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[Intervention Review]

Cognitive rehabilitation for people with schizophrenia and related conditions

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ABSTRACT

Background

Researchers have consistently found that people with schizophrenia score more poorly than others on a wide array of cognitive tasks and that these deficits persist even when the illness is in remission. The perceived impact of cognitive impairment on day-to-day functioning has led to the development of cognitive rehabilitation techniques intended to remedy these impairments, and thus improve the functioning of people with schizophrenia.

Objectives

To determine whether the use of cognitive rehabilitation techniques is associated with improvement in people with schizophrenia and related conditions.

Search methods

Electronic searches of Biological Abstracts (1982-1997), the Cochrane Schizophrenia Group's Register of trials (2000), EMBASE (1980-1997), LILACS (1982-1997), MEDLINE (1966-1997), PsycLIT (1974-1997) and SCISEARCH (1997) were undertaken. References of all identified studies were handsearched and the first author of each included trial was contacted.

Selection criteria

The reviewers included randomised trials investigating the impact of cognitive rehabilitation on people with schizophrenia, or related conditions, compared to a placebo intervention, another intervention or standard treatment. This version of the review does not include comparisons of different types of cognitive rehabilitation.

Data collection and analysis

Relevant studies were identified and data extracted reliably by two reviewers working independently. In studies which did not specify the reasons for participants dropping out, we assumed that those who had dropped out had experienced no change in the outcome measures. Where possible, Peto odds ratios (OR) and mean differences (MD) were calculated with their 95% confidence intervals (CI).

Main results

Three small studies met the inclusion criteria. Two compared cognitive rehabilitation to a placebo intervention (total n=84), and the other to occupational therapy (n=33). Although cognitive rehabilitation was as acceptable as placebo and occupational therapy, with low attrition in both groups, no effects were demonstrated on measures of mental state, social behaviour, or cognitive functioning. An effect, in favour

of cognitive rehabilitation, on a measure of self-esteem (Rosenberg Self-Esteem Scale, MD 6.3 CI 1.07-11.53) is worthy of replication in any future trials.

Authors' conclusions

Data are inconclusive and provide no evidence for or against cognitive rehabilitation as a treatment for schizophrenia.

PLAIN LANGUAGE SUMMARY**Cognitive rehabilitation for people with schizophrenia and related conditions**

Synopsis pending.

BACKGROUND

Researchers have consistently found that people with schizophrenia score more poorly than others on a wide range of cognitive tasks and that these deficits persist even when the illness is in remission (Gold 1993). The problems that people with schizophrenia experience in day-to-day functioning, and the failure of existing psychosocial rehabilitation approaches (e.g., social skills training) to improve participants' day-to-day functioning have been attributed, at least in part, to cognitive impairments (Bellack 1992).

The perceived impact of cognitive impairment has led to the development and evaluation of cognitive rehabilitation techniques intended to remedy these impairments, and thus improve the functioning of people with schizophrenia. Cognitive rehabilitation (CR) involves the retraining of basic-level processes in various inter-related cognitive domains such as memory, attention, speed of processing and abstraction levels (Spring 1992).

Although cognitive rehabilitation can take a number of forms, it generally involves repetitive, laboratory-based exercises, directly related to the cognitive process being trained. This might or might not involve equipment such as cognitive rehabilitation software, videotaped training material and auditory and visual stimuli.

Some researchers test the efficacy of cognitive rehabilitation by comparing results from participants who have been trained to complete the required tasks against results from participants who have completed the tasks with no prior training. Others use the same method of comparing one trained group against one untrained group, but using different laboratory-based tasks for the training process than those employed in the performance assessments. A number of theorists also have argued that the generalisation of cognitive rehabilitation should be evaluated by measuring the impact of training on day-to-day activities and behaviours requiring the same processes (Spring 1992). This review sought to clarify what impact cognitive rehabilitation has on performance in the specific domain of interest and on broader but more clinically relevant outcome measures related to symptomatology and general functioning.

OBJECTIVES

The primary objective of this review was to determine whether cognitive rehabilitation is an effective treatment for people with schizophrenia and related conditions.

The secondary objective was to examine whether there is a differential effect for the various types of interventions used.

METHODS

Criteria for considering studies for this review

Types of studies

All relevant randomised controlled trials.

Types of participants

People with a diagnosis of schizophrenia or related conditions, diagnosed by any criteria.

Types of interventions

1. Cognitive rehabilitation involving repetitive laboratory-based exercises to train basic-level cognitive processes such as memory, attention, speed of processing and abstraction levels. The training might or might not involve equipment such as cognitive rehabilitation software, videotaped training material and auditory and visual stimuli. Sometimes cognitive rehabilitation is combined with monetary incentives. Cognitive rehabilitation is not cognitive-behaviour therapy (CBT) which involves training strategies to modify factors such as thoughts, beliefs, and attitudes. CBT includes strategies such as those used in self-instructional training, rational emotive therapy, illness self-management, and social problem solving. A Cochrane review has recently been published on CBT with people with schizophrenia (Jones 1998).

2. Standard care, with or without a 'placebo' cognitive rehabilitation. Placebo cognitive rehabilitation could be some interaction that may provide similar contact between patient and carer to that encountered within the experimental procedure outlined above, but that includes no elements of cognitive rehabilitation.

3. Other interventions added to standard care that may be directed at preservation of cognitive abilities, but not cognitive rehabilitation.

Studies combining cognitive rehabilitation with other types of treatment have not been included in this review at this point.

Types of outcome measures

1. General level of functioning (various types of living skills, social skills, academic skills etc.):

1.1 no improvement or deterioration on the measure of level of functioning;

1.2 average change (endpoint - baseline) on the measure of level of functioning;

1.3 average endpoint score on the measure of level of functioning.

2. Mental state (hallucinations, delusions, negative symptoms etc.):

2.1 no improvement or deterioration on the measure of mental state;

2.2 average change (endpoint-baseline) on the measure of mental state;

2.3 average endpoint score on the measure of mental state.

3. Specific cognitive domain (memory, attention, speed of processing, abstraction levels etc.):

3.1 no improvement or deterioration on the specific cognitive domain;

3.2 average change (endpoint-baseline) on the specific cognitive domain;

3.3 average endpoint score on the specific cognitive domain.

4. Acceptability of the treatment:

4.1 the number of people who dropped out during the trial;

4.2 satisfaction or lack thereof with care provided;

4.3 average satisfaction score.

5. Adverse effects:

5.1 number of people who had any adverse effect.

6. Quality of life:

6.1 quality not improved or deteriorated;

6.2 average quality change;
6.3 average quality endpoint score.

7. Costs:

7.1 average direct costs;
7.2 average indirect costs.

Outcomes were divided into short term (less than three months), medium term (3-12 months) and long term (more than one year).

Search methods for identification of studies

Electronic searches

Relevant randomised trials were identified by searching several electronic data bases (Biological Abstracts, the Cochrane Schizophrenia Group's Register of Trials, EMBASE, LILACS, MEDLINE, PsycLIT and SCISEARCH).

1. BIOLOGICAL ABSTRACTS (January 1982 to 1997) was searched using the Cochrane Schizophrenia Group's phrase for randomised controlled trials and schizophrenia (see Group search strategy) combined with the phrase:

[and (cognitiv* near (rehabilitati* or educat*)) or cognitive-rehab* or cognitive-educat*]

2. COCHRANE SCHIZOPHRENIA GROUP'S REGISTER (March 2000) was searched using the phrase:

[(cognitiv* and (rehabilitati* or educat*)) or cognitive-rehab* or cognitive-educat* or #42=471]

3. EMBASE (January 1980 to July 1997) was searched using the Cochrane Schizophrenia Group's phrase for randomised controlled trials and schizophrenia (see Group search strategy) combined with the phrase:

[and (cognitiv* near (rehabilitati* or educat*)) or cognitive-rehab* or cognitive-educat* or explode PSYCHOMOTOR PERFORMANCE/all]

4. MEDLINE (January 1966 to 1997) was searched using the Cochrane Schizophrenia Group's phrase for randomised controlled trials and schizophrenia (see Group search strategy) combined with the phrase:

[and (cognitiv* near (rehabilitati* or educat*)) or cognitive-rehab* or cognitive-educat* or (cognitiv* and explode REHABILITATION/all) or explode PSYCHOMOTOR PERFORMANCE/all]

5. PsycLIT (January 1974 to 1997) was searched using the Cochrane Schizophrenia Group's phrase for randomised controlled trials and schizophrenia (see Group search strategy) combined with the phrase:

[and (cognitiv* near (rehabilitati* or educat*)) or cognitive-rehab* or cognitive-educat* or explode COGNITIVE REHABILITATION/all]

6. SCISEARCH - Science Citation Index

Each of the included studies was sought as a citation on the SCISEARCH database. Reports of articles that have cited these studies were inspected in order to identify further trials.

Searching other resources

1. Reference searching

The references of all identified studies were inspected for more studies.

2. Personal contact.

The first author of each included study was contacted for information regarding unpublished trials.

Data collection and analysis

1. Selection of trials

Two reviewers (RH, JM) independently inspected the abstract of each reference identified by the search to see if the study was likely to be relevant. When it was unclear from an abstract whether a study was a randomised trial or if there was disagreement between the two reviewers, the full article was obtained. The article was then inspected independently by the two reviewers to assess its relevance to the review. Disputes about the relevance of specific papers to the review were resolved by discussion. For studies for which there was insufficient information for reviewers to evaluate their relevance to the review, the first author of each study was contacted for further information.

2. Assessment of methodological quality

The methodological quality of the trials included in this review was assessed using the criteria described in the Cochrane Handbook (Mulrow 1997) and the Jadad Scale (Jadad 1996). The former is based on the evidence of a strong relationship between the potential for bias in the results and allocation concealment, and is defined below:

- A. Low risk of bias (adequate concealment of treatment allocation)
- B. Moderate risk of bias (some doubt about the concealment of treatment allocation)
- C. High risk of bias (inadequate concealment of treatment allocation)

The Jadad scale measures a wider range of factors that impact on the quality of the trial. It includes three items:

- A. Was the study described as randomised?
- B. Was the study described as double-blind?
- C. Was there a description of withdrawals or drop outs?

Trials were included if they met criteria A or B of the Handbook. Also, a cut-off of two points on the Jadad scale was used to check the assessment made using the Handbook criteria. However, the Jadad scores were not used to exclude trials from this review.

3. Data collection

Both reviewers independently extracted the data from the included trials. Again, any disagreement was discussed, the decisions documented and, where necessary, the first authors of the studies contacted for clarification. Reasons for excluding papers are given in the table of excluded studies.

4. Data synthesis

4.1 Incomplete data

If, for a given outcome, more than 50% of participants were not accounted for, the results have not been presented, because the reviewers considered such data impossible to interpret.

4.2 Intention to treat analysis

Unless a study clearly reported the reasons for leaving the study early, the reviewers assumed that participants who dropped out had no change in cognitive ability. When insufficient data were provided to identify the original group size (prior to leaving the study), the first authors were contacted. The numbers of patients who completed each study were used to test the sensitivity of the results, by comparing those trials that used intention-to-treat analysis with those that did not.

4.3 Dichotomous outcomes

These were analysed by calculating odds ratios (OR) for each trial with the uncertainty in each result being expressed using 95% confidence intervals (CI). The odds ratios from the different trials were combined using the Peto methods of meta-analysis. When overall results were significant, the number needed to produce (or prevent) one outcome was calculated by combining the overall odds ratio with an estimate of the prevalence of the event in the control group of the trials.

4.4 Continuous data

For continuous outcomes a weighted mean difference (WMD) between groups was estimated. If heterogeneity was found (see section 5) a random effects model was used.

4.4.1 Normal distribution - data on continuous outcomes are frequently skewed, the mean not being the centre of the distribution. The statistics for meta-analysis are thought to be able to cope with some skew, but were formulated for parametric data. To avoid this potential pitfall, the following standards were applied to all data before inclusion: (i) standard deviations and means were reported or obtained from authors; and (ii) for data with finite limits, such as endpoint scale data, the standard deviation (SD), when multiplied by two, was less than the mean. Otherwise the mean is unlikely to be an appropriate measure of the centre of the distribution (Altman 1996). The reviewers reported data which did not meet the first or second standard in the 'other data' tables.

For change data (endpoint minus baseline), the situation is even more problematic. In the absence of individual patient data, it is impossible to know if data are skewed, though likely. After consulting the ALLSTAT electronic statistics mailing list, the reviewers presented change data in Metaview in order to summarise available information. In doing this, the reviewers assumed that either the data were not skewed or that the analyses could cope with the unknown degree of skew. Without individual patient data, it is impossible to test this assumption. Where both change and endpoint data were available for the same outcome category, only endpoint data were presented. The reviewers acknowledge that by doing this much of the published change data were excluded, but argue that endpoint data is more clinically relevant and that if change data were to be presented along with endpoint data it would be given undeserved, equal, prominence. Authors of studies reporting only change data are being contacted for endpoint figures.

4.4.2 Scale data - a wide range of rating scales are available to measure outcomes in mental health trials. These scales vary in quality and many are poorly validated. It is generally accepted that measuring instruments should have the properties of reliability (the extent to which a test effectively measures anything at all) and validity (the extent to which a test measures that which it is supposed to measure). Before publication of an instrument,

most scientific journals insist that both reliability and validity be demonstrated to the satisfaction of referees. The reviewers decided, as a minimum standard, to exclude data from unpublished rating scales. In addition, the rating scale should have been either: (i) a self report; or (ii) completed by an independent rater or relative. More stringent standards for instruments may be set in future editions of this review.

Continuous data may be presented from different scales, rating the same outcome. In this event, the reviewers presented all data without summation and inspected the general direction of effect.

Where possible, reviewers entered data in such a way that the area to the left of the line of no effect indicated a favourable outcome for cognitive rehabilitation.

5. Heterogeneity

Heterogeneity in the results of the trials was assessed both by inspection of graphical presentations and by calculating a Chi-square test of heterogeneity. Five possible reasons for heterogeneity were pre-specified. The reviewers proposed that responses would differ according to (i) difference in the quality of the trial; (ii) the different types of cognitive rehabilitation used; (iii) whether monetary incentives were used; and (iv) the baseline levels of symptoms and cognitive functioning of participants. These were to be assessed by looking at separate subgroups of trials.

6. Addressing publication bias

Data from all selected trials were to be entered into a funnel graph (trial effect versus trial size) in an attempt to investigate the likelihood of overt publication bias.

RESULTS

Description of studies

1. Excluded

Most studies of cognitive rehabilitation were excluded because there was no control group; many were single case studies. Without a plausible control condition, it was impossible to distinguish the specific benefits of cognitive rehabilitation from the non-specific treatments effects which follow most psychosocial interventions for people with schizophrenia (Spaulding 1992). Five studies were excluded because they compared two different forms of cognitive rehabilitation. These trials were either based on the assumption that cognitive rehabilitation is an effective treatment and that some forms might be more effective than others (Corrigan 1995, Young 1995); or tested different forms of reinforcement in the context of a cognitive rehabilitation intervention (Bellack 1990, Summerfelt 1991). Trials were also excluded because cognitive rehabilitation had been administered in conjunction with other forms of treatment, making it impossible to evaluate the specific contribution of cognitive rehabilitation to any improvement in participants.

2. Awaiting assessment

Three studies are awaiting assessment. Funke 1989 is written in German and requires translation before it can be fully assessed for inclusion. Van der Gaag 1994 is awaiting clarification of how participants were allocated to intervention and comparison groups and whether cognitive rehabilitation was administered alone or was combined with another form of treatment. A randomised

controlled trial by [Spaulding 1998](#) awaits clarification of the specific treatments.

3. Ongoing

Two authors have referred to having begun controlled trials of cognitive rehabilitation ([Borg 1998](#), [Jaeger 1992b](#)). To date, we have no information on the status of these studies or any data generated by them.

4. Included

Three studies met the inclusion criteria ([Medalia 1998](#), [Tompkins 1995](#), [Wykes 1999](#)).

4.1 Methods

Although all three trials were randomised, none reported the method by which this was achieved. Because of the nature of the intervention, it is not practical to attempt to keep the participants 'blind' to treatment allocation. In [Medalia 1998](#), a rater blind to the group allocation of participants scored one of the outcome measures, the BPRS. In [Wykes 1999](#), symptoms were assessed by a sole rater who was blind to treatment allocation, and many of the cognitive measures were "computer driven" and therefore scored without bias. All studies used a parallel group design.

4.2 Participants

All three studies were small. The total number of people randomised to cognitive rehabilitation or control is currently 107. This renders even this meta-analysis underpowered to detect meaningful, real differences between groups. Subtle differences, picked up by use of measures and scales, may be possible to detect, even in such small trials, but the clinical utility of such data is questionable. If cognitive rehabilitation was postulated to produce dramatic effects compared to the controls, small studies would have been adequate. This, however, was never likely.

All studies involved participants whose schizophrenia had been diagnosed using operationalised criteria (either DSM-III, DSM-III-R, or DSM-IV). All participants in [Medalia 1998](#) and [Tompkins 1995](#) were inpatients, while those in [Wykes 1999](#) were on an outpatient basis. Two studies specified that participants should have an identified cognitive impairment ([Medalia 1998](#), [Wykes 1999](#)).

Two studies reported the sex of participants, the majority of whom were male ([Medalia 1998](#), [Wykes 1999](#)). In the two studies that reported participants' ages, the mean ages were from 30-57 years ([Medalia 1998](#), [Wykes 1999](#)). All three studies reported that participants were on neuroleptic medication ([Medalia 1998](#), [Tompkins 1995](#), [Wykes 1999](#)).

Psychiatric history was reported in a variety of forms: minimum hospitalisation time ([Medalia 1998](#) - six weeks), mean length of hospitalisation ([Tompkins 1995](#) - 239.7 days) and time since first contact with psychiatric services ([Wykes 1999](#) - CR group - 59% > 10 years, Control group - 81% > 10 years). All people in [Wykes 1999](#) had a minimum of two years contact with psychiatric services.

In some studies, participants were excluded if they had a history of other neurological conditions ([Medalia 1998](#), [Tompkins 1995](#), [Wykes 1999](#)), major drug or alcohol abuse ([Wykes 1999](#)) or mental retardation ([Medalia 1998](#)).

4.3 Interventions

4.3.1 Cognitive rehabilitation

In [Tompkins 1995](#), cognitive rehabilitation involved instructions in how to complete measures that were also the outcome measures: WAIS-R tasks (object assembly, picture arrangement) and the Wechsler Memory Scale - Revised (logical and visual memory - immediate and delayed). [Medalia 1998](#) used the Orientation Remedial Module (ORM), a computerised program developed for people with acquired brain injury as the experimental intervention. The ORM involves "a behavioural learning format that shapes and reinforces attentive behaviour". In [Wykes 1999](#), the cognitive rehabilitation was administered from a manual ([Delahunty 1993a](#)). Participants practised oculomotor, perceptual, fine motor and conceptual tasks of graded difficulty. The training process involved three steps: (i) overt demonstration of information processing by the therapist; (ii) overt use of the methods by the patient; and (iii) covert use ditto.

4.3.2 Control interventions

[Tompkins 1995](#) employed a comparison condition involving administering the same outcome measures as given to the experimental group. Whereas cognitive rehabilitation involved giving instructional cues for completing the outcome measures, the control did not involve such training. The intervention and comparison were administered in one session. In [Medalia 1998](#) the comparison condition involved watching National Geographic documentaries and the cognitive rehabilitation and comparison condition each involved three 20-minute sessions per week for six weeks. In [Wykes 1999](#) the comparison condition was intensive occupational therapy in which participants were involved in activities such as "relaxation, assertiveness training, life diary, comprehension of social information, and role playing". Both experimental and control interventions involved "one-hour daily sessions over 40 days" with participants expected to attend between three and five days per week. It is unclear from this description how much time each participant spent in treatment.

4.4 Outcomes

4.4.1 Overall

Most outcome measures used in the included studies were measures of specific cognitive domains. In two studies, the training tasks were the same as the outcome measures. Improvement on the training task would only show that participants were able to learn a very specific skill. Even if participants improve on cognitive measures that are different from the training task, researchers still need to assess whether these skills generalise to clinically-relevant tasks such as living skills and that these benefits endure over time. Also, only one continuous outcome measure was used in more than one study. Future research should use a limited number of cognitive and clinical measures with established psychometric properties to enhance the ability to meta-analyse and understand their data.

4.4.2 Scales

4.4.2.a Not specific to cognitive functioning

Brief Psychiatric Rating Scale ([Overall 1962](#))

The BPRS is a 16-item scale used to measure positive symptoms associated with severe psychiatric disorder. The symptoms are rated from one, 'not present' to seven, 'extremely severe' and then summed to give a total score of psychiatric symptomatology. This was the only continuous outcome measure used in more than one study ([Medalia 1998](#), [Wykes 1999](#)).

Present State Examination ([Wing 1974](#))

This is a clinician-rated scale measuring mental status. One hundred and forty symptom items are rated and combined to give various syndrome and sub-syndrome scores. Higher scores indicate greater clinical impairment. This scale was used in [Wykes 1999](#).

Rosenberg Self-Esteem Scale ([Rosenberg 1973](#))

This scale is a ten-item self-report measure. Each item involves a statement about how the respondent feels about him or herself ("I feel that I have a number of good qualities") or aspects of his or her functioning ("I feel that I can't do anything right"). Respondents rate each item on a Likert scale from 'almost always true' to 'never true'. This scale was used in [Wykes 1999](#).

Social Behaviour Schedule (SBS, [Wykes 1986](#))

The SBS is a 21-item scale designed to assess a range of areas of functioning of people with long-term mental illness. The scale covers areas such as social behaviour and communication, self care, and inappropriate behaviour. The respondent's behaviour on each item during the previous month is scored by someone familiar with him or her. Each item is rated on a five-point Likert scale, with higher scores indicating greater deficits. [Wykes 1986](#) found the SBS to have high levels of inter-rater, inter-informant, and inter-setting reliability, and "some evidence of discriminative validity". The SBS was used in [Wykes 1999](#).

4.4.2.b Cognitive functioning

No measure of a cognitive domain was used in more than one study.

Continuous Performance Test ([Rosvold 1956](#)) - computerised version

This is a measure of deficits of attention. The test requires people to press the space bar whenever the target letter 'A' appears on the screen. There are 200 target letters embedded in a series of 600 letters presented randomly, one at a time for 0.83 seconds, in a 10-minute presentation. Interdisplay time is 0.17 seconds. Scores are obtained for three outcome variables: number of right letter detections, number of left letter detections, and absolute percent correct. This test was used only in [Medalia 1998](#).

Controlled oral word fluency test ([Spreen 1991](#))

This task is a measure of cognitive flexibility. Participants are required, within one minute, to "provide as many different words as possible beginning with a particular letter". This test was used only in [Wykes 1999](#).

Digit Span (Wechsler 1991)

This task is a measure of memory and is a subtest of the WAIS-R. It was used in [Wykes 1999](#).

Dual Span ([Della Sala 1995](#))

This task is a measure of working memory. It measures the ability of the participants to perform two tasks at the same time, i.e. visual tracking and remembering numbers presented verbally. This task was used in [Wykes 1999](#).

Hayling Sentence Completion Task ([Burgess 1996](#))

This task is a measure of cognitive flexibility. In the first part participants are asked to identify a word in order to complete a sentence correctly. In the second part of the task, they are asked to identify a word that completes the sentence incorrectly. This task was used only in [Wykes 1999](#).

Response inhibition (Wykes 1990)

This task measures the ability "to inhibit a previously learned response and to learn a novel one". Initially in this task, participants have to press a button adjacent to a light. Later in the task, they have to press a button that is not adjacent to the light. This task was used in [Wykes 1999](#).

Sentence Span ([Daneman 1980](#))

This task is a measure of memory. Participants are required to remember the last word of sentences in groups of sentences that have been read to them. This test was used in [Wykes 1999](#).

Six Elements (Burgess 1991)

This task is a measure of planning ability. Participants are given 10 minutes to complete three two-part tasks (sections A & B). However, they cannot perform section B immediately following section A of the same task. This task was used in [Wykes 1999](#).

Stroop Neuropsychological Screening Test (REF)

This test is a measure of cognitive flexibility. Participants are asked to "name the ink colour of printed words that describe a different colour". This test was used in [Wykes 1999](#).

Tower of London ([Morris 1995](#))

This task is a measure of planning ability. It is a computerised task in which participants move discs on a touch screen in an attempt to make as few moves as possible in a planning task. This task was used in [Wykes 1999](#).

Trails ([Reitan 1958](#))

Trails is another measure of cognitive flexibility. It is a computerised version of Trails A and B of the Halstead-Reitan battery. It was used only in [Wykes 1999](#).

Wechsler Adult Intelligence Scale - Revised (WAIS-R; Wechsler 1991)

The WAIS-R is a measure of intelligence. It is a test battery comprising six verbal tests (information, comprehension, arithmetic, similarities, digit span, vocabulary) and five 'performance' tests (digit symbol, picture completion, block design, picture arrangement, object assembly). Each test within the WAIS-R can be used on its own, and has established reliability and validity ([Lezak 1995](#)).

WAIS-R task - Object Assembly (OA, [Peck 1987](#))

The OA subtest of the WAIS-R is a measure of visual organisation and construction ability. Participants are required to unscramble four pictures of cut-up objects within a specified time. It was used only in [Tompkins 1995](#).

WAIS-R task - Picture Arrangement (PA, [Peck 1987](#))

The PA subtest of the WAIS-R is a 10-item measure of the ability to detect nonverbal social cues and to think in a logical and sequential manner. The items involve four to six cards which depict part of a story; participants are required to arrange the cards in order within specified times. This was used only in [Tompkins 1995](#).

Wechsler Memory Scale-Revised sub-tests (Wechsler 1987)

Wechsler Memory Scale-Revised - logical memory (LM) sub-set (immediate and delayed)

The LM subtest of the Wechsler Memory Scale-Revised measures both immediate and delayed verbal memory. The examiner orally presents two brief stories to the person who is required to repeat the stories immediately following their presentation and again after 30 minutes. High scores indicate better functioning. This was used only in [Tompkins 1995](#).

Wechsler Memory Scale-Revised - visual memory (VM) sub-set (immediate and delayed)

The VM subtest of the Wechsler Memory Scale-Revised measures both immediate and delayed memory of visual information. The participant is shown three designs, one at a time, for 10 seconds each. After the presentation of each design, he or she is required to immediately draw the design from memory, and then again 30 minutes later. High scores indicate better functioning. This was used only in [Tompkins 1995](#).

Wisconsin Card Sort Test (Milner 1963)

This task is a measure of cognitive flexibility, abstract reasoning, and the ability to monitor one's behaviour and learn from feedback. It is specifically sensitive to lesions of the frontal lobe of the brain. Participants have to categorise simple geometric forms by the shape, colour, or number of the objects presented. A trial card is presented to the participant who must select a target card that matches the trial card according to one critical feature (shape, colour, or number). After the participant has successfully matched 10 consecutive trials (a category), the critical feature is changed without warning. Final scores are given for the number of categories completed and the number of preservative errors made. This test was used in [Wykes 1999](#).

Visual Span ([Lezak 1995](#))

Visual span is a validated robust measure which tests the "immediate recall of visually presented sequences". Participants are required to reproduce from memory increasingly complex figures presented on a grid ([Wykes 1999](#)).

Risk of bias in included studies

1. Randomisation

Only one study elaborated on the method of randomisation used. [Medalia 1998](#) stated that "individuals with like [test] rankings were paired into blocks of two and each was then randomly assigned". In the other two included studies randomisation was stated, but not described.

2. Blinding

[Medalia 1998](#) stated that one of the two measures used in their study, the BPRS, was scored by a rater blind to group status. In [Wykes 1999](#), symptoms were assessed by a sole rater who was blind to treatment allocation and many of the cognitive measures were "computer driven", and therefore scored without bias.

3. Follow-up

Although the specified intention had been to examine outcomes in the short term (less than three months), medium term (3-12 months), and long term (longer than one year), the only available results were short-term. No study conducted a follow-up assessment beyond the period of intervention.

Two studies mentioned attrition. Six of the 60 people in [Medalia 1998](#) dropped out of the study because of "psychotic decompensation". Although the trialists did not specify which group they had been in, three participants appear to have dropped out of each group. In [Wykes 1999](#), three participants dropped out of cognitive rehabilitation and one out of the comparison group. There was no mention of why these people left early. The methodology of [Tompkins 1995](#) strongly limited the likelihood of attrition; the outcome measure was administered once and this was in conjunction with the single training session.

Effects of interventions

1. The search

The searching identified about 500 citations that were inspected. Forty-three papers were acquired and read. Three studies were finally included.

2. COGNITIVE REHABILITATION versus PLACEBO OR NO INTERVENTION

2.1 Mental state

The Brief Psychiatric Rating Scale (BPRS) was the only continuous outcome measure used ([Medalia 1998](#)). The process of cognitive rehabilitation did not have any immediate effect on mental state when compared to a placebo intervention.

2.2 Leaving the study early

Six people in [Medalia 1998](#) dropped out of the study because of "psychotic decompensation" (total n=60). There was no mention, however, of which group they had been allocated to. Based on published data, the reviewers assumed that three people from each arm (30 in each arm) had dropped out. Cognitive rehabilitation is not obviously an intervention that people with seriously mental illness find more difficult to tolerate than the placebo approaches (OR 1.0 0.19-5.33, n=84, N=2).

2.3 Specific cognitive domains

2.3.1 Attention

[Medalia 1998](#) reported right and wrong letter detection and total percent correct as measures of attention. No data suggests an immediate measurable effect of the cognitive rehabilitation.

2.3.2 Memory

Logical and visual memory were both tested in [Tompkins 1995](#) and cognitive rehabilitation has no clear effects in the very short term.

2.3.3 WAIS subset tests

Data from object assembly and picture arrangement tests are reported but no difference between cognitive rehabilitation and the placebo approach is demonstrated. It remains unclear if this is a function of underpowering of studies and meta-analysis, rather than a true equivocal effect on which confidence can be placed.

3. COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY

3.1 Mental state

[Wykes 1999](#) measured mental state in two ways - using the Brief Psychiatric Rating Scale and the Present State Examination. The data presented in reports of this study suggest no differences in the effects of the two interventions in the very short term.

3.2 Social behaviour

There are no discernible, measurable effects of either intervention on social behaviour.

3.3 Leaving the study early

Three out of 17 participants dropped out of the cognitive rehabilitation group and one out of 16 in the comparison group (OR 3.21 CI 0.3-34.6).

3.4 Self esteem

[Wykes 1999](#) measured this variable using the Rosenberg Self Esteem Scale. Those allocated to the cognitive rehabilitation group have statistically significantly greater self esteem than people in

the occupational therapy group, at the end of testing (MD 6.3 CI 1.07-11.53).

3.5 Specific cognitive domains

3.5.1 Cognitive flexibility

For the tests of cognitive flexibility (controlled oral fluency test, Stroop test, Hayling sentence completion test, response inhibition, trials and the Wisconsin card sorting test) there are no clear differences between those allocated to cognitive rehabilitation and people in the occupational therapy group. Wide confidence intervals were obtained and the equivalence of the two interventions cannot be assumed.

3.5.2 Memory

Sentence span, visual span and dual span are not clearly different between the groups.

3.5.3 Planning

Planning was measured using the Six Elements test and the Tower of London test. Again, there are no differences demonstrated between groups.

3.5.4 WAIS subtest - digit span

Wykes 1999 use the digit span sub-test of the WAIS. There is no difference between the groups. As with all the equivocal results reported above, wide confidence intervals were obtained and the equivalence of the two interventions cannot be assumed.

4. Other analyses

Although the intention had been to examine outcomes in the short term (less than three months), medium term (3-12 months), and long term (longer than one year), the only available results were immediate term. A lack of adequate data also precluded the use of funnel analyses to estimate potential publication biases.

DISCUSSION

1. General

1.1 Definitions

The definition of cognitive rehabilitation used was relatively broad. The reviewers categorised instruction on the rules required to complete particular tests of cognitive skills as a form of cognitive rehabilitation (Tompkins 1995). Some might suggest that this is in fact cognitive behavioural therapy and not cognitive rehabilitation because participants are instructed in a strategy to deal with a situation. The reviewers regarded such interventions as cognitive rehabilitation because, rather than intending to "modify factors such as thoughts, beliefs and attitudes" (as with their definition of cognitive behavioural therapy), these rules were used "to train basic level cognitive processes" (in accordance with their definition of cognitive rehabilitation).

1.2 Few studies

Based on published data, the reviewers were only able to extract a limited amount of data from three studies. This is not entirely indicative of the small numbers of studies that have evaluated cognitive rehabilitation. It is indicative, however, of some consistent methodological issues with those studies. As indicated in the table of excluded studies, the majority of studies of cognitive rehabilitation were excluded because there was no relevant control group; many were single case studies. Without a plausible control condition, it is impossible to distinguish the specific benefits of cognitive rehabilitation from the non-specific treatments effects

that appear to follow most psychosocial interventions with people with schizophrenia (Spaulding 1992).

Five studies were excluded because they compared two forms of cognitive rehabilitation and had no control group relevant to this review. These studies were either based on the assumption that cognitive rehabilitation is an effective treatment and some forms might be more effective than others (Corrigan 1995, Young 1995), or they were testing different forms of reinforcement in the context of a cognitive rehabilitation intervention (Bellack 1990, Summerfelt 1991). In the former, given that cognitive rehabilitation does not have established efficacy, there seems little point in studying the efficacy of one form over another.

Studies were also excluded because cognitive rehabilitation had been administered in conjunction with other forms of treatment. For example, Brenner's (1980-1994) oft-cited Integrated Psychological Therapy (IPT) involves cognitive rehabilitation, cognitive behavioural therapy and skills training. In such cases, it is impossible to evaluate the specific contribution of cognitive rehabilitation.

1.3 Small studies

The randomised trial-derived evidence for cognitive rehabilitation for schizophrenia currently consists of a handful of studies. The three included studies had small numbers of participants (ranging from 24- 55) and no included trial mentioned how sample size was calculated. Trials should have adequate power to detect clinically moderate effects. A recent review has warned against placing too much emphasis on data derived from a small number of small trials (Egger 1995).

1.4 Short studies

The included studies involved a broad range of duration and intensity of cognitive rehabilitation interventions. These ranged from one treatment session in total by Tompkins 1995 to three 20-minute sessions a week for six weeks by Medalia 1998. For an intervention to have had an adequate trial, participants need to have had an adequate 'dose' of that intervention. Even though it is difficult to say at this stage what an adequate dose might be, it is highly questionable whether a population with memory deficits, like people with schizophrenia, would benefit from a very brief intervention. The duration of follow-up in all trials was very short. There are no data on the effects, or lack of effects of this intervention for periods beyond six weeks and none after the intervention had stopped.

1.5 Studies of unclear clinical relevance

The great majority of outcomes used in the included studies were measures of specific cognitive domains. In two studies, the training tasks were the same as the outcome measures. Improvement on the training task would only show that participants were able to learn a very specific skill. It would not show that the underlying cognitive processes required for the tasks have improved, or whether the skills being measured generalise to other tasks which require the same basic-level cognitive processes. An important factor which limited the analysis was that only one continuous outcome measure was used in more than one study, or had similar psychometric properties to any other measure. Future research should use a limited number of cognitive and clinical measures with established psychometric properties to enhance the ability to analyse data.

Similarly, even if participants are able to improve on measures that are different from the training task, researchers still need to assess whether these skills generalise to more clinically relevant tasks, such as living skills and symptomatology. Ultimately, for cognitive rehabilitation to be regarded as having clinical value, it must be shown to have a positive and lasting impact which extends beyond measures of specific cognitive domains.

1.6 Poorly reported studies

The power of this review was limited by incomplete reporting of methodology and data. Specific details about methods of group allocation, concealment of treatment and attrition are important but were inadequately reported. Similarly, measures, particularly those without established psychometric properties, should be well described. Averaging results across groups without presenting the standard deviation prevents data from being used for systematic reviews. The quality of studies appears, however, to be improving. Wykes 1999 has dealt with the methodological issues identified above most comprehensively. For example, this study specified treatment concealment, used measures with established psychometric properties, and administered cognitive rehabilitation independently of other treatment. Wykes 1999 also measured outcomes in all domains: general functioning, symptomatology, specific cognitive domains, and acceptability of treatment.

2. COGNITIVE REHABILITATION versus PLACEBO OR NO INTERVENTION

Analyses revealed data within this comparison to be inconclusive - providing no evidence for or against cognitive rehabilitation as a treatment for schizophrenia. Measures of mental state and specific cognitive domains demonstrated no effects. Cognitive rehabilitation was as acceptable experience as the placebos offered.

3. COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY

Again, analyses revealed data within this comparison to be inconclusive - providing little evidence for or against cognitive rehabilitation when compared to occupational therapy as a treatment for schizophrenia. Measures of mental state and specific cognitive domains demonstrated no effects. Cognitive rehabilitation was as acceptable an experience as occupational therapy. Self esteem, however, was greater in those allocated to the cognitive rehabilitation group. The reviewers are unclear as to the

clinical significance of a mean six-point difference on the Rosenberg Self Esteem Scale and how this may translate into mental state, functioning and behaviour. This could also be a function of random error and should be re-investigated in any subsequent studies.

AUTHORS' CONCLUSIONS

Implications for practice

This review was unable to locate sufficient trial-derived evidence to inform clinicians, managers and recipients of care about the role of cognitive rehabilitation in practice. If clinicians wish to use cognitive rehabilitation, the experimental nature of the intervention should be clearly explained to the patient.

Implications for research

Further studies

It is likely that additional studies are being undertaken on this experimental intervention. Given that there is insufficient quality research to say whether cognitive rehabilitation is effective or not, there is a need for further research to establish whether or not it can remediate the cognitive deficits common in this population. This is important because of the impact that these deficits have on the functioning of people with schizophrenia, and the implications of such findings regarding the neural plasticity of people with schizophrenia.

If additional studies are being planned, trials should: (i) use designs that allow the specific effects of cognitive rehabilitation to be demonstrated (Brenner 1994, for example, combined cognitive rehabilitation with other treatments with proven benefit [psychoeducation] which prevented any benefits accruing from cognitive rehabilitation alone from being assessed); (ii) have adequate power to detect clinically important effects; (iii) be of sufficiently long duration to reassure readers that a lasting benefit is occurring; (iv) consider what is an adequate 'dose' of cognitive rehabilitation for this population (the duration of intervention ranged from one session in total to three 20-minute sessions per week for six weeks in the included studies); (v) use measures that are clinically relevant and a limited number of clinical and cognitive measures with established psychometric properties; and (vi) clearly and completely report or make data available.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Medalia 1998

Methods	Allocation: pairs matched by test rankings and randomised - no further description. Blindness: BPRS scored by blind rater. Design: parallel. Setting: in hospital.
Participants	Diagnosis: schizophrenia (DSM-III-R). History: IQ>70, impaired attention <99% correct on CPT, in hospital > 6 weeks before study, on neuroleptics, no diagnosed brain disease. N = 60.* Sex: 47 M, 13 F. Age: mean ~ 33 years (SD ~6.5).
Interventions	1. Cognitive rehabilitation (ORM computer program developed for people with head injuries emphasising "practice in a behavioral learning format that shapes and reinforces attentive behavior through engaging in computerized exercises". N=30.* 2. Control: viewing National Geographic documentaries with a clinician. N=30.* Both 3 X 20 minute sessions per week for 6 weeks.
Outcomes	Mental state: BPRS. Leaving the study early. Specific cognitive domains: right letter detections, wrong letter detections, absolute percentage correct (CPT). Reaction time.
Notes	Jadad score = 1. * 6 participants dropped out, trialists analysed 54 (27 each group) - reviewers assumed 3 lost / group - unclear when attrition occurred. Letter sent to first author for further information.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Tompkins 1995

Methods	Allocation: "randomly assigned to an evaluator who was blind to the diagnosis of the patient" - no further information. Blindness: as described above - no further information. Design: parallel. Setting: in hospital.
Participants	Diagnosis: schizophrenia (DSM-III-R). History: mean age of onset ~ 21 years, mean days hospitalisation pre-study ~ 240 (SD 213), no dementia, mean chlorpromazine equivalent ~ 1 gm/day. N = 24. Sex: not specified. Age: mean ~ 37 years (SD ~ 6).
Interventions	1. Cognitive rehabilitation: cued condition with "instrumental cues on measures of visual and semantic memory, executive function, and constructional ability". N=12.* 2. Control: performed the same neuropsychological measures without cues. N=12.* Both administered in one session.
Outcomes	Specific cognitive domains: memory, logical and visual (Wechsler Memory Scale). Specific cognitive domains: WAIS-R tasks - object assembly, picture arrangement.
Notes	Jadad score = 1. * Both groups trained on outcome measures - only difference being inclusion of cueing in group 1. Letter sent to first author for further information.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wykes 1999

Methods	Allocation: random - no further details. Blindness: raters blind to group assignment. Design: parallel. Setting: day treatment centre.
Participants	Diagnosis: schizophrenia (DSM-IV). History: evidence of cognitive difficulties, no evidence of organic brain disease, no plans to change medication during treatment. N=23. Sex: 15 M, 8 F. Age: mean ~ 38 years.
Interventions	1. Neurocognitive remediation (CR) - CR as set out in Delahunty and Morice's (1993) manual. "In each session, a variety of tasks were presented to practice each of the component processes in complex planning or problem solving" 2. Intensive Occupational Therapy (IOT) - including "relaxation, assertiveness training, life diary, comprehension of social information, and role playing." Both "1-hour daily sessions over 40 days" for 3 to 5 days per week.
Outcomes	Mental state: BPRS, PSE. General functioning: SBS. Self esteem: Rosenberg Self Esteem Scale. Leaving the study early.

Wykes 1999 (Continued)

Specific cognitive domains: Cognitive Flexibility (Hayling Sentence Completion Task, Trails, Response Inhibition, Controlled Oral Word Fluency Test, Stroop, WCST), Planning (Tower of London, Six Elements), Memory & Working Memory (Visual, Sentence, Digit, & Dual Span).

Notes
Jadad score = 1.
Used intention to treat analysis.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Mental state scales
BPRS - Brief Psychiatric Rating Scale
SBS - Social Behaviour Schedule
PSE - Present State Examination
Cognitive measure
CPT - Continuous Performance Test
IQ - Intelligence quotient
WCST - Wisconsin Card Sort Test
Diagnostic aid
DSM-III-R - Diagnostic Statistical Manual - version 3, revised
General
F - female
M - male

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Adams 1981	Allocation: case study, not randomised.
Ahmed 1994	Allocation: case series, not randomised.
Bellack 1990	Allocation: allocated sequentially, not randomly. Participants: people with schizophrenia. Interventions: cognitive rehabilitation versus contingent reinforcement and noncontingent reinforcement, no placebo.
Benedict 1989	Allocation: "randomly assigned" - no further details. Participants: 20 people with schizophrenia (DSM-III), mean age ~30 years (SD 5.6) taking mean of 709mg chlorpromazine per day. Interventions: cognitive rehabilitation (computerised attention-training tasks - progression through task hierarchy dependent on improved performance. 11 tasks - "speed of information processing & vigilance"; 14 tasks - "skills in memory, concept formation & problem solving") versus attention placebo (same tasks & attention as experimental group, but no progression criteria, equal time spent on each task) versus no treatment control. Duration of cognitive rehabilitation & attention placebo: 25 X 30 minute sessions. Outcomes: reaction time (+/- auditory distraction), specific reaction time tasks (total = 120 trials) - no usable data. Letter sent to first author for further information.
Benedict 1994	Allocation: "randomly assigned in sequence", quasi-randomised. Participants: people with schizophrenia. Interventions: cognitive rehabilitation versus no-treatment control.

Study	Reason for exclusion
Brenner 1994	Allocation: not randomised, describes Integrated Psychological Therapy.
Brown 1993	Allocation: randomised - no further description. Participants: 29 people with "chronic" schizophrenia (DSM-III-R), mean age ~ 50 years, mean length of stay 7 years. Interventions: Cognitive rehabilitation (Attention Process Training - "a hierarchical, multilevel treatment program designed to remediate attention deficits in brain-injured persons . . . primarily consisting of paper-and-pencil and auditory stimuli/motor response tasks" versus control group ("traditional one-to-one task-oriented occupational therapy program aimed at improving cognitive skills through task completion"). Duration of both interventions: 3 X 60 minute sessions per week for 12 weeks Outcomes: Digit span subscale of WAIS, visual span subscale of the revised memory scale, digit symbol subscale of WAIS, trail making subtests A & B of the Halstead Reitan Neurological Battery, Bay Area Functional Performance Evaluation (BaFPE). Unusual treatment of data from two groups - "[because] neither treatment modality was more effective than the other" . . . "statistical analysis was done on the combined score" of the two treatment groups. Letter sent to first author for further information.
Corrigan 1995	Allocation: randomised. Participants: people with schizophrenia and schizoaffective disorder. Interventions: two forms of cognitive rehabilitation, no control group.
Delahunty 1993	Allocation: case studies, not randomised.
Fine 1994	Allocation: case study, not randomised.
Finnell 1997	Allocation: not randomised.
Garety 1994	Allocation: not randomised.
Goldberg 1994	Allocation: not randomised, case study.
Granholm 1992	Allocation: not randomised, review.
Jaeger 1992a	Allocation: unclear, "controlled trial" of cognitive rehabilitation aborted because participants "found the program too demanding".
Kern 1994	Allocation: not randomised, review.
Konen 1991	Allocation: not randomised, review.
Michel 1998	Allocation: not randomised, case control.
Morice 1996	Allocation: unclear. Participants: people with schizophrenia Interventions: three different groups, all cognitive rehabilitation and mixed with other interventions.
Nisbet 1996	Allocation: non-randomised controlled study.
Perris 1992	Allocation: not randomised, descriptive paper.
Reed 1992	Allocation: not randomised, case series.
Spaulding 1986	Allocation: not randomised, case series.

Study	Reason for exclusion
Spaulding 1993a	Allocation: not randomised, case series.
Spaulding 1993b	Allocation: unclear. Participants: those with schizophrenia. Interventions: problem solving training versus aperception training, not cognitive rehabilitation.
Spaulding 1994	Allocation: not randomised, case study.
Summerfelt 1991	Allocation: randomised, two period crossover design. Participants: people with schizophrenia and schizoaffective disorder. Intervention: two types of cognitive rehabilitation, with and without monetary reward, no placebo group.
Tryssenaar 1994	Allocation: not randomised, case study.
Trzepacz 1991	Allocation: not randomised, case study.
Velligan 1996	Allocation: non-randomised controlled study.
Vollema 1995	Allocation: randomised - no further details. Participants: 34 people with schizophrenia (DSM-III-R), mean age ~32 (SD ~8), mean number hospitalisations ~3 (SD 2), mean duration of illness ~32 months (SD 43), mean time in hospital since last admission ~14 months (SD 20), negative symptoms mean PANSS subscale ~17 (SD 7), > 20 perseverative errors on WCST, mean 260mg chlorpromazine per day. Interventions: cognitive rehabilitation (instruction on WCST - involved 6 measurement (M) occasions; on M3 received instruction "on sorting rules . . . and on the occurrence of shifting sets" before being administered WCST - therefore, intervention = 1 session of instructions) versus cognitive rehabilitation (instruction on WCST and monetary incentive - involved 6 M occasions: on M3 received instruction "on sorting rules . . . and on the occurrence of shifting sets" before being administered WCST and 25 cents for each correct response - therefore, intervention = 1 session of instructions & monetary incentive) versus control (tested on WCST under standard conditions on 6 occasions). Outcomes: WCST - number of categories completed and number of perseverative errors immediately following intervention, 10 minutes and 14 days post intervention. Monetary incentive and instruction - "less effective than instruction alone" but no usable data. Letter sent first author for further information.
Wexler 1997	Allocation: randomised. Participants: people with schizophrenia. Interventions: two types of cognitive rehabilitation, no placebo group.
Young 1995	Allocation: randomised. Participants: people with chronic schizophrenia Interventions: two forms of cognitive rehabilitation, no placebo control.

DSM-III-R - Diagnostic Statistical Manual, third edition, revised.

SD - standard deviation.

PANSS - Positive and negative symptom scale

WCST - Wisconsin Card Sort Test

Characteristics of ongoing studies [ordered by study ID]

Borg 1998

Trial name or title	Unknown.
Methods	

Borg 1998 (Continued)

Participants	People with schizophrenia aged from 12 to 18.
Interventions	1. Cognitive rehabilitation and psychoeducation. 2. Psychoeducation alone.
Outcomes	Diagnostic interview, BPRS, Global Assessment Scale, Camberwell Family Interview, Achenbach's Child Behavior Checklist, and neuropsychological tests of language, attention, memory, and information processing.
Starting date	
Contact information	Dr Nancy E Borg National Centre for Child and Adolescent Psychiatry Research Department Sognsvannsvn. 53-67 P.B. 26 Vinderen N-0319 Oslo Norway. e-mail: nancyb@psykiatri.uio.no Telefax: +47 22 92 08 02
Notes	Allocation: randomised. Funded by: Norwegian Council for Research

Jaeger 1992b

Trial name or title	Paper states that cognitive rehabilitation is "now undergoing controlled examination" - no further details
Methods	
Participants	Unknown.
Interventions	Unknown.
Outcomes	Unknown.
Starting date	Unknown.
Contact information	Unknown.
Notes	

DATA AND ANALYSES

Comparison 1. COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mental state: Average BPRS (end-point score, high=poor)	1	54	Mean Difference (IV, Fixed, 95% CI)	-0.90 [-2.93, 1.13]
2 Leaving the study early	2	84	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.0 [0.19, 5.33]
3 Specific cognitive domains: 1a. Attention	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
3.1 right letter detection	1	54	Mean Difference (IV, Fixed, 95% CI)	6.60 [-11.67, 24.87]
3.2 total percent correct	1	54	Mean Difference (IV, Fixed, 95% CI)	3.20 [-6.04, 12.44]
4 Specific cognitive domains: 1b. Attention - wrong letter detection (skewed data)			Other data	No numeric data
5 Specific cognitive domains: 2a. Memory - logical memory (high=good)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
5.1 immediate	1	24	Mean Difference (IV, Fixed, 95% CI)	7.30 [-3.58, 18.18]
5.2 delayed	1	24	Mean Difference (IV, Fixed, 95% CI)	8.40 [-1.04, 17.84]
6 Specific cognitive domains: 2b. Memory - visual reproduction (high=good)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
6.1 immediate	1	24	Mean Difference (IV, Fixed, 95% CI)	9.5 [-8.31, 27.31]
6.2 delayed	1	24	Mean Difference (IV, Fixed, 95% CI)	15.30 [-0.04, 30.64]
7 Specific cognitive domains: 3a. WAIS subtests - object assembly	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
8 Specific cognitive domains: 3b. WAIS subtests - picture arrangement (skewed data)			Other data	No numeric data

Analysis 1.1. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE, Outcome 1 Mental state: Average BPRS (endpoint score, high=poor).

Study or subgroup	Treatment		Control		Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
	N	Mean(SD)	N	Mean(SD)			
Medalia 1998	27	27.2 (4)	27	28.1 (3.6)		100%	-0.9[-2.93,1.13]
Total ***	27		27			100%	-0.9[-2.93,1.13]
Heterogeneity: Not applicable							
					Favours Treatment	-10	Favours Control

Study or subgroup	Treatment		Control		Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI				
	N	Mean(SD)	N	Mean(SD)							
Test for overall effect: Z=0.87(P=0.38)											
					-10	-5	0	5	10		
					Favours Treatment			Favours Control			

**Analysis 1.2. Comparison 1 COGNITIVE REHABILITATION versus
PLACEBO COGNITIVE PROCEDURE, Outcome 2 Leaving the study early.**

Study or subgroup	Treatment		Control		Peto Odds Ratio Peto, Fixed, 95% CI	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
	n/N		n/N				
Medalia 1998	3/30		3/30			100%	1[0.19,5.33]
Tompkins 1995	0/12		0/12				Not estimable
Total (95% CI)	42		42			100%	1[0.19,5.33]
Total events: 3 (Treatment), 3 (Control)							
Heterogeneity: Not applicable							
Test for overall effect: Not applicable							
Favours Treatment 0.1 0.2 0.5 1 2 5 10 Favours Control							

**Analysis 1.3. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO
COGNITIVE PROCEDURE, Outcome 3 Specific cognitive domains: 1a. Attention.**

Study or subgroup	Treatment		Control		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI		Fixed, 95% CI
1.3.1 right letter detection							
Medalia 1998	27	173.6 (30.4)	27	167 (37.7)		100%	6.6[-11.67,24.87]
Subtotal ***	27		27			100%	6.6[-11.67,24.87]
Heterogeneity: Not applicable							
Test for overall effect: Z=0.71(P=0.48)							
1.3.2 total percent correct							
Medalia 1998	27	86.5 (15.6)	27	83.3 (18.9)		100%	3.2[-6.04,12.44]
Subtotal ***	27		27			100%	3.2[-6.04,12.44]
Heterogeneity: Tau ² =0; Chi ² =0, df=0(P<0.0001); I ² =100%							
Test for overall effect: Z=0.68(P=0.5)							
Test for subgroup differences: Chi ² =0.11, df=1 (P=0.74), I ² =0%							
Favours Treatment -10 -5 0 5 10 Favours Control							

**Analysis 1.4. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE,
Outcome 4 Specific cognitive domains: 1b. Attention - wrong letter detection (skewed data).**

Specific cognitive domains: 1b. Attention - wrong letter detection (skewed data)				
Study	GROUP	mean	SD	n
Medalia 1998	Cognitive rehabilitation	16.0	16.9	27
Medalia 1998	Control	25.1	21.7	27

Analysis 1.5. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE, Outcome 5 Specific cognitive domains: 2a. Memory - logical memory (high=good).

Analysis 1.6. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE, Outcome 6 Specific cognitive domains: 2b. Memory - visual reproduction (high=good).

Analysis 1.7. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE, Outcome 7 Specific cognitive domains: 3a. WAIS subtests - object assembly.

Analysis 1.8. Comparison 1 COGNITIVE REHABILITATION versus PLACEBO COGNITIVE PROCEDURE, Outcome 8 Specific cognitive domains: 3b. WAIS subtests - picture arrangement (skewed data).

Specific cognitive domains: 3b. WAIS subtests - picture arrangement (skewed data)				
Study	GROUP	mean	SD	n
Tompkins 1995	Cognitive rehabilitation	9.8	3.1	12
Tompkins 1995	Control	7.4	4.1	12

Comparison 2. COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mental state: 1. Average BPRS (endpoint score, high=poor)	1	30	Mean Difference (IV, Fixed, 95% CI)	-2.5 [-10.64, 5.64]
2 Mental state: 2. Average PSE (endpoint scores, data skewed, high=poor)			Other data	No numeric data
3 Behaviour: Average SBS (endpoint scores, data skewed, high=poor)			Other data	No numeric data
4 Leaving the study early	1	33	Odds Ratio (M-H, Fixed, 95% CI)	3.21 [0.30, 34.64]
5 Self esteem: Average Rosenberg score (low=poor)	1	29	Mean Difference (IV, Fixed, 95% CI)	6.30 [1.07, 11.53]
6 Specific cognitive domains: 1a. Cognitive flexibility	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
6.1 controlled oral word fluency test	1	30	Mean Difference (IV, Fixed, 95% CI)	-3.30 [-12.68, 6.08]
6.2 Stroop neuropsychological screening test	1	30	Mean Difference (IV, Fixed, 95% CI)	4.80 [-9.88, 19.48]
7 Specific cognitive domains: 1b. Cognitive flexibility (skewed data)			Other data	No numeric data
7.1 Hayling sentence completion task			Other data	No numeric data
7.2 Response inhibition			Other data	No numeric data
7.3 Trails			Other data	No numeric data
7.4 Wisconsin card sorting test			Other data	No numeric data
8 Specific cognitive domains: 2a. Memory tests	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
8.1 sentence span	1	24	Mean Difference (IV, Fixed, 95% CI)	0.10 [-0.74, 0.94]
8.2 visual span	1	24	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-1.51, 1.31]
9 Specific cognitive domains: 2b. Memory tests - dual span	1	26	Mean Difference (IV, Fixed, 95% CI)	9.90 [-2.74, 22.54]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
10 Specific cognitive domains: 3a. Planning - Six Elements	1	30	Mean Difference (IV, Fixed, 95% CI)	1.0 [-0.00, 2.00]
11 Specific cognitive domains: 3b. Planning - Tower of London			Other data	No numeric data
12 Specific cognitive domains: 4. WAIS subtest - digit span	1	30	Mean Difference (IV, Fixed, 95% CI)	0.40 [-1.85, 2.65]

Analysis 2.1. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 1 Mental state: 1. Average BPRS (endpoint score, high=poor).

Analysis 2.2. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 2 Mental state: 2. Average PSE (endpoint scores, data skewed, high=poor).

Mental state: 2. Average PSE (endpoint scores, data skewed, high=poor)					
Study	GROUPS	mean	SD	n	
Wykes 1999	Cognitive rehabilitation	14.2	10.5	15	
Wykes 1999	Occupational therapy	23.1	15.2	15	

Analysis 2.3. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 3 Behaviour: Average SBS (endpoint scores, data skewed, high=poor).

Behaviour: Average SBS (endpoint scores, data skewed, high=poor)					
Study	GROUP	mean	SD	n	
Wykes 1999	Cognitive rehabilitation	12.4	8.2	16	
Wykes 1999	Occupational therapy	12.9	9.5	15	

Analysis 2.4. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 4 Leaving the study early.

Analysis 2.5. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 5 Self esteem: Average Rosenberg score (low=poor).

Analysis 2.6. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 6 Specific cognitive domains: 1a. Cognitive flexibility.

Analysis 2.7. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 7 Specific cognitive domains: 1b. Cognitive flexibility (skewed data).

Specific cognitive domains: 1b. Cognitive flexibility (skewed data)				
Study	GROUP	mean	SD	n
Hayling sentence completion task				
Wykes 1999	Cognitive rehabilitation	6.3	4.8	17
Wykes 1999	Occupational therapy	5.4	6.3	15

Specific cognitive domains: 1b. Cognitive flexibility (skewed data)				
Study	GROUP	mean	SD	n
Response inhibition				
Wykes 1999	Cognitive rehabilitation	555.0	375.0	14
Wykes 1999	Occupational therapy	380.0	175.0	15
Trails				
Wykes 1999	Cognitive rehabilitation	20.9	14.4	15
Wykes 1999	Occupational therapy	20.1	14.4	15
Wisconsin card sorting test				
Wykes 1999	Cognitive rehabilitation	2.9	1.2	15
Wykes 1999	Occupational therapy	2.2	1.5	15

Analysis 2.8. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 8 Specific cognitive domains: 2a. Memory tests.

Analysis 2.9. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 9 Specific cognitive domains: 2b. Memory tests - dual span.

Analysis 2.10. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 10 Specific cognitive domains: 3a. Planning - Six Elements.

Analysis 2.11. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 11 Specific cognitive domains: 3b. Planning - Tower of London.

Specific cognitive domains: 3b. Planning - Tower of London					
Study	GROUPS	mean	SD	n	
Wykes 1999	Cognitive rehabilitation	8.2	4.7	15	
Wykes 1999	Occupational therapy	7.0	6.2	15	

Analysis 2.12. Comparison 2 COGNITIVE REHABILITATION versus OCCUPATIONAL THERAPY, Outcome 12 Specific cognitive domains: 4. WAIS subtest - digit span.

WHAT'S NEW

Date	Event	Description
23 October 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Robyn Hayes - protocol development, searching, study selection, data extraction and assimilation, report writing.

John McGrath - protocol development, searching, study selection, data extraction and assimilation, report writing.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Queensland Health, Australia.
- University of Queensland, Australia.

External sources

- No sources of support supplied

NOTES

Cochrane Schizophrenia Group internal peer review complete (see Module).

External peer review scheduled.

INDEX TERMS

Medical Subject Headings (MeSH)

Attention; Cognition Disorders [etiology] [*rehabilitation]; Memory; Mental Processes; Randomized Controlled Trials as Topic; Schizophrenia [complications] [*rehabilitation]

MeSH check words

Humans