British Journal of Psychology (1983), **74**, 409–415 *Printed in Great Britain*

Memory symptoms and memory performance of neurological patients

Narinder Kapur and **David Pearson**

The spontaneous memory symptoms of 100 brain-damaged patients suffering from a variety of conditions were elicited. The most frequent types of symptom related to memory for people's names, memory for recent events occurring a few days or weeks ago, memory for a spoken message and remembering to do something. The spontaneous symptoms from 50 non-brain-damaged patients were also elicited. There was a considerable degree of overlap between the type and incidence of symptoms in brain-damaged and control patients. Some symptoms (e.g. remembering people's names) were reported by a similar proportion of control as brain-damaged patients. A few symptoms (e.g. spatial disorientation, temporal disorientation) were reported by brain-damaged patients but not by any control patients. One symptom (remembering to do something) occurred more frequently in the control group of patients than in the brain-damaged group. The relationship between memory symptoms and memory performance was examined in a group of head-injured patients. A short questionnaire on memory symptoms was completed by each patient and by a close observer, and the head-injured subjects also performed tests of immediate and delayed recall. Although there was a highly significant correlation between degree of memory impairment as perceived by the patient and as perceived by an observer, there was generally a low correlation between subjective or observed memory impairment and scores on commonly used clinical memory tests.

Research on the clinical assessment of memory impairment (Russell, 1981) and the theoretical implications of memory pathology (Baddeley, 1982) has been largely concerned with psychometric memory performance rather than naturally occurring memory difficulties. A number of studies have reported on the memory symptoms of normal subjects (Hermann & Neisser, 1978; Bennett-Levy & Powell, 1980) but there has been little attempt to document the memory symptoms of neurological patients, despite the fact that complaints of memory difficulty are the most frequent and, often, the most disabling among the psychological symptoms reported by brain-damaged patients. An analysis of spontaneous memory symptoms offered by neurological patients should have implications both for clinical assessment of memory impairment and the organization of human memory. In this paper, we report an analysis of the spontaneous memory symptoms of 100 patients with established brain pathology and 50 patients with extra-cerebral disease.

The relationship between subjective memory complaints and measured memory impairment has been noted, in a number of studies, to be relatively slight (Kahn *et al.*, 1975; Zelinski *et al.*, 1980). Bennett-Levy & Powell (1980) found that memory symptoms and memory performance measures which tap similar functions (e.g. face–name learning) were significantly related to each other in a group of chronic alcoholic patients. Brooks (1979) has reported a relationship between memory symptoms and memory performance at some, but not all, stages of recovery after head injury. Bennett-Levy *et al.* (1980) have shown that in patients who have undergone temporal lobectomy, similar variables (e.g. age at operation, time since operation) affect subjective memory impairment as have been reported to influence memory test performance. In this paper, we present the results of a study where degree of subjective memory impairment as indicated by a short memory symptoms questionnaire was related to performance on commonly used clinical memory tests. In addition to obtaining information from the patient as regards his memory symptoms, we were also, in most cases, able to obtain information from an observer who had known the patient for some time, and to correlate the degree of observed everyday memory impairment with the same set of memory test scores. Thus, we were able, in the

0007-1269/83/030409-07 $02.00/0

present investigation, to examine the hypothesis that one of the reasons for the low correlation between memory symptoms and memory performance found by previous research workers may be that patients lack insight into their memory lapses and may give inaccurate information, possibly as a result of their brain damage.

Experiment 1

Method

Patients. A hundred patients, with established cerebral pathology, who, either spontaneously or on questioning, admitted to the presence of everyday memory impairment, were included in the study. The aetiologies represented in the sample are indicated in Table 1. As can be seen, a wide range of

Table 1. Numbers of patients in diagnostic groups included in the study

Aetiology	Frequency
Neoplasm	23
Degenerative condition	21
Vascular affection	16
Head injury	16
Hydrocephalus	12
Infection	6
Epilepsy	4
Toxic condition	1
Metabolic abnormality	1

neurological and neurosurgical conditions were represented. Most of the patients (74 per cent) had conditions such as dementia, head injury, etc., where there was most probably bilateral cerebral involvement. Of the patients with focal lesions, 18 per cent had left hemisphere damage and 8 per cent had right hemisphere damage. The mean age of patients was 47·7 years and the numbers of patients within various age-groups were 18–40 yr (35), 41–60 yr (37), 61–72 yr (28). The sample included 67 men and 33 women. Most of the patients were seen routinely for clinical neuropsychological investigation in a regional neurological centre and reflected a range of socio-economic and educational levels. Most patients in the sample had some degree of functional disability as a result of their neurological condition. Control patients (24 men, 26 women) consisted mainly of neurological in-patients with extra-cerebral lesions and out-patients with orthopaedic problems. They were of similar socio-economic status to patients in the brain-damaged group. Mean age of control patients was 46·2 years, and the numbers of patients within various age-groups were: 16–40 yr (19), 41–60 yr (20), 61–76 yr (11).

Procedure. Each patient was simply asked to give an example of his everyday memory difficulties. In some cases, patients offered more than one example of their memory impairment and the first example offered by the patient was included for analysis.

Results

The memory symptoms were categorized according to type of memory complaint, and the frequency of each symptom type was noted. (A proportion of the symptoms was initially categorized independently by each author, and there was a high degree of concordance in respect of most symptoms.) The various types of memory symptom, and their frequency of occurrence in brain-damaged (BD) and control (C) groups, were:

(1) Remembering people's names: BD = 18 per cent, C = 18 per cent.
(2) Memory for recent events (usually occurring days or weeks earlier): BD = 15 per cent, C = 6 per cent.

(3) Memory for a spoken message: BD = 12 per cent, C = 8 per cent.
(4) Remembering to do something: BD = 8 per cent, C = 40 per cent.
(5) Some aspect of disorientation for time: BD = 6 per cent, C = 0 per cent.
(6) Memory for where something was put: BD = 6 per cent, C = 6 per cent.
(7) Memory for what he/she was about to do/supposed to do (this is different from (4), in that the patient remembered that he/she had to do something, but had forgotten what it was): BD = 5 per cent, C = 4 per cent.
(8) Retrieving knowledge and well learned information: BD = 5 per cent, C = 4 per cent.
(9) Memory for something recently read: BD = 4 per cent, C = 0 per cent.
(10) Some form of spatial disorientation: BD = 4 per cent, C = 0 per cent.
(11) Word-finding difficulty: BD = 3 per cent, C = 0 per cent.
(12) Memory for one's own speech, e.g. repeating oneself: BD = 3 per cent, C = 4 per cent.
(13) Forgetting that he/she had done something: BD = 2 per cent, C = 2 per cent.
(14) Difficulty in learning a new skill or new information: BD = 2 per cent, C = 0 per cent.
(15) Remembering what he/she was going to say in a conversation/discussion: BD = 2 per cent, C = 4 per cent.
(16) Memory for when something will happen: BD = 2 per cent, C = 4 per cent.
(17) Memory loss for events which had occurred before onset of the illness: BD = 1 per cent, C = 0 per cent.
(18) Memory for how to spell words: BD = 1 per cent, C = 0 per cent.
(19) Memory for names of things: BD = 1 per cent, C = 0 per cent.

As can be seen, the most common memory symptoms in the brain-damaged group related to remembering people's names, recent events, a spoken message and remembering to do something. Amongst the control patients, forgetting to do something was the most frequent memory complaint, followed by memory for people's names and memory for spoken messages.

Experiment 2

The purpose of this experiment was to ascertain what relationship, if any, existed between responses to a short test of memory symptoms and scores on commonly used clinical memory tests. In some of the cases included in this experiment, it was possible to obtain, from a relative or close friend of the patient, observer ratings on the memory-symptoms test. Therefore, an additional aim of this second experiment was to discover if any closer relationship existed between observed memory symptoms and memory performance, compared to subjective memory symptoms and test scores. The degree of correlation between observed and subjective memory impairment was also assessed.

Method

Patients. Fourteen patients, eight men and six women, who had received a concussional head injury were included in the present study. Thirteen of these suffered a closed head injury and one patient suffered an open head injury (i.e. the dura was torn). All of the patients reported some degree of post-traumatic amnesia and this ranged from a few minutes to one year. The mean age of the sample was 31·9 years (range 21–49). Patients were seen at a mean of 26 months after injury (range = 7–60 months).

Procedure. Patients received a number of neuropsychological tests as part of routine neuropsychological assessment (all patients and relatives were seen and tested by N.K.). Information on the following tests is reported here.

(1) Memory Symptoms Test – This consisted of a series of 10 questions in which the patient was

asked to indicate whether his memory, in respect of a particular function, was worse than before the head injury, and if so, whether it was slightly worse or very much worse. The following aspects of everyday memory function were assessed: (i) knowing the day of the week; (ii) knowing the month; (iii) remembering the names of friends or relatives you have known for some time; (iv) remembering the names of people you have recently met for the first time; (v) recognizing the faces of friends or relatives you have known for some time; (vi) remembering, when you meet someone for the second time, that you have seen them before; (vii) remembering something someone has told you; (viii) remembering where you have put something; (ix) remembering how to get somewhere you know well and have been to many times before; (x) remembering something you have been reading in a newspaper or a book. Responses to these questions were allocated 0, 1 or 2 penalty points, according to whether the patient thought his memory in respect of a particular question was unimpaired, slightly impaired or very much impaired, compared to before the injury. Thus, a maximum of 20 penalty points could be obtained on the test. In the few cases where some questions were not applicable (e.g. the patient did not have the opportunity to experience memories relevant to that question), then such a question was disregarded from the total set. A memory-symptoms score was computed by considering the number of scored penalty points as a proportion of the maxium number of penalty points which the patient could have obtained (usually 20).

In the case of nine patients, an observer who knew the patient well accompained him/her at the time of the assessment. This observer usually consisted of a close relative, e.g. spouse, parent. The observer was seen separately from the patient and was asked exactly the same set of questions regarding memory function which the patient had been asked, and responses to these questions were scored in an identical way. Neither the patient nor the observer knew before the assessment that they would be asked a series of questions about the patient's memory.

(2) WAIS Digit Span Subtest – This test, from the Wechsler Adult Intelligence Scale, measures forward and backward digit span and was administered in the usual way.

(3) Williams Delayed Recall Test (Williams, 1968) – This test assesses delayed (7–10 minutes) recall of a set of nine pictures. Free recall is followed by cued recall for pictures not initially retrieved, and recognition testing is assessed if some items are still not remembered at the time of cued recall. Penalty points are allocated to items not retrieved at uncued recall, cued recall and recognition testing (2, 3 and 4 penalty points respectively). Administration and scoring used standard instructions.

(4) Story Recall Test – The test given was an anglicized variation of the first story in Form I of the Wechsler Memory Scale and was administered using standard instructions.

(5) Visual Reproduction – In the case of nine patients, data from the Wechsler Memory Scale Visual Reproduction test (Form I) were gathered. This test assesses memory for designs, and was administered and scored in the usual way.

Table 2. Memory test scores

Test	$\bar{X}$	SD
(1) Memory Symptoms Test (patient)	34·3	22·2
(2) Memory Symptoms Test (observer)	44·6	29·2
(3) Williams Delayed Recall	12·0	8·3
(4) WAIS Digit Span (age-scaled score)	8·6	2·4
(5) Story Recall	10·0	3·2
(6) Visual Reproduction (Wechsler Memory Scale)	9·5	3·9

Note. In the case of tests 1–3, a higher score reflects greater memory impairment. For tests 4–6, a lower score indicates greater memory impairment. Normal reference values for tests 3–6 are – test 3: 7·5, test 4: 10, test 5: 11·5 and test 6: 11·4.

Results

Memory test scores are shown in Table 2, and mostly reflect mild impairments. Pearson product moment correlation coefficients were computed between memory test scores and memory symptoms scores, with separate computations for subjective and observed symptoms. The correlation coefficient between subjective and observed memory symptoms was also computed. Correlation coefficients, together with the number of pairs of data points making up each correlation coefficient, are indicated in Table 3. The relationship between subjective and observed everyday memory symptoms was highly significant ($P < 0{\cdot}005$), and there was no difference between subjective and observed memory symptoms in terms of their relationship to memory test deficits. All of the correlations between memory symptom impairment and memory test deficits were non-significant and most, except for that involving the Williams Delayed Recall Test, were in the *wrong* direction.

Table 3. Correlation coefficients between Memory Symptom Test scores and Memory Test performance

Test	Memory Symptoms[a] (patient)	WAIS Digit span[b]	Story Recall[b]	Williams Delayed Recall[a]	Visual Reproduction[b]
Memory Symptoms (observer)	0·92 (9)	−0·05 (9)	0·16 (9)	0·21 (9)	0·18 (6)
Memory Symptoms (patient)	—	0·14 (14)	0·01 (13)	0·19 (14)	0·00 (10)

[a] higher score = greater memory impairment.
[b] higher score = less memory impairment.
Note. Number of pairs for each correlation in parentheses.

Discussion

Experiment 1 showed that a wide range of memory symptoms are reported by brain-damaged patients, certain categories of symptoms being more frequent than others – thus, memory for people's names, memory for recent events, memory for a spoken message and remembering to do something were amongst the most frequent memory failures which were reported. These symptoms were also frequently reported by a group of control, non-brain-damaged patients. Some symptoms occurred more often in the brain-damaged group (e.g. temporal or spatial disorientation) and one symptom (forgetting to do something) was more common among control patients. In Expt 2, a close relationship was found between subjective and observed everyday memory impairment as indicated by performance on a short memory-symptoms questionnaire. However, scores on this questionnaire, either as reported by the patient himself or by an observer, showed a generally low correlation with memory test performance, as indicated by commonly used clinical memory tests.

Although it is not possible to specify the locus of the memory failures reported by patients, many of these were reported as verbal retrieval difficulties (e.g. difficulty in recalling a person's name, a message just heard). No non-verbal recognition memory symptoms (e.g. failure to recognize a face as familiar) were reported either by brain-damaged or control patients. The present findings suggest evidence for considerable

continuity between normal and pathological memory failures. All of the symptoms reported by control patients found some counterpart in those reported by brain-damaged patients, with some symptoms (e.g. forgetting people's names) equally common in both groups. The fact that some symptoms (e.g. relating to memory for recent events, disorientation for time and place) were more frequently found among brain-damaged patients suggests that some types of cerebral pathologies may have their own characteristic memory symptoms which predominate in the patient's everyday experience. It is possible, therefore, that there are two types of neurologically based memory symptom: those which reflect an extension of naturally occurring memory failure, and those which are specific to particular brain lesions and occur relatively infrequently in normal everyday experience. It would seem that the former memory symptoms may represent fluctuations in components of memory (attention, retrieval, etc.) which have an inbuilt variability in their degree of efficiency, and that the latter are related to cognitive systems which usually function effectively, are not influenced by fluctuations in factors such as attention, mood state, etc., and are only disturbed in the presence of specific brain pathology.

The fact that one symptom (forgetting to do something) was reported by a greater proportion of control than brain-damaged patients is puzzling. It is unlikely that it was solely due to control patients leading a more active life than brain-damaged patients, as many of the former were in-patients with spinal disease. It is possible that memory for this symptom is itself more impaired in brain-damaged patients and may reflect the absence of any subsequent feedback to the effect that a memory failure has occurred. It is also possible that the mechanisms alluded to above play a part in the differing incidence of this symptom, namely, that the symptom reflects fluctuations in processes (motivational, retrieval, etc.) which normally vary in degree of efficiency, and that, while such variability can easily manifest itself as a memory failure in respect of remembering to do something, in brain-damaged patients, memory symptoms related to specific brain pathology may be more prominent and tend to mask the occurrence of other types of memory failure.

The symptoms reported by brain-damaged or control patients in this study cannot be easily described in terms of established classifications of memory systems (e.g. short-term vs. long-term memory). At the functional level, the difficulties reported by patients included impaired ability to remember well learned information, poor memory related to one's own speech or to conversational situations, failure to remember a planned intention, and failure to remember information acquired several days or weeks before. In addition to being relatively divorced from concepts in memory research, the memory symptoms reported by patients are generally not reflected in currently available standardized memory tests. It would seem quite feasible to incorporate some of the symptoms into the design of memory tests, as has been shown in the case of face–name learning (Bennett-Levy *et al.*, 1980). From the procedural point of view, it may be worth including test situations where the initial instructions do not indicate a later memory test, and where the specific timing of the latter is not known to patients, since these features seemed to be common to many of the memory symptoms reported by patients.

A high correlation was found between observed and subjective memory symptoms and, in this respect, our findings parallel some of those obtained by Broadbent *et al.* (1982) in the case of their Cognitive Failures Questionnaire. There was no significant difference between observed and subjective memory symptoms in terms of their relationship to memory test performance: this finding would tend to refute the hypothesis that, at least in the present group of patients, a lack of accurate insight into memory lapses may explain the lack of correlation between subjective memory impairment and performance on clinical memory tests. However, we would urge some caution in generalizing these conclusions, until more data have been gathered in respect of both other memory tests and other groups of

brain-damaged patients. The memory test deficits of our head-injured group were generally mild, and it is possible that, with more marked impairment, a closer correlation between symptom severity and performance might be evident (cf. Sunderland *et al.*, 1982). It is also likely that there are a number of patients, for example, those with dementia or with frontal lobe lesions, in whom there may be quite a marked difference between observed and subjective memory symptoms, and between the relationship of each of these to memory test performance.

References

Baddeley, A. D. (1982). Implications of neuropsychological evidence for theories of normal memory. *Proceedings of the Royal Society* (in press).

Bennett-Levy, J., Polkey, C. E. & Powell, G. E. (1980). Self-report of memory skills after temporal lobectomy: The effect of clinical variables. *Cortex*, **16**, 543–557.

Bennett-Levy, J. & Powell, G. E. (1980). The Subjective Memory Questionnaire (SMQ). An investigation into the self-reporting of 'real life' memory skills. *British Journal of Social and Clinical Psychology*, **19**, 177–188.

Broadbent, D., Cooper, P., Fitzgerald, P. & Parkes, K. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, **21**, 1–16.

Brooks, N. (1979). Psychological deficits after severe blunt head injury: Their significance and rehabilitation. In D. J. Oborne, M. M. Gruneberg & J. R. Eiser (eds), *Research in Psychology and Medicine*, vol. II. London: Academic Press.

Hermann, D. J. & Neisser, U. (1978). An inventory of everyday memory experiences. In M. M. Gruneberg, P. E. Morris & R. N. Sykes (eds), *Practical Aspects of Memory*. London: Academic Press.

Kahn, R. L., Zarit, S. H., Hilbert, N. M. & Niederehe, G. A. (1975). Memory complaint and impairment in the aged: The effect of depression and altered brain function. *Archives of General Psychiatry*, **32**, 1569–1573.

Russell, E. W. (1981). The pathology and clinical examination of memory. In S. Filskov & T. Boll (eds), *Handbook of Clinical Neuropsychology*. New York: Wiley–Interscience.

Sunderland, A., Harris, J. E. & Baddeley, A. D. (1982). Everyday memory and test performance following severe head injury. *Bulletin of The British Psychological Society*, **35**, 215.

Williams, M. (1968). The measurement of memory in clinical practice. *British Journal of Social and Clinical Psychology*, **7**, 19–34.

Zelinski, E. M., Gileski, M. J. & Thompson, L. W. (1980). Do laboratory tests relate to self assessment of memory ability in the young and old? In L. W. Poon, J. L. Fozard, L. S. Cermak, D. Arenberg & L. W. Thompson (eds), *New Directions in Memory and Aging*. Hillsdale, NJ: Erlbaum.

Received 28 January 1982; revised version received 3 August 1982

Requests for reprints should be addressed to Dr N. Kapur, Wessex Neurological Centre, Tremona Road, Southampton.

David Pearson is also at the above address.