that describes the loss of cognitive abilities as following the reverse order in which they were acquired in childhood—"first in, last out." Originally designed as a model to describe normal cognitive aging (e.g., Coombs & Smith, 1973), it was eventually discarded but has re-emerged as a description of the progression of cognitive losses in dementia (e.g., Biringer & Anderson, 1992; Lipinska, Backman, & Herlitz, 1992; Reisberg, Ferris, Franssen, et al., 1986).

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We have recently studied loss of self-recognition in the later stages of AD and attempted to design interventions to reinstate this ability. Bologna and Camp (1995) describe a woman with dementia who could not recognize herself in a mirror, according to standard measures such as failure to name the reflection and no reaction to a mark on her forehead. But she could use the mirror to assist herself while combing her hair. Thus, she lacked conscious self-recognition but could use her image to facilitate a motor habit.

Self-recognition usually appears at around 24 months of age, though other forms of nondeclarative memory appear much earlier. Classical conditioning can be achieved within hours after birth (Rovee-Collier, 1987), and a form of motor priming persisting over weeks has been found in infants less than 2 months old (Rovee-Collier & Fagan, 1981). An understanding of the developmental sequencing of cognitive ability acquisition might serve as a guide for developing interventions in latter stages of dementia.

INTERVENTIONS COMBINING DIMENSIONS

Of course, interventions can capitalize on combinations of spared abilities. For example, as we mentioned earlier, a typical problem reported by caregivers and staff encountering dementia is repetitive question asking. Camp (1996) has reported a technique for reducing such questions through the use of a bulletin board with a message (the answer to a repeated question). The solution is based on the assumption that the primary cause of question asking is to solicit information that cannot be internally stored which in turn may produce stress in a person with dementia. Ideally, the message should be written by the person with dementia at the beginning of the day. (A person with dementia can generally recognize their own handwriting and will trust its truthfulness more than a message written by staff.) Thus, an external aid is one component of the intervention.

Giving that person practice going to the board and reading the answer out loud as a response to the repeated question can result in the client's learning how to retrieve the answer to his or her own question, taking caregivers out of the loop. Periodic practice retrieving information after delays involves a priming or spaced-retrieval component. Note that the client can learn a motor skill—going to the bulletin board—in order to find an answer to the question. This would be predicted, because motor learning is considered a form of nondeclarative, implicit memory.

In addition, reading the message can produce a drop in the anxiety associated with the initial information-seeking behavior. Continued pairings of approaching the bulletin board to acquire information and the resulting reduction of anxiety can produce a classical conditioning paradigm. Because classical conditioning is another form of nondeclarative, implicit memory,

the E-I-E-I-O model would also predict this outcome. In this situation, the client learns to go to the bulletin board to seek information when that client previously would have gone to a staff member. The client may not be able to consciously say *why* his or her feet are taking him or her to the board, due to deficits in explicit memory, but that does not matter. Once at the bulletin board, the client reads his or her message, feels relieved, and goes back to his or her normal activity. This is an example of a self-regulating system, and staff members are most appreciative when it is in operation.

A variation of this technique was used to solve another problem. A client was trained to use the bulletin board to find out when her son was going to pick her up. However, she often mistook someone else's car for her son's car and would try to leave the center, believing she had recognized her son's arrival. The color, make, and year of the car she would identify as her son's changed frequently. To solve the problem, a photo of the client and her son was taken as they were standing in front of his car. This photo was then placed on the bulletin board next to her message, and she could be directed to compare the car in the photo with those arriving at the center until a match was found.

A FINAL LESSON

Not all "memory" problems are indeed true memory problems. Consider the following case study. Staff members at an adult day care center complained that a client was asking the same question over and over: "When is [my husband] going to pick me up?" The staff was asked to jot down a mark each time she asked the question for several days to produce an operational definition of "over and over." (Sometimes the sheer act of record keeping demonstrates that a problem is not as severe or frequent as initially perceived.) In this case, however, everyone except direct-care staff was surprised. The client was asking the question more than 800 times a day on a consistent basis. Staff members had reached the point where they would hide in closets to get away from the incessant queries, and the client's husband was ready to place her in a nursing home.

The next step was to determine the possible cause of the question asking. The initial hypothesis was that the client was seeking information, as in the preceding examples. To test this hypothesis, staff members were next instructed to answer her question with one of their own: "When do you think?" When they did this, her answer surprised everybody: "4:30." This was correct, but was shortly followed by a repetition of her original question. This did not appear to be a typical problem driven by a pure "memory" impairment.

Her husband was then asked if he was observing any unusual behaviors at home (to check for consistencies of behavior across environments). He responded that his wife kept asking him when he was going to pick her up from the center. Both the staff and the husband were then asked to describe how they typically responded to her question. Usually, they not only gave the time the husband would arrive but also gave assurance that he was indeed going to be there and that she did not have to worry.

At this point, we hypothesized that the client's question-asking was driven by a need to obtain reassurance rather than by a need to obtain a specific piece of information. Clients in adult day care often believe that they have been abandoned, placed in a nursing home, or both, which results in high levels of anxiety. Behavioral technology suggested a solution. When she did ask the question, staff members were instructed to say, "When do you think?" Upon hearing her response of "4:30" they were to say, "That's right. Now I have to help someone else," and leave to attend another client. Staff members were then encouraged to give her comfort and reassurance when the client was *not* asking the repeated question, especially if she was engaged in social interactions with other clients, in a group activity, or in some other desirable behavior.

The end result was that the frequency of asking the target question dropped precipitously, and was confined to late afternoons (when many clients at adult day care centers show heightened anxiety). This woman became a model client, and when she was eventually placed in a nursing home 14 months later, staff members were sorry to see her leave. They actually begged the family not to place her in long-term care. They were unsuccessful in this endeavor, and the client rapidly deteriorated in her new setting.

Researchers working in real-world settings soon learn that knowledge about memory functioning is, by itself, inadequate if one wishes to be truly effective. It quickly becomes apparent that knowledge of behavioral technology, physiological changes associated with normal and pathological aging, neuroscience, behavioral ecology, human factors, and developmental psychology are extremely useful and indeed necessary. It pays to be eclectic. But researchers who successfully design ecologically valid interventions are rewarded handsomely, for they do far more than improve memory—they improve lives.

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