

For example, Cermak⁴ showed that patients with severe postencephalitic amnesia could learn a considerable amount of information related to daily life through training by visual imagery and verbal strategies. In addition, Jaffe and Katz⁵ used a verbal memory method using the first sound of a word as cue, and succeeded in training a patient with Korsakoff syndrome to learn the names of two ward staff members and the location of the locker. Wilson⁶ used various memory strategies which enabled a patient with severe amnesia to remember the names of hospital staff and the timetable. Studies using behavioral therapy have also shown that patients with memory disorder may be able to learn names of persons and to correct an excessive smoking habit.^{7,8}

These studies prompted us to attempt a 6-month group rehabilitation program of memory training for 5 patients with Korsakoff syndrome, using the photographs of 25 ward staff members. The results showed that the patients were capable of learning new names (formation of face-name association).⁹ The details of this study will be described in Part II of this paper.

The above studies indicate that amnesic patients can acquire domain-specific knowledge through appropriate procedures. The information learned there has practical importance to patients' daily life, solidly organized, consolidated and represented in the psychological makeup. These unique features may have led to successful learning by those brain-injured patients. Although the acquisition of the domain-specific knowledge has practical and theoretical significance, limitations are also acknowledged, including (1) the knowledge acquired was extremely simple and small in quantity, (2) the acquired knowledge cannot be put into practice, and (3) the knowledge is not generalized into daily life activities.

We also observed that the patients' improvement was limited to the trained items, leaving other cognitive functions measured by general memory or frontal function tests unchanged. The learning of persons' names directly led to a more comfortable relationship with others, but no other practical benefits were produced.

A further possibility of domain-specific knowledge training was pursued by Glisky and Schacter,¹⁰ who attempted to make patients acquire complex knowledge, *i.e.*, knowledge needed for operating and interacting with a computer. The method they developed was called vanishing cues, *i.e.*, systematic reduction of letter fragments of to-be-learned words across trials. This method was based on the observation that technical learning (retention of procedural memory) and priming response such as fragment completion are conserved in amnesic patients.

The training starts by learning the vocabularies for computer operation. Subjects are required to give a

word at the definition, and, when the word is not produced, the letter fragments that make up the target word are given as cues starting from the first letter and increased letter by letter until the correct answer is obtained (in the case of SAM; S, SA, SAM). In the next step, a cue is given to the patient which contains one letter less than the number of letters needed to obtain the correct answer in the last step (vanishing cues). These steps are repeated until eventually the patient is able to produce the target words in the absence of fragment cues. Using this method, Glisky and Schacter reported that patients with posttraumatic amnesia could learn computer operations such as data retrieval and input,² and the learning effect lasted 7 to 9 months.¹¹ Notably, one of the patients later worked as a data input operator in a computer company.¹²

Domain-specific knowledge training can be applied to acquire various skills and is therefore considered an important method of memory rehabilitation. It was developed utilizing various existing behavioral psychological approaches such as forward chaining (to divide a behavior into a series of steps and teach each step in turn, starting from the first step), backward chaining (start from the last step and work towards the first step) and shaping and fading of cues.

Whether this method could be applied to other knowledge, such as that of occupational skills and housework, and generalization into daily life activities, is open to future research.

Motor Coding or Using Movement as a Memory Aid

In general, amnesic patients are impaired in declarative memory, but they perform well in procedural memory tasks such as mirror drawing and Hanoi tower tests. Even patients with severe amnesia can learn body movements.¹³⁻¹⁵ Several studies have demonstrated that these two memory systems would show double dissociation, in that amnesic patients were poor at declarative memory tasks but not at procedural tasks, while in Huntington's chorea the performance pattern is reversed.^{16,17}

In view of these findings, Powell¹⁸ has advocated using gesture as a cue in memory training. For example, when teaching the name of a person called "Bird", the patient is taught simultaneously the gesture that symbolizes the name (e.g. patient flaps two arms like the wings of a bird), and by repeating the gesture as cue the patient recalls the name. Memory training of persons' names using gesture to reinforce memory is conducted similar to that using visual imagery.¹⁹ A name is divided into 2 to 3 nouns, and a unique meaning is attached to the name and a gesture expressing the meaning is performed. For example, in teaching the name "Sue", the gesture of eating soup is used, and in teaching the name