CRD summary
The authors concluded that metacognitive strategy instruction should be used to improve everyday functional problems in young to middle-aged adults with traumatic brain injury. Further research was required. Incomplete reporting of review methods and study quality, and concerns about individual studies results and meta-analysis methods undermined the reliability of the authors' conclusions.

Authors' objectives
To evaluate the effects of interventions focused on executive functions (problem solving, planning, organisation and multitasking) in patients with traumatic brain injury.

Searching
MEDLINE, PsychINFO, CINAHL and ERIC were searched from inception through 2004 for studies published in English. Search terms were reported. Reference lists of published reviews and books were screened.

Study selection
Studies of interventions aimed at improving executive functions (problem solving, planning, organisation and multitasking) in patients with traumatic brain injury were eligible for inclusion if they reported objective outcomes. Single case reports and single-subject design studies were included. Studies of pharmacological interventions were excluded. Studies focused on general self-awareness or self-regulated attention, behaviour or memory and learning were reported in other reviews (see Other Publications of Related Interest). The review assessed immediate impairment outcomes, immediate activities and participation outcomes, maintenance and generalisation effects.

All of the included studies were prospective. Studies varied in the area of executive function that was targeted. Most studies evaluated metacognitive strategy instruction (MSI) interventions. Control interventions, where these existed, included other active interventions and no treatment. Most studies evaluated individual treatment. Duration of treatment varied from 30 minutes to 48 hours; total treatment duration averaged 12 hours. Where reported, most studies were in young to middle-aged patients with chronic disabilities. Injury severity ranged from mild to severe and very severe. Only one study was in children. Approximately twice as many men as women were included. The included studies assessed up to 17 different outcome measures.

More than one reviewer examined the identified studies; it was unclear whether they selected studies independently. The final document was reviewed by research and clinical experts who suggested study additions and deletions.

Assessment of study quality
Studies were graded using the hierarchy of study design described by the Quality Standards Subcommittee of the American Academy of Neurology (AAN) 1999 (class I were well-designed randomised controlled trials, class II well-designed observational studies with concurrent control or single-subject multiple baselines across subjects and class III were case series, case reports, studies with historical controls and expert opinion). Randomised controlled trials (RCTs) were assessed using criteria described by the AAN; the maximum possible score was 8 points.

The authors did not state how the validity assessment was performed.

Data extraction
One reviewer coded the studies and either extracted available data or recorded whether the information was provided; this was checked by a second review for eight of the 15 studies. Effect sizes (ES) were calculated from reported means and standard deviations (SD) using both Cohen's d and Hedge's g methods. Some studies reported changes from pre-
post-treatment within a group and others reported between-group differences.

The authors did not state how data were extracted.

**Methods of synthesis**
The studies were grouped by outcome. Effect sizes for each study were presented in tables grouped by type of outcome. Pooled effect sizes with standard deviations (SDs) were calculated separately for all experimental treatments and for control treatments for immediate impairment outcomes. Analyses were aimed at evaluating the effect of MSI on impairments and comparing MSI with control interventions. Pooled effect sizes were calculated using a fixed-effects model for a subgroup of RCTs that evaluated step-by-step MSI interventions; studies were weighted by the quality score and the variance.

**Results of the review**
Fifteen studies were included (n=268): five were class I (RCTs), three were class II and seven were class III. Sample size ranged from 1 to 60.

**Class I evidence:**
The quality scores of the five RCTs of step-by-step MSI ranged from 6 to 7.5 out of 8.

For immediate impairment outcomes, there was no statistically significant difference in Hedge's g effect size between MSI (mean 0.41, 95% CI 0.31 to 0.50) and control interventions (mean 0.37, 95% CI 0.26 to 0.49). There was no heterogeneity within either treatment group. Pre-post treatment changes within each group were both statistically significantly greater than zero (p<0.05).

For immediate activity and participation outcomes, there was no statistically significant difference in Hedge's g effect size between MSI (mean 0.57, 95% CI 0.48 to 0.67) and control interventions (mean 0.38, 95% CI 0.27 to 0.50). There was no heterogeneity within either treatment group. Pre-post treatment changes within each group were both statistically significantly greater than zero (p<0.05).

**All evidence:**
Sixty six effect sizes were calculated for immediate impairment outcomes. The pooled Hedge's g effect size was 0.83 (SD 0.88, range 0.04 to 4.47) for all interventions and 0.46 (SD 0.40, range 0.04 to 1.50) for control groups. For activity and participation outcomes there were 34 effect sizes with a pooled Hedge's g of 0.97 (SD 0.95) for changes after the intervention.

Seven studies reported positive improvements for impairment outcomes, nine reported positive maintenance effects and nine reported generalisation effects.

**Authors' conclusions**
MSI should be used to improve everyday functional problems in young to middle-aged adults with traumatic brain injury. Further research was required.

**CRD commentary**
The review question was stated. Inclusion criteria were defined for participants and interventions; criteria for study design were broad and no inclusion criteria were specified for outcomes. Several relevant sources were searched, but no attempts were made to minimise publication and language biases. Details of review methods were not fully reported, so it was unclear whether attempts were made to minimise reviewer error and bias. Some study characteristics were adequately summarised, but study designs were not always clear and sample sizes of individual studies were not reported. The authors stated that 90% of studies reported p values, but they failed to report any in this review. Studies were classified according to a hierarchy of evidence, but only the RCTs were quality scored and full details were not reported, which made it difficult to comment independently on the reliability of the evidence. Studies were pooled using meta-analysis, but details of methods used for analyses were not always clear. Incomplete reporting of review benefits and limitations of individual studies was reported, which made it difficult to assess the overall quality of the evidence. Further research was required.
methods and study quality and concerns about individual study results and meta-analysis methods undermined the reliability of the authors' conclusions.

**Implications of the review for practice and research**

**Practice:** The authors stated that MSI interventions should be used with young to middle aged adults with traumatic brain injury for difficulties with problem solving, planning and organisation.

**Research:** The authors stated that there was a need for research to evaluate interventions in the following types of patients: brain injured children, including school-based interventions; college-aged, minority and impoverished groups, combat veterans and older adults; and patients in the acute and subacute stages of brain injury. Future studies should adequately describe patients (including comorbidity), provide sufficient data to permit calculation of an effect size, be theoretically based and assess maintenance effects.

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**Additional Data URL**

www.ancds.org/practice.shtml#TBI The authors stated that additional information was available at this web site but when accessed on 1/4/09 the supplementary tables did not appear to include data extraction tables.

**Other publications of related interest**


**Indexing Status**

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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.