

## Psychological Approaches to the Management of Memory Impairments

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Memory impairments are handicapping to those who suffer them, and a number of ways of trying to help those afflicted have been devised. Effective psychological approaches are likely to be based on methods designed either to make the most efficient use of remaining memory capacity, or to alter the environment so as to reduce the demands placed on memory. At present the success of such approaches is limited.

Impairments of memory are quite common, especially in those disorders associated with brain pathology, and they can be quite seriously handicapping. From a clinical point of view, the question arises as to what can be done to assist those with memory problems to function more adequately.

There has been increasing interest in the management or treatment of those with memory disorders. This concern has been manifest in two major lines of work, which are best seen as complementary. Firstly, the increased understanding of the physiological and biochemical mechanisms that underpin memory has made it possible to explore pharmacological means of influencing memory in a much more rational way than was previously possible. An example of this work is the attempt to influence the cholinergic system, now known to be linked to memory and affected in Alzheimer's disease (e.g. Hollander *et al*, 1986; Kopelman, 1986). The second line of work has been psychological, in terms of devising methods based on cognitive psychology to help afflicted individuals. This paper is concerned solely with psychological interventions, and mainly with techniques developed for use with patients having non-dementing illnesses. The dementias involve complex patterns of impairment, and it is often not clear whether any beneficial effects result from procedures because they ameliorate the effect of memory loss or ameliorate the consequences of some other type of impairment. Psychological interventions for use with demented patients have been considered in some detail elsewhere (Holden & Woods, 1988).

### The nature of psychological interventions

In dealing with amnesia, or indeed any other neuropsychological impairment, there are two possible general approaches that can be adopted. One is to try to remove or reduce the basic impairment directly. This may be described as the therapeutic or curative

approach. The alternative is to adopt a rehabilitative or compensatory approach. This places the emphasis on reducing the impact that the impairment may have on the individual's everyday functioning while accepting that the basic impairment itself will remain unchanged. In other words, the aim is to find alternative ways of achieving the same memory-dependent goals, either by reducing the demand on memory or by getting the individual to make more efficient use of any remaining memory capacity.

In dealing with memory impairments it can be argued that any sensible psychological strategy has to be based on a rehabilitative or compensatory approach (Miller, 1984). This is for two reasons. Firstly, psychological models of memory describe the processes involved in memory and the factors that influence memory performance. They may postulate, say, a memory store of limited capacity. They do not indicate how that capacity may be increased as opposed to indicating how material may be best packaged so as to make maximum use of the capacity that is available. Secondly, what is known about the processes underlying longer-term recovery after brain damage (i.e. once early physiological effects such as oedema have been resolved) suggests that recovery, at least in adults, is largely mediated by the individual learning strategies to achieve goals by different methods (see Miller, 1984). The clearest evidence in this regard comes from animal research, and it is interesting that the most recent work confirms the impression that animals recover function after brain lesions by means of compensatory mechanisms (e.g. Rose *et al*, 1988). As a working assumption, it seems reasonable to suppose that the effective interventions will be those that build upon and extend normal recovery processes.

The other general principles that are likely to underlie effective rehabilitative strategies are discussed below.

Having stated the case for a compensatory approach, it must be noted that some apparently do

not accept this argument. A not infrequently adopted method of attempting to enhance memory *per se* has been to use repetitive drills or practice. This is almost as if memory practice will boost memory performance in much the same way that repeated exercise can build up muscle strength. There is no good evidence that this is effective (Glisky & Schacter, 1987; O'Connor & Cermak, 1987; Sohlberg & Mateer, 1989).

If a rehabilitative or compensatory approach is to be used, then four general sources of potential technique can be identified.

- (a) Research into normal memory processes has identified certain factors that influence normal memory. Some of these suggest manipulations that may be of benefit.
- (b) Research into the nature of amnesic disturbances may similarly suggest possible techniques.
- (c) Identification of the strategies used by normal people to aid memory may reveal methods which could be adapted to help those with impairments.
- (d) The environment may be adapted so as to place less demand on memory.

A large number of techniques, or variants on them, have been described in the literature, and a full account would require a very lengthy review. This paper concentrates on elucidating the general principles involved and the implications for developments in this field. It does not claim to offer a comprehensive account of all the specific techniques that have been described, nor does it offer any detailed account of how they would be used in practice. Such information can be obtained from other sources (e.g. Wilson & Moffat, 1984; Wilson, 1987).

#### **The use of factors influencing normal memory**

Research on normal memory has identified a number of things that influence memory and which may be exploited for use with amnesic patients (see Knight & Wooles, 1980). Two examples are outlined.

One factor known to have a powerful effect on normal memory is imagery (e.g. Paivio, 1971). For example, a subject may be required to learn paired associates such that when presented with the word 'house' the subject is required to respond 'ball', and when 'tree' is supplied the subject replies 'cup'. A large number of experiments have shown that the learning and later retention of such paired associates is enhanced if subjects are specifically encouraged to use imagery to link the stimulus and response words. Thus the subject may visualise a house with a large ball balanced on the roof, a cup with a tree growing out of it, and so on.

Jones (1974) extended this work by looking at paired-associate learning in both normal and memory-impaired subjects. She found that those who had undergone removal of the mesial parts of the left temporal lobe for the relief of epilepsy, and who therefore had some disturbance of verbal memory, performed less well overall than controls. Nevertheless, this memory-impaired group did show approximately the same degree of improvement in later recall of the paired associates with the use of imagery. Further work has confirmed this finding and shown that even subjects with very severe amnesia can benefit from the use of imagery, at least under experimental conditions (e.g. Leng & Parkin, 1988).

This finding is encouraging but there are limitations. Lewinsohn *et al* (1977) carried out a similar investigation to that reported by Jones, but with two interesting modifications in addition to using what appear to have been head-injured subjects as the memory-impaired group. Firstly, an allegedly more realistic task, that of learning names to go with head-and-shoulders photographs of people, was included as well as ordinary paired-associate learning. (Those with memory problems often complain that they cannot remember the names of people.) Secondly, retention of learning was examined both after 30 minutes and after a week. The results confirmed those of Jones (1974) in showing a beneficial effect of imagery, but this was greater for paired associates than for the face-name task. Unfortunately, the benefits of imagery present 30 minutes after learning had disappeared after a week. The failure to find an effect at a week was not due to retention having dropped to such a low level that the beneficial effect of imagery could not be detected (i.e. there was no 'floor' effect).

Lewinsohn's group was not unduly disappointed by these results and reported a single-case investigation with a head-injured student who claimed to have undue difficulty in recalling the names of people he met in his everyday life (Glasgow *et al*, 1977). The student was taught to use imagery to associate features in the people he met with their names. This actually made little difference to his ability to recall names in his normal life. A much simpler procedure did. He was encouraged to write on a card the names of people he encountered where he felt that he should have known the name but did not. Three times a day he was asked to spend ten minutes going through the names and trying to recall who it was that went with each name. This reduced the number of failures from about eight per day to two to three per day.

There has been much more work on the use of imagery as a possible means of helping people to cope with memory impairments (O'Connor &

Cermak, 1987). What is emerging is that imagery works best in artificial, laboratory-type situations (e.g. paired-associate learning) and its application in real-life contexts has shown little benefit. Reasons for its failure have been discussed by Crovitz *et al* (1979) and O'Connor & Cermak (1987), among others. A major factor is that it is not a very 'user-friendly' technique, in that it requires much mental effort to think of suitable images. This is especially so for memory-impaired individuals, who may be less able to create suitable images rapidly and whose limited information-processing capacity is more easily overloaded by the additional task of having to create images.

Another aspect of normal memory that may be exploited in some contexts has been identified by Schacter *et al* (1985). If subjects learn some material (e.g. a list of words) and retention is tested after different intervals, it is well established that an exponential decay in the amount retained is found. Retention declines rapidly to begin with and the rate of decline then tails off. In an interesting experiment, Landauer & Bjork (1978) looked at the effect of getting normal subjects to recall the information at set intervals after the original learning. This enforced rehearsal enhances long-term retention. They compared longer-term retention after using regularly spaced intervals for this rehearsal as opposed to intervals based on an expanding sequence (e.g. after 2 minutes, 5 minutes, 30 minutes, etc.), with these expanding intervals corresponding more or less to equal drops in recall efficiency. The expanding sequence gave the best long-term retention.

Schacter *et al* (1985) then demonstrated that the same results were obtained with subjects with memory disorders. This raises the possibility of using recall at appropriate intervals as a means of helping amnesic patients to retain newly acquired information. For most memory-impaired subjects it may require someone else to prompt recall after the set amount of time has expired. However, Schacter *et al* suggested that some of their subjects managed to use the strategy entirely on their own. Given that the subject has to remember to rehearse the information and that one effect of an impaired memory can be to reduce the ability to judge time intervals accurately, the self-prompting of rehearsal may not be feasible in most instances. Nevertheless, the technique could prove of value where it is useful for a memory-impaired person to acquire some new information.

#### Ideas from research on amnesia

In a review which indicated that success in the remediation of memory disorders has been rather

limited, Salmon & Butters (1987) indicate that "a more fruitful approach may be to identify and characterize the preserved memory capacities of amnesics, and to build rehabilitative strategies around them". This is an interesting suggestion.

In research on amnesia, and not only the most severe manifestations like the Korsakoff syndrome, groups of memory-impaired subjects perform badly on almost any memory task. In such circumstances any memory-related task at which amnesic subjects do reasonably well becomes of considerable interest. Certain perceptual and motor skills appear to be acquired and retained in a more or less normal manner (e.g. Cohen & Squire, 1980) as well as so-called 'priming' tasks (Shimamura, 1986). An essential feature of the latter is that they test for retention in an indirect or covert way. In a typical priming experiment, subjects are presented with lists of words which may include 'elephant', 'finger', 'monkey', 'book', and so on. After a suitable delay a recall test can be given, in which subjects are asked to recall as many of the words originally presented as possible. Amnesic subjects will recall very few of the words. Alternatively a priming task may be used. The subject may be given three letters, such as 'e', 'l', 'e' and asked to produce a word beginning with these letters. They may also be given a category task in which they have to provide as many words as they can belonging to a given category, for example animals. For these priming tasks there is no requirement for the subject to produce words from the original list, although these would fit the response requirements.

In the case of control subjects there is a clear tendency to produce words from the original list, so that 'elephant' would be used as the word beginning with the letters 'e', 'l', 'e' and both 'elephant' and 'monkey' as words fitting the category of animals. These words will appear much more frequently as responses to the priming task than if the latter had been given with no prior exposure to the original list of words. Typically, this priming effect is just as strong in amnesic subjects as in normal controls.

This work has interesting implications. Just how it is possible to have good priming but poor straightforward recall in amnesic subjects is difficult to explain and is open to some dispute. For present purposes it is sufficient that priming offers a situation that reveals apparently normal retention in amnesic subjects. Can it therefore be put to practical use?

An account of an attempt to exploit a form of priming has been provided by Jaffe & Katz (1975). They studied a patient with an alcoholic Korsakoff syndrome and severe amnesia in a Canadian psychiatric hospital. They noted that the patient had

been resident in the same ward for a very long time yet had still not been able to learn the names of other residents and staff with whom he came into regular contact. They used an experimental procedure originally described by Warrington & Weiskrantz (1970). Their subject was very bad at recalling a list of words after a short interval. Nevertheless, when presented with the initial letters of the words in the list and just asked to give a word beginning with that letter, the words produced contained a substantial number from the original list.

Jaffe & Katz then tried to apply this principle in teaching their patient the names of people that he commonly encountered in the hospital, such as the nurse in charge of the ward. If this nurse were called 'John Smith', the patient would be informed of this fact and then asked to name this person after a short delay. If this did not produce the right response, the patient would be given the initials 'JS' and asked to think of a name beginning with these initials. By proceeding in this way they claimed to have taught the patient the names of several people in a fairly short time.

An analogous procedure has been described by Glisky & Schacter (1987) in dealing with a woman who was severely amnesic as a result of herpes simplex encephalitis. In an attempt to get her back into employment she was trained in computer data-entry skills. The training procedure, which started in the laboratory and was then transferred to the work place, involved presenting cues as the correct response and then gradually fading these. A good level of performance was eventually obtained, although it is interesting that, despite this good practical performance, her ability to describe verbally what she was doing was very poor.

#### **Strategies to aid memory used by normal people**

Yet another way to approach the problem of helping those with amnesia is to look at the strategies used by normal people to aid their memories. Most people are aware that their memories are not always entirely reliable and it is quite common to use some memory aids or props. A diary in which to record appointments is just one example.

In a study designed to ascertain what memory aids normal people use in their everyday lives, Harris (1980) made a distinction between internal and external strategies. Internal strategies involve such things as the use of imagery that require the person to carry out some form of internal mental manipulation. In contrast, external strategies rely on something outside the person such as making a

shopping list to remember what to buy when at the supermarket.

Harris found that when normal people wished to remember something, they relied heavily on external aids. Thus making a note on a piece of paper and leaving it somewhere where it is likely to be seen, putting an object in a prominent place, keeping a diary, making lists, and so on, were all strategies that were used at some time by most subjects. On the other hand, internal strategies, such as the use of mnemonics, were rarely employed. The only internal strategy that was tried with any frequency, and that not particularly often by those who used it, was mentally to trace a sequence of events to help remember something. This is most applicable to finding something that is lost, as when one has put something down and cannot immediately remember where.

If normal people rely on external strategies and, as has been argued, internal strategies have limitations, then those with impaired memories may find the systematic use of external strategies helpful. This can be done by encouraging patients to make detailed use of such things as notice boards to record information, lists of things to do, and diaries, with the latter providing both a record of what has been done and a prompt for things to do next. Some preliminary work along these lines has been reported by McKinley & Hickox (1988).

One particular method of this type has been the use of 'memory books' as compensatory written memory aids (rather like an elaborate diary). These are often not used by patients, but Sohlberg & Mateer (1989) suggest that this may be because they are frequently just handed out to patients, whereas what may be needed is a systematic training programme in how to use them. They present a single case study showing much more encouraging results after the subject was systematically trained in the use of a memory book. It is also interesting that Zencuis *et al* (1990), who compared a number of memory strategies, including rehearsal and mnemonic devices, found that only the memory notebook appeared to have any real effect for subjects with memory impairment due to traumatic brain injuries.

#### **Reducing external demands on memory**

The final approach is based on altering the environment so that the demands placed on memory are reduced. It is a method that has found occasional use in practice but it has not been systematically studied. Examples involve such things as the placing of coloured lines on the floor of a psychogeriatric unit so that residents with dementia only had to



remember to follow a line of a certain colour to end up in the dining room or the lavatory. An accounts clerk I saw with a severe head injury had certain of his work procedures altered so as to follow a fairly rigid pattern, with cues as to the sequence to be followed provided on his desk. Manipulations of this kind are designed to reduce memory load in the hope that individuals will then be able to function adequately in certain important ways. Research to determine whether such interventions are of value and under what circumstances has yet to be carried out.

### Discussion

Unfortunately, it cannot be claimed that the work described has achieved a great deal. Where benefits have been obtained these have not been large and may have been at the expense of substantial effort on behalf of both therapist and patient. In some ways this is a disappointing conclusion, but it is also the case that this is a difficult field in which to work and many more approaches to the amelioration of memory disorders remain to be explored. This aspect of clinical neuropsychology is in its earliest stages.

The crucial question for the moment is whether further work of this kind will lead to better results. It is certainly not possible to guarantee final success, and returning the individual to a state where functioning is as good as it once was is probably not a reasonable goal. Nevertheless, there are reasons to hope that further work will become increasingly sophisticated and that methods will be slowly developed which will offer worthwhile assistance to a wider range of memory-impaired individuals.

The work carried out so far has relied very heavily on internal strategies such as imagery. Internal strategies have not proved successful, and this is partly because they place a heavy mental load on those who use them. This is so even for normal people, let alone those with memory impairments, who may well have other limitations on their information-processing capacities. Parkin *et al* (1988) have also shown that amnesic subjects are less likely than normal controls to think of using internal strategies as a means of aiding their memories. At least in the forms devised so far, internal strategies are simply not 'user friendly'. Techniques such as imagery convey their biggest advantage in learning such things as unrelated lists of words, and this is not the type of task for which people commonly use their memories.

In contrast, external strategies, such as the use of notice boards, lists, memory books, and so on, may well confer greater benefit and can be readily adapted to everyday circumstances. They do not put large

mental loads on those who use them. External strategies require much more exploration, particularly with regard to what kinds can be best used under what circumstances. Modern electronic gadgetry may have something to offer in providing aids that are easy to use. Where it is useful for the individual to learn and retain specific pieces of information or skills, techniques like spaced prompting (Schacter *et al*, 1985) or fading cues (Glisky & Schacter, 1987) may play a useful role.

An assumption that appears to have underpinned much of the work done is that general strategies to aid memory can be devised. In other words, if a useful technique can be identified, it can then be turned to use in almost any memory-related situation that causes difficulties for the patient. This may not be so, and much research in psychology attests to the fact that small changes in circumstances can often alter behaviour quite drastically, including, it must be presumed, responses to remedial strategies. In addition, memory is a complex process with a number of facets. What may be needed is not just one, or even a small number of effective techniques, but a whole range of methods. What is appropriate may then be determined by what has to be remembered and in what context. The techniques that can be used will also be limited by any other psychological impairments that the patient may have, since only rarely are patients encountered with memory deficits alone. This may make the whole problem of assisting those with memory impairments much more complex than some have envisaged.

The most effective interventions are likely to be those that are targeted at dealing with a specific memory-related problem that the patient encounters. This is opposed to teaching a general strategy in the hope that its use will be generalised by the patient. In this regard, Glisky & Schacter's (1987) apparently successful attempt to teach work skills is of interest, since it directly tackled a real difficulty faced by their subject that was important in achieving a return to work.

The understanding of memory and the processes underlying it is still rudimentary. The study of memory has undoubtedly progressed considerably since the early pioneering experiments of Ebbinghaus (1885). Despite the gains in knowledge, the areas of ignorance still remain considerable. Models or theories of memory exist in profusion, but their range of applicability is often restricted to a few experimental paradigms used in the experimental psychology laboratory. There is still a long way to go to understand memory as it is used in everyday life, despite the fact that the everyday uses of memory have recently become much more of a focus

for study (e.g. Cohen, 1989). It is the impact of memory impairments on everyday life that has to be the focus of any rehabilitative programmes.

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