THE SELF REPORT OF EVERYDAY MEMORY DETERIORATION IN NEUROLOGICALLY IMPAIRED SUBJECTS: RELIABILITY AND VALIDITY

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ABSTRACT

The present study investigated the reliability and validity of neurologically impaired patients' ability to report on the deterioration in their everyday memory.

In order to do so, a thirty-five item questionnaire, the Metamemory Change Questionnaire (M.M.C.Q.), was constructed and subjects' responses were validated against their performance on the Wechsler Memory Scale (W.M.S.), an objective index of memory deterioration, and a close relative's ratings concerning the patient's memory problems.

Forty one outpatients with confirmed neurological conditions were selected according to a set of inclusion criteria. Each subject endorsed the M.M.C.Q. twice in order to determine the questionnaire reliability, and they were also required to indicate their overall perception of change on a single five point Likert scale. On the second occasion, he/she was also administered the W.M.S. and the National Adult Reading Test. An index of deterioration was then calculated by comparing his current memory quotient to his estimated premorbid verbal I.Q.. At that stage a relative was also requested to independently endorse the M.M.C.Q. according to that person's perception of the patient.

The data obtained from these various measures were then subjected to correlation analyses. The M.M.C.Q. was found to be a very reliable instrument, and good agreement was obtained between the patients' and relatives' estimates of the subjects' memory deterioration. Its relationship to the I.Q. minus M.Q. index of deterioration was, however, dependent on the severity of the

respondent's memory impairment. Thus the magnitude of correlations between subjective reports and test performance was substantially greater in the more severely affected subjects. A similar pattern of results was obtained with the simple overall rating scale, so that the relative merits of using the entire M.M.C.Q. over that global judgement will require further investigation.

The results of this study are interpreted as suggesting that more severe memory impairment is associated with more accurate self report of deterioration. Alternative explanations are discussed and suggestions for further research offered.

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CHAPTER 1

EXPERIMENTAL TRADITION AND ECOLOGICAL VALIDITY

100 Years of Experimental Tradition

"Set against a background of academic research, which for decades was concerned with no more than the memorising of lists of words, the temptation to try to investigate memory in everyday life is enormous. However, once the decision to take on real world remembering is made, the psychologist tends to reel back in the face of the problems that sent Ebbinghaus, who was well aware of the interest and variety of memory phenomena, in search of the nonsense syllable." (Morris, 1984, p. 153)

This statement encapsulates the dilemma faced by psychologists interested in the study of human memory. Although the initial impetus to study memory must have been the desire to elucidate everyday human experience, the vast majority of published research has stemmed from the laboratory and the experimental paradigm. Thus, while both Galton (1883) and Bartlett (1932) advocated the study of memory in natural contexts, their plea has largely been ignored in favour of the experimental methods espoused by Ebbinghaus (1885). The reasons for this emphasis can be traced back to two major factors: The complexity of naturally occurring memory phenomena, and the desire to establish the scientific respectability of Psychology. That approach has allowed the fragmentation and simplification of complex memory variables for the sake of experimental control. Such a reductionistic model, for instance, permits greater control over such factors as subject selection, instructions, modality of presentation, length of exposure, retention interval, method of recall, and environmental factors.

Ease of manipulation, however, does not guarantee practical relevance and the experimental tradition has led to what Tulving and Madigan (1970) have termed the functional autonomy of methods. This refers to the tendency for methods originally designed to study some substantive and applied phenomena to themselves become the primary object of study. The result is a

kind of incestuous product which further and further departs from the original goal of research.

Neisser (1978) has criticised this voluminous amount of experimental research on the grounds that the information so obtained has been largely trivial and that it has failed to generalise outside the laboratory. Although such criticisms have had the beneficial effect of fostering a more practical approach to the study of memory, they perhaps overstate the case. As Cohen (1989) points out, these two methodologies (experimental vs. ecological) "... are not two different ways of doing the same thing, one of which is better than the other. They are two equally valid ways of doing two different, but equally important jobs." (p. 4). That is, they are not competing but complementary methods. Laboratory research is concerned with establishing the capacity of the system and with the derivation and testing of theoretical models. Everyday memory research, on the other hand, seeks to describe and predict behaviour in applied settings. In doing so, ecologically valid research not only brings immediate relevance and practicality, but also stands to generate a host of new and interesting questions which might not have emanated from traditional research.

Baddeley and Wilkins (1984) further point out that everyday memory research stands to provide a new testing ground for the theories generated by conventional methods. Attempts to test the generalisation of some of the more robust experimental findings have, to date, yielded mixed findings. Woodhead, Baddeley, and Simmonds (1979), for instance, failed to observe a depth of processing effect (Craik and Lockhart, 1972) in their facial recognition experiment. These authors report that asking their subjects to analyse faces into their component features did not significantly enhance performance. Similarly, Winograd (1976) reports that asking subjects to attend to their estimates

of a person's intelligence, honesty, or weight only had a very modest effect on facial recognition. The size of that effect was so small, however, as to be of no practical value.

On a more positive note, the work of Ley and his colleagues (Ley, 1972, 1979, Ley, Bradshaw, Eaves, and Walker, 1973) has demonstrated the relevance of some experimentally derived principles to the recall of medical information. Thus Ley (1972) observed a clear primacy effect in patients' memory for medical information. Ley (1979) also replicated Murdock's (1962) finding that percentage recall declines with increasing information load by showing a similar effect in patients' recall of medical advice. Finally, Ley et al (1973) confirmed the beneficial effects of categorisation by demonstrating that patients recalled more information if the latter was presented under distinct headings.

Using these results, Ley (1979) was able to significantly improve patients' retention of medical information by counselling their doctors on how best to present that information. Such work is a clear indication that some experimental memory findings can and do have ecological validity and practical applications. More research is required to investigate the validity and practical relevance of the concepts and principles generated by the experimental tradition.

The Need for Ecological Validity

The need for Psychology to be more responsive to the problems in our society led Neisser (1978) to forcefully argue the case for more ecologically valid memory research. There is no doubt that the credibility and standing of Psychology will be enhanced by its willingness and ability to address the problems of the real world rather than to cling to increasingly complex and reductionistic principles.

In the clinical setting, this is readily translated into a need for a more practical approach to the assessment and treatment of disordered memory. Memory impairment is a most common and debilitating sequel of such neurological conditions as head injuries (Oddy, Humphrey, and Uttley,1978) and cerebro-vascular accidents (Sorensen, Boysen,Jensen, and Schnohr,1982, Wade,Parker,and Hewer,1986). The assessment of such brain damaged patients has, with a few notable exceptions (Wilson, Cockburn, and Baddeley, 1985), relied heavily on traditional experimental tasks. Free recall tests, paired associate learning, and visual retention tasks have found their way into most popular clinical memory tests (eg: Wechsler, 1945, 1987), the validity of which has largely been measured against their ability to discriminate pathological groups from controls. This, in turn, reflects the emphasis psychologists have put on diagnostic issues.

Given the sophistication of modern neuro-imaging techniques, the role of the neuropsychologist as a diagnostician is rapidly changing. The advent of computer axial tomography (C.A.T.), and more recently positron emission tomography (P.E.T.) and nuclear magnetic resonance (N.M.R.) technology have reduced the demand for structural diagnostic inferences based on neuropsychological data. Structural imaging techniques, however, have little to say concerning the functional ramifications of identified neurological damage. Neuropsychology has a vital role to play in this regard, and the symbiotic relationship between it and neuro-radiology can only be enhanced by advances in the latter. The ability to measure the impact of disease on the person's cognitive functions and overall adjustment is not only important in terms of consolidating brain-behaviour theories, but also in terms of fostering better rehabilitation strategies and treatment outcome measures.

The therapeutic nihilism which has dominated memory

research has, in more recent times, yielded to a new optimism that such impairments might be remediable. Reviews of the cognitive rehabilitation literature by Ponsford (1984), Bennett-levy (1984), and Andrewes (1985) indicate that attempts at memory retraining have also been bound to the experimental tradition. Therapeutic endeavours, typically, have concentrated on teaching various mnemonic strategies to patients who could not perform traditional experimental tasks when tested with formal psychological tests (Gianutsos, and Gianutsos, 1979, Aeschleman and Snoy,1982). Assessment of the efficacy of such interventions has relied heavily on patients' performance on these tests before and after training. Unfortunately, while it can generally be shown that improvements do occur on the training tasks, such improvements often fail to generalise to everyday situations. Clearly, the goal of memory rehabilitation is to improve the functional abilities of patients and not to merely train them to perform memory tests. Performance on experimental memory tasks is therefore insufficient as an outcome measure to assess the clinical effectiveness of memory treatment.

Ponsford (1988) defines the problem of past assessment strategies as an over-reliance on the measurement of impairment at the expense of measuring disability. Standardised tests do yield useful diagnostic information and help define which particular cognitive components are responsible for the patient's memory difficulties, but they do not directly address how a person functions in everyday life (Heaton and Pendleton, 1981). They do not provide information on which particular problems a patient has in his day to day life, let alone quantify their severity. There is, therefore, a need to broaden neuropsychological assessment to include measures of everyday memory functions in order to select appropriate targets for rehabilitation and to provide more ecologically valid outcome measures.

Another impetus for the development of ecologically valid memory assessment techniques concerns the emerging role of the neuropsychologist as expert witness in compensation litigation. As Matarazzo (1987) states: "The legal profession is today... engaging increasing numbers of psychologists... in fiercely focussed debates... forcing us to demonstrate without equivocation (within reasonable psychological probability) the validity of our clinical opinions, including those based on our most respected instruments, for psychological assessment." (p. 310). The term "validity", in the eyes of the legal profession, arguably refers to ecological validity rather than to construct or concurrent validity. The court is primarily interested in assessing the impact of brain dysfunction on the claimant's everyday life so as to apportion appropriate monetary compensation. The predictive validity of our clinical instruments concerning everyday disability is therefore a central medico-legal issue which psychologists need to address as a matter of urgency. Concurrently, there exists a need to develop new assessment strategies that specifically target everyday functions.

Methodological Aspects of Ecologically Valid Research

The revival of ecological memory research is a relatively recent phenomenon and comparatively little is known about the variables of interest. Appropriate methodologies, therefore, need to be developed to improve our knowledge of this new area. This will require a trade-off in terms of how much researchers are willing to sacrifice strict experimental control for the sake of ecological validity. At one end of the continuum, traditional methods are retained and merely moved out of the laboratory and into a realistic environment. At the other end there are those who feel that ecologically valid research is only possible when the context within which the studied behaviour(s)

occur is not tampered with in any way. Such naturalistic methodologies are, by necessity, "softer" than traditional psychological research methods, but allow a greater range of variables and situations to be studied. Nevertheless, ecological validity should not be sought at the expense of manageable and interpretable results. To do so would lead to the production of a plethora of unrelated and theoretically barren research findings.

At the lower end of the ecological continuum are studies which aim to test the generalisation of specific experimental findings by replicating them in more ecological contexts. An example of such research is that of Baddeley (1981) who confirmed the results of laboratory research on the effects of alcohol on performance, by transferring his experiment into the pub. Next in the continuum toward ecological validity are experiments that aim to study topics of practical interest in real or simulated everyday circumstances. Thus such research typically involves the study of naturally occurring variables such as the ability to remember faces, names, or conversations rather than nonsense trigrams or lists of words. Wilkins and Baddeley (1978), for instance, investigated pill taking behaviour (a salient clinical problem) by using an analogue task whereby their subjects had to remember to push a button on a timing device at set times during the day. While such studies can tell us a great deal about isolated memory phenomena, the number and types of variables that can be studied this way is limited.

An individual is faced by a large variety of situations every day which require different abilities, some of which are not directly observable or open to experimental manipulation. Given the range and complexity of everyday demands, it is not surprising that psychologists are investigating the use of self-report measures to broaden their knowledge of this area. While this approach is at the less controlled end of the research spectrum,

it does provide a cost effective and efficient way of gathering information on a large range of naturally occurring memory phenomena. Questionnaire research also allows one to study aspects of memory which would be impossible or very difficult to study by laboratory or naturalistic methods.

Synopsis

This study is concerned with the development and validity of a self report measure of everyday memory impairment in a mixed neurological sample. The data so obtained will then be used to quantify and elucidate the types of functional memory disabilities reported by typical rehabilitation clients and their relationship to more conventional neuropsychological assessment procedures.

Chapter 2 will review the types of existing memory questionnaires and their reliabilities. The contents and methodological aspects of these instruments will also be discussed in the light of the emerging phenomenology of everyday memory. Chapter 3 will address the validity of self report and the factors that impinge on it. The effects of aging on self report of memory functions and the relationship between patients and relatives' ratings will also be summarised. The correlation between questionnaire results and performance on objective memory tests will then be reviewed in chapter 4. Chapter 5 will describe the development of a metamemory change questionnaire and the methodology of this research project. Chapter 6 will present the results of this investigation, which will then be critically discussed in relation to prior research in chapter 7.

CHAPTER 2

SELF REPORT IN EVERYDAY MEMORY RESEARCH

Types of Memory Questionnaires

Everyday memory questionnaires first begun to appear nearly a century ago (Colgrave,1898, Miles, 1893) but then fell into disrepute until the recent revival of interest in their potential. Since then the value of questionnaires in elucidating the phenomenology of everyday memory, and their role in studying the validity of self report of memory functions has become increasingly recognised. They are, potentially, an efficient way of gathering large amounts of data, and there is a growing expectation that such instruments may be useful in studying the ecological validity of existing clinical tests. Accordingly, there has been a proliferation of memory questionnaires, the most common of which have been reviewed by Herrman (1982, 1984).

Herrman (1984) has reviewed the contents of existing questionnaires and divides them into two broad types of instruments ; memory questionnaires (M.Q.s) and metamemory questionnaires (M.M.Q.s). Memory questionnaires are tests in as much as they measure a person's ability to remember factual information. As with other tests, they can be scored accurately and provide an objective way of investigating memory for past information. M.Q.s are primarily used for the assessment of remote memory in normal samples and the assessment of retrograde amnesia in clinical samples.

Metamemory questionnaires, on the other hand, are not tests. They do not measure the subject's memory for past events, but his beliefs concerning his current memory functioning. Consequently the information provided by such instruments is potentially useful not only in terms of investigating the validity of self report and the phenomenology of everyday memory, but also as a means of studying the impact of memory beliefs on actual memory performance.

The memory beliefs of normal individuals might represent

a specific subset of the person's overall cognitive style and general self-perception (Sehulster, 1981). This is an important area of research which is yet to be fully explored. If a person's memory beliefs are indeed a function of that person's general theory of his self, then attempts to study everyday memory using self report measures will be inextricably confounded by non-specific factors related to self concept and self esteem. Available factor analytic evidence from metamemory questionnaires, however does not suggest that individuals regard their memory as a unitary phenomenon as might be expected if memory beliefs were tied to the person's general perception of self (Sehulster, 1981, Bennett-levy and Powell,1980, Herrman and Neisser, 1978).

Clearly, memory beliefs must be related to one's trust in one's memory and, consequently might affect not only performance on memory tasks but also the amount of risk one is willing to take with one's memory. The results of the experiment carried out by Sehulster (1981), for instance, indicated that the amount of play money wagered on a trivia quiz was related to certain aspect's of the subject's memory beliefs. Such effects, however, need to be replicated in more natural, ecologically valid situations. Flavell (1979) also suggests that memory beliefs are an important factor in deciding whether or not memory strategies should be used to cope with particular situations. This is a critical factor in the clinical remediation of memory disorders. Insightless patients are unlikely to benefit from rehabilitation because their memory beliefs are at odds with their memory ability. A better knowledge of the relationship between memory self report and objective memory tests would set the background for improved selection procedures for inclusion in rehabilitation programmes. For example, if the relationship between tests and self report is found to be generally substantial, then a large discrepancy between these two measures in patients seen in the

clinic, could be interpreted as evidence of lack of insight. The relationship between self report and actual performance will be reviewed in the next chapter.

Some eighteen M.M.Q.s have so far been designed. Table 1 adapted from Herrman (1982), lists the better known instruments together with their reliabilities.

Table 1 : Metamemory questionnaires and their properties

Questionnaires.	Authors	No. of items	reliability
Cognitive Failures Questionnaire (C.F.Q.)	Broadbent,Cooper, Fitzerald,&Parkes, (1982)	25	.54(n=73) .80(n=32) .82(n=57)
Everyday Memory Questionnaire (E.M.Q.)	Sunderland,Harris, & Baddeley, (1983)	28	N.R.
Head Injury Postal Questionnaire (H.I.P.Q.)	Harris,&Sunderland, (1980)	28	.78(n=60)
Inventory of Memory experiences (I.M.E.)	Herrman,&Neisser, (1978)	72	.68(n=41)
Short Inventory of Memory Experiences (S.I.M.E.)	Herrman, (1979)	32	.66(n=40)
Metamemory Questionnaire (M.M.Q.)	Zelinski,Gilewski, &Thompson, (1980)	92	N.R.
Memory Scale (M.S.)	Sehulster, (1981)	60	.64(n=33)
Error Proneness Questionnaire (E.P.Q.)	Reason, (1981)	30	N.R.
Subjective Memory Questionnaire (S.M.Q.)	Bennett-Levy,& Powell,(1980)	43	.86(n=94)

Note: Reliability coefficients determined by test-retest method. N.R= not reported.

As can be seen from the above table, the test-retest reliability of metamemory questionnaires has, by and large, been satisfactory and comparable to that reported for many psychometric

instruments. The validity of questionnaires will be discussed in chapter 3.

Methodological Issues in Questionnaire Design

The majority of existing M.M.Q.s have evolved independently of each other and, consequently, vary substantially in the time period sampled (six months for the C.F.Q. and E.M.Q., unspecified for the S.M.Q.) and question format. Thus some questionnaires require that subjects endorse their estimate of frequency of memory failures in specified situations (eg: C.F.Q.) while others ask respondents to rate how good their memory is for different types of information (S.M.Q.), the clarity of their remembering (part of the I.M.E.), or their use of memory strategies (part of the M.M.Q.). Most require respondents to endorse Likert scales ranging from nine points (H.I.P.Q.) to five points (S.M.Q., E.M.Q., C.F.Q.). The majority of existing questionnaires request an absolute estimate of everyday memory ability. In those which focus on memory failures, for example, subjects are instructed to report absolute frequency of forgetting in specific situations, by endorsing scales ranging from "very bad" to "very good" (S.M.Q.) or "never to always" (I.M.E., C.F.Q.).

Such response scales present certain methodological problems which act to reduce the validity of the questionnaires using them. For instance, it is unlikely that individuals "never" or "always" forget in any particular circumstances. The inclusion of such extreme points, therefore reduces the effective range of options the subject can endorse. A more general problem concerns subjects' reference criteria when making judgments on such scales. It is likely that respondents make their own individual interpretation of the scale's anchor points. "often" compared to what ? Other types of memory problems ?! Other people they know ?!

Their expectations of what normal memory is ?! The use of such absolute anchors makes it possible that an item given a rating of "often" might occur less frequently than one rated as "rarely" if one type of failure is considered unusual and the other is perceived as commonplace by the respondent. There is some evidence that such confounding effects do occur. Harris (1979), for example, reported a differential range effect in his study of the use of memory aids in a student population. In that study, students seemed to assign different values to the same anchor points depending on whether the question dealt with their use of internal or external memory aids. That is, their frequency ratings were influenced by their expectations of normal usage of one type of memory aid or the other. The use of a diary once a week may seem rare if one assumes that people use them regularly, while the same frequency of mnemonics utilisation may be experienced as excessive. In a subsequent study, Harris (1980) sought to reduce this effect by modifying the response scale to make it more objective and precise. He dispensed with the use of such confusing anchor points as "often" or "rarely" and replaced them with actual frequency estimates such as "about once a week" or "several times a day". This simple modification substantially reduced the range effect noted in his 1979 study, presumably due to the provision of uniform criteria against which each subject could rate his responses objectively. Similar scale modifications have subsequently been adopted by other authors (Harris and Sunderland, 1980, Sunderland et al, 1983).

While the use of more accurate response scales is certainly an improvement in questionnaire design, they are still prone to the memory introspection paradox. People seem, as a rule, not to monitor their memory lapses unless they are confronted with them and, consequently, they tend to remember them more poorly than occasions when their memory performed adequately. Wilkins and

Baddeley (1978), for example, report that their subjects were able to remember having performed planned actions but were inclined to forget their omissions. Such findings must clearly make one suspicious of scales which require individuals to estimate actual frequency of prospective memory failures. It is also unclear whether subjects' endorsement of such precise absolute scales reflects their general opinion of the severity of their memory disorder or the actual frequency of specific memory lapses as asked by most questionnaires.

In clinical populations some of the difficulties delineated above might be averted or diminished by asking subjects to rate their current memory functions relative to their premorbid status. Such an approach would mean that subjects would, in essence, act as their own controls thereby removing the confounding factors that plague absolute frequency judgments. The assessment of perceived change in memory functions would also be more in keeping with clinical experience which suggests that patients' sense of loss typically involves a comparison between "now" and "then". The accuracy with which this change is assessed is yet to be determined, but might be less susceptible to the memory introspection paradox than the endorsement of absolute frequencies which require the subject to recall specific instances of forgetting. At this point in time, the only questionnaire dedicated to the appraisal of perceived change in memory functions remains the Memory Change Questionnaire (Cronholm and Ottoson, 1961) which was originally designed to evaluate the effects of E.C.T. on the memory of depressed individuals. This is, however, a very short instrument consisting of only five questions, and reliability data have not been reported.

Questionnaire Content / Phenomenology of Everyday Memory

The revival of interest into everyday memory is

relatively recent and the phenomenology of such remembering is yet
to be adequately described and classified. Clearly, knowing what
questions to ask is crucial to the validity of everyday memory
questionnaires. Earlier questionnaire designers have had little
empirical data to guide them in defining the content of their
scales. Many existing scales have therefore evolved independently
and their contents have largely been determined by the designer's
concept and experience of everyday memory. Although there is a
reassuring degree of overlap between M.M.Q.s, some do contain
fairly idiosyncratic questions. If a questionnaire is to be truly
ecologically valid, then it must tap situations relevant to a
large majority of people. Questions concerning memory for
mathematical formulae or the colour code of electrical plugs
(S.M.Q.) are far too restrictive and exclude the mathematically
naive among us who do not tamper with their electrical appliances.

In order to validly respond, the subject needs to have
had the opportunity to experience the types of memory situations
described, and the latter need to be sufficiently common as to
bring a large enough pool of instances to mind when the subject
makes his rating. On the other hand, Harris (1979) reports that
specific memory cues lead to more reliable retrieval than general
cues. Questionnaire designers must therefore negotiate a
compromise between the desirability of specific retrieval cues and
the need for representativeness and generalisation. Such a
compromise might be reached by addressing the importance of
question detail while at the same time retaining question
relevance .Thus a question concerning memory for names (a
universal phenomenon) can be made more reliable by specifying
whether it refers to new as opposed to previously known names, or
by reference to context in which such forgetting occurs (eg: at
work, at a party etc...).

Factor analyses of existing questionnaires have

indicated that individuals do not conceive of their memory as a unitary trait, but in terms of both general and specific aptitudes. Thus Sehulster's (1981) principle component analysis of the Memory Scale using a very large student sample (893) yielded three factors. The first factor, accounting for 14.2 % of the variance, was interpreted as reflecting memory for verbal knowledge. The second factor concerned memory for past personal events (7.7 %) while the third related to memory for appointments (5.8. %). Bennett-Levy and Powell (1980) extracted no less than sixteen components from their analysis of the S.M.Q., the largest of which accounted for 12.4 % of the variance. That factor was deemed to pertain to the ability to remember to carry out intended actions (viz: remembering to remember). The other factors were too small to interpret and the authors claimed this as evidence that everyday memory is highly task specific in a normal population. Lastly, Herrman and Neisser's (1978) analysis of the I.M.E. yielded factors labelled rote memory, absent-mindedness, names, conversations, errands, places, and retrieval failures. The results of these studies suggest that the structure of everyday memory (at least as far as self report is concerned) is qualitatively different from the parameters studied in experimental memory research, and underscore the importance of empirically establishing the ecological validity of our clinical assessment procedures.

The factors that have been extracted from the above questionnaire studies have, however, been relatively weak in terms of the amount of variance they explain, leaving a large proportion of total variance unexplained. One, clearly, gets out of a factor analysis what one puts into it, and the limited explanatory power of reported factors might be a by-product of the "shotgun", atheoritical approach which seems to characterise any new field of endeavour. Morris (1984) has, for instance, criticised existing

questionnaires for trying to capture too many types of memory failures. In spite of these problems, past questionnaire research has been germinal to the phenomenological account of everyday memory, and future instruments will benefit from the accumulated data and theoretical knowledge so derived.

Prospective Memory

Clinical experience dictates that memory disordered patients tend to have a different view of memory than psychologists. To many, the inability to remember to perform some future action is as much a memory problem as the forgetting of past information. Indeed there is evidence that prospective memory failure (Meicham and Leiman, 1982) may be more salient than retrospective memory failure. Thus, in a large survey of normal and brain damaged individuals, Mateer, Sohlberg, and Crinean (1987) found that the failure to perform intended actions was reported as more problematic in both groups than the failure to remember past information. Crovitz, Gordoni, Daniel, and Perlmann (1984) reported similar results in their diary study of normal subjects. Analysis of the types of forgetting experiences entered in the diaries indicated that prospective memory failures occurred with the greatest frequency. The importance of prospective memory in everyday life is further highlighted by Harris' (1980) study of memory aids usage in a student population. The most frequently used aids were reported to be those which acted as reminders for the performance of actions (eg : appointment diaries) rather than those concerned with information storage (eg : mnemonics). It would seem, then, that the ability to perform future actions is crucial to one's functional independence. Yet all established clinical tests of memory with the exception of the Rivermead Behavioural Memory Test (Wilson, Baddeley, and Cockburn, 1985) shun this important aspect of memory. The same criticism can be

levelled at the memory rehabilitation literature which has, with a few exceptions (Mateer and Sohlberg, 1988, Mateer and Sohlberg, 1989) largely focussed on the training of retrospective memory.

The distinction between retrospective and prospective memory is not clear cut however. Prospective remembering necessarily involves a retrospective memory component (eg : the content of what was to be remembered such as the details of appointments etc...). One must therefore distinguish prospective memory failure due to the forgetting of what was to be done from that due to failure to remember to carry out an action, the details of which are available in memory.

Harris (1984) has reviewed the growing body of literature concerning the nature of prospective memory, and the relevance of established retrospective memory concepts to this aspect of memory. Prospective memory has been divided into short term, long term, semantic, and episodic prospective memory. Semantic prospective memory is equated with the implementation of overlearnt, well established sequences of actions (the performance of routines such as brushing one's teeth), while episodic prospective memory refers to the remembering of actions which are novel and not part of routines. Harris and Wilkins (1982) have shown that prospective plans can be forgotten very quickly. In that study, subjects were required to monitor a clock while watching a film, in order to perform an action at a predetermined time (a task analogous to the cooking of a meal while engaged in some other activity). The authors report that some of their subjects forgot to carry out the required action although they were clearly monitoring the clock only seconds before. This may be interpreted as short term prospective forgetting. Long term prospective memory, on the hand concerns the ability to implement plans in the more distant future such as those involved in remembering to celebrate someone's birthday.

Although the tentative application of traditional memory concepts (viz : episodic - semantic, short term - long term) has much appeal, their validity in the domain of prospective memory is yet to be established. Many questions remain unanswered regarding prospective remembering, including whether it is truly a memory phenomenon or merely the outward expression of attentional capacity.

Limited evidence exists suggesting that prospective and retrospective memory abilities do not necessarily covary in normals. Wilkins and Baddeley (1978), for example, report that subjects who performed better on a traditional free recall task were more likely to perform poorly on a prospective memory task (a pill taking analogue in this case). There is as yet, little information available concerning the neuroanatomical substrate of prospective memory, and from a neuropsychological point of view there is still insufficient evidence to establish whether it is dissociable from retrospective memory across neurological conditions. The production of patients whose neurological status selectively impairs prospective remembering while leaving retrospective memory intact would considerably promote the cause of prospective memory.

While the theoretical merits of prospective memory are still the object of debate, the factor analyses reviewed above all yielded some factors based on prospective functioning in spite of the fact that most of these scales include only few prospective memory items. Furthermore, the salience of failing to remember to remember in both normal and pathological populations warrants the deliberate inclusion of such questions in future M.M.Q.s in a ratio which more clearly reflects the importance of this aspect of functioning. The distinction between prospective and retrospective memory also undermines the current practice of summing up questionnaire responses to yield a total score. The relationship

between these two types of memory is an empirical issue which remains to be fully explored. In the meantime, the derivation of a total score from questionnaires might obscure the relationship between different facets of everyday memory and objective tests results, thereby underestimating the validity of both tests and questionnaires.

Considerations for Future Questionnaires' Contents

Arguably the ideal metamemory questionnaire would possess both discriminative and ecological validity. This will require careful consideration of content areas as not all memory failures carry the same practical implications, and different types of memory failures may be differentially related to the existence of different types of brain dysfunction. Future designers should be guided by available empirical evidence that some aspects of self reported memory have better discriminative power than others. Sunderland et al (1983), for instance, report that particular types of failures were reported as occurring relatively rarely and others quite frequently by both head injured subjects and orthopaedic controls. Misplacing things around the house were frequently reported by both groups whereas failure to recognise a friend or relative by sight was rarely endorsed. The same authors found that although patients' total scores did not significantly differ from controls, eight of the thirty five questionnaire items were endorsed more frequently by the head injured group. The observation that certain questions had better discriminative power enabled Sunderland, Harris, and Baddeley (1984) to subsequently improve their memory questionnaire. the continuation of such projects should ensure that future researchers will become increasingly sophisticated in knowing what questions to ask.

Lastly, it is likely that factors such as patients'

motivation and attention to question detail will impact on the validity and reliability of future questionnaires. Scales should therefore incorporate internal consistency checks. Memory failures which have been shown to occur with low frequency could be used as indices of the validity of subjects' responding style. Thus endorsement of great difficulties in recognising relatives or in recalling information from the distant past would suggest an indiscriminate tendency to report memory impairment. Significant discrepancies across repeated questions should also be viewed suspiciously. Subjects exhibiting any or all of these trends should then be excluded from further analyses.

CHAPTER   3

THE VALIDITY OF SELF REPORT OF MEMORY FUNCTION

Factors Limiting the Validity of Self Report

As discussed by Morris (1984), several steps are involved in determining whether a memory failure is reported. Firstly, the subject must have an appropriate memory failure; secondly he must classify it as a failure; thirdly he must remember the failure when he is quizzed about it; fourthly he must assess the failure significant enough to be reported and, lastly he must classify or describe the failure accurately. Failure at any one of these stages will diminish the validity of a subject's self report.

Several other factors, aside from actual memory ability, will influence self report. There are wide variations in opportunities for memory failures across individuals. Thus, the more organised or sheltered one's lifestyle is, the fewer demands are made on one's memory and, consequently the fewer failures will be reported. It is also likely that an individual's report will be influenced by the extent to which he is confronted by his lapses. The degree to which relatives feel compelled to highlight the patient's failures to promote "improvement" may therefore have a bearing on the subject's report. In such a situation, it would be difficult to determine the extent to which questionnaire responses reflect the patient's own impressions rather than the reflection of his relatives' opinions. The use of compensatory techniques will also obscure efforts to establish the validity of M.M.Q.s. The use of *aide-memoires*, for instance, will offset the impact of memory impairment in everyday life so that the subject will "validly" report fewer problems and give a false impression of his actual ability. The willingness to use compensatory strategies will, in turn, vary with the patient's insight and acceptance of his difficulties, thereby further confounding the issue.

Cavanaugh and Morton (1987) also stress the importance of expectations in the reporting of memory failures. They state

that "Clinically, attributions may well be the basis for memory complaints, since complaints in turn probably result from a consistent mismatch between self generated expectations and performance... " (p. 210). The effects of attributional factors on self report require more investigation as they might, for example, explain why older individuals do not report their memory to be worse than younger subjects (see review below). That is, older persons' decreased memory may be matched by lowered self expectations so that they do not report their memory as unusually poor. Personality, psychopathology, self efficacy, motivation, locus of control, and social context are other likely contributors to the self reporting of memory competence.

The process by which instances of failures are brought forward in one's mind in order to endorse questionnaires is probably subject to the availability heuristic (Kahneman and Tversky, 1972, 1973, Tversky and Kahneman, 1973). The frequency assigned to a particular memory failure will be influenced by the ease with which examples of that failure are brought to mind. If examples are easily generated, then that particular type of memory lapse will be assigned an inflated probability .On the other hand, if examples are not readily available, then that event will be ascribed a lower frequency value. Thus the availability heuristic may act to promote overestimation or underestimation of the actual frequency of the problem. Furthermore, the consequences of different memory failures will vary a great deal and those that create a lot of inconvenience or embarrassment are likely to be more memorable than those with benign consequences. It is therefore possible for relatively rare but salient failures to be judged as occurring more frequently than more commonplace, but less consequential slips of memory.

The notion that distinctiveness promotes better recall is, of course, not new and underlies the use of humour or

absurdity to augment the efficacy of mnemonics training. In the
area of memory for conversations, there is also some evidence that
the verbatim content is better recalled if such utterances have a
personal significance for the listener (Keenan, MacWhinney, and
Mayhew, 1977) or are surprising and distinctive (Kemper and
Thissen,1981). While the generality of such effects in everyday
memory reporting is yet to be ascertained, it is tempting to
speculate that personally meaningful, distinctive failures will be
reported with artificially inflated frequency.

One also needs to differentiate between questionnaire
validity and the validity of self report. Thus a questionnaire may
be an intrinsically valid instrument and provide accurate
information when applied to some populations but not with others.
Some patient groups are notorious for their lack of insight (eg:
frontal lobe patients, Alzheimer's disease etc...) and may create
an unnecessarily pessimistic view of the validity of self report
instruments. One might also expect to obtain less reliable and
valid data from acute as opposed to chronic patients, and from
those whose conditions are characterised by variability. Indeed if
a questionnaire's validity coefficient is affected in the expected
way when applied to such groups, then this might in itself
constitute evidence of its validity and usefulness. Clinically,
the distinction between questionnaire and self report validity is
an important one. If a questionnaire can be shown to provide valid
results in at least some populations, it will become a welcome
help in quantifying insight in clinical practice.

Herrman (1982) points out that some individuals' memory
beliefs are not stable over time and that this causes
inconsistencies across questionnaire administrations. Not
surprisingly he also presents evidence that the correlation
between questionnaire scores and performance on objective memory
tasks is much lower for inconsistent subjects than for consistent

ones. It would therefore be a fairer test of an instrument's validity if unreliable subjects were excluded from its computation. Subsequent clinical use of the scale should, of course, include two separate administrations to determine whether any particular patient is a reliable responder before accepting the validity of his perceived memory difficulties. The validity of any questionnaire would, however, be in serious doubt if "reliable responders" failed to show a significant correlation between their questionnaire score and appropriate objective criterion measures.

Questionnaire Responses with Aging

It is generally accepted that memory capacity declines with age. One would therefore expect older samples to report more memory failures than younger individuals. While some studies have shown this expected trend (Perlmutter, 1978), several others have produced the opposite, counter-intuitive trend (Bennett-Levy and Powell,1980, Chaffin and Herrman, 1983). One possibility is that older individuals have less active lifestyles which place fewer demands on their memory, and that they consequently have fewer opportunities for failures. This explanation, however, loses some plausibility in the light of a study carried out by Harris and Sunderland (1981). Having replicated this surprising trend with a sample of retired older subjects, they sought to repeat their study while controlling for activity level. In that second study, they compared the self report of young subjects with that of older but pre-retirement subjects. This manipulation, however, failed to reverse the results obtained in the first experiment. Analysis of the raw data indicated that older subjects were especially likely to report fewer prospective memory failures compared to younger persons. This is congruent with evidence from Martin (1986) and from Moscovitch and Minde (cited in Moscovitch, 1982) that older

subjects are indeed more reliable than younger subjects in their performance of prospective memory tasks. In the latter study, subjects were required to telephone an answering service at fixed times several times a day. The results showed older subjects to totally forget that task less frequently than younger ones, and to be more punctual in their performance (viz: less late in ringing) than their younger counterparts. The authors however did not control for the possibility that younger and older individuals may make differential use of external memory aids. Their post experiment interviews did, in fact, suggest that younger subjects who were confident in their ability (and therefore felt no need for external aids) were more likely to forget to telephone at the appointed time.

In support of this contention, Perlmutter (1978) suggests that older individuals do not expect their memory to be as good as it was and that they might adjust both their criteria for reporting memory failures and their use of memory aids. Older subjects have also had many more years to fine tune their memory strategies compared to young individuals. Asking older subjects to report actual frequencies of everyday memory dysfunction (as most questionnaires do) might therefore fail to highlight their lowered memory capacity, as their use of external aids might protect them from experiencing the same number of everyday failures as younger individuals. The use of absolute frequency scales is therefore likely to underestimate the validity of self report in older samples. Rabbitt (1982) reports that although older subjects do not endorse higher rates of everyday forgetting, they do rate their current memory as less efficient than that of their youth. Asking older individuals to rate their memory relative to when they were at their peak would therefore reduce the confounding effects of external aids and reduced self expectation.

Questionnaire Responses in Clinical Samples

There are strong grounds for expecting that brain
damaged patients will have increased memory problems. One would
therefore anticipate that such groups should report increased
frequencies of forgetting .This does not, however appear to be the
case (Baddeley, Sunderland, and Harris, 1982, Crovitz et al,
1984). Sunderland, Harris, and Baddeley (1983) compared the
questionnaire responses of head injured groups to those of a
control group but also failed to corroborate this expected trend.
Head injured subjects did not yield questionnaire scores that were
significantly different from that of control subjects. The authors
therefore concluded that their patients' questionnaire responses
were inaccurate and invalid, possibly as a result of forgetting
their memory lapses. To investigate that hypothesis, they
subsequently asked their head injured subjects to keep a daily
diary of their memory failures in a bid to reduce the likelihood
of them forgetting these lapses. Their results supported their
hypothesis in as much as the frequency of memory difficulties
reported in the patients' checklists were indeed significantly
higher than that contained in the controls' checklists. If one
accepts that the endorsement of daily checklists reduces the
memory demands of the self reporting process itself, then one is
faced with the conclusion that questionnaire methodology is an
inappropriate way of gathering valid information on everyday
memory. It is noteworthy, however that in the above study,
patients were instructed to fill in their checklists every evening
for a period of seven days. Under these conditions, it is
difficult to know if their subjects really endorsed the checklist
independently or whether they were externally reminded to do so
and / or cued with regard to their contents. Furthermore, any
clinician who has ever attempted to teach memory disordered
patients to use a diary will know that pertinent events need to be

entered immediately following their occurrence lest they never get recorded. Asking subjects to check their memory failures at the end of the day is therefore unlikely to yield valid results, except in mildly impaired groups.

One might also reasonably expect acute patients groups to report more severe memory problems than chronic patients, and that valid questionnaire scores should reflect this trend. Baddeley et al (1982), however, report that self report of memory functions on the E.M.Q. failed to differentiate acute from chronic head injured patients and that neither group endorsed more memory failures than an orthopaedic control group. These results might be confounded by several factors, not least of which is the possibility that insight covaries with chronicity. Acute patients have, by and large, had fewer opportunities to be confronted by their limitations, and their inflated assessment of their memory capacity might also be influenced by their sense of rapid recovery from recent, severe memory dysfunction (eg: P.T.A.).

Aside from chronicity, the effects of brain damage are extremely varied and complex so that the validity of self report is likely to vary across diagnostic groups. In keeping with this suggestion, Bennett-Levy, Polkey, and Powell (1980) found that temporal lobectomy patients of between six months and six years chronicity did rate their memory as poorer than normals on the S.M.Q. .The different results obtained with head injured and temporal lobectomy groups probably reflect diagnosis specific factors. Head injured patients are notoriously insightless whereas temporal patients tend to be painfully aware of their disability (Walsh, 1978).

There are other converging lines of evidence that seriously implicate the accuracy with which patients assess the frequency of their memory lapses. Schlechter and Herrman (cited in Harris and Morris, 1984) for instance reported a poor correlation

between subjects' rating on the S.I.M.E. and their subsequent entries in a diary. Interestingly, re-administration of the questionnaire after the diary phase of the study substantially increased the correlation between the two forms of self report. The authors interpreted this result as an indication that the exercise of keeping a diary improved the subjects' appreciation of their memory difficulties. Clearly if one's awareness of one's memory is fostered by recent exposure to one's performance, the order in which tasks are presented (questionnaires, diaries, objective tests) becomes an important research consideration when studying the validity of self report.

It must be born in mind, however, that this increased correspondence between the S.I.M.E. and diary entries concerns two self generated reports, neither of which may have a lot to do with actual performance. Similarly, although moderate correlations (.6) have been reported between different questionnaires (Broadbent et al, 1982), this cannot be taken as evidence of their validity. Concurrent validity of this type only indicates that two instruments tap the same thing, and is no guarantee that this factor is the phenomenon of interest. Such correlations between metamemory questionnaires might reflect their content overlap, their ability to tap subjects' beliefs about their memory, or their actual memory performance. The evidence reviewed so far is not supportive of the latter possibility.

Relationship Between Patients' and Relatives' Self Report

Broadbent et al (1982) reported significant agreement between normal subjects and their relatives concerning the subjects' memory in day to day life. Such agreement between normal subjects and their relatives suggests the possibility of using spouses' ratings as a means of evaluating the validity of patients' self report in clinical studies. Logically, however, one

would not expect perfect agreement between patients and their relatives. Some types of memory failures are not immediately apparent to an outside observer unless the patient complains of them. Sunderland et al (1983) for example suggest that visual memory failures might be more difficult to observe than verbal memory lapses. Verbal failures are not only more easily observable, but considering the verbal nature of our society, they are probably more salient as a source of day to day difficulties. The authors offer this rationale as an explanation for their result that relatives' ratings correlate best with the patient' performance on verbal memory tests.

Not only will relatives have fewer opportunities to observe memory failures, but their report of frequency of lapses will be based on a different pool of instances than the patients'. Crovitz et al (1984) studied the diary entries of both patients and their relatives and indeed found very little overlap between the two. That is, the memory failures recorded by the patients were rarely duplicated in the relatives' diaries. Other factors which might also act to reduce the correspondence between patients and relatives' self report include denial from one or both partner, anxiety, varying expectations, and the efficiency of the spouse's own memory system.

In spite of these difficulties, there is evidence that relatives' reports do present researchers with a useful means of studying the accuracy of patient self report. The study of Sunderland et al (1983) showed that relatives of head injured subjects did report more memory failures than relatives of control subjects. As previously mentioned, this is a strongly expected trend which did not emerge from the patients' self reports. However, the rank correlations between patients' and relatives' questionnaires in the control, early head injuries, and late head injuries groups were found to be very high (.84, .82, and .90

respectively). This indicates that while patients did not endorse memory failures with greater frequency than controls, there nevertheless appeared to be good agreement between patients and relatives as to which memory failures were rare and which were more common. This further suggests that patients are aware of the types of memory failures they suffer but are poor at estimating their frequencies. The superior validity of relatives' report was also highlighted by the observation that the correlation between questionnaire and checklist scores was higher for the relatives compared to that of their patients. It is also interesting to note that the relationship between subjects' and relatives questionnaire scores was much higher in the head injured group (.58) than in the control group (.09). Although chance factors cannot entirely be excluded, these different correlations do suggest that in this study the relatives of memory disordered individuals may have been more sensitised to their mates' memory than the relatives of control subjects. This is consistent with clinical experience. Relatives of brain damaged individuals not infrequently overinterpret the patient's memory failures by attributing inflated importance to common memory lapses that would have gone unnoticed prior to the onset of brain dysfunction.

Lastly, one might expect that more severely injured patients should report more functional memory difficulties. Sunderland, Harris, and Cleave (1984) studied the self reports of fifty severely, and thirty three mildly head injured patients and did not find a main effect for severity of injury. A significant severity effect was, however, found for the relatives' reports of patients' memory problems. This finding lends further weight to the proposition that that relatives reports are more valid than that of patients, at least on instruments that seek to estimate actual frequencies of failures.

Overall, it would therefore seem that relatives'

reports, while not ideal, do provide one means of testing the validity of patients' perceptions of the frequency of their memory failures. Confidence in the validity of patients' and relatives' reports would be considerably augmented if either or both could be shown to correlate with a third, objective criterion of memory functioning. Traditionally, this has involved the study of the relationship between self report and performance on objective memory tests. This aspect of research will be reviewed in the next chapter.

CHAPTER 4

SELF REPORT AND OBJECTIVE MEMORY ASSESSMENT

Demand Characteristics of Tests and Everyday Memory

Traditional memory assessment has relied heavily on the use of experimentally derived tasks which are primarily based on an intentional verbal learning paradigm. Thus commonly used clinical batteries are replete with such tests as digit span, short story recall and paired associate learning. The ecological predictive validity of such tasks has only recently been queried and the results have been equivocal .Studies which have investigated the relationship of patient's self report to objective test performance have reported weak correlations, although the figures reported with relatives' ratings have been more encouraging (Bennett-Levy et al, 1980, Sunderland et al, 1983, 1984).

It is evident, however, that the demands made by clinical tests are quite different from that required in everyday life. Some of these differences are outlined below:

1. Tests assess aspects of tests rarely encountered in real life (eg: paired associate learning).

2. Tests are constructed so as to exclude unwanted variance, and measure relatively pure aspects of memory. By contrast, everyday memory is characterised by the presence of contextual cues, and cuts across modalities.

3. Tests are administered under optimal conditions (focussed attention, high motivation) and therefore measure the subject's capacity rather than his functional efficiency.

4. The motivational state of the individual varies a great deal in real life depending on affective and other factors. Response costs are also different in the real world than they are in the clinic.

5. The contents of tests are often perceived as trivial and irrelevant by patients.

6. Most tests focus on retrospective memory and are given under structured instructions which include cueing that something should

now be recalled. They therefore fail to assess the subject's capacity to "remember to remember", a very important everyday function.

7. Some aspects of clinical memory tests are also out of keeping with more recent experimental evidence concerning memory. For instance, the scoring criteria for logical prose recall are at odds with the variables that govern the recall of real conversations (see Cohen, 1989 for a review). The rote recall of Anna Thompson's demise is, for example, a very different task than the recall of real conversations which are not usually remembered verbatim.

Given this myriad of confounding variables, one would not expect a perfect relationship between tests results and everyday dysfunction. Everyday memory is also dependent on a host of factors, some of which have little to do with memory per se, so that "pure" memory tests are likely to be limited in their explanatory power. This is, indeed, why neuropsychologists evaluate patients along several dimensions and base their predictions on their interpretation of integrated tests results rather than single test data. Before one can proceed to study the ecological validity of psychologists' opinions (as opposed to tests' results), it would seem logical to establish the ecological validity of their instruments as this would provide a baseline upon which to compare "clinical expertise".

Correlations Between Questionnaires and Tests' Performance

As previously stated, the validity of self report has typically been investigated by studying the correlation between questionnaires and performance on objective tests. The correlations so obtained, particularly in patients samples, have not however been very impressive to date (Sunderland et al, 1983, Bennett-Levy and Powell, 1980, Broadbent et al, 1982), suggesting

limited validity for either self report, objective tests, or both.

The evidence available from relatives' reports suggests that patients' self report should be viewed suspiciously. Sunderland et al (1983) studied the relationship between patients' reports, relatives' reports, and the patient's performance on a variety of memory tasks including paired associate learning, forced-choice word recognition, face and pattern recognition, and short story recall (immediate and delayed). The strongest relationship was found between the relatives' questionnaire responses and the patient's performance on the story recall task (immediate: .72, delayed: .63). Patients questionnaire responses, while significantly related to story recall (p < .05) were not as highly correlated with performance (immediate: .36, delayed: .35) and did not explain much test variance. A similar pattern of correlations was observed in the orthopaedic control group where relatives' questionnaire scores correlated .41 and .37 with immediate and delayed recall respectively while that of the control subjects' were non significant and in the wrong direction (immediate: -.25, delayed: -.17). Relatives' reports were therefore more predictive of actual test performance than the subjects' self reports in both the experimental and control groups. Interestingly, the correlations obtained in the control group were substantially smaller than those in the experimental group. This suggests that the relatives of neurological (memory) impaired individuals were better able to assess the memory capacity of their partners than their counterparts in the control group. This is not altogether unexpected if one assumes that the increased frequency of memory failures encountered in neurological groups sensitises relatives to such lapses, thereby rendering them better "primed" to observe and report these than the relatives of patients whose conditions are not expected to affect memory. The lack of correspondence between the controls' questionnaires and

their test results is somewhat counter-intuitive. One might have expected controls to be more aware of their memory capacity than neurologically impaired patients. Although speculative, several possible explanations can be advanced to account for these results. Firstly, these findings might reflect a statistical artefact due to a restricted range effect in the controls' questionnaire scores distribution, thereby limiting the potential correlation between self report and memory performance. Secondly, it might be posited that everyday memory functions and performance on objective tests draw upon different cognitive systems and that the observed lack of correlation validly reflects the natural state of affairs. Neither of these explanations do, however account for the significant correlations obtained with the relatives of control subjects. If the range of memory ability in normals is indeed too narrow for correlational analysis, or if everyday function and performance on memory tests depend on different systems, then one would expect that valid relatives' reports should also fail to correlate with performance on experimental tasks. A third possibility is that normal subjects do not monitor their memory in daily situations whereas brain damaged individuals who have been sensitised by their cognitive disabilities are more accurate in their reports. Taken together, the results of this study would be consistent with this hypothesis. Lastly, one could hypothesise an interaction effect between the validity of relatives' reports and severity of patients' memory deficits. That is, the above results could be explained by postulating that as the subject's memory capacity approximates "normality" relatives' reports become less valid. Further research is necessary in order to determine which of these explanations is the most accurate.

Given the differences between everyday memory and objective tests outlined previously, one might reasonably expect

that tests which mimic real life situations should correlate better with self report than tests which bear no resemblance to everyday demands. Although there have been encouraging reports with the Rivermead Behavioural Memory Test (Wilson et al, 1989, Van Der Feen, Van Balen, and Eling, 1989, Lincoln and Tinson, 1989), the literature does not conclusively support this contention. Both Herrman (1984) and Bennett-Levy and Powell (1980) report only moderate correlations between performance on digit span and self rated memory for telephone numbers (.4 and .35 respectively). Furthermore, when the data presented by Bennett-Levy and Powell (1980) was analysed on the basis of individual questionnaire items rather than total S.M.Q. scores, it was found that most items yielding reasonable correlations with one or more objective measures were seemingly unrelated to the performance task with which they correlated. Sunderland et al (1983) also report that performance on a face recognition task showed no relationship to self report concerning this aspect of memory. The significant correlations obtained by Sunderland et al (1983) between self report, relatives' report, and such experimental tasks as paired associate learning further suggest that tests do not necessarily need to mimic everyday memory in order to be predictive of it. Elucidation of this issue will have to await a more thorough understanding of the mechanisms subserving everyday memory. As evidenced by the factor analyses previously reviewed, these are likely to include both specific and general memory factors, so that typical memory tests may only correlate with the latter thereby limiting their potential for ecological prediction.

The Wechsler Memory Scale

Since its publication, the Wechsler Memory Scale (Wechsler, 1945) has enjoyed a great deal of popularity as a

convenient test of memory in clinical practice. It is based on the then current concepts of memory and includes such tasks as digit span, short story recall, immediate visual reproduction, and verbal paired associate learning. Russell (1975) subsequently extented the usefulness of the test by providing norms for the delayed recall of some of its subtests. Although the W.M.S. contains both verbal and visual tests, it has primarily become accepted as a test of verbal short term memory, and has received a large amount of attention in the literature (see reviews by Prigatano, 1978,and Erickson and Scott, 1977).

Factor analytic studies of the scale have, however, consistently demonstrated a multifactorial structure. Kear-Colwell and co-workers (1973,1977, 1980) have isolated three factors, accounting for approximately 76 % of the variance. The first factor concerns the learning and immediate recall of new information (loadings from logical memory, visual reproduction, and paired associate); the second factor was interpreted as a measure of attention and freedom from distractibility (mental control and digit span), and the third factor related to orientation in time and place. Other authors have reported essentially similar factor structures (Davis and Swenson, 1970, Bachrach and Mintz, 1974) although the orientation factor has not always been replicated (Kear-Colwell and Heller, 1978). The scale, therefore has a stable factor structure but the expected verbal/visual distinction has not received corroboration from the factor analytic research.

Prigatano (1978) has criticised the W.M.S. on psychometric and theoretical grounds. The original standardisation sample was far too small, there is little information available concerning its reliability, and the concept of the memory quotient implies a unitary view of memory which belies the complex structure of human memory. Several revisions of Wechsler's norms

have been published and are reviewed by D'Elia, Satz, and Schretlen (1989). Importantly, Ivison (1977) provides norms based on a suitably large Australian sample (n= 500), together with a few minor modifications of content and scoring method to suit the Australian population.

More recently a revised version of the scale has appeared (Wechsler, 1987). The W.M.S.(R) is a more extensive instrument than its predecessor, taking one hour or more to administer. It incorporates a more even balance between verbal and visual tasks as well as delayed recall trials which were overlooked in the original version. The new scale also replaces the memory quotient with a general memory index and a series of indexes reflecting the integrity of verbal memory, visual memory, attention/concentration, and delayed recall. The standardisation sample consisted of 300 subjects between the ages of 16 to 75 but, unfortunately, normative data was not collected for the important age groups 18 to 19, 25 to 34 and 45 to 54. The norms provided for these age groups in the manual are based on interpolation techniques and should therefore be viewed cautiously. A review of the literature to date indicates that empirical normative data for these groups has still not been collected and this limits its utility. While it has already been shown to discriminate between some pathological populations (Chelune and Bornstein, 1988),its ecological validity has not been investigated. There is as yet insufficient information available concerning its factor structure,although preliminary findings do suggest a three factor solution involving attention/concentration, immediate memory, and delayed recall (Roth, Conboy, Reeder, & Boll, 1990). Finally its relationship to other tests, notably intelligence scales is still to be determined so that direct comparisons are not yet possible.

Thus, although the W.M.S.(R) is potentially a better test than the W.M.S., the recency of its publication and the

limitations described above limit its clinical usefulness. It is likely, therefore that the original scale will continue to be used by many clinicians in the foreseeable future.

Performance on the W.M.S. is known to be highly correlated with I.Q. except at the extremes of the I.Q. distribution. Black (1973), Kear-Colwell (1973), and Solomon, Greene, Farr, and Kelly (1986) for instance report I.Q.-M.Q. correlations of .75, .82, and .76 respectively. This relationship has long been exploited in clinical practice, allowing the assessment of memory deficits relative to a patient's general cognitive competency. The I.Q.-M.Q. discrepancy has therefore been regarded as a general measure of neuropsychological integrity in patient populations. In conditions which affect both mnestic and intellectual functions, however, this discrepancy will not provide a valid clinical index. While a large I.Q.-M.Q. difference will clearly identify an amnesic disorder, a smaller discrepancy in conditions which cause global deterioration of functions will not give a true indication of the extent of memory impairment. It is therefore crucial that researchers clearly identify their samples when studying ecological memory as the relationship between tests and self report may vary between pathological groups.

Mayes (1986) correctly points out that the I.Q.-M.Q. relationship is not surprising, considering that the ability to distinctively encode and store new memories is likely to be partly determined by intellectual factors. Thus, although some authors (eg: Erickson and Scott, 1977) argue that a good memory test should be independent of intelligence, the realisation of this is somewhat unlikely given that both are complex functions which depend on the general integrity of the brain. Nevertheless, the high I.Q.-M.Q. correlation means that a large amount of variance on the W.M.S. could be explained by intellectual rather than pure

memory factors. The saturation of memory test performance with intellect might therefore act to attenuate the relationship between memory test performance and self report of everyday memory functioning if the latter is independent of I.Q.. The effect of intelligence on everyday memory functions is yet to be empirically investigated.

The correlation between M.Q. and I.Q. dictates that a thorough assessment of memory should include an estimate of intellectual status. In order to by-pass the difficulties associated with the concurrent impairment of memory and intelligence seen in diffuse conditions, it is desirable to use an estimate of premorbid rather than current intellectual status as a basis for calculating the I.Q.-M.Q. discrepancy. The National Adult Reading Test - N.A.R.T. (Nelson, 1982) has been reported to be relatively insensitive to intellectual deterioration in a variety of neurological conditions (Nelson and McKenna, 1975, O' Carrol, Baikie, and Whittick, 1987, Moss, and Dowd, 1991, Crawford, Besson, and Parker, 1988) and has become generally accepted as a valid measure of premorbid I.Q.. More recently, Schlosser and Ivison (1989) have also successfully predicted W.M.S. scores from N.A.R.T. scores and age in an elderly population, using multiple regression techniques. A multiple correlation of .73 was obtained, providing preliminary evidence that the N.A.R.T. might also be an appropriate instrument to estimate premorbid M.Q..

The Need for Change

In the clinical setting, one routinely sees patients with relatively high M.Q.s who nevertheless complain bitterly of day to day memory problems, while others with comparatively low M.Q.s report no such problems. Experienced clinicians, however do not interpret the results of memory tests in a vacuum and utilise

the well documented relationship between memory and intelligence. Thus a sub-average M.Q. in an intellectually dull individual would not arouse suspicions of everyday memory dysfunction whereas a similar M.Q. in an intellectually bright individual would. In short, the clinical significance of an obtained M.Q. is usually determined by reference to some estimate of premorbid functioning. The practice of assessing self report against absolute performance on memory tasks which most of the research on ecological memory has adopted is therefore out of keeping with common clinical practice which is, after all, the *raison d'etre* for the development of self report instruments in the first place.

Given that psychologists and patients alike tend to assess disability by estimating the extent of deterioration from some premorbid level, it is surprising that existing questionnaires have largely focussed on absolute frequencies and that their validity has been measured against absolute rather than relative memory performance. The results of Rabbitt (1982) cited earlier provide initial corroborative support for the notion that research in the self report of memory in clinical samples should perhaps concentrate on measuring perceived changes in ability and that the accuracy of this should be assessed against an objective index of memory deterioration.

This study proposes to design a questionnaire to sample patients' perception of change in their everyday memory functions, and to validate this against relatives' ratings on the one hand and estimated decrements in objective memory test performance on the other.

CHAPTER 5

METHOD

<u>Subjects</u>

A sample of neurological patients was drawn from the the Douglas Parker Rehabilitation Centre over a period of seven months. The centre is the major rehabilitation facility in Tasmania and draws its population from General Practitioners and state-wide hospitals.

All new referrals were considered for inclusion in this study provided they met the following criteria:

1. A confirmed neurological diagnosis.

2. Age range between 20 and 70. This range was imposed by the standardisation of the tests used.

3. No history of previous neurological insults. As this study is concerned with the perception of change from premorbid status, the existence of prior disease would have obscured the baseline from which to measure that change.

4. Patients needed to be alert and not confused. Patients still in P.T.A., for instance, were excluded. Patients presenting with the amnestic syndrome were also excluded because of their notorious lack of insight.

5. Patients with a documented psychiatric history were also excluded on the grounds that memory efficiency is often compromised by psychiatric disorders. In particular any patient with a history of alcohol abuse was excluded. This criteria did not exclude the reactive emotional difficulties so often observed in patients with debilitating neurological impairments.

6. Patients needed to be able to read functionally. Any patient with a history of developmental dyslexia was thererfore excluded. Conditions such as hemianopia or diplopia were not, however, ground for automatic exclusion provided they did not impair functional reading ability.

8. Aphasic symptoms did not constitute grounds for exclusion provided they did not prevent reliable endorsement of the

questionnaire and the N.A.R.T..

9. Patients needed to have been residing at home and with a relative for at least two weeks post hospital discharge. In the case of those living at home only part time (eg: weekends) a period of four weeks was imposed.

10. Subjects were required to have completed at least grade 9 education. Any migrant was required to have completed at least four years of schooling in an English speaking country.

11. Patients needed to be able to engage in a modicum of daily activities. Any bed-ridden patient was therefore excluded but hemiplegic or wheelchair patients were included provided they were sufficiently mobile.

The above criteria were assessed by an Occupational Therapist, a Speech Pathologist, or a Nursing Sister involved in the care of the patient. Eligibility was also assessed by the Psychologist conducting the study. Assessment was by means of the patient's clinical file, interviews, and where doubt remained by interviewing a close relative. No formal personality or reading assessments were performed.

A total of 155 patients were screened for inclusion in this study. Of these, 103 failed to meet one or more of the above criteria and were therefore excluded. Of the remaining 52 subjects two did not complete the study because of further neurological complications (recurrences), and three were discharged before they could participate. No subject refused to participate in any phase of the study. A further six patients were rejected on the ground that they failed to satisfy some of the criteria of internal consistency outlined in the questionnaire section below. The final sample therefore consisted of 41 subjects, the characteristics of which are summarised in table 2.

Table 2: Sample characteristics

Variable	Total sample
Sex Male	30
female	11
Age (years)	
Mean	37.7
(S.D)	12.0
Range	20-62
Diagnosis	
Multiple Sclerosis	8
Head injury	21
C.V.A. total	8
left	1
right	6
other	1
Other diagnoses	4
Chronicity (months)	
< 3	12
3-6	5
6-12	9
12-24	6
> 24	9
Working status	
yes	5
no	36
Medications	
Phenytoin	5
Carbamazepine	4
Psychotropics	7

Questionnaire Design

A thirty five item questionnaire designed to sample patients' perceptions of memory changes since their cerebral traumas, the Metamemory Change Questionnaire (M.M.C.Q.), was constructed. The M.M.C.Q. requires subjects to evaluate the extent to which their memory has deteriorated in 34 everyday situations

and to indicate this on a 5 point Likert scale ranging from "no worse than before" to "very much worse than before". Subjects were also required to indicate their overall perception of memory change on a similar visual analogue scale prior to endorsing the questionnaire (from now on referred to as the overall rating).

Questionnaire content was determined by two methods. Firstly, three experienced Occupational Therapists and three experienced Speech Pathologists were requested to list the most common memory complaints reported to them. These therapists were all working colleagues of the author and were informed of the general aim of the study (viz to devise a questionnaire to sample self report of everyday memory failures in neurologically impaired patients, and to study its relationship to standard psychometric tests of memory). More specifically, they were asked to independently supply common everyday memory situations that caused significant handicap for their clients. The details of the project were not discussed with them at that point in time.

Concurrently , the author reviewed the contents of existing questionnaires. Possible items were selected on the basis of communality between the questionnaires.

Preliminary lists of items were compiled from these two sources and compared. A high degree of consensus was observed between the areas identified by the therapists and the contents of questionnaires. Thus, therapists did not produce novel information not contained in one or more existing scales. A notable exception concerned patients' reliability with their medication regimen.

The majority of questions was therefore derived from the questionnaires reviewed (with varying degrees of modification to the wording of the items) in such a way as to include representation of the memory domains identified by Crovitz el al (1984) (rote memory, names, places, people, intended actions,

conversations, and absent-mindedness). Items were also included to sample the forgetting of past activities, material read, and the learning of new information and skills (Sunderland et al, 1983).

The list was subsequently revised in the light of empirical evidence concerning the discriminant validity of certain types of memory failures (Sunderland et al, 1983), although no statistical item analyses were carried out in designing the instrument used in this study.

Further criteria for item inclusion were that the M.M.C.Q. should provide a reasonable balance between prospective and retrospective aspects of memory , and that the types of situations sampled should be sufficiently common as to apply to the majority of subjects. A last requirement was that questions should target potentially observable events rather than internal states which could not be observed by relatives. Items related to memory for feelings, sensations, thoughts etc... were therefore excluded.

Of the 35 items, 12 pertained to prospective memory situations and 21 to retrospective situations. Question number 8 was repeated at question 28 to check for internal consistency. Subjects who recorded a difference of 2 or more points between these two questions were omitted from further analysis (subjects who responded "slightly worse" for one of these questions and "much worse" for the other were also rejected, as this two points difference was not deemed equivalent to the difference between "no worse" and "slightly worse" or between "much worse" and "very much worse") . Four subjects were excluded in this manner. Question number 27 sampled remote memory which is largely held to be unaffected by brain damage. A rating greater than 3 on that item was interpreted as evidence of indiscriminate responding and such subjects were also eliminated from analysis. Two subjects were rejected on this ground.

A small pilot study involving 5 patients was conducted prior to the commencement of the study, in order to assess their ability to comprehend and endorse the questionnaire. A few minor changes were subsequently made and the study proper began.

Materials

- Subjects were administered the Metamemory Change Questionnaire, a copy of which can be found in appendix A. Two relatives' versions of the questionnaire were also drawn up. These were essentially identical to the M.M.C.Q. in contents except that one specifically referred to male patients and the other to female subjects. The female version is appended in appendix B. All versions were prefaced with a consent form which the patient and relative were required to sign.

- An estimate of premorbid I.Q. was obtained from the National Adult Reading Test (Nelson, 1982). This test consists of a list of fifty irregularly spelt words, the reading of which cannot be derived by the application of phonetic decoding rules. The subject is merely asked to read the words aloud, and the test is scored according to the accuracy with which he does so, irrespective of his understanding of the meanings of the words. Split-half reliability for the N.A.R.T. has been reported to be very high by its author (Chronbach Alpha .93), and Crawford, Parker, Stewart, Besson, and DeLacey (1989) have found good test-retest and inter-rater reliabilities (.98 and .96 to .98 respectively) . The norms used in this study are the ones provided by Nelson (1982) for the estimation of W.A.I.S. verbal I.Q.. An estimate of verbal I.Q. was felt to be most appropriate as the Wechsler Memory Scale is considered to be primarily a test of verbal memory.

- The Wechsler Memory Scale (Wechsler, 1945) was used to give an objective estimate of memory functioning. This is a well

known clinical scale consisting of the following seven sub-tests: Personal and Current Information, Orientation, Logical Memory, Digit Span, Visual Reproduction, and Paired Associate Learning. The administration and scoring of the W.M.S. were slightly modified to make it more applicable to the Australian population as suggested by Ivison (1977). The standardisation data used was also that reported by Ivison (1977).

Procedure

A brief description of the study was given to the patient verbally. Following this, the subject was asked to read and sign the consent form. He was then required to endorse the M.M.C.Q. according to the instructions printed on the front page. This was done there and then except on rare occasions when practical considerations dictated that the patient be allowed to take the questionnaire home. In that instance the subject was specifically instructed to fill in the questionnaire independently of relatives. In addition to the author, the M.M.C.Q. was administered by a post graduate psychology student on clinical placement, or an experienced Occupational Therapist or Speech Pathologist. All those concerned were conversant with the nature of this study and were handed a list of the inclusion/exclusion criteria.

Completed questionnaires were returned to the author and follow-up appointments were made with those subjects who were deemed to have endorsed the M.M.C.Q. validly (according to criteria already described). Patients who failed to meet this requirement were omitted from further involvement.

At the second phase of the study, subjects were re-administered the M.M.C.Q. (average time delay: 14.7 days) with explicit instructions to endorse it as they felt "today" rather than on the basis of their memory of their previous endorsement.

Authorisation to approach a nominated relative was also sought at that stage (appendix C).

During this second session, patients also underwent psychological examination with the W.M.S. and the N.A.R.T.. The subject's responses to the N.A.R.T. were tape recorded and scored independently at a later stage by the author and the other psychologist employed at the centre.

No patient refused to have a relative approached, and all relatives agreed to contribute to the study. Whenever possible the relative endorsed the questionnaire in the author's office. Others were dispatched the questionnaire via the mail or the patient. Where the latter course of action was taken, the request was made that the completed questionnaire be returned in a sealed post paid envelope provided. Instructions on the relatives' questionnaire stressed the need for independence of responding.

Patients were reassured at the outset that the results of their assessment, including their relative's perceptions would be discussed with them once all data had been collected. This was complied with and, where necessary, clinical management was offered.

CHAPTER 6

RESULTS

<u>Analyses</u>

All analyses reported in this chapter were performed on an Apple Macintosh computer using the Statview statistical package. Any missing questionnaire data was treated by prorating the M.M.C.Q. total. The number of qestions left unanswered on any questionnaire did not exceed four.

<u>Severity of Impairment</u>

Severity of memory impairment can be estimated from several different sources in this study: The patients' and the relatives' questionnaire totals, their respective overall ratings, or the magnitude of the I.Q./M.Q. discrepancy. Table 3 lists the severity statistics relevant to these sources.

Table 3: Subjects' severity of memory impairment

	Mean	Standard Deviation	range
Patients' M.M.C.Q. total	69.8	30.1	34 - 151
Patients' overall rating	2.5	1.3	1 - 5
Relatives' M.M.C.Q. total	74.4	32.0	34 - 150
Relatives' overall rating	2.9	1.3	1 - 5
I.Q./M.Q. difference	7.2	10.6	-15 - 30

Note: possible range of M.M.C.Q. scores= 34-170.

On average therefore this sample could be considered to represent a mild to moderate severity of memory impairment depending on the method of determination. The range of severity, however was wide, ranging from no disability to very severe impairment.

Figures 1 to 3 show the frequency data for the patients' average questionnaire totals, the relatives' questionnaire totals,
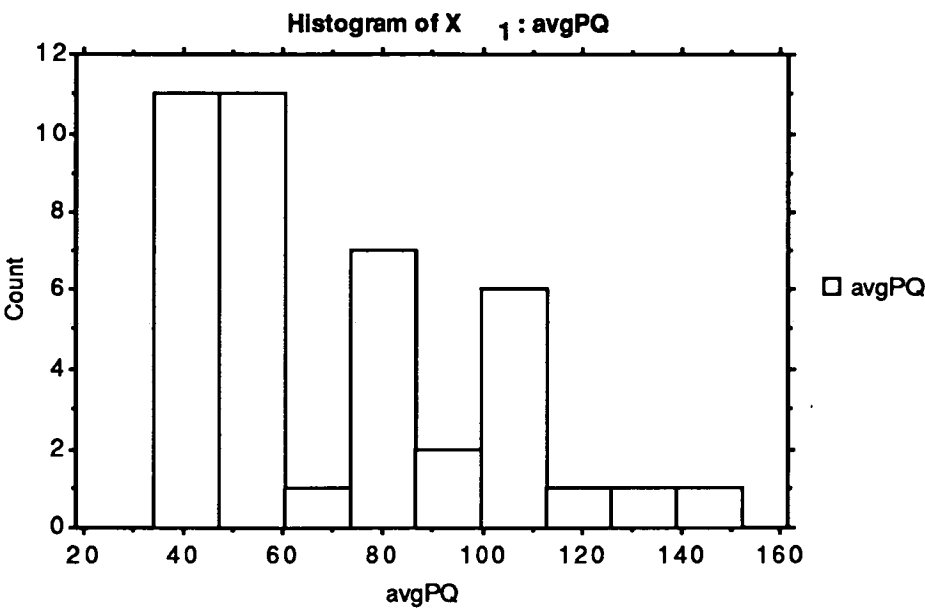
and the I.Q./M.Q. discrepancies.

Histogram of X $_1$: avgPQ

Figure 1: Frequency distribution of averaged patients' M.M.C.Q. totals.

Histogram of X $_1$: Rel.QT
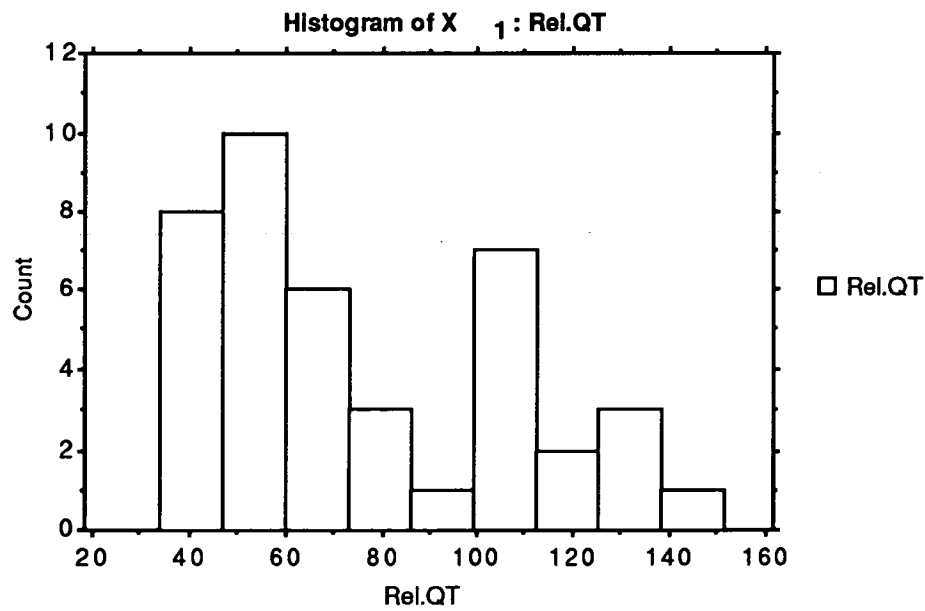
Figure 2: Frequency distribution of relatives' M.M.C.Q. totals.
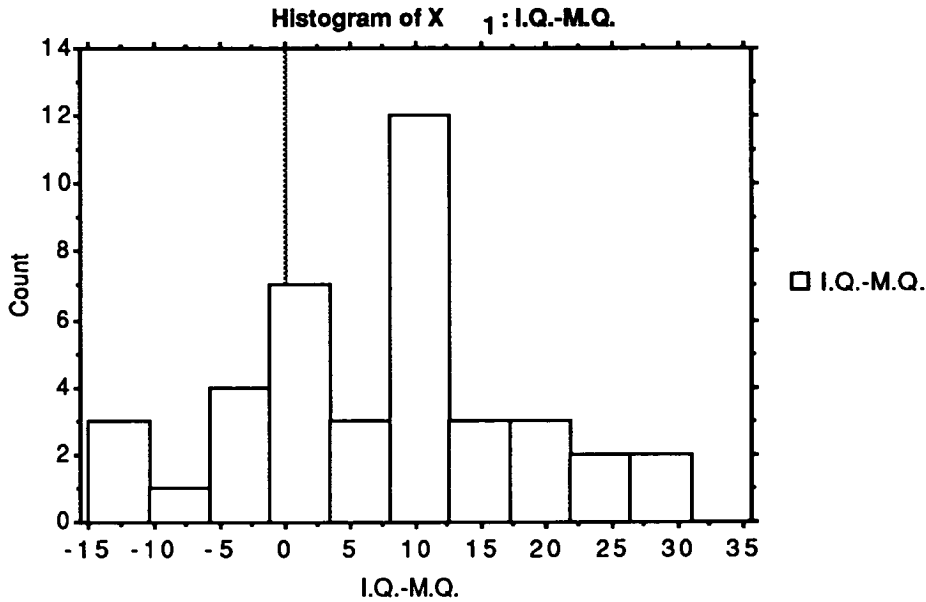
Histogram of X ₁ : I.Q.-M.Q.

Figure 3: Frequency distribution for I.Q./M.Q.
discrepancies.

Reliability

The interscorer reliability for the N.A.R.T. was .99 and
therefore very satisfactory.

The average delay between the first and second
administration of the M.M.C.Q. was 14.8 days (S.D. 8.7, range 6 to
35 days). Test-retest reliability for the M.M.C.Q. over that
period of time was .93. The questionnaire therefore provided a
reliable estimate of patients' beliefs about changes in their
everyday memory functions.

Distribution of Psychometric Tests Results

The means, standard deviations, and range of scores
obtained on the W.M.S., N.A.R.T., and W.M.S. minus N.A.R.T.
comparison are shown in table 4. Ten subjects obtained a negative
I.Q.-M.Q. discrepancy (mean= -5.9, S.D.=4.9). Although one would
not logically expect post brain damage memory efficiency to be in
excess of premorbid ability, the reliability of I.Q./M.Q.
differences is uncertain, and the actual I.Q./M.Q. values were

therefore used in all analyses.

Table 4: Distribution of psychometric scores.

Variable	Mean	S.D.	Range
W.M.S. M.Q.	98.0	13	70 - 131
N.A.R.T. I.Q.	105	8.7	89 - 123
I.Q.-M.Q.	7.2	10.6	-15 - 30

As can be seen from table 4, this sample was average in terms of M.Q.. Again this suggests that, on average, the patients included in this study did not suffer from severe memory impairment. The range of I.Q./M.Q. differences does however suggest that the range of severity of deficits (at least as far as this measure indicates) is sufficiently wide to permit correlational analysis.

Relationship Between Patients' Self Report, Relatives' Ratings, and Test Performance

Table 5 reports the intercorrelations between the various measures of patients and relatives reports of memory impairment and the patients' psychometric performance.

Table 5: Intercorrelations between patients' self report, relatives' ratings, and test performance

	avq.PQT	Rel.QT	M.Q.	I.Q.-M.Q.	Por	Ror	age
avq.PQT							
Rel.QT	.73**						
M.Q.	-.21	-.26					
I.Q.-M.Q.	.20	.37*	-.72**				
Por	.84**	.64**	-.33*	.43**			
Ror	.59**	.80**	-.36*	.52**	.63**		
age	.12	-.07	.45**	-.23	-.05	-.04	

avq.PQT=average patients questionnaire total.
Rel.QT=Relatives questionnaire total.
M.Q=Memory Quotient.
I.Q.-M.Q.=I.Q./M.Q. discrepancy.
Por=Patients' overall rating.
Ror=Relatives' overall rating.
** p<.01   * p<.05

As can be seen from Table 5, there was a significant, and substantial relationship between patients' and relatives' total scores on the M.M.C.Q.. A slightly weaker but still substantial relationship was also found between the patients' and relatives' endorsement of a simple visual analogue scale of overall memory deterioration.

The prospective and retrospective memory subtotals were highly correlated with each other (r=.89) and with the patients' average M.M.C.Q. total score (r=.94, prospective, r=.95, retrospective). This suggests that, in this sample, subjects did not on average respond differentially to these two types of questions. The M.M.C.Q. would therefore be best considered as a measure of overall self reported everyday memory deterioration.

Simply asking subjects to estimate their memory deterioration on a 5 point Likert scale (the patients' overall rating) was also highly correlated with their M.M.C.Q. total score and the relatives' overall ratings, providing further indication of the reliability of self report in this sample.

The correlation matrix further indicates that age was

unrelated to any of the self report measures; suggesting that subjects were able to resist the temptation to assess their current memory functions relative to when it was at its peak (ie in their youth). This issue will require further investigation with a sample of elderly patients.

Table 5 also shows that the patients' M.Q. (an absolute index of memory functioning) failed to correlate significantly with either the subjects' or the relatives' M.M.C.Q. totals. The objective estimate of memory deterioration used in this study (the I.Q./M.Q. discrepancy), on the other hand, did correlate significantly with relatives' but not the subjects' endorsement of the questionnaire. The relatives' M.M.C.Q. ratings were therefore more predictive of the patients' objective test deterioration than the patients' own reports.

Surprisingly, the overall deterioration ratings of both patients and relatives were better related to the M.Q. and I.Q.-M.Q. scores than their respective M.M.C.Q. totals. The highest correlations were again observed with the objective measure of deterioration. While such ratings do not provide the qualitative information potential of the M.M.C.Q., they nevertheless appear to offer a more valid quantitative appraisal of perceived memory deterioration.

Subjective ratings were unrelated to the N.A.R.T. in either the patients or relatives samples (.02 and -.07 respectively). The significant relationships observed between the relatives' M.M.C.Q. totals, the visual analogue ratings, and the I.Q./M.Q. discrepancy are therefore more likely to be attributable to deterioration in memory function than to any relationship with I.Q..

Age was significantly related to M.Q. in this sample. A look at the raw data suggested that the younger subjects had obtained lower M.Q.s on objective assessment than their older

counterparts. The sample was therefore separated into those below and those over 38 years of age (n=20 and 21 respectively). The qualitatively observed trend was confirmed by t-test analysis (mean M.Q.s= 92 and 104 for young and old subjects respectively, t=-3.21, p<.003). While it is possible that this age effect is due to an excessive age correction factor in the Australian revision of the W.M.S., it is more likely to reflect sampling bias and/or confounding due to the relationship between age and diagnostic category in the current sample (eg: younger patients being more likely to have head injuries, and older subjects C.V.A.s; each of which may be associated with a different impact on M.Q.).

Relationship Between Self Report and Test Performance According to Severity of Impairment

Given the relatively high proportion of subjects reporting only mild memory deficits, it was decided to repeat the correlational analyses separately for the mildly and moderately to severely impaired subjects. Accordingly, all patients who obtained an I.Q./M.Q. discrepancy of less than 8 points were assigned to the mild group, while the rest were assigned to the severe group. The characteristics of these two groups are outlined in table 6. As can be seen from that table, the two groups did not deviate substantially in terms of sex ratio, age, diagnoses, or chronicity of condition. As expected, however, the two groups differed significantly in terms of M.Q., the more severely impaired patients obtaining a lower average M.Q.. Although the difference in the patients' M.M.C.Q. totals was in the expected direction, the only M.M.C.Q. total to approach significance in terms of differentiating the groups was that of the relatives. On the other hand, both patients and relatives endorsed significantly more problems on the simple overall rating scales in the severe group than in the mild group.

Table 6: Sample characteristics for the mildly and severely impaired groups

Variable	Mild group	severe group	t-test
Sex male	14	16	
female	4	6	
Age (years)			
Mean	36.45	38.17	t=.429, p>.05
(S.D.)	11.82	13.40	
Diagnosis			
M.S.	3	5	
Head injury	10	11	
C.V.A.	3	4	
Other	2	2	
Chronicity (months)			
<3	5	7	
3-6	3	2	
6-12	5	4	
12-24	1	4	
>24	5	4	
M.Q. Mean	105.22	92.09	t=3.62, p<.001
(S.D.)	10.47	12.10	
I.Q.-M.Q.			
Mean	-2.22	14.86	
(S.D.)	5.75	6.71	
avq.PQT			
Mean	65.89	74.05	t=-.84,p>.05
(S.D.)	33.71	27.49	
Rel.QT			
Mean	64.33	83.55	t=-1.94,p=.06
(S.D.)	30.87	31.44	
Por			
Mean	2.06	2.86	t=-2.00,p<.05
(S.D.)	1.17	1.36	
Ror			
Mean	2.22	3.45	t=-3.50,p<.001
(S.D.)	1.00	1.18	

avq.PQT=average patients questionnaire total.

Rel.QT=Relatives' questionnaire total.

Por=Patients' overall rating, Ror=Relatives' overall rating.

Tables 7 and 8 report the intercorrelations between the patients' self reports, the relatives' ratings, and the psychometric measures in the mild and severe groups respectively.

Table 7: Intercorrelations between reports of everyday memory deterioration and test performance in the mild group

	avq.PQT	Rel.QT	M.Q.	I.Q.-M.Q.	Por	Ror	age
avq.PQT							
Rel.QT	.69**						
M.Q.	.18	.20					
I.Q.-M.Q.	-.31	.24	-.49*				
Por	.91**	.55*	-.01	-.24			
Ror	.76**	.77**	-.04	-.11	.80**		
age	.31	.11	.37	-.30	.22	.04	

avq.PQT=average patients questionnaire total.
Rel.QT=Relatives questionnaire total.
M.Q=Memory Quotient.
I.Q.-M.Q.=I.Q./M.Q. discrepancy.
Por=Patients overall rating.
Ror=Relatives overall rating.
** p<.01 * p<.05

Table 8: Intercorrelations between reports of everyday memory deterioration and test performance in the severe group

	avq.PQT	Rel.QT	M.Q.	I.Q.-M.Q.	Por	Ror	age
avq.PQT							
Rel.QT	.77**						
M.Q.	-.47*	-.37					
I.Q.-M.Q.	.54**	.54**	-.69**				
Por	.81**	.64**	-.34	.65**			
Ror	.49*	.80**	-.20	.43*	.46*		
age	-.07	-.10	.59**	-.31	-.23	-.03	

avq.PQT=average patients questionnaire total.
Rel.QT=Relatives questionnaire total.
M.Q=Memory Quotient.
I.Q.-M.Q.=I.Q./M.Q. discrepancy.
Por=Patients overall rating.
Ror=Relatives overall rating.
** p<.01 * p<.05

The effect of separating mildly impaired and severely impaired subjects did not suppress the significant relationship between patients and relatives reports in either group. The relationship between the prospective and retrospective aspects of

of the questionnaire was also unaffected by splitting the sample in this way (r=.91 and .88 in mild and severe groups respectively).

It is clear from tables 7 and 8 that the major consequence of separating these two groups was that, in the severely impaired group the correlations between the subjective ratings of both patients' and relatives' were substantially higher with objective test performance. In that group, all aspects of perceived memory deterioration (Patients' M.M.C.Q. total, relatives' M.M.C.Q. total, and the overall ratings of both patients and relatives) were related to patients' objective test performance, particularly the I.Q./M.Q. deterioration index. By contrast, none of the self report measures or relatives' ratings were significantly correlated with test results in the mildly impaired group. Furthermore these differential results were not due to a restricted range of M.M.C.Q. or M.Q. scores in the mild group compared with the severe group as the standard deviations were similar in both groups.

Taken together, these results indicate that the relationship of patients and relatives ratings with objective memory performance was dependent on the severity of the patients' memory problems (as gauged by the I.Q./M.Q. discrepancy). Contrary to expectations, that relationship was enhanced in the more severely affected subjects. Possible reasons for this will be advanced in the next chapter.

CHAPTER 7

DISCUSSION

Overview of Results

The obtained test-retest reliability of the M.M.C.Q. compares very favourably with that reported for other self report instruments (see Herrman, 1982). In this sample, subjects did not, however, respond differentially to the retrospective and prospective components of the questionnaire, and consequently the scale cannot be expected to provide specific information regarding these aspects of memory or their relationship with objective test performance. The high correlation observed between the prospective and retrospective sub-totals could be interpreted in two ways: 1- that these two aspects of memory are naturally highly related, or 2- that subjects do not discriminate between the two and responded to the M.M.C.Q. according to their overall impression of their memory deficits. The high levels of concordance between the patients' overall ratings, their M.M.C.Q. totals, and their retrospective and prospective sub-totals are congruent with the latter although it, of course, does not exclude the former. In either case, the strong relationship between the prospective and retrospective components of the questionnaire clearly limit the extent to which they are free to covary with objective estimates of memory functioning, or the patients and relatives M.M.C.Q. totals.

The M.M.C.Q. might therefore be best regarded as a stable measure of perceived general memory deterioration in the types of patients included in this study.

The results also indicate a strong relationship between subjects' and relatives' endorsements of both the overall visual analogue scale and the M.M.C.Q.. That is, the subjects and their relatives shared similar opinions concerning the severity of patients' everyday memory deterioration. Furthermore, the strength of this relationship was not substantially affected by the severity of the subjects' objective memory deficits. Although such

significant correlations between patients and relatives
perceptions have been reported previously (Sunderland et al,
1983), this cannot be interpreted as proof that the M.M.C.Q.
provides a valid measure of actual memory functioning in daily
situations. Such concurrent validity between patients and
relatives' appraisals could merely reflect the possibility that
subjects' and relatives' perceptions might have been influenced by
their mutual daily assertions and confrontations about the state
of the subjects' memory, shared denial, subjective distress, or
other such confounding factors.

The correlations obtained between the patients'
questionnaire results and their test performance were found to be
relatively weak or non significant in the total sample. Thus, the
subjects' M.M.C.Q. totals were unrelated to their absolute
performance on the Wechsler Memory Scale, or to the psychometric
estimate of their memory deterioration. This in keeping with
previous reports (Sunderland et al, 1983, Bennett-Levy & Powell,
1980, Broadbent et al, 1982.) which found a similar lack of
correspondence in cortically damaged patients. Collectively, these
results call into question the validity with which neurological
patients assess not only their actual memory efficiency, but also
changes in their memory functions. Only the relatives' endorsement
of the M.M.C.Q. was significantly related to test performance, and
then only when the I.Q./M.Q. discrepancy was involved. The size
of that relationship in the total sample was, however, too small
(.37) to be of clinical utility.

By comparison, the patients' and the relatives' overall
ratings of memory deterioration were significantly related to both
actual level of performance (M.Q.), and to the objective index of
deterioration (I.Q.-M.Q.). In keeping with the expectations of
this study, the I.Q./M.Q. difference was somewhat better related
to both the subjects' and the relatives' general impression of

deterioration.

When the sample was divided into two groups on the basis
of the severity of their I.Q./M.Q. discrepancies, an interesting
trend emerged. Notwithstanding the reduced size of the samples and
the arbitrarily chosen cut-off score, the correspondence between
the subjects' and relatives' questionnaire totals and the
psychometric measures used increased substantially in the more
severely affected group. Moderate correlations (.47 to .54) were
now observed with both the W.M.S. M.Q. and the objective index of
deterioration (the I.Q./M.Q. difference.).

Such significant correlations were not observed in the
less severely affected patients and this effect was not due to a
restricted range of questionnaire scores in the less severely
affected subjects. Clearly, however, the high level of agreement
between these mild subjects and their relatives on the M.M.C.Q.
indicates that they were not responding in a totally random
fashion. If one assumes that these subjects were not merely
repeating their relatives' point of view, then whatever they are
agreeing about, it is not something the W.M.S. measures
effectively. It might be argued, for instance, that the W.M.S. is
only susceptible to certain types of memory problems and that the
latter were characteristic of the severe group only. That is, the
"mild group" might in fact have severe deficits in areas not
measured by the W.M.S..

The effects of separating these two groups were
nevertheless consistent across the various subjective measures.
Not only were the questionnaire totals more predictive of
objective test performance in the severe group, but so were the
overall ratings of both the patients and their relatives. While
the severe patients' M.M.C.Q. totals were significantly related to
their Memory Quotients, consistently greater correlations were
again observed with the I.Q.-M.Q. difference than with the M.Q..

Although the difference was not marked, the consistent observation that reported memory deterioration is better related to an objective index of deterioration than to absolute test performance might, itself, be considered evidence of validity for both the M.M.C.Q. and the I.Q.-M.Q. discrepancy.

The clear pattern of results observed between the mild and severe groups could also lead one to the tentative conclusion that the more severely impaired subjects and their families were more accurate observers of their memory functions than their more mildly affected counterparts. While this might, at first sight be considered to be counter-intuitive, it is again reminiscent of Sunderland et al's (1983) results. In that study, the correlations obtained between perceived memory competence and test performance in the control group (r=.41 for relatives, r=-.25 for orthopaedic patients) were substantially weaker than those found in their brain damaged late group (r=.72 for relatives, r=.36 for patients), for both subjects and relatives. As suggested in chapter 4, a possible explanation for this severity effect is that individuals are not, as a rule, adept at observing their memory functions in everyday life, whereas neurologically impaired patients and their close relatives become sensitised by the increase in the number of daily failures and their consequences. This possibility is supported by the correlations reported by Sunderland et al (1983) between subjects' and relatives' endorsement of their questionnaire (r= .58 in late brain damaged group, r= .09 in orthopaedic controls).

In the present study, however, the mildly impaired subjects and their relatives did show good agreement concerning their perceptions of the extent of memory deterioration which the patient has suffered. They therefore agree about something, but that something, be it a loss in a cognitive system other than memory or a common expression of subjective distress, is not

tapped by the W.M.S.. Nevertheless, if such a severity effect can be replicated, then subsequent research will need to clearly define their samples in terms of this variable, as we may be dealing with two distinct populations, each of which requiring separate investigation to determine the relevant parameters implicated in the formation of memory beliefs.

The fact that patients' self reports and relatives' ratings were highly related, and significantly correlated with test performance in this more severely impaired subsample is at odds with previously published research which demonstrated the inaccuracy of patient self report and the superiority of relatives' reports (Sunderland et al, 1983, Sunderland et al, 1984). The improved validity of patients' reports found in this study might suggest that they are better able to report on their perception of deterioration than they are able to report actual frequencies of memory failures (as sampled by most other studies). This, in turn, might reflect methodological differences in the endorsement of relative deterioration as opposed to absolute performance questionnaires. As pointed out in the introductory chapters, the requirement to report changes relative to premorbid status means that subjects largely act as their own controls and thus limits the potential effects of a number of external confounding factors.

An alternative explanation of these results centres around sampling differences. The current study included stringent exclusion criteria which, while they undoubtedly reduce the generalizability of its findings, reduced the potential number of confounding factors. The range of neurological disabilities is very wide both in terms of diversity and severity, and future researchers will need to define their samples more stringently before results can be reliably compared across studies. Furthermore the validity of patients' reports was only established

in the severe group and this factor may confuse comparisons with studies which did not separate their subjects in terms of severity.

It is also noteworthy that the significant correlations between self report and the W.M.S. M.Q. and the I.Q./M.Q. discrepancy suggests that tests do not necessarily need to mimic real life situations in order to be predictive of everyday memory. Similar findings have previously been reported (Bennett-Levy & Powell, 1980, Sunderland et al, 1983). It may be , as reviewed in chapter 4, that everyday memory is likely to include both specific and general factors. If such is the case, then it would be inappropriate to expect any one test to predict any more than a moderate amount of ecological memory variance, and a composite test battery might improve the prediction of everyday memory dysfunction. The correlations obtained with the objective indices used in this study must therefore be considered relatively high considering their global and non specific nature (the W.M.S. is a multifactorial scale, but the M.Q. actually averages out specific aspects of memory). In this regard, it would be interesting to test whether the addition of "ecologically valid tests" such as the Rivermead Behavioural Memory Test would enhance the prediction of reported everyday performance.

Methodological Considerations

Although the sample size used in this study is comparable with that used in some previously published research (Herrman and Neisser, 1978, Herrman, 1979, Fitzerald and Parkes, 1982, Sehulster, 1981), the obtained results should be considered as preliminary and their robustness should be tested by the collection of more data.

Only a third of the clients attending the rehabilitation centre qualified for inclusion in this research project. While

this is a direct result of the strict admission criteria employed, the generalizability of the results obtained is clearly limited to these types of patients. It might, however be argued that this ratio of suitable patients (viz. meeting the inclusion criteria) is quite typical of rehabilitation populations, and therefore applicable to the latter.

The sample was however not equally representative of the various diagnostic groups. Aside from the bias for the head injured, only one left C.V.A. was included. This is not only artefactual but may have reduced the potential relationship of self report with the psychometric measures, as the W.M.S. is primarily a test of verbal memory functions and might therefore be expected to vary more systematically with left hemisphere lesions.

Also, the reliability of the relatives' self report was not directly investigated. Such an omission may not however be of great import in this study, as the correlations between patients' and relatives' ratings were quite high and could be considered to have established the inter-rater reliability of the M.M.C.Q..

As previously stated, the validity of relatives' ratings may be influenced by their relationship to the patient, and their opportunities to observe the impaired family member in situations other than highly structured home routines (which are less demanding of the patient' cognitive resources). Future research might therefore benefit from the collection of data from other sources (eg: workmates, friends, etc...) as well as family members.

Suggestions for Further Research

In this sample, the reliability of the simple visual analogue scale was comparable to that of the entire M.M.C.Q., and discriminated better between the severe and mild groups. Further investigation, using a larger sample, is therefore required to

determine whether the details afforded by the M.M.C.Q. warrant its use over and above that of a simple overall rating of deterioration. Such research could, for instance examine the predictive and discriminative validities of individual questions. It may be that certain M.M.C.Q. items will prove more reliable and valid than others and that the scale could be modified in the light of such empirical data to improve its reliability and predictive validity.

The M.M.C.Q. might also prove useful in the elucidation of the structure of everyday memory beliefs. Factor analysis of the questionnaire may yield some insight in this respect and, by comparison, might allow one to determine whether the factors involved in the report of everyday memory deterioration are similar to those inherent in the report of estimated frequency of everyday failures. Furthermore, multiple regression analysis techniques might be employed to predict patients' general impression of disability from individual M.M.C.Q. items, its factorial structure, or both. This type of research would potentially improve our knowledge of the types of memory situations which are especially salient to patients, and help refine our approach to memory rehabilitation.

Clinical experience indicates that patients and psychologists have different conceptions of what constitute memory impairment. Patients are not concerned about the capacity of the system, but with its practical end products (ie: a behavioural definition). They do not, for instance, complain of not being able to rote learn lists of words, or of forgetting visual designs. They do, however report practical difficulties in activities of daily living, and their degree of complaint is likely to be related to the practical significance of their failures in the context of their particular lifestyle. Patients are apt to report any number of neuropsychological deficits (eg: attentional

impairment, adynamia, deficient foreplanning, etc...) as a memory problem by virtue of their non-specific impact on their daily functional efficiency. So while many cognitive impairments will impact on the subject' everyday memory efficiency, these may not be accurately reflected in the results of formal memory testing. The relationship between self report and "pure memory" test results could therefore never be expected to be very high, and the correlations reported in this study must again be considered quite encouraging. Although an argument could be mounted for the need to study the validity of self report across diagnostic groups, many of these show overlap in the functional systems compromised by brain damage, and group allocations based on neuropsychological test performance rather than diagnostic membership would therefore seem to hold more promise.

For the same reasons, further research is required to investigate the relationship of self report to a battery of tests which more closely approximates the clinical practice of most psychologists when they attempt to predict patients' behaviour. The inlusion of other relevant "non memory" cognitive variables would also lend itself to the use of multiple regression techniques which might further our understanding of the factors involved in the derivation of memory beliefs.

Godfrey, Partridge, Knight, and Bishara (1991), in their follow-up study of severely head injured patients found that patients reported greater impairment at one year, two years, and three years, than at six months post injury. It is unlikely that these patients actually got worse with time, and their data therefore suggest that chronicity of impairment is related to the accuracy of self appraisal of disability (at least in that population). Consequently, although the current sample size does not permit it, further research concerning the validity of self report will need to include comparisons at different stages of

recovery from trauma.

The mechanisms underlying the formation of stable memory beliefs have, to date, largely been ignored, but are likely to include both cognitive and emotional factors. The importance of depression and other emotional aspects to self report of cognitive dysfunction is still the object of debate. Thus while Larrabee, West, and Crook (1991) failed to report any association between self report and depression, Heaton, Chelune and Lehman (1981) (cited in Ponsford, 1986) found that patients' perceptions of their disability were more related to their responses on the M.M.P.I. than their performance on neuropsychological testing. Other authors have also commented on the importance of emotional issues. Godfrey et al (1991) for instance reported that their patients' self appraisal of impairment was correlated with measures of both depression and anxiety. It is impossible to determine the extent to which emotional factors may have contributed to the current results, and subsequent research with the M.M.C.Q. will need to include objective indices of emotional status.

Theoretical Issues

The manner in which everyday memory failures give rise to one's sense of deterioration remains to be clarified. The idea that the ability to recall past memory failures and the formation of a stable memory belief system may be dissociated is of crucial relevance to the validity of self report. The literature contains examples of dissociation between memory impairment and insight. That is, not all memory impaired patients display lack of insight. For instance, Walsh (1978), in his review of the amnestic syndrome, reports that diencephalic amnesia (due to chronic alcoholism) is characterised by loss of insight whereas temporal lobes amnesics (due to encephalitis) remain painfully aware of

their deficits.

Such a distinction has important ramifications for research into the validity of self report. It may be that the recollection of actual memory failures is not a prerequisite for the formation of valid attitudes concerning one's memory. While the recall of past failures is dependent on the episodic memory system (and therefore disrupted by many forms of brain dysfunction), memory beliefs may be more akin to semantic memory traces which are less affected by damage to the brain. In this sense, memory beliefs may be similar to many aspects of our knowledge about ourselves. We believe many facts about our past life, and have a large store of general knowledge, but have long forgotten the episodes that gave rise to these "memories". Although episodic memory traces are probably required for the initial formation of these semantic memories, the correlation between the two are likely to be attenuated in neurological patients whose episodic memory is selectively impaired. One could not therefore expect a perfect relationship between memory questionnaires and performance on objective tests of episodic memory.

A model based on this argument would need to assume that as the patient experiences a failure, a parallel system processes that error in terms of modifying his memory beliefs and that the latter impression persists long after the actual episode has been forgotten. The patient's self perception would then be valid, albeit not based on the efficiency of his episodic memory system.

How such a bi-partite system could operate is speculative, but probably would include such factors as insight (which might then be defined as the failure to process information in parallel between the episodic and semantic memory systems), psychological denial, and psychopathology as well as memory per se.

Clinical Implications

From an assessment point of view, the correlations obtained between the M.M.C.Q. and test performance are not sufficiently large to warrant its use with individuals as the sole means of assessment. In spite of the good agreement observed between patients and relatives ratings, and their correlations with test performance in the severe group, some large individual discrepancies were recorded. Clinical interpretation of the M.M.C.Q. should therefore be restricted to the context of a full neuropsychological assessment.

The M.M.C.Q. may, with further research, prove a useful adjunct to the assessment of patients for entry into memory retraining programmes, as well as help select appropriate, personally meaningful, everyday memory situations for rehabilitative efforts. Large discrepancies between self report and test performance might for instance be used as a sign of loss of insight, or of the operation of emotional factors. Such conditions would need to be addressed before implementation of memory retraining, as Flavell (1979) has demonstrated that memory beliefs do influence the decision of whether memory strategies will be used.

Rehabilitation of memory disorders should also not be defined too narrowly, and irrespective of the incongruities between perceived and measured memory efficiency, clinicians will need to target the patient's belief system as an integral part of rehabilitation. Clearly, any treatment package which focuses on memory but fails to modify patients' beliefs cannot be regarded as successful. This is also an argument for the inclusion of a reliable scale such as the M.M.C.Q. as part of the evaluation of retraining programmes.

Sehulster (1981) has provided preliminary evidence that beliefs about one's memory may be instrumental in the amount of

risk one is prepared to take. If such is the case, then modification of these beliefs either through cognitive therapy or psychotherapy might induce patients to venture out socially and undertake various activities, thereby promoting their adaptation to their disability.

Lastly, Godfrey et al (1991), have provided preliminary evidence that the emotional adjustment of severely head injured patients is partly mediated by their appraisal of their difficulties. These authors also suggest that stress related problems can be of late onset as the patient becomes more aware of his deficits. While this is a commonsense clinical observation, the use of such questionnaires as the M.M.C.Q. may provide an objective means of screening patients longitudinally in order to identify those whose self appraisal becomes such that they require counselling intervention.

Conclusion

This investigation provides preliminary support for the reliability and validity of the Metamemory Change Questionnaire as an index of perceived general memory deterioration. The test re-test reliability of the M.M.C.Q. compares very favourably with previously published scales and indicates that the neurological subjects selected for this study held very stable opinions concerning changes in their memory. Further, the degree of agreement between patients' and relatives' subjective ratings concerning the severity of the subjects' memory loss was substantial, and may be interpreted as evidence of concurrent validity. Further evidence of validity was obtained from the relationships between all subjective ratings and performance on objective tests. Importantly, these relationships were only significant in the more severely impaired group of subjects, and the psychometric index of memory deterioration was somewhat more

consistently related to subjective appraisals than absolute memory test performance. The mere requirement of asking subjects to evaluate their memory loss on a 5 point Likert scale also yielded good evidence of reliability and validity and the clinical utility of the M.M.C.Q. over that of this simple judgement will necessitate further research, as will the impact of personality and emotional factors on the validity of self report.

In this sample, therefore, the validity of self report was dependent on the severity of impairment and suggests that the accuracy of both patients' and relatives' perceptions is enhanced by confrontation with more frequent memory failures.

Clearly however, the results of this project concern the relationship between two subjective measures and laboratory tests of memory, none of which may have a lot to do with the actual performance of the patient in everyday situations. The proper assessment of the predictive validity of the M.M.C.Q. will therefore require the development of incontrovertible behavioural tests of everyday memory in the first instance.

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APPENDIX A

Metamemory Change Questionnaire
(PATIENTS' VERSION)

The enclosed questionnaire is part of a research project set up in collaboration between the University of Tasmania and the Douglas Parker Rehabilitation Centre. The aim of this study is to investigate the impact of neurological disorders on memory functions required in everyday life.

Your cooperation in completing this questionnaire would be most appreciated as it will promote a greater understanding of the types of everyday memory problems faced by clients attending this centre.

The information you provide will be treated confidentially and will not be discussed outside your treating team.

If you are willing to take part in this study, please enter your name below and sign this consent form.

Thank you for your consideration of this matter.

....
John Fourez,
Clinical Neuropsychologist.

I (enter your name) .... agree to participate in this study as described above.

Signed: ....

Date: /   / 1990.

Metamemory change questionnaire .

Please answer the following questions :

1. From what condition do you suffer ? (tick appropriate box)
Stroke   Head injury   Multiple Sclerosis   Tumour
Other   (please specify) ....

2. When did this occur ? (in the case of a disease , when was it first
diagnosed ?) . (please state) ....

3. Have you ever had a cerebral trauma / disease before this current
episode? (tick appropriate box)
Yes   No
If yes , what was it ? (please state) ....
When did it happen ? (please state) ....

4. What sex are you ? (tick one)
Male   Female

5. What is your age ? (please state) ....

6. What was your occupation ? (please state)
....

7.Are you currently working ? (tick appropriate box)
Yes   No

8. Compared to before your illness , how good do you feel your memory is
these days ? (please circle appropriate answer)

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

Below is a list of statements concerning your memory in various day to day situations . I would like to know how **you** think your memory has changed **compared to before your illness** .

Please think about each statement carefully and answer it from your **own point of view** .

Once you have made up your mind , please circle one of the responses provided . For example , if you decide that your memory is slightly worse , then you would circle " *slightly worse* " . Of course , there are no right or wrong answers .

Please read the following instructions before answering questionnaire :

    1. Use a biro to enter your responses .

    2. Answer all questions .

    3. Answer the questions in the order given .

    4. Once you have given an answer , do not go back over it or correct it .

    5. Try not to be influenced by what other people think of your memory , or how you would prefer it to be .

    6. Of course , answer the questions according to how good your memory would be **without external help** from diaries , other people , etc... .

questionnaire

1. Forgetting important things you were told yesterday or a few days ago .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

2. Having a feeling that you were meant to do something but you cannot remember what .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

3. Forgetting the names of people to whom you have recently been introduced .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

4. Forgetting to bring up an important point that you had planned to introduce into the conversation . Perhaps forgetting to ask your doctor an important question .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

5. Repeating something you have already told someone . Perhaps asking the same question , or repeating the same joke several times .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

6. Finding it difficult to follow the theme of a book or a magazine story because you forget details of what you have already read . Perhaps having to constantly go back over what you have already read .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

7. Forgetting to tell someone something important , although you said you would . For instance forgetting to pass on a message .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

8. Forgetting what happened yesterday or getting the details of what happened mixed up .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

9. Walking into a room to do something but you forget why you came into the room when you get there .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

10. Forgetting the characters or the plot of a television show , so that you cannot follow it easily . Perhaps having to ask others to explain what is happening .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

11. Forgetting to telephone someone although you had intended to do so .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

12. Forgetting to take your medication at the right time if you are not reminded to do so .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

13. Going to the shop and coming back without some of the items you had intended to purchase .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

14. Finding it difficult to adjust to changes in your routine . Perhaps following your old routine by mistake .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

15. Forgetting the details of your appointments (such as who it is with , the time , or the date) unless you write them down .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

16. Forgetting to attend for an appointment although you can clearly remember the time and date of that appointment , when you are reminded of it later .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

17. Doing the same thing two or more times because you forgot having already done it .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

18. Forgetting to carry out some regular routine such as taking the garbage out or checking the letter box .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

19. Forgetting your way around a new place where you have only been a few times before .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

20. Forgetting where you put things . Perhaps losing things around the house .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

21. Forgetting to take things with you when you go out , such as your keys , wallet , glasses etc... . Perhaps having to go back to fetch them .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

22. Having to check whether you have actually done things you had intended to do , such as turning off the lights or locking the doors .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

23. Forgetting what you were doing after being distracted by something else . Perhaps forgetting to resume what you were doing before the distraction .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

24. Putting things down , such as your keys or your glasses , and then leaving them behind .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

25. Forgetting verbal directions on how to get to a new place .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

26. Forgetting items of news from television or the newspaper . Perhaps being unable to take part in a conversation about the latest news events .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

27. Forgetting things that happened long before you became ill , such as your school days , past holidays , etc... .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

28. Forgetting what you did yesterday or getting the details of what happened mixed up .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

29. Forgetting who told you a particular piece of information .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

30. Remembering something that happened after you became ill , but forgetting when it happened . For example whether it was yesterday or last week .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

31. Forgetting a regular routine such as brushing your teeth or combing your hair without having to be reminded .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

32. Finding it difficult to learn and retain new information such as new telephone numbers and addresses .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

33. Forgetting what was said in past conversations . Perhaps having people tell you that you have been told something , but you cannot remember being told .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

34. Forgetting well established skills , such as those involved in your occupation or a favourite hobby .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

35. Being able to learn new things such as learning a new hobby , or how to operate a new gadget .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

Thank you very much for your help !

APPENDIX B

metamemory change questionnaire
(RELATIVES' VERSION)

the enclosed questionnaire is part of a research project set up in
collaboration between the University of Tasmania and the Douglas Parker
Rehabilitation Centre. The aim of this study is to investigate the impact
of neurological disorders on memory functions required in everyday life.

Your .... has already completed the questionnaire, and
I am also interested in your opinion , based on your observations ,
concerning ....' s memory difficulties since the illness
began.

Your cooperation in promptly filling in this questionnaire and returning it
to me in the stamped envelope provided would be most appreciated as it
will promote a greater understanding of memory problems faced by clients
attending the centre .

It is essential that you complete the questionnaire independently of your
relative .

The information you provide will be treated confidentially .

If you are willing to take part in this study , please enter your name below
and sign this consent form.

Thank you for your consideration of this matter.

....
John Fourez ,
Clinical Neuropsychologist.

I (enter your name) .... agree to participate
in this study as described above.

Signed : ....

Date :   /   / 1990.

Metamemory change questionnaire .

Please answer the following questions :

1. Is your relative living at home full time at present ? (tick appropriate box)
   Yes   No
   If not , how many days per week does she spend at home ? (please state)
   ....

2. Are you currently working ? (tick appropriate box)
   Yes   No

3. In terms of her usual pastimes , how much activity does she engage in these days Compared to before her illness? (circle appropriate answer)

| No less than before | Slightly less than before | Moderately less than before | Much less than before | Very much less than before |

4. Compared to before her illness , how good do you feel her memory is these days ? (please circle appropriate answer)

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

5. How would you rate your own memory ? (circle appropriate answer)

| Poor | Below average | Average | Above average | Excellent |

Below is a list of statements concerning your relative ' s memory in various day to day situations . I would like to know how **you** think her memory has changed **compared to before the illness** .

Please think about each statement carefully and answer it according to your **own observations** (not what she thinks about it) .

Once you have made up your mind , please circle one of the responses provided . For example , if you decide that her memory is slightly worse , then you would circle " *slightly worse* " . Of course , there are no right or wrong answers .

Please read the following instructions before answering questionnaire :

  1. Use a biro to enter your responses .
  2. Answer all questions .
  3. Answer the questions in the order given .
  4. Once you have given an answer , do not go back over it or correct it .
  5. Try not to be influenced by what other people think of her memory , or how you would prefer it to be .
  6. Of course , answer the questions according to how good her memory would be **without external help** from diaries , other people , etc... .

questionnaire

1.   Forgetting important things she was told yesterday or a few days ago .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

2.   She has a feeling that she was meant to do something but she cannot remember what .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

3.   Forgetting the names of people to whom she has recently been introduced.

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

4. Forgetting to bring up an important point that she had planned to introduce into the conversation . Perhaps forgetting to ask her doctor an important question .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

5. Repeating something she has already told someone . Perhaps asking the same question , or repeating the same joke several times .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

6. Finding it difficult to follow the theme of a book or a magazine story because she forgets details of what she has already read . Perhaps having to constantly go back over what she has already read .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

7. Forgetting to tell someone something important , although she said she would . For instance forgetting to pass on a message .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

8. Forgetting what happened yesterday or getting the details of what happened mixed up .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

9. Walking into a room to do something but she forgets why she came into the room when she gets there .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

10. Forgetting the characters or the plot of a television show , so that she cannot follow it easily . Perhaps having to ask others to explain what is happening .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

11. Forgetting to telephone someone although she had intended to do so .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

12. Forgetting to take her medication at the right time if she is not reminded to do so .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

13. Going to the shop and coming back without some of the items she had intended to purchase .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

14. Finding it difficult to adjust to changes in her routine . Perhaps following her old routine by mistake .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

15. Forgetting the details of her appointments (such as who it is with , the date , or the time) unless she writes them down .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

16. Forgetting to attend for an appointment although she can clearly remember the details of that appointment when she is reminded of it later

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

17. Doing the same thing two or more times because she forgot having already done it .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

18. Forgetting to carry out some regular routine such as taking the garbage out or checking the letter box .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

19. Forgetting her way around a new place where she has only been a few times before .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

20. Forgetting where she puts things .Perhaps losing things around the house.

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

21. Forgetting to take things with her when she goes out , such as her keys , wallet , glasses etc... . Perhaps having to go back to fetch them .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

22. She has to check whether she has actually done things she had intended to do , such as turning off the lights or locking the doors .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

23. Forgetting what she was doing after being distracted by something else . Perhaps forgetting to resume what she was doing before the distraction .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

24. Putting things down , such as her keys or her glasses , and then leaving them behind .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

25. Forgetting verbal directions on how to get to a new place .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

26. Forgetting items of news from television or the newspaper . Perhaps being unable to take part in a conversation about the latest news events .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

27. Forgetting things that happened long before she became ill , such as her school days , past holidays , etc... .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

28. Forgetting what she did yesterday or getting the details of what happened mixed up .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

29. Forgetting who told her a particular piece of information .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

30. Remembering something that happened after she became ill , but forgetting when it happened . For example whether it was yesterday or last week .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

31. Forgetting a regular routine such as brushing her teeth or combing her hair without having to be reminded .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

32. Finding it difficult to learn and retain new information such as new telephone numbers and addresses .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

33. Forgetting what was said in past conversations . Perhaps having people tell her that she has been told something , but she cannot remember being told .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

34. Forgetting well established skills , such as those involved in her occupation or a favourite hobby .

| No worse than before | Slightly worse | Moderately worse | Much worse | Very much worse |

35. Being able to learn new things such as learning a new hobby , or how to operate a new gadget .

No worse than before	Slightly worse	Moderately worse	Much worse	Very much worse

Thank you very much for your help !

APPENDIX C

Authorisation to approach a relative

some time ago you kindly completed a questionnaire regarding changes you have observed in your memory . I am now seeking your cooperation in an extension of this study .

This phase of the study aims to investigate the relationship between your view of your memory , the observations of a close relative concerning your memory , and your performance on a variety of well established clinical memory tests .

The clinical assessment of your memory will take approximately 45 minutes and the results will be used to help plan your rehabilitation at the centre . the relative you nominate will merely be asked to fill in the same questionnaire as you did .

The information so obtained will be treated confidentially and will not be discussed outside your treating team .

If you are willing to help with this part of the study , please enter your name below and sign this consent form .

Thank you for your consideration of this matter .

....

John Fourez ,
Clinical Neuropsychologist .

I , (enter your name) .... agree to participate in this study as described above . Further , I give my permission for .... (enter your relative 's name) to be approached concerning my memory .

Signed : ....

Date :   /   /1990