



# AOTA Evidence Briefs

## Parkinson's Disease

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

### P #3

## Visual, time-related cues may improve the reaching speed and accuracy of people with Parkinson's disease

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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.

### Level IB2b

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

### Why research this topic?

Consensus is lacking on what causes **bradykinesia** (*see Glossary*), a common sign of Parkinson's disease. Majsak and colleagues (1998), variously affiliated with Columbia University (New York City), Allegheny University of the Health Sciences (Philadelphia), and Queens University (Kingston, Canada), hypothesized that people with Parkinson's display bradykinesia because they cannot internally initiate or ideally control their motor output when they are regulating the speed of their movements.

### What did the researchers do?

The researchers studied 12 adults, 6 with Parkinson's in **stage 3** (*see Glossary*) (the treatment group) and 6 with no history of neurological disorders (the control group). Each group consisted of 4 men and 2 women between the ages of 64 and 74 (no average age reported). All were right-handed, had vision corrected to 20/20, and had a level of cognition sufficient to understand the requirements of the experimental task. All were taking L-dopa (levodopa). None showed evidence of resting tremor or **dyskinesia** (*see Glossary*).

The experiment required the participants, from a sitting position, to reach and grasp a ball about the size of a tennis ball as quickly as possible under two conditions. In the first condition, the ball was stationary in a 4-inch contact zone located in the middle of an inclined track. In the second condition, the ball rolled from behind a barrier, left to right down the inclined track, and through the contact zone. The designation of a fixed contact zone ensured that the participants would grasp the ball from the same location on the track under both conditions.

The participants first performed six practice trials, then six trials of each of three tasks: (1) reach and grasp the stationary ball as quickly as possible, (2) reach and grasp the moving ball as it passed through the contact zone, and (3) repeat the first task.

The researchers were interested in two outcomes: *reaching speed*, as indicated by peak velocity, time to peak velocity, and movement time; and *reaching accuracy*. To obtain speed measurements the researchers tracked the participants' movements using a reflective marker attached to the wrist and a video camera, referred to as kinematic analysis or assessment.

## What did the researchers find?

On the outcome of speed, participants with Parkinson's disease reached more slowly than control group participants when the ball was stationary. Their peak velocity was **significantly** (*see Glossary*) lower, their time to peak velocity significantly greater, and their movement time significantly greater. There were **no significant** (*see Glossary*) differences between the groups in the moving-ball condition, however.

In reaching accuracy, the Parkinson's participants were no different from the control group participants. The Parkinson's participants did have some difficulty timing and coordinating their grasp in the moving-ball condition. This difficulty may have been a tradeoff for greater movement speed. That is, when the ball was stationary and they had to initiate movement themselves, they may have valued successful grasp over speed of movement. In the moving-ball condition, they had no such choice.

## What do the findings mean?

■ For therapists and other providers, the findings suggest that speed of movement can be positively influenced by practicing a reaching task. The findings also suggest the importance of the environment. For individuals with Parkinson's disease, the findings begin to point out the possibility that movement activities can positively influence (break-up) bradykinesia, which may increase performance. This study involved practicing reaching movements, an intervention at the impairment level. It did not measure the transfer of effects to functional activities. Therefore, although decrease in bradykinesia may have implications for occupational performance, this conclusion cannot be drawn from this study based on the study design and measures.

## What are the study's limitations?

The results of this study may have limited generalizability because a convenience sample was used and the sample size was small (n=12). These design flaws threaten internal validity of the study because the findings may not be applicable to the population of persons with Parkinson's disease. Further research is necessary to determine whether the visual stimulus of the moving ball or its motion is the more important cue.

## 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*)

**Hoehn & Yahr**—system of classifying symptoms

**Stage 1:** unilateral involvement only, usually with minimal or no functional impairment.

**Stage 2:** bilateral or midline involvement, without impairment of balance.

**Stage 3:** first sign of impaired righting reflexes. This is evident by unsteadiness as the patient turns or is demonstrated when he is pushed from standing equilibrium with the feet together and eyes closed. Functionally, the patient is somewhat restricted in his activities but may have some work potential depending upon the type of employment. Patients are physically capable of leading independent lives, and their disability is mild to moderate.

**Stage 4:** fully developed, severely disabling disease; the patient is still able to walk and stand unassisted but is markedly incapacitated.

**Stage 5:** confinement to bed or wheelchair unless aided.

Hoehn, M. M. & Yahr, M. D. (1967). Parkinsonism: Onset, progression, and mortality. *Neurology*, 17(5), S11-S26.

**nonsignificant or no significance**—A statistical term that refers to study findings that are likely to be due to chance differences between the groups rather than to other factors (like the treatment of interest). A nonsignificant result is not generalizable outside the study. Like significance, a nonsignificant result does not indicate the clinical effect. Often studies will show nonsignificant results, yet the treatment group's mean will be better than the control group's. This is usually referred to as a trend in the right direction. Because significance is closely determined by sample size, nonsignificant results would often become significant if the sample size were increased.

**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.



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