# ERRORLESS VERSUS ERRORFUL LEARNING IN MEMORY-IMPAIRED PATIENTS WITH SCHIZOPHRENIA: IMPLICATIONS FOR COGNITIVE REHABILITATION.

**AND RESEARCH PORTFOLIO**

**VOLUME ONE**

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**31st July 2000**

**Submitted in partial fulfilment of the degree of Doctor of Clinical Psychology within the Faculty of Medicine, University of Glasgow.**

**ACKNOWLEDGEMENTS**

There are many people to whom I would like to extend my sincere thanks, without whose help this dissertation could not have been completed. In no particular order, they are, the members of Clydesdale CMHT (1998), especially Joanne Illsley, for the small scale project.

Professor Robin McCreadie and Dr. Ciara Kelly for their enthusiastic support and Dr. Paul Fleming for his guidance. Val Sharkey for her invaluable inside information and Drs. Hall and Graham for their cooperation. Dr. Angus MacMillan for his flexibility and the members of Nithbank CMHT for so willingly accommodating me into their schedules. The patients of Nithsdale who suffer daily from arguably the worst of all psychiatric illnesses but gave freely of their time to participate in the major project.

On a personal level, my family for their support and encouragement, especially my wife Rona for letting me be a stranger, my sister Grace for providing respite baby-sitting and my mother for her unfailing confidence. Finally, see camaraderie? See the Waltons? See the class of 2000!

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# 1. SMALL SCALE RESEARCH PROJECT

# PERCEPTIONS, AWARENESS, AND FUNCTION OF CLINICAL PSYCHOLOGY IN A RURAL CMHT.

Supervisor: Dr. K. Davidson

Prepared in accordance with the guidelines for the Journal of Health Services Research and Policy (see appendix for notes to contributors).

**Perceptions, awareness, and function of Clinical Psychology in a rural CMHT.**

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**Objectives:** To provide descriptive data on the types of referral received by clinical psychology within a Community Mental Health Team (CMHT) during a four month period after the service's inception. To identify the perceptions held by other team members (from nursing, psychiatry, occupational therapy, and social work) of the clinical psychologist's role in the CMHT and establish their level of awareness of the skills particular to clinical psychology. To examine the post-intervention effect of an education package to the team, i.e. whether this could effect an attitudinal change in terms of types of referral considered appropriate, satisfaction with, and expectations of clinical psychology.

**Methods:** Case notes were reviewed to identify the types of problem being referred. A questionnaire was designed to assess the above. Following assessment of initial responses an education package was presented at a team meeting. Eight weeks later, the questionnaire was recirculated and assessed for significant change using non-parametric methods.

**Results:** Significant attitudinal change was limited. Members demonstrated sound knowledge of appropriate referrals, placed high value on the psychologist's therapeutic work with individuals, collaborative working, and the provision of

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information from new research. Satisfaction with the referral process declined. Qualitatively, members emphasised the need for improved interprofessional knowledge of each profession's skill base.

**Conclusion:** Although psychology is clearly valued, group dynamics within teams of different professionals may make such interventions vulnerable to inoculation effects. Attitudinal and behavioural change may best be enhanced by increased awareness of the difficulties which different professions face.

## INTRODUCTION

Since 1962 when Enoch Powell,[1] then Minister for Health, defined the government's policy direction as the "elimination of by far the greater part of this country's mental hospitals as they stand today", hospitalisation has been replaced by a policy of community care. People with severe mental illness have complex and enduring health and social care needs which demands a multidisciplinary approach [2]. Government policy emphasised the importance of interprofessional working between health and social services which led to the development of Community Mental Health Teams (CMHT'S) across the U.K.

As a model for the provision of mental health care, CMHT's have been increasingly under fire for failing to live up to the expectations that they engendered when they were first set up [3]. Theoretically, multidisciplinary team working aims to offer systematic case allocation following comprehensive assessment of clinical need, whilst bearing in mind the individual professional skills of team members [4]. This laudable integrative approach depends on

understanding the roles and skills of other team members. In reality, case allocation can decline into random "dishing out" to whoever has space on their caseload [5].

The appropriateness of psychological interventions for clients with serious mental illness, which has been demonstrated by research e.g. Tarrier [6], has established an active role for clinical psychologists within CMHT's. Osborne-Davies [7] described their principal roles as clinical work and training, but identified the fact that other professions perceived them as a "virtually unknown professional group". Cushion [8] found their main roles to be assessment and individual work with clients. This study questioned other CMHT members about how clinical psychology was actually being used and identified a significant perception that clinical psychologists were a poorly used resource often being "too bogged down in routine work".

## THE PRESENT STUDY

In November 1997, a clinical psychologist was appointed to a half-time post in Clydesdale CMHT. The team was set up in 1995 and covers an extensive rural area of 510 square miles (population 57 588) and is split between two bases, one in Lanark and the other in Newmains. The latter is outwith the geographical boundaries of Clydesdale but has served as a base for the north of the district due to lack of accommodation within the district.

As a recent addition to the CMHT the clinical psychologist hopes to avoid the type of unfocused confusion discussed above. At the time of this study, the psychologist had already found that limited clinical time was being taken up by

long term intervention on an individual basis. This severely curtails the number of cases referred to the team that have any psychological input and a principal concern was that this was not the most efficient deployment of clinical time. Subsequently, the waiting list was closed in April as it was decided more appropriate to discuss and agree referrals as spaces became available.

The main aims of the present study are outlined as follows:

i) To identify the perceptions held by other team members of the clinical psychologist's role in the CMHT and establish their level of awareness of the skills particular to clinical psychology.

ii) To examine the post-intervention effect of an education package to team members i.e. whether or not by providing information an attitudinal change could be effected in terms of, types of referral considered appropriate for clinical psychology, levels of satisfaction with the service and expectations of clinical psychology by other professions.

iii) To provide descriptive data on the types of referral received by clinical psychology during the period December 1st - April 1st (pre-intervention).

## METHOD

Procedure

Firstly, current literature in this area was reviewed and a questionnaire was specially designed to target current research themes e.g. other professions' perception of clinical psychology within a CMHT. Aspects of the questionnaire were tailored specifically to answer questions relating to the psychology service in Clydesdale CMHT. The questionnaire was distributed to team members during the second week of April (a copy of the questionnaire is appended).

Secondly, an education leaflet was designed as a companion follow-up to the information gleaned from the initial set of questionnaire responses. The leaflet was circulated at a monthly meeting on June 8th, in conjunction with an explanatory talk to the team by the psychologist (a summary transcript of the talk is appended). Four team members who were unable to attend the meeting were provided with the education leaflet and the talk transcript after all questionnaires from participating members had been collected.

Next, the questionnaire was recirculated to the team on July 28th. Pre-education responses were compared with post-education responses for significant change using non-parametric methods i.e. the Wilcoxon Signed Ranks test. Respondents selected code names to be used on both occasions when filling out the questionnaires; this guaranteed anonymity while providing the identification required for cross matching responses.

Lastly, permission was given to access client case files and a review of the referrals made to clinical psychology during the period December 1st - April 1st was undertaken.

Participants:

The Clydesdale CMHT consists of eleven members whose designations are as follows:

6 Community Psychiatric Nurses

3 Social Workers

1 Psychiatrist

1 Occupational Therapist

Initially, nine team members took part in the study; the participation of one member of nursing was later discontinued due to long-term sick leave. Two members of social work declined to take part in the study; one was interviewed by telephone and given the opportunity to expand on their reasons for not taking part. Of the three social workers, the full-time CMHT member is funded by North Lanarkshire Council, although they work in Clydesdale, South Lanarkshire. The second senior social worker (from North Lanarkshire) acts only in a supervisory role and does not see clients in Clydesdale. The third social worker (from South Lanarkshire Council) acts as a Mental Health Officer and has limited direct contact with clients in Clydesdale.

**The Questionnaire:** (see appendix)

The questionnaire was structured in the following way -:

1. Appropriate types of referral to clinical psychology within the CMHT.

There followed a list of 19 problems which members were asked to rate for appropriateness on a scale of 1-5. 1= not appropriate, 5= extremely appropriate.

2. Importance of specific roles in terms of clinical psychology's input to the CMHT.

Members were asked to rate roles, which from research literature are commonly performed by psychologists, on a 1-5 scale of importance. 1= not important, 5= extremely important.

3. Possible importance of certain complementary roles in terms of clinical psychology's input to the CMHT.

Members were asked to rate roles that were potentially available but were not performed at the present time on a 1-5 scale of importance.

4. Satisfaction with specific aspects of the clinical psychology service within the CMHT.

Members were asked to rate their level of satisfaction with certain aspects of the service e.g. waiting time, process of feedback, and access to consultation on a scale of 1-5. 1= not influential, 5= extremely influential

5. Factors influencing referral decisions to clinical psychology.

Members were asked to define the degree of influence that certain factors brought to bear on their referral decisions on a scale of 1-5. 1= not influential, 5= extremely influential.

6. Future developments for the service

Members were asked to comment freely on any ways in which they would like to see the clinical psychology service develop.

For questions 1-5 above space was provided for qualitative comment on the reasons for their ratings.

## The Education Package

A prepared leaflet addressed:

* the potential of clinical psychology in a supervisory, consultative, and training role.

* the capacity of brief focused assessment or short-term intervention for specific problems in more complex cases.

* referral criteria based on the Framework for Mental Health [9]

* reasons for waiting list closure

* queries noted from questionnaire responses e.g. existence of a psychiatric out-patients' clinic; patients with personality disorder.

## RESULTS

### Types of referral:

Referrals to clinical psychology December 1st - April 1st

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**Insert Table 1 about here.**

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As can be seen from Table 1, the main types of referral to psychology were depression and multiple problems. Information from case notes indicated that 16% were considered inappropriate for the CMHT psychology service and were re-referred to Primary Care psychology services. Two inappropriate referrals were for depression and one for depression with OCD.

### Questionnaire Data

Key: PRE= pre-intervention mean ratings, POST= post-intervention mean ratings. Sig.= level of significance.

The data set for all participants' appropriateness of referral ratings for specified problem types can be seen in table 2 below.

**Appropriateness of problem types for referral to clinical psychology.**

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**Insert Table 2 about here**

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Inspection reveals that only two of the problem types demonstrated significant change between pre and post intervention (*). Post-intervention, severe depression was rated as significantly more appropriate, $p<0.014$, and marital difficulties were rated as significantly less appropriate, $p<0.046$. However, given that the ratings in general appear to indicate a good level of understanding of what is and is not an appropriate referral pre-intervention, we would neither want nor expect a significant change in these ratings. Low ratings of <2 for generalised anxiety, bereavement reaction, and substance abuse, along with high ratings of >3 for schizophrenia, could be said to have pre-empted an education package in this area.

Against this background, consistently high ratings of >3 for problems like phobias may appear anomalous; however, examination of the qualitative comments may clarify this. Of the five members who provided comment pre-intervention, four endorsed the view that all of the above could be seen as legitimate CMHT referrals depending on the psychiatric history of the patient and whether or not the presenting problem was secondary to a longer standing serious mental health problem. Three members emphasised that they would consider other agencies such as CRUSE bereavement counselling depending on assessment of the severity/disabling nature of the presenting problem. Of these three, two also noted that long-standing complicating factors such as eating disorders and personality disorders would preferably receive more intensive input at a psychology out-patient clinic were such a service available. One member, who

rated personality disorders as 'not appropriate', expressed doubts as to the efficacy of psychological treatment in this area.

**Importance of clinical psychologist's roles within the CMHT**

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**Insert Table 3 about here.**

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Inspection of the data in table 3 above, reveals no significant change in any of the six identified roles. It is notable that one of the highest ratings is for "collaboration on clinical management of team cases" which is in the spirit of CMHT working as mentioned in the introduction. Three members who commented highlighted this as the most important aspect of team working. Therapeutic intervention with individuals is also rated as 'very important' (4 pre-intervention and higher at 4.4 post-intervention although this is non-significant). As mentioned above, this at present fills most of the psychologist's clinical time. These ratings contrast with those for "assessment only to advise key worker" which remained unchanged at 2.9 despite the educational intervention emphasising the possibilities of such briefer contact expanding the number of patients seen by psychology. Raw data scores reveal that this reflects a marked difference in opinion within the team; three members consistently rating at 2 or below and three members at 4 or above for this category. One member, explaining their 'extremely important' rating, stated that short-term assessment to start patients on a self-help course or to guide a key worker could be an effective use of clinical time. No other qualitative comments were given in this section.

**Importance of clinical psychology's complementary roles within the CMHT**

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**Insert Table 4 about here.**

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The results in table 4 show no significant change in these ratings, but indicate that the team are generally receptive to these possibilities; 'updates on new relevant research' is rated as very important (4). The single comment in this section explains that a "1" rating for 'research collaboration' does not reflect a lack of interest, merely the lack of time.

**Service satisfaction**

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**Insert Table 5 about here.**

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One member declined to comment on this section due to a lack of experience with the psychology service e.g. being unaware that a psychology referral form was in use. The results indicate that members are satisfied or very satisfied with access to and opportunity to liaise with the psychologist as well as the process of feedback. Only one significant change occurred (*), a decline in satisfaction with the process of referral ($p<0.038$). Satisfaction with the referral criteria also remained low. Three members offered qualitative comments pre-intervention. One stated that they were confused by psychology's discussion of primary care referrals as if they were "a different set of disorders" which they couldn't understand. Two stated that the nature of multidisciplinary input creates over-prescription of any service as clear cut referral criteria are not possible. In

these circumstances, individual professionals must use their own clinical judgement as to when they refer within the team. No comments were made post-intervention.

**Factors influencing referral decisions**

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**Insert Table 6 about here.**

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No significant changes occurred in the ratings of influencing factors. Members reported that the nature of the problem and the specific type of intervention required were 'very important' influencing factors in their referral decisions. Inspection of the raw data revealed a marked differential, pre and post, in ratings for 'perception of being stuck' which mean scores disguise. These included three 'not influential' and two 'somewhat influential' ratings compared to one 'very influential' and one 'extremely influential' ratings . No qualitative comments were offered.

**Future developments of the psychology service**

Five members responded in this qualitative section, which sought comments/suggestions for the future development of the service. Responses are summarised as follows:

* more clinics in rural areas due to difficulties regarding transport for patients
* increase psychology service from 0.5 to 1.0 equivalent
* more opportunities for joint working
* in-service education by psychologist to fellow team members to increase repertoire of interventions available
* improved collaborative understanding from recognising the skills and practical experience of other professions as opposed to telling team members what psychology will offer

**Telephone interview**

The social worker who declined to take part cited the following reasons:

* Being split between Hamilton and Clydesdale CMHT, they had too little contact with psychology to comment e.g. never having referred to psychology in Clydesdale.
* Commenting on the appropriateness of psychiatric disorders was outwith the scope of their professional knowledge.

## DISCUSSION

The lack of significant change in this study is probably due to a number of factors both overt and covert. Where members' pre-intervention ratings concurred with the planned education leaflet, change should neither be expected nor desired e.g. being "very satisfied" with consultation and liaising on casework or collaborative working being seen as "very important". Members demonstrated a sound knowledge of appropriate referrals broadly following CMHT policy to target clients with serious and enduring mental health problems. Qualitative comments clarified high ratings for seemingly inappropriate problems e.g. phobias, by explaining that they referred to cases where these were concomitant with a serious mental health problem. Members do bear specialist services in mind for problems such as bereavement or substance abuse. Doubt was expressed as to the efficacy of psychological interventions with personality disorder; this highlights the need for psychology to provide continually updated information from clinical research. Encouragingly, the team rated this complementary role as "very important". The education leaflet clarified that intervention with personality disorder within the CMHT would be at the systems level and that treatment of comorbid axis 1 disorders could be re-routed to other services. The availability of an out-patient service for psychiatric referrals, which had not been used to date, was highlighted.

The education leaflet was concise so that it would be less time consuming to read and facilitate ease of reference. However, in hindsight, it may have been too direct and given the impression that psychology was dictating its role as opposed to offering guidance on how the service might be most effectively used.

This may be reflected in continued low ratings of target areas such as "assessment only" interventions and a significant decline in satisfaction with the "process of referral". Some professions may have felt threatened or undervalued and responded defensively on ratings for "perception of being stuck". In addition, the time interval between pre and post-intervention measurement may have been too short to allow assimilation of the information. Attitudinal change may yet occur via a working through process when the psychologist encourages behavioural change by increasing one to one contact with other professionals.

More subtle covert factors may also have been at work. Although this was the first psychologist to join this team, other professionals are likely to have had pre-formed attributions and heuristics[10] about psychology in general. Informal discussion revealed that some team members felt that psychologists' power to discharge, set criteria for referral, or re-refer to another service made for an "easy life". If it were branded as self-serving, the educational presentation could have been weakened by unreasonable heuristic processing based on such attributions. Again, increased personal contact with the psychologist is more likely to change heuristics than the provision of information.

My impression is of a team operating in a difficult situation, e.g., some members from social work who do not see clients, nursing staff in separate geographical bases, and one base outwith district boundaries, which creates some unusual group dynamics and an embattled sense of isolation not conducive to team cohesion. Against this background, lack of significant change in target areas, and even a decline in satisfaction with the process of referral, may be the result of an inoculation effect [11]. That is, prior exposure to weaker versions of a persuasive communication actually increases resistance to later presentation of the

communication. This suggests that studies seeking attitudinal and behaviour change should minimise any explanatory preamble before the study begins and consider lengthening the time elapsed between pre-measurement, intervention, and post-measurement where resistance to change is suspected.

**Conclusion**

Team members' responses clearly indicate that they particularly value the individual work undertaken by psychology, the access to consultation and liaison with the psychologist, and would like to work more collaboratively. They also see complementary roles such as updates on new research as important.

Qualitative comments suggest that perceptions and awareness of how to efficiently use psychology may be advanced, by demonstrating an empathic understanding of the difficulties that other professions face. Nursing, for example, has little power of discharge and a statutory obligation to contact "urgent" referrals within four hours. This may create a sense of lacking control and understandable resentment towards psychology's apparent autonomy.

Psychologists' are well placed to understand the negative effects of lack of control and our knowledge of the laws of reciprocity should guide our team interactions [12].

A future study could usefully examine the process of group dynamics in a qualitative way, and given the large differentials between members' ratings on specific points, it would be interesting to examine responses of different professional groups. Unfortunately, in this study this was not possible due to the requirements of anonymity as some professions only had one representative.

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**TABLE 1**

**Types of referral:**

Referrals to clinical psychology December 1st - April 1st

| TYPE OF PROBLEM | NUMBER OF REFERRALS |
|---|---|
| Depression | 5 |
| Multiple Problems | 4 |
| Personality Disorder | 2 |
| Schizophrenia | 2 |
| Paranoia | 1 |
| Mixed Anxiety and Depression (including depression with OCD) | 3 |
| Bipolar Affective Disorder | 1 |
| Obsessive Compulsive Disorder | 1 |

**TABLE 2**

**Appropriateness of problem types for referral to clinical psychology.**

| PROBLEM TYPE | PRE | POST | Z score | Sig. |
|---|---|---|---|---|
| Adjustment to physical illness | 2 | 2 | 0.0 | 1.000 |
| Anxiety Generalised | 1.9 | 1.4 | -1.30 | 0.194 |
| Anxiety Severe | 3.5 | 3.6 | -0.45 | 0.655 |
| Bereavement reaction | 1.4 | 1.5 | -0.58 | 0.564 |
| Cognitive functioning | 4 | 3.4 | -1.89 | 0.059 |
| Depression reactive | 1.9 | 2.2 | -0.74 | 0.461 |
| Depression severe | 3.2 | 4 | -2.45 | 0.014* |
| Eating disorder | 3.2 | 3.7 | -1.63 | 0.102 |
| Family relationship difficulties | 2.5 | 2 | -1.00 | 0.317 |
| Mania | 2.7 | 3.4 | -1.19 | 0.238 |
| Marital difficulties | 1.6 | 1.1 | -2.00 | 0.046* |
| Obsessive Compulsive Disorder | 4.4 | 4.2 | -0.58 | 0.564 |
| Personality Disorder | 2.7 | 2.4 | -0.53 | 0.593 |
| Phobias | 4 | 3.1 | -1.60 | 0.109 |
| Post Traumatic Stress Disorder | 3.4 | 3.4 | -0.45 | 0.655 |
| Psychosexual Difficulties | 3.1 | 3.1 | 0.00 | 1.000 |
| Schizophrenia | 3.9 | 3.9 | -0.09 | 0.931 |
| Sexual Abuse | 3.2 | 3.1 | -0.59 | 0.564 |
| Substance Abuse | 1.7 | 1.5 | -0.56 | 0.577 |

Ratings on a scale of appropriateness 1-5. 1= not appropriate, 5= extremely appropriate.

**TABLE 3**

**Importance of clinical psychologist's roles within the CMHT**

| ROLES | PRE | POST | Z score | Sig. |
|---|---|---|---|---|
| Assessment only to advise key worker | 2.9 | 2.9 | 0.00 | 1.000 |
| Collaboration on clinical management of team cases | 4.1 | 4.4 | -1.41 | 0.157 |
| Neuropsychological assessment | 4.4 | 4.2 | -1.00 | 0.317 |
| Therapeutic intervention (individuals) | 4 | 4.4 | -1.73 | 0.083 |
| Therapeutic intervention (groups) | 2.6 | 3.5 | -0.68 | 0.498 |
| Work with family and carers | 3.6 | 3.6 | 0.00 | 1.000 |

Ratings on a scale of importance 1-5, 1= not important, 5= extremely important.

**TABLE 4**

**Importance of clinical psychology's complementary roles within the CMHT**

| COMPLEMENTARY ROLES | PRE | POST | Z score | Sig. |
|---|---|---|---|---|
| Audit collaboration | 2.5 | 3 | -1.63 | 0.102 |
| Providing information on the psychological treatment of disorders | 3.9 | 3.6 | -1.00 | 0.317 |
| Staff development and support (e.g. stress management) | 2.7 | 2.7 | 0.00 | 1.000 |
| Research collaboration | 3 | 3.4 | -1.73 | 0.083 |
| Updates on new relevant research | 3.7 | 4 | -1.00 | 0.317 |

Ratings on a scale of importance 1-5, 1= not important, 5= extremely important.

**TABLE 5**

**Service satisfaction**

| ASPECT OF SERVICE n=7 | PRE | POST | Z score | Sig. |
|---|---|---|---|---|
| Current referral form to clinical psychology e.g. design, completion time | 2.7 | 2.9 | -0.38 | 0.705 |
| Process of referral to psychology | 3 | 2 | -2.07 | 0.038* |
| Process of feedback | 3.4 | 3 | -1.34 | 0.180 |
| Waiting time | 2 | 1.7 | -1.41 | 0.157 |
| Criteria for referral to psychology | 1.9 | 2.7 | -1.47 | 0.141 |
| Access to consultation with clinical psychologist regarding own cases | 3.7 | 3.8 | -0.58 | 0.564 |
| Opportunity to liaise with clinical psychologist regarding joint cases | 4 | 4 | 0.00 | 1.000 |

Ratings on a scale of satisfaction 1-5. 1= not satisfied, 5= extremely satisfied.

**TABLE 6**

**Factors influencing referral decisions**

| INFLUENCING FACTOR | PRE | POST | Z score | Sig. |
|---|---|---|---|---|
| Nature of problem e.g. complexity, chronicity | 4.5 | 4.7 | -1.41 | 0.157 |
| Perception of "being stuck" | 2.4 | 2.2 | -0.45 | 0.655 |
| Alternative opinion | 3.5 | 3.6 | -0.69 | 0.492 |
| Lack of space on own caseload | 1.2 | 1.1 | -1.00 | 0.317 |
| Specific type of intervention e.g. cognitive therapy for delusions | 3.9 | 4.2 | -1.00 | 0.317 |

Ratings on a scale of influence 1-5. 1= not influential, 5= extremely influential.

## 2. MAJOR RESEARCH PROJECT LITERATURE REVIEW

# A REVIEW OF THE IMPLICIT-EXPLICIT MEMORY TRADE-OFF IN SCHIZOPHRENIA: ERRORLESS LEARNING LESSONS FROM BRAIN-INJURED PATIENTS.

Prepared according to the guidelines for contributors to Acta Psychiatrica Scandinavica (see appendix for notes)

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## A REVIEW OF THE IMPLICIT-EXPLICIT MEMORY TRADE-OFF IN SCHIZOPHRENIA: ERRORLESS LEARNING LESSONS FROM BRAIN-INJURED PATIENTS.

**Objective:** To review the current status of knowledge regarding implicit and explicit memory functioning in schizophrenia and acquired brain injury patients and examine the present position of errorless learning in cognitive rehabilitation.

**Method:** Relevant reports were identified by a literature search. In addition, some respected researchers in this field kindly provided information from recent findings which are currently in press.

**Results:** The review focuses on the implicit-explicit memory dissociation observed in the "classic amnesia syndrome" (CAS) commonly the result of acquired brain injury and on studies which have identified CAS in a significant sub-group of patients with schizophrenia. Studies, which attempt to account for the dissociation as evidence of separate memory systems, are compared with those who cite differences in task demands. Laboratory studies of Errorless Learning in the cognitive rehabilitation of memory impaired patients are discussed.

**Conclusion:** Preventing errors during the learning process in patients with CAS has been found to offer significant advantages over traditional trial and error learning. The precise mechanisms which underlie this process remain unclear. However, there is sufficient evidence to proceed with errorless learning as a method of cognitive rehabilitation in controlled studies in patients with schizophrenia who suffer from CAS.

Key words: schizophrenia, memory impairment, errorless learning, cognitive rehabilitation.

**Introduction**

The position that schizophrenia is a neurobehavioural syndrome of neurodevelopmental origin is now widely supported (1,2) as there are consistent reports of cognitive/neuropsychological deficits in patients with schizophrenia (see 3 for a review). Agreement on the exact character of these deficits remains elusive as it has proven difficult to differentiate specific areas of dysfunction against a backdrop of global impairment (4,5). In addition, having identified such deficits in schizophrenia, they have very often emerged as features of other psychiatric illnesses e.g. in affective conditions (6). However, longitudinal studies suggest that, post-onset, deficits are relatively stable over time and do not follow a degenerative course (7 for a review of this area). Some studies (e.g.8,9), while recognising the accumulated evidence that brain abnormalities in schizophrenia are both subtle and widespread, advocate the study of overlapping cognitive dysfunction by selecting patients according to the presence of specific symptoms.

Two schools of thought in the field of neuropsychology seem to have emerged, each seeking to explain the vagaries of schizophrenic behaviour: the first asserts that selective executive dysfunction is of particular importance (e.g.10) whereas the second emphasises the primary role of disproportionate memory impairment (e.g.11). As recently as 1990 the latter assertion would have been disputed. In that year, Cutting (12) stated "there is no evidence whatsoever that schizophrenics have an amnesic syndrome" and yet in the same year McKenna et al. published an article entitled "amnesic syndrome in schizophrenia" (13) in a study of 60 patients of varying severity and chronicity. It is this amnesic profile in schizophrenia which will be the focus of this review, along with the

potentially disabling consequences for sufferers in terms of cognitive rehabilitation. Evidence from the literature on errorless learning for rehabilitating patients with an acquired brain injury, who display a similar pattern of memory deficits, will also be considered. Lastly, evidence for the efficacy of this technique in the schizophrenia population will be discussed.

**Memory Impairment in Schizophrenia**

In recent years the accumulation of evidence has been such that there can no longer be any doubt that a significant proportion of patients with schizophrenia exhibit a marked degree of memory impairment (8,11,13,14,15,16,17,18). While the level of global cognitive functioning remains relatively intact, the extent of the memory impairment can be disproportionately severe and debilitating (19). The possibility that this level of memory impairment may be accounted for in terms of the effects of antipsychotic or antimuscarinic medication, chronicity of illness or even institutionalisation has been discounted following studies demonstrating extensive cognitive impairment in patients previously untreated by neuroleptic or anticholinergic medication (11,17,20). Saykin's 1994 study (11) established that significant selective memory and learning deficits are present even in young, unmedicated patients with schizophrenia experiencing an acute phase of their illness. On a range of cognitive function measures compared to a well matched control group, patients' scores were generally lower than the controls' mean by at least one standard deviation. Moreover, measures of learning and memory were markedly worse at approximately three standard deviations below the controls' mean. Saykin noted that it is the relative severity and selectivity of memory and

learning impairment, against a backdrop of generally poorer cognitive and behavioural function, which had previously gone unnoticed.

Despite advances in the treatment of schizophrenia with neuroleptic medication, there remains a significant minority of patients (as many as 25%) who derive little benefit from typical neuroleptics (21). It has proved extremely difficult to differentiate such patients, with poor prognosis, from those with a good prognosis whose treatment response is such that they may return to work and/or live in the community with minimal support. However, Lawrie et al's. (21) elaborate between-group study of good versus poor outcome patients found that, while brain imaging variables (cerebral structure and blood flow from MRI and PET scans) were not statistically related to treatment response, several significant differences were apparent from neuropsychological testing. The principal differentiating factor was memory functioning; suggesting that long term episodic memory impairment is linked to, and may even predict poor prognosis. Although this is intuitively appealing, a study by Clark and O'Carroll in 1998 (22) failed to establish the predicted relationship between memory impairment and rehabilitation status. However, as the authors admit, the latter study was a within-subjects correlational one which critically depends on sample size; thus, there is the possibility that the presence of small effects went undetected. However, Kelly et al. in 2000 (18) conducted neuropsychological assessment of the Nithsdale population of patients with schizophrenia. They reported a significant relationship between memory impairment measured by the Rivermead Behavioural Memory Test (RBMT, 23) and functional impairment measure by the Health of the Nation

Outcome Scales(HoNOS, 24); the greater the memory impairment the worse the functional impairment.

Since treatment-resistant patients present a considerable challenge to modern psychiatry and place significant demands on healthcare budgets, the possible gain from addressing memory impairment in schizophrenia with some form of cognitive rehabilitation is very attractive. Research indicates that the form of long term episodic memory impairment found in schizophrenia is indistinguishable from an amnesic syndrome known as "classic amnesia" often observed in patients following severe brain injury (13,15). It shares many common features with the classic amnesic syndrome [CAS] (19) where general intelligence and other cognitive functions remain well preserved, as do short-term and *implicit* memory, although *explicit* long-term memory is markedly impaired (14). This pattern of deficits is seen in Korsakoff's Amnesia and patients with acquired brain injury (15). Unlike Korsakoff's Amnesia, in relation to semantic memory – which may be defined as "knowledge of the world that is independent of a person's identity and past" (Tulving, [25], 1983, p.9) – people with schizophrenia also appear to have problems in this domain (15,26). McKenna (27) proposed that delusions could be seen as abnormal knowledge stored in semantic memory and that dysfunctional semantic memory could lead to the "progressive accretion of erroneous semantic memories - false knowledge or delusions" (p.40). However, others have noted no correlation between measures of semantic memory and positive symptoms (15), and an overall lack of association between memory impairment and symptom patterns(15,28).

**The Explicit/Implicit Dissociation**

A promising development is to make the best use of memory which remains intact while minimising the disruptive effects of dysfunctional memory, that is, to take advantage of the dissociation between performance on tasks which place demands on explicit and implicit memory. Graf and Schacter (29) used the terms *explicit* and *implicit* memory to differentiate between performance on tasks which require conscious recollection or **declarative learning** (30) of the episode (explicit) from covert knowledge which facilitates performance without conscious recollection of the learning experience i.e. implicit **procedural learning** (30,31). Studies have shown normal levels of performance in amnesic patients on tests of implicit memory despite profound deficits on tests of explicit memory (32,33) which has led to the postulation that implicit memory may be able to support learning normally assumed to require explicit memory (34,35). A similar differential has been noted by researchers in schizophrenia patients (36,37) and other psychotic patients (38,30). Implicit learning was tested using lexical and semantic priming (38), category production and word identification (36) whereas explicit learning was tested using the Rey Auditory Verbal Learning Test (RAVLT {39}) (38) and graphemic cued recall (36).

However, some researchers have asserted that this observed dissociation is not due to a fundamental difference between implicit and explicit memory but arises because the tasks used to represent implicit and explicit learning access different processes (40,41). This position distinguishes *data-driven* processes (implicit tests such as word-fragment completion or word identification) from *conceptually-driven* processes (explicit tests such as recall and recognition).

Cognitive activity in data-driven processes is guided by **physical** or **perceptual features** of the items as opposed to conceptually-driven processes which are guided by **concepts** or **meaningful features** of the items (36,40). A study by Schwartz et al. (36) examined this issue in a series of experiments by manipulating the type of processing required while holding the type of memory test constant and vice versa. Their findings that schizophrenic patients were "impaired on explicit, but not implicit, memory tests that involved conceptually driven processes" (Schwartz et al., 1993, p.69) did not support this position. Instead, it lends weight to the position that explicit and implicit memory involves separate systems (e.g.42).

**Errorless Learning and Brain-injury**

Studies on implicit learning from the field of cognitive neuropsychology (e.g. see 43) were also influenced considerably by earlier work in skills training for the learning disabled using the approach known as *errorless* learning (see 44 for a review). More recently, Errorless Learning, the opposite of traditional trial and error learning, has received considerable attention as a method of cognitive rehabilitation in patients with acquired memory deficits after brain injury (e.g.35,45,46,47). Subjects are trained in such a way that they do not experience failure while they are learning the set task. Baddeley and Wilson's 1994 study (34) is an example of this: patients were taught lists of words by an **errorful** 'trial and error' approach and an **errorless** approach. Their ability to remember the words learned by the errorless approach was significantly better than those learned by the errorful method. Wilson et al. (46) have also successfully used this errorless approach in the memory training of patients suffering from CAS on a range of

tasks including learning names of people and objects, orientation, general knowledge and programming an electronic memory aid. It is postulated that intact implicit memory does not differentiate between errors and target items, but encodes them equally. Attempts to recall target items are hindered by the production of errors whose memory trace is as strong as the targets. Ordinarily, explicit memory would encode the correct 'to be remembered' items with a stronger memory trace and on recall would inhibit the production of errors whose memory trace would be weaker (34).

More recent studies have lent support to the efficacy of errorless learning at least for the learning of novel word associations (48), face-name associations (49), and in cued- and free-recall of learned word lists, including after a delay of 48 hours (50). However, there remains some uncertainty as to the processes that underlie errorless learning and similarly which tasks will derive most benefit. Squires et al. (48) report much more modest benefits on associative learning tasks which appear easier but lack novelty. Moreover, Evans et al. (49) failed to observe the expected advantage for errorless learning on route learning, identification of degraded pictures, and programming an electronic organiser. Both Squires et al. (48) and Evans et al. (49) suggest that if learning is so easy that it becomes passive and subjects expend little effort, the encoding traces may be correspondingly weaker. Evidence from some studies in memory on patients with schizophrenia, noted deficits in verbal and visual memory only when numbers of stimuli to be recalled exceeds the 5-7 item span of short-term memory (51). Thus, the six steps used to program the personal organiser (49) may have been too few to reveal underlying problems. Evans et al. (49) conclude that errorless learning

may only be of use when responses rely on implicit memory such as cued recall e.g. first letter for names.

Hunkin et al. (50) dispute the claim that cued recall relies more heavily on implicit memory. They noted that although the errorless condition maintained its advantage over errorful, there was a significant decline in performance over a 48 hour delay in the errorless condition compared to some recovery of responses in the errorful condition. Baddeley and Wilson (34) suggest that learning is reliant on implicit memory in both conditions but that errorless learning aids recall by minimising interference from competing errors. If this were accurate it would not predict differential rates of forgetting in each condition after a delay (50). Other studies have also noted a phenomenon of *spontaneous recovery* in trial and error learning (48,52) in which previously "forgotten" responses reappear after a delay. The *retrieval inhibition hypothesis* theorizes that newly acquired associations to stimuli serve to inhibit previous associations which subjects encoded or tried to encode (51). Furthermore, Hunkin et al. (50) note that errorless learning produced significantly higher scores on free recall (a well recognised *explicit* task) than errorful free recall (see also 49). They propose other plausible explanations of the processes which may underlie this, 1. that residual explicit memory may also derive benefit from reducing errors or 2. information acquired by implicit memory is later accessible by explicit memory.

Connectionist models of memory may also shed some light on this issue (53,54,55). They propose a distinction between the roles of the hippocampal/medial temporal lobe structures and the neocortex. The former are

believed to act as temporary holding structures or as a means of linking incoming information, which may be consolidated in the neocortex depending on whether sufficient learning (rehearsal or repetition) has occurred. Murre (55) has noted three principal types of learning within these models: 1. normal episodic learning leading to consolidation, 2. learning which reinforces already existing neocortical connections and 3. learning by repetition which forms new cortical connections. The hippocampus and medial temporal lobe structures are involved in type 1 but not types 2 or 3. Type 1 is "normal episodic", i.e. memories not just of *what* was learned but *when*, the actual episode, and accompanying contextual information. Type 2 is considered to be equivalent to implicit memory e.g. priming. Type three, repetition learning, has been likened to the formation of semantic memories where stored knowledge is consciously available but lacks the contextual detail surrounding the actual learning episode. Problems in explicit memory would severely impair episodic learning (type 1) leaving patients to rely on types 2 and 3 both of which, it has been argued, will benefit from reducing interference during learning by minimising the potential for errors. As Evans et al. (49) notes that learning word lists or names, clearly a type 2 task, benefits consistently from an errorless approach. However, evidence is equivocal on the success of errorless learning for type 3 tasks (e.g.46,49) e.g. route learning, programming an electronic organiser. It is suggested this may be due to the fact that the amount of time and repetitions spent training participants have been insufficient to support the formation of new neo-cortical connections. The question as to whether or not the benefits of errorless learning on any task can endure over a delay of several days or more will also require further investigation.

**Errorless Learning and Schizophrenia**

The principles of errorless learning within the context of procedural learning were used by Wykes et al. (56) in a trial of "intensive cognitive remediation" where patients were seen daily for 1 hour for three months. The intervention also used targeted reinforcement and massed practice and compared their experimental group to a control group receiving "intensive occupational therapy". In common with other researchers the focus of the intervention was on rehabilitation of frontal/executive impairments (e.g. 57, see 58 for a review) and their neuropsychological battery reflects this, assessing cognitive flexibility, planning, working memory and social functioning. A differential effect in favour of cognitive remediation is reported for all of these factors with the exception of social functioning, which showed no change between the groups.

Wykes et al.'s (56) study is interesting in its inclusion of errorless learning in an intervention seeking improvements in executive functioning. However, there is insufficient detail in their report to ascertain exactly how this was done and it seems that it was only one component of several combined strategies. Moreover, there was no measure of long term memory and it is the documented impairments in this domain which are the focus of this review. Studies which examine rehabilitation of classic amnesic patients are subtly different in their emphasis. They do not seek or expect errorless learning to improve scores on standard memory tests. Instead they recognise that a deficit exists but aim to improve performance by circumventing the difficulty with a strategy that facilitates the working of memory systems that remain intact.

Using a modified version of the Baddeley and Wilson procedure (34) to learn lists of words, O'Carroll et al. (28) obtained the same differential performance on cued recall in a group of memory *impaired* schizophrenic patients. Comparison groups of memory *unimpaired* schizophrenic patients and healthy controls were able to learn the task equally well by either method of learning. The task itself could be criticised on the grounds that it is dependent on the verbal fluency of subjects and is somewhat artificial with limited implications for practical rehabilitation. However, Wilson et al. (46,59) extended their work on the brain injured population to more practical tasks, as noted above, and found similar results; e.g. programming an electronic memory aid with a memo by errorful learning and a telephone number by errorless learning. Their subject was unable to learn the procedure by the errorful method but completed it accurately after errorless learning. In a recent review (3), O'Carroll highlighted the need for further investigation of errorless learning approaches in schizophrenia, beyond the confines of the laboratory, to examine whether it offers any lasting benefit. To the author's knowledge, as yet there has been no attempt to extend the tentative findings of O'Carroll et al. (29) using errorless learning procedures in schizophrenic patients by applying this method in more practical tasks such as those reported by Wilson et al. (46) in brain injured patients.

**Future directions**

In conclusion, a great deal of research has been generated to investigate the memory processes in the classic amnesic syndrome (CAS) that underlie dissociated performances on a variety of implicit and explicit tasks. A top-down processing approach can provide valuable information in identifying the

anatomical correlates of target disorders or the specific cognitive processes which are dysfunctional or spared. Researchers have been increasingly inventive in their manipulation of laboratory tasks to try and advance theories and clarify these issues (e.g.36). However, regardless of the mechanisms, which may underlie learning in people with CAS, preventing errors during the learning process has been found to offer significant advantages over traditional trial and error learning. If the object of this research is to guide cognitive rehabilitation of memory-impaired patients, then there is already enough evidence to support a bottom-up approach using errorless learning with schizophrenic patients, i.e. applying this procedure on more practical tasks under controlled experimental conditions. The evidence above suggests that schizophrenic patients are not impaired for procedural learning tasks, can acquire motor skills (36) and learn sequential motor responses (30,31) which rely more on visuo-motor memory rather than declarative recollection. A bottom-up approach is not at all unusual in therapeutics. Psychiatry continues to use many drug treatments, often after a chance discovery and although their therapeutic benefits have been proven, the exact mechanisms of action are not always unequivocally known.

As mentioned above, the pattern of memory dysfunction exhibited by memory impaired schizophrenic patients has much in common with the profile of CAS patients. On this basis the schizophrenic patients should, in theory, benefit from an errorless learning approach. A study to identify whether errorless learning of an everyday memory task, e.g. programming an electronic memory aid, would improve the performance of memory impaired schizophrenic patients relative to an errorful approach could be an informative extension to current research in this

area. The experimental hypothesis would be that an errorless approach would have a facilitative effect on learning leading to fewer errors and significantly improved recall (and better retention over time) compared to the errorful approach in a sample of memory impaired schizophrenic patients.

In the light of research above, the question as to whether or not the benefits of errorless learning on any task can endure over a delay of several days or more, could be addressed by a delayed recall session at least one week later. The theoretical explanations discussed by Evans et al. (49), based on connectionist models of memory (55), seek to explain their failure to replicate Wilson et al.'s (46) finding that errorless learning facilitated memory for programming an electronic organiser. These concerns could be addressed by increasing the number of repetition trials during the learning phase. Increasing the number of programming steps to more than the 5-7 supraspan could also address the issue of task oversimplification.

By adopting a bottom-up approach, this study would not add anything to the ongoing debate as to which processes underlie errorless learning or how best to access these. It does, however, offer a potential strategy for success in a subgroup of patients within the schizophrenic population whose whole adult life experience may have been one of failure both in terms of not attaining a therapeutic response to drug treatment and little or no progress in terms of social rehabilitation.

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# 3. MAJOR RESEARCH PROJECT PROPOSAL

# ERRORLESS VERSUS ERRORFUL LEARNING IN MEMORY-IMPAIRED PATIENTS WITH SCHIZOPHRENIA: IMPLICATIONS FOR COGNITIVE REHABILTATION

**DUMFRIES AND GALLOWAY**

LOCAL RESEARCH ETHICS COMMITTEE

REQUEST FOR ETHICAL APPROVAL

(Answers should be typed)

1. **BRIEF TITLE OF PROJECT**

ERRORLESS VERSUS ERRORFUL LEARNING IN MEMORY-IMPAIRED PATIENTS WITH SCHIZOPHRENIA: IMPLICATIONS FOR COGNITIVE REHABILITATION.

**STATE: Where research will be undertaken.**

Crichton Royal Hospital, Dumfries and its associated day and outpatient services. Also home settings within Nithsdale.

2. **<u>INVESTIGATORS</u>: List names, qualifications, positions, departmental addresses and functions in the proposed research of all investigators. Indicate to which investigator correspondence should be sent.**

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**Experience of principal investigator in the field of research concerned:**

Currently, I am in my second year of post-graduate clinical training for the degree of Doctor of Clinical Psychology within the Faculty of Medicine, University of Glasgow. This study would form part of my doctoral dissertation in partial fulfilment of the above degree. Previously, I was employed as a sessional support worker with Lanarkshire Association for Mental Health. This involved direct

contact with the seriously mentally ill within the community to help them engage in recreational activities. More recently, as a research assistant with the University of Stirling I was responsible for the recruitment and assessment of 90 patients with schizophrenia in a comparison study of memory and its effects on a verbal learning task. The results were published in *Psychological Medicine* (O'Carroll, R.E., Russell, H.H., Lawrie, S.M. & Johnstone, E.C. Errorless learning and the cognitive rehabilitation of schizophrenic patients. *Psychological Medicine*, 1999, 29, 105-112).

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4. **<u>WHAT IS THE OBJECT OF THE PROJECT?</u> Please state as exactly as possible the hypothesis which is to be tested, in terms appropriate to an intelligent lay person. Say whether this is original research or a replication.**

Research in recent years has consistently identified a significant proportion of schizophrenic patients with severe memory impairment, which cannot be explained by the effects of institutionalisation, chronicity or medication. The profile of the memory deficit is similar to that of the Classic Amnesic Syndrome (CAS) often sustained following traumatic brain injury. Studies in the brain-injured population have established that, adopting an *errorless* learning approach (subjects are prevented from making mistakes during training) to memory rehabilitation confers significant advantages for subjects over the traditional trial and error or *errorful* approaches. Recently, a similar advantage was found in a sample of patients with schizophrenia on a word-learning task (O'Carroll et al. 1999). The theoretical explanation for this suggests that preserved memory for unconscious procedural learning (implicit memory) in amnesic patients records correct and uncorrect responses in an undifferentiated way. Problems in memory for conscious recording of when a response was made and its consequences (explicit memory) do not inhibit do not inhibit the production of incorrect reponses on recall, thus, interfering with task

performance. In errorless learning, subjects do not experience failure and; consequently, intact implicit memory records only the correct responses.

This study is an extension of previous research using word-learning tasks in the brain-injured population (Baddeley & Wilson 1994), which was extended to a study of patients with schizophrenia by O'Carroll et al. (1999). However, it will compare performances of two matched groups of memory impaired patients *with schizophrenia* on a realistic practical task of programming an electronic memory aid using two different methods of learning known as *errorless* and *errorful.* Although the task modification of Baddeley & Wilson's (1994) reported a single case research study on a patient with brain injury, to date there are no published systematic studies of such practical rehabilitation approaches being applied to patients with memory impairment and schizophrenia. Memory impairment in the absence of other cognitive impairment will be identified from the cognitive assessments, which have recently been conducted in this population by the Department of Clinical Research, Crichton Royal Hospital, Dumfries [The Rivermead Behavioural Memory Test (Wilson et al., 1985) and the Mini Mental State Examination (Folstein et al. 1975)].

5. **State briefly the <u>PROJECT DESIGN</u> (e.g. open, random, stratified, within subject, blind) and what measurements will be made. Has professional statistical advice been sought on size, power and design of the project? If so, from whom?**

This is a comparison study between two matched independent samples. Each subject will be seen on two occasions 7-10 days apart. The first test session will last for approximately 50 minutes and the second will last 20-25 minutes. Statistical advice has been sought from Dr. Paul Fleming, Clinical Psychologist, Glasgow University Department of Psychological Medicine, Academic Centre, Gartnavel Royal Hospital, 1055 Great Western Road, Glasgow G12 0XH.

A sample size of n = 20 in each experimental group is in line with recommendations for carrying out appropriate analysis as deemed by a power calculation. Comparable studies have similar sample sizes.

6. **<u>WILL THE PROJECT RECEIVE FINANCIAL SUPPORT FROM A GOVERNMENT AGENCY, RESEARCH COUNCIL, CHARITY, DRUG COMPANY ETC? IF SO SPECIFY THE NATURE OF SUPPORT.</u>**

   (a) **Specify any financial or other direct benefits to investigators of their department from the study and the use to which these benefits will be put.** NONE

(b) **Are you aware of the hourly rates recommended by the B.M.A. and have you taken this into account when negotiating with the sponsor?** NOT APPLICABLE

(c) **How much time do you anticipate other staff will be involved in the project?**

It is not anticipated that staff in other departments will have any significant involvement with this project.

7. **<u>WILL THE SUBJECTS BE:</u> Outpatients, inpatients or healthy volunteers and if the latter, how will they be recruited and selected? How many subjects will be involved?**

Subjects will be recruited from both outpatient and inpatient settings under the clinical supervision of Dr. R.G. McCreadie.

8. **LIST INCLUSION AND EXCLUSION CRITERIA.**

**(a) Will those who are pregnant or involved in other research be excluded? (Please include a copy of the original protocol if lengthy).**

All patients recruited for this study will have a diagnosis of schizophrenia according to ICD-10, no other history of organic brain disease and no diagnosis of alcohol or drug dependency. Memory impairment will be defined as a score of 9 or below on the Rivermead Behavioural Memory Test and only patients whose cognitive functioning is within the normal range (i.e. a score at or above 24 on the Mini Mental State Examination) will be included. Pregnancy will not exclude patients from participating.

**(b) Will any of the subjects be in a dependent position to the investigators? (e.g. students in relation to supervisors, junior in relation to senior).** NO

9. **WILL THE SUBJECTS EXPENSES BE PAID OR ANY OTHER PAYMENT MADE? Please be specific.** NO

10. **WHAT INVESTIGATIONS OR INTERVENTIONS WILL BE CARRIED OUT ON THE SUBJECTS. Please explain in terms appropriate to an intelligent layman. Give details of procedures such as X-rays, cannulation, endoscopy, anaesthesia, etc. (Please include a**

**copy of the relevant pages from the original protocol if lengthy).** The task involves the demonstration of a nine-stage procedure to program an electronic memory aid. This is followed by eight learning trials and subsequently, 5 minutes later, by four recall trials. In the second delayed session, 7-10 days later, participants will be asked to recall the procedure over six trials. This is not an invasive procedure and it is unlikely to cause any undue distress.

**11. (a) <u>Does the project involve any other disciplines or departments</u>, e.g. General Practice, Radiology, Haematology, Clinical Chemistry, Pharmacy, Nursing of Outpatients? Will the project have any significant effect on the workload or work pattern of these disciplines or departments and, if so, can additional departmental costs be met?**

It is not anticipated that any other department will be affected in terms of workload or costs.

(b) **Have approaches been made to those disciplines involved to enquire if there would be any difficulty with the project?**

NOT APPLICABLE

**12. <u>WHAT RISKS CAN YOU FORESEE</u> to the subjects. State possible injuries to subjects and the probability of them occurring. Will the subjects receive any benefits from participation?**

There are no known potential risks to participants arising from this

research. Although no immediate benefits to participants are likely, results from the study may highlight the importance of adopting different strategies in the rehabilitation of patients with schizophrenia where there is concomitant memory impairment. This in turn may have implications for maintaining this sub-group's engagement with healthcare professionals, which is an important factor on reducing the risk of relapse. Previous research has suggested that memory impairment is a significant factor in treatment resistance.

13. **<u>What DISCOMFORT to the subjects do you foresee?</u> Specify possible minor discomfort, pain, limitation of activity, inconvenience or expense likely to be incurred by subjects. Where samples are to be taken, please specify amount.**

    Discomfort is unlikely, but if any subject appears distressed, e.g. in response to feedback, the appropriate medical practitioner will be informed.

14. **<u>LIST ANY DRUGS TO BE GIVEN.</u> Also specify special diets, isotopes, vaccines, and state the route, dose, frequency and precautions in administration. (Please include copy of original protocol if lengthy).**

    No drugs will be used.

15. **<u>WHO WILL COMPENSATE THE SUBJECTS?</u> Does any pharmaceutical company involved accept strict liability for its products and will it compensate subjects or volunteers (in terms of**

**ABPI guidelines) in the event of death, damage or lasting disability being produced by a product involved in this study? (A written statement to that effect should be submitted). If not (or not applicable) who will assume responsibility? Please include a letter of indemnity from the company, which should reflect the Laws of Scotland. If you have independent professional indemnity insurance check with your insurers, in the unusual case of research work outwith the Health Board's responsibility.**

NOT APPLICABLE.

16. **HAS ARSAC APPROVAL BEEN GIVEN FOR THE USE OF RADIO ISOPTOPES? Attach copy of approval if appropriate.**

NOT APPLICABLE

17. **LIST ALL OTHER PRODUCTS OR EQUIPMENT TO BE USED.**

Boots 12 kb electronic personal organiser.

18. **DOES THE PHARMACEUTICAL PREPARATION (OR PRODUCT) POSSESS ONE OF THE FOLLOWING?**

**(a) a product licence**

**(b) a clinical certificate**

**(c) a clinical trial exemption certificate**

**copies of relevant licence or certificate should be enclosed.**

NOT APPLICABLE

19. **HAS C.S.M. APPROVAL BEEN GIVEN FOR All DRUGS TO BE USED?**

NOT APPLICABLE

20. **<u>INFORMED CONSENT:</u> How will consent be obtained from the subject, or for a minor, from the parent or guardian? How much time will be allowed between giving an explanation of the research and requesting consent? Consent must be witnessed. Information given to subjects should be in the form of a Subject Information Sheet, which should be separate from the Consent Form, so that the subject may retain a copy of the information. Please ensure that a named person to whom the subject can refer to at any time during the project is included. The model consent form appended should normally be used but if you wish to use your own please submit a copy with this application.**

Please see attached information sheet and consent form. Having read these, patients will be given the opportunity to ask questions about the study at that time and will be informed that they need not decide immediately as they may wish to consider their participation for a few weeks.

However, as the study is non-invasive it is envisaged that some patients will reasonably be able to make up their minds as to whether or not to take part within a short space of time. For those patients, an appointment may be arranged as soon as is convenient to them: for others, it is recognised that several days may elapse between receiving the information and agreeing to participate before a first appointment can be arranged.

21. **In the case where the potential participant in the study (other than a minor) might be regarded as <u>QUESTIONABLY ABLE TO GIVE CONSENT</u>, indicate the steps you would take to satisfy an intelligent layman that the patient has indicated his/her willingness to take part: (such as the assistance of an independent colleague, or next of kin). Please name any independent person.**

All patients will be able to give informed consent.

22. **<u>GIVE NAME OF DOCTOR OR OTHER SUITABLE PERSON</u> independent of the trial to whom the subject being asked to take part can refer e.g. G.P.**

Participants will be able to discuss the study with their General Practitioner.

23. **<u>HOW WILL SUBJECTS BE INFORMED OF THEIR RIGHT TO WITHDRAW?</u> It is customary to highlight this on the information sheet provided.**

Their right to withdraw will be highlighted on the information sheet, which will be provided at the initial recruitment stage.

24. **<u>WHAT INFORMATION WILL BE GIVEN TO THE SUBJECT'S G.P. AND BY WHOM?</u> Will the G.P. or consultant in overall charge of a subject be asked for permission to enter the subject into the study? Can it be ensured that that the information will be given to the G.P. where appropriate?**

The consultant in overall charge will be asked for permission to enter a subject into the study. Any significant information will be passed to them for a decision on whether or not the G.P. needs to be informed.

**25. HOW WILL CONFIDENTIALITY BE ENSURED?**

Only the aforementioned investigators and supervisor will have access to files. Files will be kept in a locked filing cabinet. Data entered on computer using SPSS (Statistical Package for the Social Sciences) database will be coded so as to prevent identification of particular individuals.

**26. WILL ANY RESTRICTIONS BE PLACED ON THE PUBLICATION OF THE RESULTS?**

NO

**27. HAS A SUBMISSION BEEN MADE TO ANY OTHER ETHICS COMMITTEE? E.g. university ethics committee if university staff or students are to be used as subjects. Please also identify if the application has been refused by other ethics committees.**

This application has not been submitted to any other ethics committee at any time.

SIGNATURE OF PRINCIPAL INVESTIGATOR

---

DATE ----------

## CONSENT FORM

Name of participant: _____

I agree to participate in this study.

I have read the consent form and the Patient Information Sheet and had the opportunity to ask questions about them.

I agree to the provision of clinically relevant information to my General Practitioner.

I understand that I am under no obligation to take part in this study and that a decision not to participate will not alter the treatment that I would normally receive.

I understand that I have the right to withdraw from this study at any stage and that to do so will not affect my treatment.

Signature of participant: _____

Witness: _____

Signature of investigator: _____

Date: .....

Copies to be made:
Original to be retained by investigator
Copy 1 to be retained by participant
Copy 2 to be filed in any relevant hospital case notes

# INFORMATION SHEET

**Memory aids for patients**

Many people with a psychiatric illness experience memory difficulties e.g. forgetting appointments, people's names etc. The aim of this research project is to compare two different ways of trying to help people to remember things using an electronic memo pad, a bit like a calculator. The study involves two sessions. During the first one, you will be asked to learn how to record a note of a future appointment into the memo pad. This should take about 50 minutes and you will be given plenty of help with the process. Later on, 7-10 days after this, in the second session, you will be asked to code in the same appointment into the memo pad again. This is a shorter session and should only last about 25 minutes.

You are perfectly free to participate or not, and also if you do agree to participate, you can withdraw from the project at any point you like. Your current and future treatment will not be affected in any way whether you decide to take part or not. Further information is available from Hugh Russell, Psychologist, Nithbank Hospital, Dumfries (TEL. 01387 244495). If you prefer to discuss the project with a doctor who is not involved in the research you can contact your General Practitioner.

The reason for carrying out this study is that we want to see whether we can develop more effective ways of helping people with memory problems.

# DUMFRIES and GALLOWAY HEALTH BOARD

GRIERSON HOUSE, THE CRICHTON, BANKEND ROAD, DUMFRIES. DG1 4ZG
Tel: Dumfries (01387) 272700
Fax: 01387 252375

**Local Research Ethics Committee**


Our Ref. Your Ref. Enquiries to:
Ms Carole Kerr
01387-272708

18 May 1999

Mr Hugh Russell
Glasgow University Department of Psychological Medicine
Academic Centre
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow
G12 0XH

Dear Mr Russell

**Errorless versus Errorful Learning in Memory Impaired Schizophrenic Patients: Implications for Cognitive Rehabilitation**

Thank you attending the meeting on Friday 14 May 1999 to present the above protocol.

The protocol was carefully considered by the Committee and I am pleased to advise you that it was approved and you have permission to proceed with the study.

Reports on the progress of the study are required to be submitted to the Committee at regular intervals and your first report should be made available no later than Friday 12 November 1999, where appropriate subsequent reports must be sent at yearly intervals until the work is complete.

Yours sincerely

Mr A MacDonald
Vice Chairman

CK/N:LREC/LETMAY99/MR HUGH RUSSELL CA APPROVAL

## 4.MAJOR RESEARCH PROJECT PAPER

# ERRORLESS VERSUS ERRORFUL LEARNING IN MEMORY-IMPAIRED PATIENTS WITH SCHIZOPHRENIA: IMPLICATIONS FOR COGNITIVE REHABILITATION.

Prepared according to the guidelines for contributors to Psychological Medicine (see appendix for notes).

# Errorless versus errorful learning in memory-impaired patients with schizophrenia: Implications for cognitive rehabilitation.

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## ABSTRACT

**Background.** Severe memory impairment is now a recognised component of schizophrenia for a significant proportion of patients. The debilitating effects of this deficit cannot be attributed to the effects of medication, chronicity or institutionalisation and it is associated with poor psychosocial outcome and treatment resistance. Studies of memory training in the classic amnesic syndrome (CAS) have demonstrated an advantage for teaching by "errorless" learning (subjects do not experience failure during learning) over traditional trial and error or "errorful" methods. Theoretically, it is postulated that deficits within the explicit memory system prevent it from filtering out target items from incorrect responses that were remembered by intact implicit memory in an undifferentiated fashion.

**Method.** We compared two methods of learning, errorless and errorful, between two groups of memory-impaired patients with schizophrenia on a practical task of programming an electronic personal organiser.

**Results.** Patients who learned by the errorless method recalled significantly more of the task than those who learned by the errorful method. The advantage for errorless learning was maintained in a follow-up session 7-10 days later.

**Conclusions.** Errorless learning approaches merit further investigation as they may offer considerable benefits in the cognitive rehabilitation of memory-impaired schizophrenic patients.

## INTRODUCTION

In recent years the accumulation of evidence has been such that there can no longer be any doubt that a significant proportion of patients with schizophrenia exhibit a marked degree of memory impairment (McKenna et al.,1990; Duffy & O'Carroll, 1994, Kelly et al., in press). While the level of global cognitive functioning remains relatively intact, the extent of the memory impairment can be disproportionately severe and debilitating (Tamlyn et al.,1992). The possibility that this level of memory impairment may be accounted for in terms of the effects of antipsychotic or antimuscarinic medication, chronicity of illness or even institutionalisation has been discounted following a study by Saykin et al. (1994). Saykin's study established that significant memory deficits are present even in young, unmedicated schizophrenic patients experiencing an acute phase of their illness.

Despite advances in the treatment of schizophrenia with neuroleptic medication, there remains a significant minority of patients (as many as 25%) who derive little benefit from typical neuroleptic's (Lawrie et al.,1995). It has proved extremely difficult to differentiate such patients, with poor prognosis, from those with a good prognosis whose treatment response is such that they may return to work and/or live in the community with minimal support. However, Lawrie et al's. (1995) elaborate study of good versus poor outcome patients found that, while brain imaging variables (cerebral structure and blood flow from MRI and PET scans) were not statistically related to treatment response, several significant differences were apparent from neuropsychological testing. The only differentiating factor that remained was memory functioning; suggesting that long

term episodic memory impairment is linked to, and may even predict, poor prognosis.

Since treatment resistant patients present a considerable challenge to modern psychiatry and place considerable demands on healthcare budgets, the possible gain from addressing memory impairment in schizophrenia with some form of cognitive rehabilitation is attractive. Research indicates that the form of long term episodic memory impairment found in schizophrenia is indistinguishable from a common memory dysfunction suffered by patients who have sustained severe brain injury, i.e. the classic amnesic syndrome (CAS) (McKenna, 1990). In CAS general intelligence and other cognitive functions remain well preserved, as do short term and *implicit* memory, although *explicit* memory is markedly impaired (Tamlyn et al., 1992). Similarly, for many patients with schizophrenia, it is the presence of intact implicit memory despite dysfunctional explicit memory which is striking (Clare et al., 1993; Huron et al., 1995).

**Cognitive rehabilitation**

It is generally accepted that complete recovery of function following brain injury is an unrealistic goal. However, for patients suffering from memory dysfunction, there are long established approaches using external aids and alternative problem solving strategies to circumvent their problems (Wilson & Moffat, 1992).

A promising development is to make the best use of memory that remains intact, while minimising the disruptive effects of dysfunctional memory by the use of Errorless Learning (the opposite of trial and error learning) as a method of cognitive rehabilitation. Subjects are trained in such a way that they do not experience failure while they are learning the set task. Wilson et al. (1994) have used this errorless approach in the memory training of brain injured patients suffering from CAS. The patients were taught lists of words by an **errorful** 'trial and error' approach and an **errorless** approach. Their ability to remember the words learned by the errorless approach was significantly better than those learned by the errorful method. Using a modified version of this approach, O'Carroll et al. (1999) obtained the same differential performance in a group of memory *impaired* schizophrenic patients. Comparison groups of memory *unimpaired* schizophrenic patients and healthy controls were able to learn the task equally well by either method of learning. It is postulated that intact implicit memory does not differentiate between errors and target items, but encodes them equally. Attempts to recall target items are hindered by the production of errors whose memory trace is as strong as the targets. Ordinarily, explicit memory would encode the correct 'to be remembered' items with a stronger memory trace and on recall would inhibit the production of errors whose memory trace would be weaker (Baddeley & Wilson, 1994).

The task itself could be criticised on the grounds that it is dependent on the verbal fluency of subjects and is somewhat artificial with limited implications for practical rehabilitation. However, Baddeley and Wilson extended their work in the brain injured population to more practical tasks and found similar results. One

such task was programming an electronic memory aid with a memo by errorful learning and programming a telephone number by errorless learning. Their subject was unable to learn the procedure by the errorful method but completed it accurately after errorless learning. It is a modified version of this task that was used to examine whether or not the same differential benefits can be found in a sample of memory impaired schizophrenic patients.

## AIM

The aim of this study was to identify whether errorless learning of an everyday memory task, in this instance programming an electronic memory aid, would improve the performance of memory impaired schizophrenic patients relative to an errorful approach. The experimental hypothesis was that the errorless approach would have a facilitative effect on learning leading to fewer errors and significantly improved recall (and better retention over time) compared to the errorful approach in a sample of memory impaired schizophrenic patients.

## METHOD

### Subjects:

All subjects were from the Crichton Royal Hospital and its associated services. They formed part of the Nithsdale population of patients with schizophrenia (Kelly et al., 1998) and all met criteria for a diagnosis of schizophrenia according to ICD-10 (WHO, 1992) and had been screened using OPCRIT (McGuffin et al., 1991).

Cognitive functioning:

They had been assessed previously as part of an earlier study by Kelly et al. (in press) using a neuropsychological battery that included: Mini Mental State Examination (MMSE, Folstein et al., 1975); Rivermead Behavioural Memory Test (RBMT, Wilson et al., 1985); National Adult Reading Test (NART, Nelson, 1982). The findings of this study identified a sub-group of n=110 patients with poor to severe memory impairment (RBMT scores <10) while their global cognitive functioning was within the normal range (i.e. MMSE scores 24-30). The RBMT (Wilson et al.,1985) has been used extensively in schizophrenia research (McKenna et al.,1990; Tamlyn et al.,1992; Clare et al.,1993; Duffy and O'Caroll,1994; Lawrie et al.,1995; O'Carroll et al.,1999). Its ecological validity as a measure of everyday memory is well recognised, correlating well with objective observation (Wilson et al.,1989). The MMSE (Folstein et al.,1975) is commonly used as a short screening measure of global cognitive functioning. There is general agreement that scores of less than 24 out of 30 indicate significant cognitive impairment (Anthony et al., 1982).

From the identified sub-group of n=110 memory impaired patients, fifty-one patients between the ages of 18-65 years were recruited for the present study. Patients came from acute, rehabilitation and out-patient settings encompassing a broad range of severity and chronicity. Exclusion criteria included patients with a diagnosis of drug/alcohol dependency, a history of organic brain disease, and those who had undergone ECT treatment within the previous 12 months. Patients whose daily dosage of anti-muscarinic medication was in excess of 20mg of procyclidine (or its equivalent) were also excluded. During the first test session of

the present study, the patient's current cognitive state was assessed again, using the Mini Mental State Exam (MMSE). Patients scoring less than 24/30 were excluded.

Subjects were tested over two sessions and participated voluntarily without payment. The study received full approval from Dumfries and Galloway Local Research Ethics Committee. Two subjects withdrew their consent prior to commencing the first session, one failed to attend twice and three withdrew during the learning phase of session 1, two from the Errorful group and one from the Errorless group. 45 subjects, comprising 39 out-patients in moderate to good remission and 6 in-patients, completed the first session. Of these, three were excluded from the Errorful group. One due to their impaired cognitive functioning, scoring <24 on the MMSE and two because they did not meet the pre-set criterion level for errors i.e. they made less than three errors on trials 1-3 of the learning phase and were deemed not to have learned in an errorful way. All subjects in the Errorless group required at least three prompts (equivalent to errors) during learning trials 1-3. Thirty-eight subjects completed the second session. Two subjects from the Errorful group, whose scores had been poor in session 1, were reluctant to return. One formally withdrew and the other missed follow-up appointments. Two subjects from the Errorless group also missed follow-up appointments. One telephoned to cancel due to ill-health and one was arrested by police shortly beforehand and remanded in custody. Four patients in the errorless group were taking procyclidine at a mean daily dosage of 10mg. (range 5-20mg.). In the errorful group one patient was taking benzotropine, 2mg. daily, and another was taking procyclidine, 15mg. daily. All patients were taking

anti-psychotic medication. In the errorless group, 44.5% were taking "atypicals"only (excluding clozapine), 14% oral "typicals" only, 14% an "atypical/typical mix, 14% clozapine and 14% depot preparations. In the errorful group, 25% were taking "atypicals" only, 5% oral "typicals" only, 20% an "atypical/typical mix, 20% clozapine, 15% depot preparations only, 10% an oral "typical" and a depot and 5% an "atypical" and a depot. A comparison between the groups for those patients taking oral "typical" and depot medication can be seen in Table 1.

**Design:**

Patients in the sub-group of n=110 were targeted from a prepared list of names. There was no randomisation for selecting names as patients were seen primarily because they were due to have contact with services in a particular week. Target groupings of in-patients; regular day service attenders; patients attending out-patient clinics and patients whose primary mode of contact was with a Community Psychiatric Nurse were sequentially selected into group 1 or group 2. Males and females were identified separately and allocated to the learning condition in a counterbalanced fashion. There was no attempt to match the groups on the potentially confounding main variables of RBMT scores, chronicity of illness, IQ and MMSE scores and to minimize the potential for experimenter bias these details were not admitted until after a subject had completed testing. These variables were analysed retrospectively mid-way through and towards the end of the study to check that there were no significant differences. There were none and the procedure remained the same throughout. Use of the Mini Mental State Exam (MMSE) at the first session to assess the patients' current cognitive functioning

during the break between the learning phase and recall testing provided structure and consistency to the conversation between the experimenter and participant. Patients' level of interest/cooperation was assessed on a five point scale 1-5 (Shakow, 1981).

**Experimental Procedure:**

The object was to compare two different methods of training between two matched independent samples with the aim of teaching subjects how to program an electronic memory aid with information about a hypothetical future appointment. Group 1 were taught using an *errorless* method and group 2 were taught using an *errorful* method. The study also had a delayed session to measure retention 7-10 days after the initial training and recall session.

Following Baddeley and Wilson (1994) a modified version of their training programme for teaching a brain-injured patient to use an electronic memory aid was used (see Baddeley & Wilson, 1994, for detail). The task selected was to write an appointment memo into an electronic personal organizer. The task involved 9 steps as follows:

1. Press ON button.
2. Press the purple button marked SCHED.
3. Write in "SEE DOCTOR".
4. Press grey button with down arrow to get to the date and time.
5. Type in tomorrow's date and time 11.15am using grey button with right hand arrow to move along from the year to the day.
6. Press ENTER.
7. Press INS button to set alarm.
8. Press one of the green buttons with the white arrow below the word SEARCH.
9. Press OFF button.

The initial session involved one demonstration trial where participants were shown by example how to program the memory aid; this was followed by eight consecutive learning trials then a five minute break followed by four recall trials. The delayed session 7-10 days later consisted of six recall trials. All participants were given the date and time of an imaginary appointment (SEE DOCTOR *tomorrow's date* at 11.15am). The initial test session took approximately 50-55 minutes and the delayed test session took 20-25 minutes. Patients were seated at the end of a rectangular desk facing along its length. The instructor was seated immediately on the patients left, facing across the width of the desk.

**Errorful learning procedure:**

A verbatim account of the demonstration monologue used in the instructional procedure can be seen in the appendix.

During the eight learning trials subjects were expected to enter the memo themselves, they were given feedback after each of the nine steps and corrected when necessary. No prompting was given until the subject had attempted to complete a step. There was then a five minute break, during which time the MMSE was conducted, followed by four trials of recall, 9-12, where the same approach to prompting and correction was adopted. The delayed retention session 7-10 days later, had six recall trials and the same approach as that used during the four recall trials of the initial session was followed.

**Errorless learning procedure:**

The demonstration trial was presented in exactly the same way as in the errorful procedure above. However, for trials 1-8, the learning trials, subjects in this condition were given written instructions in order to prevent errors. The demonstration trial was outlined exactly as the demonstration monologue for the errorful procedure (see appendix) except that the words "*here are some instructions for you to follow closely each time you use the machine*" were inserted into the demonstration monologue after "*Now it's your turn,...*". The instructions were printed on a white A4 sheet supported by a book lectern, placed directly behind the keypad. A copy of the instruction sheet can be seen in the appendix. Subjects in the Errorful group never saw these instructions. They did, however, have a blank A4 sheet supported by the lectern in the same position as the instruction sheet. Trials 9-12, after the five minute break, had no written instructions as an aid; however, subjects were watched closely and, if required, were prevented from making an error which could have contaminated future recall. Interventions counted as errors. The six recall trials in the delayed retention session 7-10 days later followed the same procedure as trials 9-12 in this format.

**Procedure for intervention when correcting errors:**

The timing of intervention was necessarily different in each of the learning methods. In **errorful** learning, the intervention to correct only occurs **after** a subject has completed an action in error whereas in the **errorless** condition the intervention is specifically to **pre-empt** and prevent an error from being acted out i.e. pressing the wrong key. However, in so far as was possible the instructor used the same direction in both groups by saying *"no that's not quite right,... {let's look*

*at the instructions}... you were on step X so you need to press button Y".* Monologue within the brackets was used only in the errorless learning group. If the machine required to be reset after an error, it was done by the instructor out of the participant's sight. The display was returned to the step immediately preceding the error.

Participants in both groups were asked to verbalise their intentions as they progressed through the steps. This afforded the instructor additional information: it also helped to distinguish between accidental errors i.e. pressing the wrong button having expressed the intention to press the correct one and, in the errorless condition, it facilitated pre-emptive intervention by alerting the instructor to impending errors.

**Statistics**

Between group differences in demographic and matching variables were analysed using an independent samples T-test. Where appropriate, a non-parametric Mann-Whitney U-test was used. The main hypothesis was tested by comparing the group performances (number of correct responses) on the final recall trial of each session i.e. trial four after the five minute delay and trial six after 7-10 days delay using an independent samples Mann-Whitney U-test.

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**Insert table 1 about here**

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## RESULTS

Inspection of Table 1 indicates that between the groups there are no significant differences on the variables of age, IQ, educational background, sex, or alcohol consumption. Moreover, there were no significant differences for current level of cognitive functioning (MMSE scores), level of memory impairment (RBMT scores), mean chlorpromazine drug dosage, or interest/cooperation ratings. The main results across all trials can be seen in Table 2, which shows that the mean number of steps completed by the Errorless learning group was consistently higher than that of the Errorful learning group on all trials.

The performance of both groups on memory testing after a five minute delay is illustrated in Figure 1. Clearly those patients who learned the procedure by the **errorless** method have performed better on each of the four recall trials than those patients who learned by the **errorful** method. The difference on the last trial (T4) is significant ($U = 124.5$, $P = 0.0055$).

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**Insert figure 1 about here.**

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The performance of both groups on memory testing after a delay of 7-10 days is illustrated in Figure 2. The performance of the errorless learning group on each of the six delayed recall trials is still superior to that of the errorful learning group. On the final delayed trial (DT6) the difference is significant at ($U = 114.0$, $P = 0.0125$). Thus, these results offer evidence for rejecting the null hypothesis that there would be no differences between the groups ability to recall the

procedure. There is clear support for the main hypothesis that patients instructed by errorless learning would exhibit a significant advantage over patients instructed by errorful learning, as demonstrated by improved recall and better retention over time.

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**Insert figure 2 about here.**

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## DISCUSSION

The findings of the present study suggest that when memory impaired patients with schizophrenia are taught a procedure by a method which specifically prevents the production of errors during learning, their memory performance is significantly better than those patients who were allowed to guess and make errors during the learning phase. The groups do not differ significantly on the potentially confounding variables of age, IQ, educational background, sex, alcohol consumption, current level of cognitive functioning (MMSE scores), level of memory impairment (RBMT scores), mean chlorpromazine drug dosage, or interest/cooperation ratings and thus, the differences between the groups cannot be explained by these factors. The results also cannot be accounted for by a ceiling effect, as both groups demonstrated an improvement over time, albeit that more patients in the errorless group achieved higher scores. The same experimenter conducted the training in both groups and the tightness of the experimental protocol reduced the potential for experimenter bias.

Thus, the results offer evidence in support of findings reported by Baddeley and Wilson (1994) that errorless learning improved the memory performance of patients with brain injury suffering from classic amnesic syndrome. Moreover, they extend the findings of O'Carroll et al. (1999), who reported similar benefits of errorless learning in memory-impaired patients with schizophrenia on a word-learning task.

The task in the present study, programming a personal organiser, goes some way in addressing concerns that lab-based tasks, such as learning words, may not be readily generalizable to "real life" tasks. The connections between the present task and everyday work activity such as keyboard skills are stronger. Further, the retention of the procedure was well maintained at 7-10 day re-testing. Previously, other researchers in the field have rightly highlighted the fact that retention over time is crucial to the value of errorless learning (e.g. Evans et al., 2000) and that this has not been adequately supported to date.

While recent studies in brain injury populations have lent support to the efficacy of errorless procedures for the learning of novel word associations (Squires et al., 1997), face-name associations (Evans et al. 2000), and cued- and free-recall of learned word lists, including after a delay of 48 hours (Hunkin et al., 1998), there remains some uncertainty as to the processes which underlie errorless learning and similarly which tasks will derive most benefit. Squires et al. (1997) report much more modest benefits on associative learning tasks which appear easier but lack novelty. Moreover, Evans et al. (2000) failed to observe the expected advantage for errorless learning on route learning, identification of

degraded pictures, and programming an electronic organiser. Both Squires et al. (1997) and Evans et al. (2000) suggest that if learning is so easy that it becomes passive and subjects expend little effort, the encoding traces may be correspondingly weaker. Evidence from Cohen et al's., (1992) study on memory in patients with schizophrenia, noted deficits in verbal and visual memory only when numbers of stimuli to be recalled exceeds the 5-7 item span of short-term memory. Thus, Evans et al's.(2000) six steps used to program the personal organiser may have been too few to reveal underlying problems. In consideration of this, we elected to use a nine-step procedure for our task and it is possible that the greater demands that this places on memory functioning resulted in the observed differential performance in favour of errorless learning.

As noted in the introduction, Clare et al. (1993) observed marked deficits in the functioning of explicit memory along with intact implicit memory in schizophrenia. The findings of the present study may be due to the trade-off between preserved implicit memory and dysfunctional explicit memory. If all responses were remembered implicitly, those patients who were allowed to make errors during learning may subsequently have been unable to differentiate correct from incorrect responses due to poor explicit memory. Ordinarily, it is explicit memory that should provide enough episodic detail to identify which previous responses were made in error and those that were correct. Only future studies could offer support for this hypothesis if they showed that those patients who derived greatest benefit from errorless learning had well preserved implicit memory. Hunkin et al. (1998) examined this issue in a study of amnesic patients and found that better errorless learning performance was not correlated with

preserved implicit memory. They offer alternative explanations: firstly, that residual explicit memory may also derive benefit from reducing errors or secondly, that information acquired by implicit memory is later accessible by explicit memory.

As discussed by O'Carroll (1999), a different interpretation of patients' differential performance in errorless versus errorful learning comes from the literature on "source monitoring" difficulties in schizophrenia (Bentall et al., 1991; Frith et al., 1991; Vinogradov et al., 1997). It is postulated that patients have difficulty distinguishing self-generated from externally-generated stimuli on recall. As O'Carroll (1999) suggests, the format of errorful learning is such that patients are allowed to make errors, self-generated stimuli, after which the instructor provides the correct response, an externally-generated stimuli. They suggest that it is conceivable that such a "source memory" problem would impair the performance of patients under errorful learning conditions as they would have difficulty identifying the correct instructor-generated responses from their own self-generated errors.

Much research has been generated to investigate the memory processes in CAS that underlie dissociated performances on a variety of implicit and explicit tasks. A top-down processing approach can provide valuable information in identifying the anatomical correlates of target disorders or the specific cognitive processes that are dysfunctional or spared (Schwartz et al.,1993; Hunkin et al., 1998). However, regardless of the mechanisms that may underlie learning in people with CAS, preventing errors during the learning process has been found to

offer significant advantages over trial and error learning. If the object of this research is to guide cognitive rehabilitation of memory impaired patients, then there is already enough evidence to support a bottom-up approach using errorless learning with people with schizophrenia, i.e. applying this procedure on more practical tasks under controlled experimental conditions.

Ironically, most rehabilitation approaches to date have focussed on encouraging patients to "take a guess" and blamed a lack of motivation or effort when they fail. Of course, there is good evidence from Craik and Lockhart's (1972) "levels of processing" work that applying oneself to the task facilitates memory performance. For those of us with normal memory, "taking a guess" may promote recall for the correct responses; however, for patients whose explicit memory is dysfunctional, it may lead to confusion during retrieval when they are unable to differentiate between the correct and incorrect responses made during learning. The difficulty, until recently, has been that memory impairment was not recognised as being central to schizophrenia and was confused by the fact that a significant minority of patients with schizophrenia do not have memory impairment (e.g. Kelly et al., in press; see O'Carroll, 2000 for a review). By adopting a bottom-up approach, this study does not add anything to the ongoing debate as to which processes underlie errorless learning or how best to access these. It does, however, offer support to a potential strategy for success in a subgroup of patients within the schizophrenic population whose whole adult life experience may have been one of failure both in terms of not attaining a therapeutic response to drug treatment and little or no progress in terms of social rehabilitation. Green (1996) noted in a review that verbal memory functioning

was the best predictor of successful reintegration to the community and Kelly et al. (in press) reported a significant correlation between poor memory and functional impairment. To conclude, in so far as errorless learning may circumvent some of the difficulties resulting from memory impairment, it may offer the prospect of more successful community reintegration for some patients and, therefore, it merits further investigation in the cognitive rehabilitation of patients with schizophrenia.

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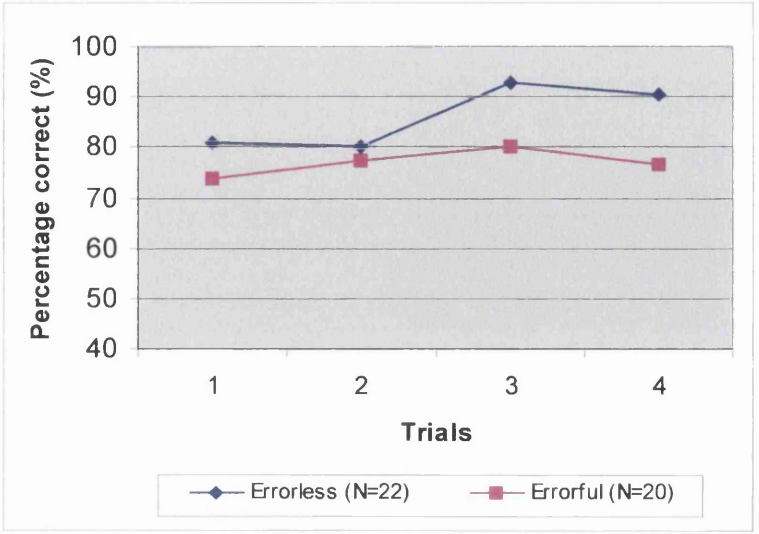
**FIGURE 1.**

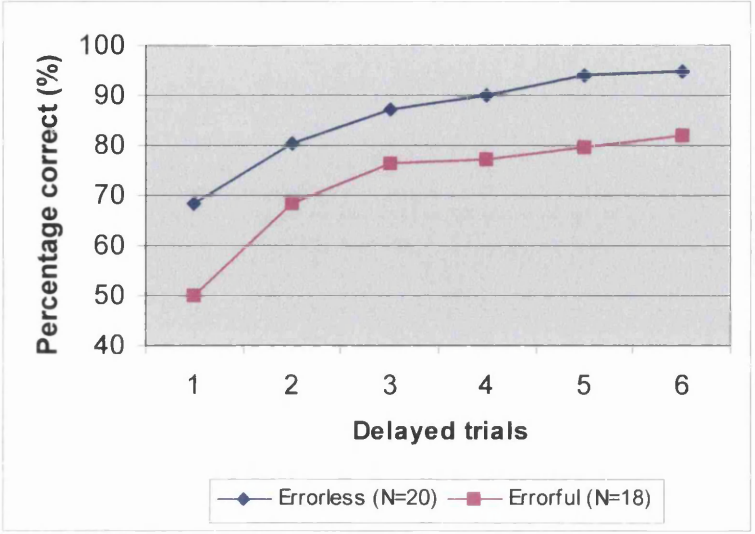
**Memory performance following 5 minute delay**




Trial 4, U = 124.5,
p = 0.0055

**FIGURE 2.**

**Memory performance following 7-10 days delay.**




Delayed trial 6, U = 114.0, p = 0.0125.

**Table 1.** Comparison of group means on demographic and matching variables.

| | **Errorless (N=22)** | **Errorful (N=20)** | **T or U** | **P** |
|---|---|---|---|---|
| **Age** | 40.7 (10.8) | 43.9 (9.7) | T = -1.01 | 0.32 |
| **Sex** | 13 M : 9 F | 14 M : 6 F | $\chi 2 = 0.54$ | 0.53 |
| **Education** | 12.1 (1.3) | 11.5 (0.9) | U = 163.5 | 0.12 |
| **IQ** | 104.4 (6.3) | 104.5 (9.5) | U = 182.5 | 0.49 |
| **Alcohol** | 7.1 (15.2) | 6.9 (8.1) | U = 177.0 | 0.27 |
| **RBMT** | 7.0 (1.7) | 6.5 (2.0) | T = 0.94 | 0.35 |
| **MMSE** | 27.9 (1.4) | 27.6 (1.7) | T = 0.73 | 0.47 |
| **Chronicity** | 16.1 (9.6) | 20.2 (11.6) | T = -1.25 | 0.22 |
| **CPZ** | 336 (271.9) | 293.7 (256.1) | T = 0.350 | 0.731 |
| **Cooperation** | 4.0 (0.4) | 4.1 (0.7) | T = -0.80 | 0.43 |

IQ, NART; Alcohol, mean units per week; Chonicity, years since diagnosis, CPZ, mean chlorpromazine equivalents (Foster, 1989; Depixol and Clopixol equivalences calculated according to the guidelines of the manufacturer – Lundbeck).

**Table 2.** Main results: group means across all recall trials.

| | ERROR METHOD | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| **T1** | LESS | 22 | 7.27 | 2.10 | .45 |
| | FUL | 20 | 6.65 | 2.01 | .45 |
| **T2** | LESS | 22 | 7.23 | 2.27 | .48 |
| | FUL | 20 | 6.95 | 2.14 | .48 |
| **T3** | LESS | 22 | 8.36 | 1.09 | .23 |
| | FUL | 20 | 7.20 | 1.82 | .41 |
| **T4** | LESS | 22 | 8.14 | 1.46 | .31 |
| | FUL | 20 | 6.90 | 1.89 | .42 |
| **DT1** | LESS | 20 | 6.15 | 1.90 | .42 |
| | FUL | 18 | 4.50 | 2.12 | .50 |
| **DT2** | LESS | 20 | 7.25 | 1.94 | .43 |
| | FUL | 18 | 6.17 | 2.26 | .53 |
| **DT3** | LESS | 20 | 7.85 | 1.76 | .39 |
| | FUL | 18 | 6.89 | 2.05 | .48 |
| **DT4** | LESS | 20 | 8.10 | 1.37 | .31 |
| | FUL | 18 | 6.94 | 2.10 | .49 |
| **DT5** | LESS | 20 | 8.45 | 1.19 | .27 |
| | FUL | 18 | 7.17 | 1.98 | .47 |
| **DT6** | LESS | 20 | 8.55 | .94 | .21 |
| | FUL | 18 | 7.39 | 1.94 | .46 |

**Key:** T1 – T4 = Recall trials 1-4 from session one after a five minute delay.

DT1 – DT6 = Recall trials 1-6 from the session two 7-10 days later.

Mean scores are the mean number of steps successfully completed in the nine step procedure.

## 5. SINGLE N RESEARCH CASE STUDY

# MANAGEMENT STRATEGIES FOR THE TREATMENT OF CHRONIC HEADACHES AND RELATED BEHAVIOUR IN A 9 YEAR OLD BOY: A CASE STUDY.

Supervisor: Dr. P. Fleming

Prepared in accordance with the notes for contributors to the journal "Behavioural and Cognitive Psychotherapy"

# Management strategies for the treatment of chronic headaches and related behaviour in a 9 year old boy: a case study.

H.H.Russell[2], P.F.J. Fleming

Department of Psychological Medicine, University of Glasgow.

## ABSTRACT

This paper presents a single case study of the treatment of a 9 year old boy with chronic non-progressive ("tension") headaches. The boy suffered debilitating headaches 2-3 times per week, which resulted in missing school, taking medication and other withdrawal activity. In addition, he exhibited a number of anxious behaviours e.g. fear of the dark and sleeping with his parents. A treatment package aimed at encouraging independent coping with pain, reducing headache frequency and re-instating sleeping alone consisted of relaxation training, psycho-education for parents on the role of parent-mediated pain behaviour and manipulation of reinforcement contingencies. The intervention was successful in re-instating sleeping alone and in reducing headache frequency, intensity and duration. This was maintained at 2 and 6 month follow-up. The results are discussed in the context of reinforcement contingencies, somatisation and parental factors.

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## 6. APPENDICES

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**Note:**

Copies of the actual educational package, e.g. referral guidelines, have not been made available to respect confidentiality. There follows overleaf a transcript of the talk given when the package was presented.

## CMHT EDUCATIONAL PACKAGE

### Summary transcript of accompanying talk

The Educational Package was presented to the CMHT members on 8 June, 1998. Present were members from Psychiatry, Community Psychiatric Nursing and Occupational Therapy. One CPN was not present due to sick leave and no members from Social Work were present. All the members present had filled in an Audit Questionnaire prior to the Education Package. The absent CPN had also filled in such a questionnaire. Nobody from Social Work attended the meeting, however, one had returned a completed questionnaire.

First staff were oriented towards a brief summary of the current in-put by Psychology to the CMHT ie assessment and intervention with individuals and couples, mainly with direct face to face work. People with a variety of diagnosis had been referred including personality disorder, psychiatric illnesses such as bi-polar affective disorder, schizophrenia, paranoid psychosis, obsessive compulsive disorder, chronic anxiety in depressive states. It was noted that the input from Psychology was half time - 0.5 WTE which consisted of 3 Clinical Sessions per week. Clients were initially seen for assessment and treatment in December 1997, and a waiting list had been open 6 months. During this time, there had been difficulties in establishing clinics that were accessible by the clients with serious mental illness. Three clinics have now been formalised, two sessions to be based in Lanark taking clients from the Lanark CMHT and one clinic in Newmains, established to take clients referred from the Newmains CMHT. Although there were few clients remaining on the waiting list, the clinics were full to capacity, there had been initial difficulties in establishing rooms to see clients, and that one client is still on the waiting list from its conception ie 6 months. It was decided that a review be carried out of the Psychologists role within the CMHT, with a view to education regarding the nature of appropriate referrals and the referral process. Members of the CMHT were informed that the role of Psychology within this CMHT, was an evolving one and that the Educational Package related only to the next 6 months, when a possible further review would be undertaken with opportunities for an expansion of roles performed by the Psychologists within the CMHT. At the moment however, the psychological input would be as described within the Educational Package ie for the next 6 months.

The members were then informed about the appropriate criteria for referrals to the CMHT Clinical Psychologist as outlined in the referral criteria form. The referral criteria were established using the Framework for Mental Health and referral criteria for other available psychological services within the geographical region. The referral process was outlined, ie referrals from GPs to the CMHT would be discussed at the allocation meeting and if deemed appropriate, referred on to Clinical Psychology. Clients that were already being seen by CMHT members could be referred from the professional themselves on the CMHT Clinical Psychology Referral Form.

The CMHT members were then informed that the waiting lists were to be closed. This was to prevent people with serious mental illness waiting on a lengthy waiting list. It also educated members as to the need to recognise that the input would tend to be on a focused piece of work and that longterm support would be preferably carried out by other members of the CMHT. It was noted however that occasionally there would be a need for a client with a serious mental illness to have flexible access to the Clinical Psychology Service. However,/....

However, it was noted that the intention would again be to support the client again on a focused piece of work and then to hand back to the key worker. When a space became available after a client had been discharged from the service, CMHT members would then be informed and negotiation would occur between the staff and psychologist as to who would benefit the most from the use of psychological services at that time.

The CMHT members were then informed of other roles outwith direct clinical intervention with which the Clinical Psychologist could be involved. They were also handed written information about this and were also informed that due to the time commitment on direct clinical intervention, that currently these roles could not be performed, however this could be a possibility after the review in 6 months time. Staff were encouraged to consider setting aside time for joint meetings regarding clinical case loads to prevent duplication of clinical work, and how best to work collaboratively with the clients.

Members were informed, in light of the closure of the CMHT Clinical Psychology Waiting Lists, that any referrals subsequently discussed and deemed to be appropriate for other Services by the CMHT Psychologist, would be re-directed and assistance given regarding referring on to these other Services. Those deemed appropriate for the CMHT Clinical Psychology Service were to be kept in mind for when a place became available.

Certain queries from the Audit Questionnaires were then addressed. The difference between the type of clients seen in Primary Care Psychology Services and CMHT Psychology Services was outlined. Also reference was made to the Psychiatrist who could refer to Psychiatric Out-patients and the appropriate criteria for that Service. There appeared to be a number of concerns about the clients with Personality Disorder. It was highlighted that such clients would be seen by the Psychology Services, but for short term focused work mainly directed at systems level and how the client is interacting with the system and the best way to manage this. It was noted that more collaborative work was needed and consultation sessions were encouraged. It was also noted that in-service education could be a possibility, however not at the present time, but when there was less direct clinical intervention. It was noted that the criticism regarding the waiting list time was understandable. It was hoped that this new way of working ie closing the waiting lists, and negotiating when a space became available, would increase the efficiency of the Psychology Service by seeing a client that would most benefit from psychological input at that point in time.

The members were then informed that they would be given a second questionnaire in 8 weeks time and thanked for their assistance in this matter.

July 1998

**To all members of Clydesdale Community Mental Health Team**

You may remember filling out a questionnaire some weeks ago, and yes, it's time for the second questionnaire which we warned you about.

The information gleaned from the first set of questionnaires has been very interesting and helpful. To complete the project we would be very grateful if you could spare a few minutes to answer the following questions.

The replies are anonymous and confidential; however, in order to compare both sets of information we need to be able to keep the responses of each person together. For this reason please remember to use the inventive **code names** which you made up for yourself the first time round.

I would appreciate it if you could return your questionnaire to myself Hugh Russell, or Joanne Ilsley at the Psychology Department, Hartwoodhill Hospital by Friday, 31st July, 1998.

**CODE NAME:**

Please tick below which profession you belong to:-

Nursing

Occupational Therapy

Psychiatry

Social Work

Thank you very much for your help.

1. How appropriate do you consider the following client problems for referral to clinical psychology within the CMHT ?

*please rate all categories using the following scale:*

| not appropriate | somewhat appropriate | appropriate | very appropriate | extremely appropriate |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| | RATING |
|---|---|
| Adjustment to physical illness/ disability | 3 |
| Anxiety disorder (generalised) | 3 |
| Anxiety severe and chronic | 5 |
| Bereavement reaction | 4 |
| Cognitive functioning (e.g. memory) | 5 |
| Depression severe | 3 |
| Depression reactive | 3 |
| Eating disorders | 5 |
| Family relationship difficulties | 5 |
| Mania | 2 |
| Marital difficulties | 3 |
| Obsessive compulsive disorder | 5 |
| Personality disorders | 4 |
| Phobias | 4 |
| Post traumatic stress disorder | 5 |
| Psychosexual difficulties | 5 |
| Schizophrenia | 3 |
| Sexual abuse | 5 |
| Substance abuse/addiction | 3 |
| Other (please specify) | |
| | |

Please use this space if you wish to further qualify your reasons for rating the above cases as inappropriate/appropriate.

2. How important do you consider the following roles in terms of clinical psychology's input to the CMHT ?

*please rate all categories using the following scale:*

| not important | somewhat important | important | very important | extremely important |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| | RATING |
|---|---|
| Assessment only - to advise key worker | 5 |
| Collaboration on clinical management of team cases | 5 |
| Neuropsychological assessment | 5 |
| Therapeutic intervention with individuals | 5 |
| Therapeutic intervention with groups | 2 |
| Work with families and carers | 5 |
| Other (please specify) | |

Please use this space to elaborate on what you see as most helpful in terms of clinical work.

3. How important would you consider the following complementary roles to be in terms of psychology's input to the CMHT ?

*please rate all categories using the following scale:*

| not important | somewhat important | important | very important | extremely important |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| | RATING |
|---|---|
| Collaboration with audit projects | 3 |
| Providing information on psychological treatment of disorders | 3 |
| Staff development and support (e.g. stress management) | 5 |
| Research collaboration | 3 |
| Updates on new relevant research | 3 |
| Other (please specify) | |

Please use this space to elaborate on what you think might be most helpful in terms complementary work.

4. How satisfied are you with the following aspects of the clinical psychology service within the CMHT ?

*please rate all categories using the following scale:*

| not satisfied | somewhat satisfied | satisfied | very satisfied | extremely satisfied |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| | RATING |
|---|---|
| Current referral form to clinical psychology e.g. design, completion time | 3 |
| Process of referral to clinical pschology | 3 |
| Process of feedback about patient | 5 |
| Waiting time between formal referral and initial appointment | 4 |
| Criteria for referral to clinical pschology | 3 |
| Access to consultation with clinical psychologist regarding own cases | 5 |
| Opportunity to liaise with clinical psychology regarding joint cases | 5 |

Please use this space if you wish to further qualify your reasons for rating satisfied/dissatisfied to the above aspects.

5. How much do the following factors influence your decision to refer a case to clinical psychology ?

*please rate all categories using the following scale:*

| not influential | somewhat influential | influential | very influential | extremely influential |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

| | RATING |
|---|---|
| Nature of problem e.g. complexity, chronicity | 5 |
| Perception of "being stuck" | 3 |
| Alternative opinion | 5 |
| Lack of space on own caseload | 1 |
| Specific type of intervention e.g. cognitive therapy for delusions | 5 |

6. Please detail any ways in which you would like to see the psychology service develop using the space below.

# Instructions to Contributors

Submit manuscripts to Povl Munk-Jørgensen, Editor of Acta Psychiatrica Scandinavica, Department of Psychiatric Demography, Psychiatric Hospital in Aarhus, The Aarhus University Hospital, DK-8240 Risskov, Denmark

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2 Corporate author
International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. Ann Intern Med 1988:**108**: 258–265.

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**The demonstration monologue for the errorful instructional procedure was as follows:**

*"First we need to switch the machine on by pressing the ON button. You see the screen now has today's date on it - year, month and day - followed by the time below. To put in a reminder about the appointment we need to press the purple button with SCHED written above it. Now using the letter buttons we type in SEE DOCTOR, you see it appears at the top of the screen. Now we have to move down a line to change the date and time, so we press the grey button with the DOWN arrow once. The year is now flashing, but we don't need to change the year or the month so we move along the line to the day by pressing the grey button with the right hand arrow. We can change the day to the 'tomorrow's date' by using the number buttons. Now we need to put in the time 11.15am using the number buttons. Have a look at the screen to see if it's right, if it's correct we press enter. We also want an alarm call to remind us about the appointment so we must press this button marked INS. Do you see the musical note above it? Now we want to check that the machine has recorded this, so we press one of the green buttons with the white triangle below the word SEARCH. We can see it displays the appointment which we entered. All we have to do now is to remember to switch the machine off, so we press the OFF button.*

*Now it's your turn, take your time and try it for yourself. Take one step at a time and talk me through each step, as you are about to do it. I'll help you if you make a mistake."*

Instruction sheet for errorless learning condition appeared as follows:

1. **Press ON button.**
2. **Press the purple button marked SCHED.**
3. **Write in "SEE DOCTOR".**
4. **Press grey button with down arrow to get to the date and time.**
5. **Type in tomorrow's date and time 11.15am using grey button with right hand arrow to move along from the year to the day.**
6. **Press ENTER.**
7. **Press INS button to set alarm.**
8. **Press one of the green buttons with the white arrow below the word SEARCH.**
9. **Press OFF button.**