Electrical stimulation in cerebral palsy: a review of effects on strength and motor function

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CRD summary
This review evaluated the efficacy of electrical stimulation in children with cerebral palsy. The authors concluded that the evidence is insufficient to provide conclusive evidence for or against the use of neuromuscular electrical stimulation or threshold electrical stimulation. Despite limitations in the review methodology, the authors' conclusion is likely to reflect the evidence available in this field.

Authors' objectives
To assess the efficacy of electrical stimulation in strengthening or improving the motor function of children with cerebral palsy (CP).

Searching
MEDLINE (1966 to 2003), CINAHL (1982 to 2003), AMED (1985 to 2003) and PEDro (1966 to 2003) were searched using the terms reported. The reference lists of retrieved articles were also checked. Abstracts, letters, commentaries and review articles were excluded, with the exception of one study reported in a letter. The search was limited to articles written in English.

Study selection
Study designs of evaluations included in the review
Studies of any design were eligible for inclusion.

Specific interventions included in the review
Studies of electrical stimulation as a primary intervention to improve strength or motor performance were eligible for inclusion. The included studies evaluated neuromuscular electrical stimulation (NMES) or threshold electrical stimulation (TES), generally in addition to usual physiotherapy (with or without daily stretching) or intensive physiotherapy. Frequencies of stimulation were generally in the range of 30 to 45 Hz, pulse durations were 100 to 300 microseconds, and the time to reach desired intensity ranged from 0.5 to 2 seconds. The contraction or relaxation times varied, as did the intensity and duration of treatment. Further details were reported.

Participants included in the review
Studies of participants with CP were eligible for inclusion. In the included studies, the type of CP was diplegia, hemiplegia or quadriplegia, and the age of the participants ranged from 8 months to 18 years.

Outcomes assessed in the review
Explicit inclusion criteria for the outcomes were not reported. The included studies evaluated impairment (problems in body structures or functions) and activity limitations (difficulties in performing tasks).

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors used the American Academy for Cerebral Palsy and Developmental Medicine (AACPDM) system to grade study designs according to level of evidence (levels I to V), and the studies were rated as strong, moderate or weak, accordingly. Three reviewers independently used the AACPDM system to classify levels of evidence. Final decisions on grading were made by group discussion.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Data were extracted on outcome measures and whether they showed an increase, decrease or non significant change following the intervention.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative, grouped by level of evidence.

How were differences between studies investigated?
Differences were apparent from the tabulation of the studies, and were discussed in the narrative.

Results of the review
Eighteen studies (n=235) were included in the review: 6 randomised controlled trials, 4 uncontrolled/cohort studies and 8 case series.

NMES (12 studies).
One study found no improvement following stimulation, one reported inconclusive results, and ten reported at least one improvement in function and/or strength following stimulation.

Three studies provided level I evidence, one level III, two level IV and five level V. Level I studies reported fewer positive outcomes than uncontrolled studies and case reports.

TES (6 studies).
Two studies reported at least one statistically significant improvement following stimulation, two reported no significant effect, and two case series reported improvement.

Three studies provided level I evidence, one level IV and two level V.

Authors' conclusions
There is more evidence to support the use of NMES than TES. However, the findings should be interpreted with caution as the studies had insufficient power to provide conclusive evidence for or against the use of these modalities.

CRD commentary
The review addressed a clear research question, but inclusion criteria were defined only for the participants and intervention. Several relevant sources were searched for relevant studies. However, the search was restricted to articles written in English, which increases the risk of language bias, and relevant studies might have been missed. The authors stated that letters were not eligible for inclusion, but they allowed the inclusion of one known study published in a letter. This might have introduced selection bias, although this factor will not have impacted on the conclusion of the review. Methods used to minimise reviewer bias and error in the study selection and data abstraction processes were not reported. The included studies were graded according to a classification system developed for this particular field, which adequately reflects the quality of research in this field.

The details provided of the individual studies indicated methodological and clinical variations across the included studies, thus the decision to combine them in a narrative was appropriate. The authors also provided a thorough discussion of the apparent limitations of the evidence for the use of electrical stimulation in CP: for example, the scarcity of well-conducted studies, problems with recruiting adequate numbers of participants and reporting of methodology, lack of valid outcome measures and variations in stimulation parameters. Despite the limitations in the review process, the authors' cautious conclusion is appropriate and likely to reflect the evidence in this field.
Implications of the review for practice and research

Practice: The authors stated that it is difficult to support definitively or discard the use of electrical stimulation in children with CP.

Research: The authors stated that further studies using rigorous study designs and follow-up, larger sample sizes and homogeneous patient groups, are needed for the unequivocal support of the use of electrical stimulation.

Bibliographic details

PubMedID
14995090

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Cerebral Palsy /physiopathology /rehabilitation; Child; Child, Preschool; Clinical Trials as Topic; Evidence-Based Medicine; Humans; Infant; Isometric Contraction /physiology; Motor Skills /physiology; Neuromuscular Junction /physiopathology; Range of Motion, Articular /physiology; Transcutaneous Electric Nerve Stimulation; Treatment Outcome

AccessionNumber
12004009314

Date bibliographic record published
30/09/2006

Date abstract record published
30/09/2006

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.