Evidenced-based cognitive rehabilitation for persons with multiple sclerosis: a review of the literature
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CRD summary
The review concluded that more methodologically rigorous research was required to determine the effectiveness and efficacy of various cognitive rehabilitation interventions for people with multiple sclerosis. The authors' conclusion is appropriate given the limited evidence available.

Authors' objectives
To evaluate evidence-based cognitive rehabilitation for people with multiple sclerosis (MS).

Searching
MEDLINE, PsycINFO and CINAHL were searched. Search terms were reported. Reference lists of relevant articles were scanned for additional studies. Only studies published in English were eligible for inclusion.

Study selection
Studies that evaluated cognitive rehabilitation interventions in adult participants with a diagnosis of MS were eligible for inclusion. Studies that were not peer-reviewed or did not report empirical outcomes were excluded.

Cognitive rehabilitation therapy in the included studies used various techniques, these included: computer-assisted programmes; calendars, notebooks, diaries and lists; metacognitive therapy; generation and repetition effect; story memory techniques; face-name techniques; cognitive training; neuropsychotherapy; communication skills; and psychoeducation. Participants in the included studies had various stages of MS, which included relapsing-remitting, primary progressive, secondary progressive or were described as clinically defined. Some control groups included healthy participants. Outcomes were assessed using a variety of tools and evaluated attention, memory, executive function, verbal learning, non-specific or multiple skills and quality of life (QoL).

The authors stated neither how papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
Studies were classified based on study design using published criteria of the American Association of Neurologic Surgeons and Cicerone. Studies were classified into one of four classes: Class I was a well designed, prospective, randomised controlled trial (RCT) and Class IV was evidence from uncontrolled studies, case series, case reports or expert opinion.

Two reviewers independently assessed validity; differences were resolved through recourse to a third reviewer.

Data extraction
Data were extracted independently by at least two reviewers who used predetermined criteria.

Methods of synthesis
Studies were grouped by outcome category (attention, executive functioning, learning and memory). Studies of non-specific rehabilitation interventions were grouped separately and discussed in a narrative synthesis.

Results of the review
Sixteen studies (n=733) were included in the review: four Class I, five Class II, two class III and five Class IV studies.

Effects on attention (four studies): Mixed results were reported. One study found a significant improvement in alertness and divided attention for people who received specific training compared to non-specific training, and for cognitive...
functioning in everyday life and QoL for up to nine weeks. Two studies (one RCT) reported no improvements for attention or memory, subjectively reported cognitive impairment, mood and QoL. Qualitative improvements for attention remediation were reported for a treatment group in a further study, but no supporting quantitative evidence was reported.

**Effects on executive functioning (two studies):** One uncontrolled study reported significant improvements for participants with relapsing-remitting MS after an intervention compared to participants with secondary progressive MS. Another study found no significant differences for executive function between groups.

**Effects on learning and memory (nine studies):** In one RCT, participants who had moderate to severe learning impairments showed a significant improvement in learning abilities with a modified memory technique intervention compared to control, although there were only slight improvement for participants with mild learning impairments. Self-report for memory function was significantly improved for participants in the intervention group. A case study also reported that the participant showed improvements in learning and memory scales after a modified memory technique intervention. One study reported that specific memory training was superior to non-specific training and no training. Six studies reported there were no statistically significant differences between groups in terms of improvement of learning and memory.

**Non-specific Cognitive Rehabilitation Interventions (four studies):** One RCT reported significant improvement in depression scores for the intervention group compared with the control group, but not for other cognitive measures. One uncontrolled study reported improvements on visual spatial memory and visuomotor speed as well as depression at short-term follow-up. Long-term follow-up showed only sustained improvements in visuospatial memory and depression, but there were differences between groups at baseline. One study reported that participants experienced an improvement in cognition and a reduction in the number of problems reported after the intervention. One case study did not report outcomes sufficiently to enable evaluation of effectiveness.

**Authors’ conclusions**
More methodologically rigorous research was required to determine the effectiveness and efficacy of various cognitive rehabilitation interventions.

**CRD commentary**
Inclusion criteria were clearly, though broadly, defined for interventions, participants, outcomes and study design. Several relevant sources were searched, but no attempts were made to minimise language and publication biases. Search dates were not reported. Appropriate methods were used to minimise reviewer error and bias in the assessment of validity and extraction of data, but it was unclear whether similar steps were taken in the selection of studies. Validity was assessed using appropriate criteria and results of the assessment were reported. A narrative synthesis was appropriate given the differences between studies. However, although some characteristics of the included studies was presented in tables, findings were reported without supporting data or levels of statistical significance and this meant that it was not possible to verify the findings reported in the review. The authors appropriately described the limitations of the review, which included differences between studies and small sample sizes. The authors’ conclusion was appropriate given the limited evidence available.

**Implications of the review for practice and research**
**Practice:** The authors stated that use of a modified story memory technique intervention and a self generation intervention can be recommended to improve learning and memory for people with MS.

**Research:** The authors stated that further research was needed. The should include larger sample sizes, sufficient detail of interventions to enable implementation and evaluation and objective assessment of pre-treatment cognitive skills, and use empirically supported cognitive rehabilitation protocols and replicate interventions that have shown effectiveness in other populations exhibiting cognitive impairments. Future focus should be on interventions that are functional and contextual in nature and directly address generalisation during treatment and should include outcomes that assess global functioning to determine impact of the interventions for people's daily lives. In addition, information exchange should be encouraged between clinical researchers and clinical practitioners.
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