AOTA Evidence Briefs
Parkinson's Disease

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

P #5

Practice reduces bradykinesia in aiming task

Platz, T., Brown, R. G., & Marsden, C. D. (1998). Training improves the speed of aimed movements in Parkinson's disease. *Brain*, *121*, 505–514.

Level IB2b

Randomized controlled trial, less than 20 participants per condition, moderate internal validity, moderate external validity

Why research this topic?

Bradykinesia, (*see Glossary*) a common symptom of Parkinson's disease, influences clients' performance in daily life activities. Yet there have been relatively few attempts to assess whether practice or training can reduce bradykinesia, and before the study reported here, no one had investigated the sensitivity of movement speed to practice or training.

What did the researchers do?

Platz and colleagues (1998), variously affiliated with the Free University (Berlin) and the Institute of Neurology (London), recruited 16 clients with **idiopathic** (*see Glossary*) Parkinson's disease from outpatient clinics at the National Hospital for Neurology and Neurosurgery in London. All were right-handed, and none had marked tremor, **dyskinesia** (*see Glossay*), or susceptibility to sudden **"off" periods** (*see Glossary*) None had any other disabling general medical condition or accompanying neurological diseases, such as dementia.

The 16 participants were randomly assigned to one of two training conditions, one with rhythmic auditory cues and one without. One person was subsequently excluded because of poor performance not characteristic of the other participants in the study. The average stage of disease for the remaining participants was 2.25.

Each participant with Parkinson's disease was then matched to a control participant of the same gender and approximately the same age. All the control participants were right-handed. None had a history of neurological or musculoskeletal problems, none had neurological signs at the time of testing, and none were taking drugs that affect the central nervous system.

The final sample consisted of 30 participants: 16 men and 14 women. The average ages were 63.9 for the participants with Parkinson's disease and 61.4 for the control group participants. Among the participants with Parkinson's, the average durations of disease were 7.6 years for subgroup 1 (cued) and 4.3 years for subgroup 2 (uncued).

The participants were presented with an aiming task that involved moving a pen-shaped device across an electronic tablet from the midline of their body to a half-inch circular target about 8 inches away. They were instructed to make smooth, single movements that were both fast and accurate. Each participant performed 15 trials of aiming with each arm, 100 trials of training with one arm (the arm more affected by bradykinetic movements, in the case of the participants with Parkinson's disease), 15 more trials with each arm, and 15 more trials after a 1-hour break.

The participants in the uncued condition began movement after two tones signaled "ready" and "go." The participants in the cued condition used the rhythm of five equally spaced tones to control their speed of movement, starting after the third tone and finishing by the fifth tone.

The outcome areas of interest were *movement time* and *maximum acceleration of movement.*

What did the researchers find?

Across the training trials, both the participants with Parkinson's disease and the control group participants showed a significant overall decrease in movement time. However, contrary to the researchers' expectations, the uncued participants in both groups showed a **significantly** (*see Glossary*) greater decrease in movement time than the cued participants.

Both groups also significantly increased maximum acceleration of movement across the training trials. Again though, the uncued participants in both groups showed a significantly greater overall increase than the cued participants.

The control group participants increased much more than the participants with Parkinson's disease in the un-cued condition. And again, there was no significant difference across conditions. On repeat testing after a 1-hour delay, the uncued participants in both groups showed a significant increase in movement time, whereas the cued participants showed no change. As for maximum acceleration, a significant decrease was evident across groups, regardless of condition. In neither case, however, did values return to baseline levels, so the participants at least partially retained their acquired skill.

Looking at the data for the untrained arm, the researchers found that transfer of training did occur for both groups: Total movement time significantly decreased from the baseline measurement to the measurement immediately following training.

What do the findings mean?

- For therapists and other providers, the findings show that practice can reduce bradykinesia. However, the findings are based on an aiming task only. Further research should address outcomes for real-life tasks, such as activities of daily living (ADL).
- The findings also suggest that, in an aiming task, rhythmic auditory cues are not an effective aid to training. Indeed, in this kind of task they may interfere with the goal of the training.
- Providers should compare the findings of this study with those of the study by Majsak, Kaminski, Gentile, and Flanagan (Majsak, M. J., Kaminski, T., Gentile, A. M., & Flanagan, J. R. [1998]. The reaching movements of patients with Parkinson's disease under self-determined maximal speed and visually cued conditions. *Brain*, *121*, 755–766). The latter findings also suggest that practice can positively affect bradykinesia. In that study, external cues *were* helpful in stimulating movement. The cues were visual and temporal, however, not auditory, and the task was to reach for and grasp a ball, not to aim a device at a target.
- The findings provide preliminary support for should boost our' confidence in funding programs that use practice to reduce the effects of bradykinesia. They also suggest a direction that research could take: investigate the effects of practice on real-life tasks such as ADL.

What are the study's limitations?

The results of this study may have limited generalizability because participants were not randomly selected. This design flaw threatens internal validity of the study because the findings may not be applicable to the population of persons with Parkinson's disease.

Glossary

bradykinesia—"extreme slowness of movements and reflexes" (*Merriam-Webster's Medical Dictionary*)

dyskinesia—"impairment of voluntary movements resulting in fragmented or jerky motions" (*Merriam-Webster's Medical Dictionary*)

idiopathic—"arising spontaneously or from an obscure or unknown cause" (*Merriam-Webster's Medical Dictionary*)

"off" period—a time when a person is not responding optimally to the medication he or she is taking and is having trouble with usual motor functions and activities (e.g., walking, eating, speaking). It often occurs before the next dose of medication is to be taken but can occur at other times.

significance (or significant)—A statistical term, this 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 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 group. However, if you read the study you may find that the treatment group was able to walk, on average, 6 feet, whereas the control group was able to walk, on average, 5 feet. Although the outcome may be statistically significant, a clinician may not believe that a 1-foot increase will improve his or her client's function.

■ 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 Susan Murphy, ScD, OTR/L, and Linda Tickle-Degnen, PhD, OTR/L, FAOTA.

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

AOTA®

Copyright 2003 American Occupational Therapy Association, Inc. All rights reserved.
This material may be reproduced and distributed without prior written consent.