
Background of the Article Review

*Cognition* can be defined as mental processes. In other words, cognition relates to thinking skills, involving, for example, attention, memory, visual processing, language skills, conceiving, judging, reasoning, problem solving, and imagining.

*Cognitive dysfunction* (poor mental functioning or “brain fog”) is a non-motor symptom of Parkinson’s disease (PD) that affects up to 80% of PD patients and contributes to:

- Disability
- Reduced quality of life
- Caregiver strain

Although cognitive deficits may vary, the most common features of cognitive dysfunction are:

- **Executive dysfunction**: Problems with higher-order mental processes (e.g., monitor, manage, and regulate the completion of tasks) that guide decision-making, thought and behavior
- **Visuospatial dysfunction**: Problems with the visual perception of space and the spatial relationship between objects
- **Difficulties with memory**

Unfortunately, while advances in medicine and surgery have improved PD motor symptoms and enabled patients to live longer, disability from cognitive decline continues to rise. As a result, there is a significant need to develop more effective treatments for cognitive dysfunction in PD.

Accordingly, a recent article review by researchers of the Baylor College of Medicine (BCM) and the Michael E. DeBakey Veterans Affairs Medical Center (MEDVAMC) in Texas, identifies that *cognitive rehabilitation*, a behavioral treatment method *used to improve cognitive skills*, is a promising treatment option to improve cognitive dysfunction and quality of life in patients with PD. However, due to the variability of PD and its symptoms, researchers suggest that future cognitive rehabilitation programs should be flexible and tailored to match each patient’s strengths and deficits.
About Cognitive Rehabilitation

Cognitive rehabilitation differs from program to program, but all programs involve basic skills training related to work/employment, social interaction/communication, and daily living. To develop basic skills in these areas, each training program can focus on improving the cognitive targets below:

- **Visuospatial awareness:** The ability to perceive the relationship between space and objects
- **Attention**
- **Working Memory**
- **Executive functioning:** The ability to perform higher-level mental processes (e.g., monitor, manage, and regulate the completion of tasks) that guide decision-making, thought and behavior.

In addition, programs can be taught in-person or with the aid of computers and software, using the cognitive rehabilitation strategies below:

- **Restorative techniques:** Strategies that focus on improving cognitive functions closer to the patient’s level before there was an obvious decline
- **Compensatory techniques:** Strategies that focus on organizing information to improve memory recall and learning and providing detailed instruction to self-management strategies.

Purpose of Article Review

The purpose of the review was to determine whether or not cognitive rehabilitation has potential to improve cognitive skills and quality of life in patients with cognitive dysfunction in PD.

Article Review Methods

In order to evaluate the potential of using cognitive rehabilitation to treat PD-related cognitive dysfunction, researchers reviewed the outcomes of former research studies published on cognitive rehabilitation programs used on Parkinson’s patients. After reviewing all the studies that met their criteria, researchers did the following:

- Provided an overview of the types of cognitive deficits that are targeted in rehabilitation for cognitive dysfunction in PD
- Compared the contents and methods of cognitive interventions applied to PD patients
Identified the strengths and limitations of the studies and discussed the future direction of cognitive rehabilitation in PD.

Article Review Findings & Results
Overall, researchers found four studies that met their review criteria. The studies reported on Parkinson’s patients who underwent cognitive rehabilitation programs targeting executive functioning, attention, and visuospatial awareness. Of the four studies, two were open-trial studies in which the patients knew what treatment they were receiving, and two were small randomized control trials (RTCs) in which the patients did not know whether they were receiving standard rehabilitation or cognitive rehabilitation. Each study is summarized below:

Report #1 (Sinforiani et. al.): Open-trial Study
- **Patient Sample:** 20 Parkinson’s patients enrolled in a hospital-based rehabilitation program.
- **Program Summary:** A 6-week, in-patient computerized cognitive rehabilitation program was given to these patients. The intervention focused on improving attention, abstract reasoning, and visuospatial abilities.
- **Results/Outcomes:**
  - Patients showed significant improvement in 1) verbal fluency, 2) immediate and delayed logical memory retrieval, and 3) visuospatial reasoning
  - Program benefits were maintained for 6 months
  - There was no change or difference in short-term memory, set-shifting (ability to move back and forth between tasks), or inhibition (ability to pay attention and suppress certain responses/actions).
- **Significance of Results:** The study suggests that patients with PD have the potential to complete cognitive rehabilitation, improve their performance on cognitive assessments, and maintain those benefits.
- **Study Limitations:** The small patient sample, in-patient setting, and lack of a control group (non-treated patient group used for comparison) or measurement of everyday functioning limits findings on:
  - The overall cognitive and functional improvement enhanced by the program
  - The ability to generalize these results to a larger population of PD patients who do not have access to an in-patient setting.

Report #2 (Mohlman et. al.): Open-trial Study
- **Patient Sample:** 14 Parkinson’s patients with a Mini-Mental State Exam (MMSE) score of >23, which indicates normal cognition to mild cognitive impairment.
Cognitive Rehabilitation for Executive Dysfunction in Parkinson’s Disease

- **Program Summary:** A 4-week attention process training program that focused on improving sustained, selective, alternating and divided attention using in-person training, practices exercises and attention task worksheets.

- **Results/Outcomes:**
  - Patients showed positive self-report ratings on the feasibility of the program, ranging from “some” to “much” improvement of attention and enjoyment
  - Patients showed improvement of executive skills.

- **Significance of Results:** The study suggests that it is feasibility to administering an in-person cognitive training program for PD and patients are accepting of such training. The authors do highlight the importance of monitoring fatigue, as fatigue was found to be related to greater difficulties with executive skills.

- **Study Limitations:** The small patient sample, limited study design and outcome measures, and lack of a control group or long-term follow-up limits findings on the program’s effectiveness and its long-term benefits.

**Report #3 (Sammer et. al.): Randomized Controlled Trial**

- **Patient Sample:** 26 Parkinson’s patients that were randomly selected to receive standard rehabilitation or standard rehabilitation plus a cognitive training program.

- **Program Summary:** A 3-4 week, in-patient cognitive training program that focused on improving executive functioning using working memory tasks, including: puzzles, search tasks, speech production, picture completion and storytelling.

- **Results/Outcomes:**
  - The 12 patients in the cognitive training program showed improved executive function, compared with the 14 patients in the standard treatment program
  - Patients in the cognitive training program maintained their working memory scores recorded at the start of the trial, whereas patients in the standard treatment program showed reduced working memory scores.

- **Study Limitations:** The small patient sample and lack of long-term assessments or measurements of daily activity performance limits findings on the program’s long-term impact and its contribution to overall functional improvement.

**Report #4 (Paris et. al.): Randomized Controlled Trial**

- **Patient Sample:** 33 Parkinson’s patients with an Mini Mental State Exam (MMSE) score of >23 (a performance that reflects either normal cognitive functions or only mild cognitive difficulties) that were randomly selected to receive a speech therapy program or a computerized cognitive training program.

- **Program Summary:** A 4-week, outpatient computer-based cognitive training program that focused on improving attention, memory, reaction speed, executive functions and visuospatial awareness.
The 18 patients in the cognitive training program showed improved attention, information processing, visual memory, verbal fluency, motor coordination and executive functioning, compared with the 15 patients in the speech therapy program.

The lack of long-term assessments limits findings on the program’s sustained benefits and lasting effects.

The studies in the review focused on cognitive rehabilitation programs that used in-person and computer-based interventions to target attention, visuospatial awareness, and executive functioning in Parkinson’s patients without dementia (severe cognitive impairment). Overall, the studies suggest that cognitive rehabilitation is a promising treatment option for PD-related cognitive dysfunction and has potential to help patients maintain a higher level of daily living skills and quality of life. This is evident by the study outcomes below:

- Patients showed short-term improvement on cognitive assessments after completing the programs, particularly those that focused on executive functioning
- Patients indicated that they accepted the training and were receptive to the programs.

Nevertheless, the studies were limited by:

- Small patient sample size
- Lack of data on the long-term effects and lasting benefits of the programs
- Absence of valid assessments to measure improvement in daily function or generalized improvement in other areas of daily living.

Based on these study outcomes and limitations, researchers suggest that further research is necessary on cognitive rehabilitation programs in PD and more information is needed on the patient characteristics that help predict success in these programs (ex. age, years of diagnosed PD, and type and severity of cognitive impairments). As a result, researchers recommend that future cognitive rehabilitations in PD do the following:

- Use a randomized, controlled study design
- Include long-term patient follow-up evaluations
- Address the limitations of programs developed for non-PD populations and specify how they should be adapted for patients with PD
- Explore and develop valid assessments that measure:
  - Improvement of daily functioning
o Generalized improvement in other areas of daily living.

Researchers suggest that future cognitive rehabilitation programs need to account for the variability of Parkinson’s symptoms and PD-related cognitive impairment by personalizing and tailoring each program to match each patient’s strengths and deficits.