AOTA Evidence Briefs

Cerebral Palsy

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

CP #9

Electrical stimulation delivered at home by parents may reduce contractures in children with cerebral palsy

Hazlewood, M. E., Brown, J. K., Rowe, P. J., & Salter, P. M. (1994). The use of therapeutic electrical stimulation in the treatment of hemiplegic cerebral palsy. *Developmental Medicine and Child Neurology*, *36*, 661–673.

Level: IB2b

Randomized (after matching pairs) controlled trial, two groups, less than 20 participants per condition, moderate internal validity, moderate external validity

Why research this topic?

Some researchers have reported successful use of electrical stimulation to improve muscle power and gait, and to reduce **spasticity** (see *Glossary*), in children with cerebral palsy. No studies have reported use of electrical stimulation to improve joint **range of motion** (see *Glossary*) in this population, though it has been tried with adults who have neuromuscular disorders. Children with cerebral palsy commonly show a reduced range of ankle "dorsiflexion" (bending of the foot upward), which often causes their gait pattern to deteriorate. Existing methods of treatment are surgery, splinting, casting, and physical therapy, all time consuming and expensive.

What did the researchers do?

Hazlewood, Brown, Rowe, and Salter (1994), variously affiliated with the Royal Hospital for Sick Children (Edinburgh, Scotland) and Queen Margaret College (Edinburgh), studied the effects of electrical stimulation on ankle dorsiflexion. They recruited 20 children (15 boys and 5 girls) with mild to severe "hemiplegic cerebral palsy" (cerebral palsy resulting in paralysis on one side of the body). Their average age was 8.7 years. The children were matched for age, severity of gait pattern, and degree of **contracture** (see *Glossary*) in the affected ankle. Then one of each pair was randomly assigned to the experimental group and the other to the **control group** (see *Glossary*).

The experimental group members continued with their current physical therapy regimen. They also received electrical stimulation to the anterior tibial muscles of the hemiplegic leg applied by the parents at home 1 hour/day for 35 days.

The control group members simply continued with their current physical therapy regimen.

The researchers were interested in the following outcome areas: **active and passive dorsiflexion** (see *Glossary*) of the ankle, with knee bent and knee extended, and gait pattern. both as measured by an electrogoniometer and muscle power (as measured by the Medical Research Council's grades).

What did the researchers find?

On the measure of passive dorsiflexion of the ankle with the knee extended, the experimental group showed a **significant** (see *Glossary*) improvement from before to after treatment. This group also performed significantly better than the control group on the measure after treatment.

On the measure of active dorsiflexion of the ankle, the experimental group performed significantly better than the control group on the measure after treatment, when the child was sitting.

Gait analysis did not show the improvement in gait that the researchers expected to accompany the improvement in range of motion.

On the measure of muscle power, the experimental group showed a significant improvement in the anterior tibial muscle from before to after treatment.

What do the findings mean?

- The findings suggest that electrical stimulation is an effective home therapy to reduce contractures in children with cerebral palsy. The effects are temporary, so intermittent use may be necessary, "as an adjunct to other forms of therapy at times of rapid growth or increasing contractures" (p. 672). However, before such an approach is widely used, researchers and providers must clarify the appropriate amount of stimulation to be applied.
- The findings should boost confidence in funding programs that use electrical stimulation to promote range of movement in children with cerebral palsy. Policy makers should be especially interested in the cost-effectiveness of this method, which, according to the study author, is less expensive and less time consuming than other treatments.

What are the study's limitations?

- Sample recruited from one metropolitan area.
- Overall, well-designed and implemented study.
- Assessor not **blinded** (see *Glossary*) to treatment group assignment of children.
- Some delay in administration of assessment after initial assessments were completed.
- Generalization limited by age, diagnosis (hemiplegic cerebral palsy), and geographic area.

GLOSSARY

active dorsiflexion—The degree of bending in the ankle when the child attempts to bend it.

blinding—Refers to the practice of keeping members of the research study unaware of which group a participant is assigned to (treatment or control) in the study. Single blinding usually refers to keeping study participants unaware of whether they are receiving the experimental or the sham treatment. Double blinding usually refers to keeping the participants and those who are administering the treatment unaware of who is receiving the experimental and who is receiving the sham treatments. In some cases, where it is impossible to blind those administering treatment, the individuals who are administering the outcome measures can be blinded to group status.

Studies in which blinding does not occur can have significant biases. When the participants know that they are receiving the experimental treatment, they often get better because they think they ought to (this is often referred to as the placebo effect). When researchers know that a participant is receiving the experimental treatment, they often subconsciously favor those participants when evaluating them on outcome measures. For instance, when timing a participant in the treatment group, researchers may unknowingly stop the watch a little faster or slower so the treatment participant seems to do better.

contracture—Permanent shortening (as of muscle, tendon, or scar tissue) producing deformity or distortion.

control group—A group that received special attention similar to that which the treatment group received , but did not receive the treatment.

passive dorsiflexion—The degree of bending in the ankle when manipulated by an external force, or the hand of the therapist in this case.

range of motion—Arc of motion through which a joint passes.

significance (or significant)—A statistical term that refers to the probability that the results obtained in the study are not due to chance, but to some other factor (such as the treatment of interest). A significant result is one that is likely to be generalizable to populations outside the study.

Significance should not be confused with clinical effect. A study can be statistically significant without having a very large clinical effect on the sample. For example, a study that examines the effect of a treatment on a client's ability to walk, may report that the participants in the treatment group were able to walk significantly longer distances than the control. However, if you read the study you may find that the treatment group was able to walk, on average, 6 feet, while the control group was able to walk, on average, 5 feet. While the outcome may be statistically significant, a clinician may not feel that a 1-foot increase will make his or her client functional.

spasticity—A state of increased muscular tone with exaggeration of the tendon reflexes.

■ Terminology used in this document is based on two systems of classification current at the time the evidence-based literature reviews were completed: *Uniform Terminology for Occupational Therapy Practice—Third Edition* (AOTA, 1994) and *International Classification of Functioning, Disability and Health (ICIDH-2)* (World Health Organization [WHO], 1999). More recently, the *Uniform Terminology* document was replaced by *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2002), and modifications to *ICIDH-2* were finalized in the *International Classification of Functioning, Disability and Health* (WHO, 2001).

This work is based on the evidence-based literature review completed by Erna Imperatore Blanche, PhD, OTR/L, FAOTA, and Gustavo Reinoso, OTR/L, with contributions from Patricia D. LaVesser, PhD, OTR/L, and Christine R. Berg, PhD, OTR/L.

For more information about the Evidence-Based Literature Review Project, contact the Practice Department at the American Occupational Therapy Association, 301-652-6611, ext. 2040.

AOTA

Copyright 2004 American Occupational Therapy Association, Inc. All rights reserved.

This material may be reproduced and distributed without prior written consent.