The impact of bilateral therapy on upper limb function after chronic stroke: a systematic review

Latimer CP, Keeling J, Lin B, Henderson M, Hale LA

CRD summary
The review concluded there was some evidence that bilateral therapy improved upper limb function in adults with first-time chronic stroke, although the evidence was ambiguous and more research was needed. These conclusions broadly reflect the limited evidence available and appear likely to be reliable.

Authors' objectives
To determine the effectiveness of bilateral therapy interventions for improving upper limb function in adults with a range of upper limb activity limitations due to a first-time chronic stroke.

Searching
PubMed, EMBASE, AMED, CINAHL, Web of science, and the Cochrane Library were searched for full-text articles published in English from 1996 to 2008; search terms were reported. Reference lists of included studies were scanned. Collaborators were contacted to identify studies in press.

Study selection
Effectiveness studies of bilateral upper limb interventions for adults (aged 18 or over) diagnosed with a chronic first stroke (occurring more than six months prior to the intervention) were eligible for inclusion. Studies had to report a validated outcome measure of upper limb function.

The mean age of included participants ranged from 55 to 64 years; most were men. Most stroke lesions were located in the right hemisphere of the brain. The mean post-stroke period ranged from nine to 98 months, although all participants had some degree of voluntary movement in their affected shoulder. A range of interventions were used; bilateral arm training with rhythmic auditory cueing (BATRAC) was the most common intervention. Treatment durations ranged from six days to eight weeks; total training times ranged from 315 to 840 minutes (all BATRAC studies were 360 minutes). Control treatments included training, exercises, and motor practice. Several types of functional outcome measure were used; the Fugl-Meyer assessment was used most frequently.

Two reviewers independently selected studies for inclusion, with disagreements resolved via a third reviewer.

Assessment of study quality
The quality index (Downs & Black, 1998) was used to assess study quality, with a score out of 27 points. It appeared that this index evaluated criteria on the use of a power calculation, use of intention-to-treat analysis, presence of control groups and randomisation, and degree of blinding.

Two reviewers independently assessed study quality, with disagreements resolved by a third.

Data extraction
Two reviewers independently extracted data.

Methods of synthesis
A narrative synthesis was presented, grouped by intervention.

Results of the review
Nine studies were included in the review; five were cohort studies (n=82 patients), three were randomised controlled trials (RCTs, n=65 patients), and one was a non-randomised controlled study (n=20 patients). Quality index scores ranged from 18 to 25 out of 27 points.
Bilateral arm training with rhythmic auditory cueing (BATRAC): Three cohort studies reported statistically significant (pre-post) functional improvements, although an RCT using the same dose found no significant differences between groups, nor did a cohort study which used a modified BATRAC protocol. One RCT reported significant functional improvements following six days of training with a non-mechanical bilateral task. Further results were reported.

**Authors' conclusions**
There was some evidence that bilateral therapy improved function in adults after chronic stroke, although the evidence was ambiguous. More RCTs were needed.

**CRD commentary**
The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify relevant studies were undertaken by searching databases and checking references. However, the restriction to studies published in English meant relevant studies may have been missed, and the review may have been subject to language or publication bias. Suitable methods were employed to reduce the risks of reviewer error and bias throughout the review process.

Study quality was assessed and was used in interpreting the effectiveness results of the review. Sufficient study details were provided. An appropriate narrative synthesis of the data was undertaken. Most studies had small sample sizes and no control groups.

Although it was possible that relevant studies may not have been identified, the authors' conclusions broadly reflect the limited evidence available, and appear likely to be reliable.

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

**Practice:** The authors stated that BATRAC may be a suitable bilateral intervention for the recovery of upper limb function in adults with chronic stroke.

**Research:** The authors stated that adequately powered RCTs were needed to establish the most effective intervention and optimal protocol for upper limb rehabilitation in patients with chronic stroke.

**Funding**
Not reported.

**Bibliographic details**

**PubMedID**
20156045

**DOI**
10.3109/09638280903483877

**Original Paper URL**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adult; Arm /physiopathology; Chronic Disease; Humans; Recovery of Function; Stroke /rehabilitation; Task Performance and Analysis; Treatment Outcome
Accession Number
12010005492

Date bibliographic record published
10/11/2010

Date abstract record published
30/11/2011

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.