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Remembering to do things in the laboratory and everyday life

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Epilepsy can give rise to memory problems that are transient, long-standing or more-or-less permanent, depending on epileptic discharges, drug therapy, or brain lesions. The memory deficits are therefore potentially very complex and I shall not attempt to separate the various sources of deficit. Instead I shall take an entirely pragmatic perspective, with little in the way of intervention from theory. I shall begin by describing various techniques for the investigation of the failures of memory that occur in everyday life, the strengths and weaknesses of these techniques, and how they can be improved. I shall argue that we need to adapt the way in which memory is conventionally examined in the clinical context so as to take account of the limitations inherent in the psychometric tradition from which much of the work in this area stems. We need to tackle the issues regarding the validity of the tests we use, above all their validity in everyday life.

The techniques for measuring memory deficits can be divided into those that seek to describe memory in the context of everyday life, and those that measure memory in the laboratory or examining room. The former techniques obviously have a greater potential relevance to everyday life – a greater "ecological validity", to use the overused jargon. The latter techniques have a greater potential reliability, partly because the examining room provides few of the highly variable and idiosyncratic cues that occur in everyday life. Measures that are unreliable cannot be valid so there may well be a trade-off: attempts to increase ecological validity may actually decrease predictive validity by virtue of a decrease in reliability. So how well do those techniques that have attempted to measure memory in everyday life fare? Just how valid are they?

There are several techniques that have been described in the literature. Most use an observer to note down those aspects of everyday behaviour that suggest some failure of memory. Sometimes the observer may be required to fill out a questionnaire that asks how often certain incidents occur. For example, the observer might be asked to judge how frequently the patient forgets where he has put something, how often he loses things around the house, or to judge how frequently he fails to recognise places that he has been to before.

Instead of simply making a judgement as to how often these events occur, the observer may be asked to keep a diary, and at the end of each day to make a note of any failures of memory. Diaries with checklists have the advantage of recording actual events but they are, of course, relatively time-consuming.

Sometimes the patient himself may be the observer, sometimes a relative may take this role. When the patient is the observer it is possible to record those failures of memory that do not give rise to observable behaviour. On the other hand when a relative of the patient does the observation the memory failures may perhaps be less likely to be forgotten before they are recorded.

The above advantages and disadvantages of the various techniques were borne out in a study by Sunderland and co-workers (1) who investigated memory after severe head injury. They addressed the issue of the validity of the techniques in a variety of ways. For example the intercorrelations between the various techniques were reasonably high, although generally lower for questionnaires than for diary checklists, and lower when the patient himself was the observer (Table 1). For the present purposes the most pertinent of these validity checks were the correlations that obtained between the measures of everyday memory and

	Head-injured group (N=32)			Control group (N=37)		
	PQ[a]	PC[b]	RQ[c]	PQ	PC	RQ
PC	.54**			.53**		
RQ	.58**	.65**		.09	.39*	
RC[d]	.38*	.61**	.81**	.45**	.60**	.49**

Table 1. Correlations between the totals for the subjective measures (Spearman's Rho). ([a]PQ = patients' questionnaire, [b]PC = patients' checklist, [c]RQ = relatives' questionnaire, [d]RC = relatives' checklist, *p<.05, one tail, **p<.01, one tail.) (From Sunderland et al. (1).)

Subjective measure	*Head-injured group*	*Control group*
Patients' questionnaire	.36*	-.25
Patients' checklist	.50**	-.02
Relatives' questionnaire	.72**	.41**
Relatives' checklist	.58**	.22

Table 2. Correlations between the totals for the subjective measures and immediate recall of prose (Spearman's Rho).

the performance on a conventional memory test, namely the recall of a passage of prose. The relevant correlation coefficients are shown in Table 2. The correlations are in general higher for a group of head-injured patients than for normal controls presumably because the range of deficits is larger. Note that the correlations are generally higher when the observer is a relative.

These data from Sunderland and co-workers suggest that the ability to recall short passages of prose is a reasonable predictor of aspects of memory function that are relevant in everyday life. The recall of prose passages is one of a set of memory tests that are conventionally used in the clinical evaluation of patients. These tests derive from a psychometric tradition in which tests that have been developed in the laboratory have been used in the assessment of individual differences in the clinical context, often with very little theoretical rationale. One general characteristic of these tests is that the patient is given material to remember which he has subsequently to recall in response to a prompt from the examiner. The ability of the patient to remember to recall without such a prompt has received hardly any study. Nobody knows much about how people remember to do things without being reminded! Conventional memory tests leave this aspect of memory unassessed. And yet it goes without saying that remembering to do something without being reminded is one of the most important aspects of memory function in everyday life. It follows that the predictive validity of the tests that we use to assess memory dysfunction might be increased if we were to measure the ability to remember to do something without being prompted.

One example of this kind of unprompted remembering which is especially relevant for patients with epilepsy is the task of taking anticonvulsant medication at prearranged times. There is evidence that performance of this task is not positively related to those aspects of memory that are measured by conventional clinical tests. Indeed if any relationship exists at all it may be a negative one. Wilkins & Baddeley (2) simulated the task of remembering to take medication by requiring normal subjects to press a button on a small portable box at prearranged times, four times a day for a week. The people who were good at this task had a relatively poor memory for lists of words. People with a good memory for lists of words were relatively poor at pushing the button on time. This is one of several studies which suggest that conventional memory tests may be poor at predicting how well patients will remember to do things without a prompt.

Another rather interesting aspect of the above simulation was that when subjects forgot to push the button on time they appeared subsequently to be unaware of their failure. It was as if they forgot they had forgotten. The converse was not the case, if subjects remembered to make the response they never forgot that they had done so. The failure of subjects to remember their lapses of memory suggests one possible explanation for the relatively low validity of patients' subjective memory ques-

tionnaires reported by Sunderland and co-workers. Of course, extrapolation from these data to the real-life task of taking medication should be made with extreme caution, but at the very least the study illustrates another way of investigating memory in everyday life – by simulating simple tasks which can easily be monitored.

The quest for valid ways of measuring everyday memory does not necessarily require that memory failures be measured outside the laboratory. It is possible to simulate an everyday task within a laboratory setting. Harris & Wilkins (3) chose to simulate the task of baking a cake in the oven whilst watching television. From time to time it is necessary to check the clock to see whether it is time to take the cake out. There are many everyday tasks of this kind that require periodic monitoring. The memory processes involved are far from simple and once again involve remembering to do something without being reminded. Harris & Wilkins asked people to watch an exciting film and to make an arbitrary response at prearranged times. On occasions when the subjects forgot to respond they had often observed the clock a few seconds before the response was due. Evidently some plans for actions can be forgotten very quickly. As an example, consider a patient who is just about to take his medication when the telephone rings. The consequent distraction may mean that the intention to take the medication is forgotten and not remembered again until it is too late for the dose.

Remembering to do things appears to involve hippocampal circuity, although in a rather unconventional way. Pajurkova & Wilkins (4) investigated remembering in patients who had undergone surgery for relief of intractible epilepsy. The patients routinely undertook an extensive battery of tests of intelligence and memory, during which they were required amongst other things to draw an object (a bicycle) and to manipulate coloured blocks (Block Design subtest of the Wechsler Bellevue Intelligence Scale). At the outset of the battery of tests the following instructions were read to the patient:

"I want to see how well you can remember to do something without being reminded. Later on I shall ask you to draw the bicycle in red pencil. I shall not remind you. Sometime later I shall give you some coloured blocks and shall ask you to arrange them to form a design. Before we begin that test I want you to remind me to make a phone call. Now could you please tell me what it is you have to remember to do?"

The patient was asked to repeat these directions until he had satisfied the examiner that they were understood. Many patients forgot to perform the to-be-remembered actions at the appropriate time. The patients who performed particularly poorly were those with large excisions of the left hippocampus. It is interesting that small removals failed to produce any deficits because such lesions can give rise to impairments on conventional memory tests including those that measure episodic (5) and semantic memory (6). Perhaps the relatively small number of response alternatives made the remembering task less sensitive to small deficits. The absence of a deficit after right hippocampal removals is surprising, and it suggests that remembering to do something can involve material-specific memories with a hemispheric lateralisation, despite the complexity of the environmental cues to recall.

Pajurkova & Wilkins (4) found that the correlations between performance of their remembering task and performance on more conventional memory tests were very low, a finding that tends to confirm the results of the studies mentioned above, and lends support to the suggestion that the remembering tasks are measuring a different aspect of memory function.

One obvious way in which remembering to do something differs from conventional recall is with respect to the planning of actions. If a patient's ability to plan is impaired this impairment might be expected to affect remembering to do something more than memory for what has been done. It is therefore of interest that Pajurkova & Wilkins report preliminary data suggesting that patients with left frontal excisions were impaired. Surprisingly, the patients in the right frontal group were not impaired despite the fact that patients with right frontal lesions have a poorer ability to sustain attention voluntarily than do patients with temporal lesions. Wilkins and co-workers (7) asked patients with frontal and temporal excisions to count a succession of auditory and tactile stimuli that were presented at a variety of rates. At slow rates when the task was monotonous and required the voluntary maintenance of attention patients with right frontal lesions were selectively impaired. At high rates there were no anterior/posterior differences. Whatever the attentional mechanisms that impose attention on a monotonous task, they would appear to dissociate from the attentional mechanisms involved in planning and remembering future activity.

1. Remembering one new name
2. Remembering to ask for a personal belonging that had been hidden
3. Remembering to do something when alarm sounds
4. Remembering a new route (immediate recall)
5. Remembering a new route (delayed recall)
6. Remembering to deliver message
7. Learning new skill
8. Orientation (year, month, day of week, place)
9. Date (separate from other orientation questions as correlation between 8 and 9 is not high)
10. Face recognition (five faces to be recalled from ten after five minutes delay)
11. Picture recognition (10 pictures to be recalled from 20 after five minutes delay)

Table 3.

It will be obvious from the above that remembering to do things without a cue is something that can be measured in the laboratory. But I know of no studies that have investigated whether performance of these arbitrary and artificial laboratory tasks of remembering to do things has predictive validity when it comes to everyday remembering. Obviously, if a laboratory task involves remembering to do something without being reminded it may, potentially at least, capture one aspect of everyday memory that is left untouched by conventional measures. It is also quite possible that the variability in the environmental cues that subjects chose to use in the laboratory task may invalidate the measure. Conventional tests of memory in which the experimenter prompts recall may provide a measure that is more reliable, and as a result more valid. It will not be long before data concerning the predictive validity of tests of remembering to do things become available. In a recent book on the clinical management of memory problems Wilson (8) describes the Rivermead Behavioural Memory Test. The test battery differs in obvious ways from those derived from the psychometric tradition and includes several measures of patients' ability to remember to do things. The test items are listed in Table 3. The test is currently under evaluation. The test results are being compared with therapists' observations of failures of memory on the ward. It remains to be seen which types of memory task will be most sensitive to the particular memory difficulties that patients experience.

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