Efficacy of executive function interventions after stroke: a systematic review

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CRD summary
The review concluded that limited evidence suggested that stroke patients may possibly benefit from specific executive function training and learn compensatory strategies to reduce the consequences of executive impairments. Despite some review limitations, the authors' conclusions were suitably cautious in reflecting the evidence available and appear likely to be reliable.

Authors' objectives
To determine whether executive function interventions are more effective than no intervention or alternative interventions in improving executive functions and functional abilities in the acute, subacute and chronic stages of stroke recovery.

Searching
MEDLINE, CINAHL, PsycINFO, OTseeker, Web of Science and The Cochrane Library were searched to January 2011 for studies published in English or French; search terms were reported. Reference lists of retrieved studies were examined.

Study selection
Randomised controlled trials (RCTs), pre-post, case-control, cohort and case studies were eligible. Studies had to be in adults (≥18 years) experiencing executive function deficits after ischaemic or haemorrhagic stroke (including ruptured aneurysm). Eligible studies needed at least 50% of the population to be stroke patients (or report stroke patient data separately). Interventions had to be cognitive but could not be directed exclusively at attention deficits. Outcomes needed to measure some aspect of executive functioning through neuropsychological/psychological tests or performance of daily activities.

All studies were of patients with chronic stoke (usually more than one year post-stroke) except for one study of patients with subacute stroke. Interventions varied: around one third of studies used electronic cueing with a paging system and around a third used no treatment for the control group; some interventions targeted working memory and others targeted problem solving. Outcome types varied and included laboratory-based tasks, neuropsychological tests and self-reported measures of instrumental activities of daily living.

The authors did not state how many reviewers selected studies.

Assessment of study quality
RCTs were appraised independently by two reviewers using the PEDro scale (10 criteria); studies with scores below 4 were classed as poor quality, those that scoring 4 or 5 were fair quality and those that scored 6 or more were high quality. Any discrepancies were resolved by discussion. The other studies were evaluated using the Newcastle-Ottawa Scale (no scoring was performed).

Data extraction
Results of individual studies were extracted as reported.

The authors did not state how many reviewers extracted data.

Methods of synthesis
After considering methodological and clinical heterogeneity across studies, the authors performed a narrative synthesis with results grouped by stage of stroke recovery and type of intervention. Levels of evidence (incorporating trial quality; details defined in the paper) were used to summarise.

Results of the review
Ten studies were included (186 participants): two RCTs (one with 103 participants and the other with 18 participants),
one randomised cross-over trial, four case studies, two pre-post studies and one pre-post controlled group study.

**Subacute stroke**: Limited evidence from one pre-post controlled group study (of nine aneurysm rupture patients and nine controls) suggested computerised dual-task training was more effective than no intervention at improving specific executive functions (such as ability to coordinate two actions).

**Chronic stroke**: Limited evidence from a RCT of fair quality (103 participants of which 55 had had a stroke) supported use of working memory training compared to no intervention for the remediation of working memory in chronic stroke. Limited evidence from four studies (one RCT, two pre-post studies and one case study) suggested that strategy training in problem solving using various formats was more effective than no intervention at improving executive functioning and possibly everyday functional abilities. Limited evidence from one RCT suggested that use of a paging system was more effective than no intervention to improve functional tasks. Limited evidence from a single subject study suggested that a pager was more effective than a task-specific checklist in achieving specific functional goals.

There were no studies of patients with acute stroke.

**Authors' conclusions**
Limited evidence suggested that stroke patients may possibly benefit from specific executive function training and learn compensatory strategies to reduce the consequences of executive impairments.

**CRD commentary**
The review addressed a clear question and was supported by clear and reproducible eligibility criteria. Relevant electronic databases were searched. The restriction to published studies in English or French risked language and publication biases and it was possible that some relevant studies were missed. Suitable methods were employed to reduce risks of reviewer error and bias when assessing study quality; the authors did not report on whether such methods were used when selecting studies and extracting data. Study quality was assessed and the findings were used in interpreting the results of the review. Sufficient study details were provided and an appropriate narrative synthesis of the data was undertaken.

Despite some review limitations, the authors' conclusions were suitably cautious in reflecting the evidence available and appear likely to be reliable.

**Implications of the review for practice and research**
**Practice**: The authors stated that it was not possible to give specific intervention recommendations to clinicians based on the available evidence.

**Research**: The authors stated a need for studies to compare executive function interventions with conventional therapy or an alternative intervention. Further research was needed in acute and subacute stroke where the impact of treatment was potentially great and where few studies had been undertaken. Studies were needed on combination approaches.

**Funding**
Fonds de la recherche en santé du Quebec; Canadian Stroke Network.

**Bibliographic details**

**PubMedID**
22436364

**DOI**
10.1310/tsr1902-158

**Original Paper URL**
http://thomasland.metapress.com/content/h0w145k980j46109/
Indexing Status
Subject indexing assigned by NLM

MeSH
Cognition /physiology; Evidence-Based Medicine /standards; Executive Function /physiology; Humans; Memory, Short-Term /physiology; Stroke /physiopathology /rehabilitation

AccessionNumber
12012019409

Date bibliographic record published
22/05/2012

Date abstract record published
17/10/2012

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.