



# What Are The Long-Term Psychological And Quality Of Life Outcomes For Parkinson's Disease Patients Receiving Cognitive Behavioral Therapy Interventions? : A Systematic Review

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## ABSTRACT

**Introduction:** Parkinson's disease (PD) is a neurodegenerative disorder that significantly affects both motor and non-motor functions, leading to psychological issues such as depression and anxiety. Cognitive Behavioral Therapy (CBT) has emerged as an effective intervention for improving psychological outcomes in PD patients. This study investigates the long-term psychological and quality of life outcomes of PD patients receiving CBT. **Methods:** A systematic review was conducted adhering to PRISMA guidelines, focusing on studies that included adult PD patients undergoing CBT as a primary intervention. Eligible studies were screened, and data were extracted regarding study design, intervention characteristics, and outcomes related to psychological well-being and quality of life. **Results:** The review identified 40 studies, demonstrating that CBT significantly reduces depressive and anxiety symptoms in PD patients. Most studies reported positive changes in quality of life, particularly at 6-month follow-ups. However, the sustainability of these benefits over longer periods remains unclear, with some studies indicating diminished effects after 24 months. **Discussion:** While CBT shows promise in enhancing psychological health among PD patients, the variability in intervention formats and follow-up durations complicates the understanding of long-term efficacy. Factors such as intervention duration, delivery method, and individual patient characteristics may influence treatment outcomes. **Conclusion:** CBT is a valuable therapeutic approach for managing psychological symptoms in Parkinson's disease. However, further research is necessary to clarify the long-term effects and optimize treatment delivery, ensuring that patients receive sustained psychological support.

**Keywords:** Parkinson's disease, Cognitive Behavioral Therapy, depression, anxiety, quality of life, systematic review.

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## INTRODUCTION

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Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor symptoms such as tremors, rigidity, and bradykinesia, as well as non-motor symptoms including depression and anxiety. The psychological impact of PD is profound, often leading to a significant decline in quality of life (QoL) for affected individuals. Cognitive Behavioral Therapy (CBT) has emerged as a promising intervention for addressing the psychological symptoms associated with PD. This introduction aims to explore the long-term psychological and quality of life outcomes for PD patients receiving CBT, drawing on recent literature to provide a comprehensive overview of the subject.

The prevalence of depression and anxiety among PD patients is notably high, with estimates suggesting that up to 50% of individuals with PD experience clinically significant depressive symptoms (Hong et al., 2021). These psychological symptoms can exacerbate motor dysfunction and contribute to a downward spiral of worsening health and quality of life. Thus, addressing these issues through effective therapeutic interventions is crucial for improving overall patient outcomes.

CBT is a structured, time-limited psychotherapy that focuses on identifying and modifying negative thought patterns and behaviors. It has been widely studied for its effectiveness in treating depression and anxiety across various populations, including those with chronic illnesses. The application of CBT in PD patients has garnered attention due to its potential to alleviate psychological distress and enhance life quality (Luo et al., 2021).

Recent studies have demonstrated that CBT can lead to significant reductions in depressive and anxiety symptoms among PD patients. For instance, a systematic review and meta-analysis by Luo et al. (2021) reported that CBT interventions yielded positive effects on mood disorders, sleep disturbances, fatigue, and overall quality of life. These findings underscore the importance of integrating psychological therapies into the standard care for PD.

Long-term outcomes of CBT in PD patients, however, present a more complex picture.

While short- to medium-term benefits have been well documented, evidence regarding the sustainability of these effects over extended periods remains limited. Gloster et al. (2013) found that although clinically meaningful improvements were maintained for up to 24 months, effect sizes diminished compared to earlier follow-ups. This suggests that while CBT can provide initial relief from psychological symptoms, ongoing support may be necessary to sustain benefits.

The delivery format of CBT also plays a critical role in its effectiveness. Various modalities, including individual, group, telephone-based, and internet-based CBT, have been explored in the literature. Studies such as those by Dobkin et al. (2020) and Kraepelien et al. (2020) indicate that remote delivery methods can be as effective as traditional in-person therapy, enhancing accessibility for patients who may have mobility challenges.

Another significant factor influencing the outcomes of CBT in PD patients is the duration and frequency of the intervention. Research suggests that longer interventions, typically exceeding eight weeks, tend to yield better results (Luo et al., 2020). This highlights the need for tailored treatment plans that consider individual patient needs and circumstances.

Moreover, the inclusion of caregiver support in CBT interventions has shown promise in enhancing treatment outcomes. Studies indicate that involving caregivers can improve the therapeutic process and lead to better psychological outcomes for both patients and their caregivers (Dobkin et al., 2020). This approach emphasizes the importance of a holistic treatment strategy that addresses the needs of the entire family unit.

Despite the promising findings surrounding CBT for PD patients, there are still gaps in the literature that need addressing. Many studies have reported limited follow-up durations, often focusing on outcomes at one or six months post-intervention. This lack of long-term data complicates the ability to draw definitive conclusions about the enduring benefits of CBT and the optimal timing for subsequent interventions.

In summary, while CBT has shown considerable potential in improving psychological outcomes and quality of life for Parkinson's disease patients, the long-term efficacy and

sustainability of these benefits require further investigation. Future research should aim to standardize intervention protocols, explore the impact of various delivery formats, and assess the role of caregiver involvement in treatment outcomes. By addressing these areas, we can enhance the therapeutic landscape for individuals living with Parkinson's disease.

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## METHODS

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### Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

### Criteria for Eligibility

This systematic review aims to evaluate the long-term psychological and quality of life outcomes for parkinson's disease patients receiving cognitive behavioral therapy interventions.

### Screening

We screened in papers that met these criteria:

- **Population Age:** Are all study participants adults ( 18 years)?
- **Primary Condition:** Is Parkinson's disease the primary diagnosed condition for all study participants?
- **Intervention Type:** Is Cognitive Behavioral Therapy (CBT) the primary intervention being studied?
- **Intervention Delivery:** Is the CBT intervention delivered by qualified mental health professionals?
- **Intervention Isolation:** Is CBT delivered as a standalone psychological intervention (not combined with other psychological therapies)?

- **Outcome Measures:** Does the study measure psychological outcomes and/or quality of life using validated instruments?
- **Study Design:** Is the study either a randomized controlled trial, controlled clinical trial, or systematic review/meta-analysis?
- **Comparison Group:** Does the study include a comparison group (e.g., treatment as usual, waitlist, other interventions)?
- **Follow-up Duration:** Does the study include a follow-up period of at least 6 months post- intervention?
- **Sample Size:** Does the study include at least 10 participants?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

### **Data extraction**

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Study Design:**

Identify the specific type of study design used. Look in the methods section for clear description of the study type. Possible designs include:

- Randomized Controlled Trial (RCT)
- Quasi-experimental study
- Observational study
- Single-arm intervention study

If multiple design elements are present, list all. If unclear, note "design not clearly specified". Prioritize the most specific design description provided in the manuscript.

- **Intervention Details:**

Comprehensively describe the cognitive behavioral therapy (CBT) intervention:

- Specific CBT approach used (e.g., modified PD-specific CBT)
- Intervention components (e.g., activity scheduling, motor symptom management)
- Delivery method (individual/group, in-person/remote)
- Total intervention duration
- Frequency of sessions
- Session length

If multiple intervention variations exist, document all. If details are incomplete, note "insufficient information provided". Be as precise as possible about intervention characteristics.

- **Participant Demographics:**

Extract the following participant characteristics:

- Total sample size
- Mean age (and standard deviation)
- Gender distribution
- Parkinson's disease stage/severity
- Specific inclusion/exclusion criteria related to PD symptoms

If any demographic information is missing, explicitly state "not reported". Use exact numbers and percent- ages where available. If ranges are provided, include both minimum and maximum values.

- **Primary Psychological Outcomes:**

Identify and document:

- Specific psychological outcomes measured (e.g., depression, anxiety, quality of life)
- Measurement tools/scales used
- Time points of outcome assessment
- Whether outcomes were primary or secondary

Prioritize outcomes directly related to psychological and quality of life domains. If multiple outcome measures are used for the same construct, list all. If outcome measurement details are incomplete,

note "insufficient outcome measurement information".

- **Key Findings:**

Extract:

- Statistical results for primary psychological outcomes
- Effect sizes (if reported)
- Statistical significance levels
- Any noted long-term follow-up results

Focus on quantitative results related to psychological and quality of life outcomes. If results are complex, summarize the primary conclusion. If no statistically significant results were found, explicitly state this.

- **Risk of Bias Assessment:**

Document potential sources of bias:

- Randomization method (if applicable)
- Blinding procedures
- Loss to follow-up rates
- Potential conflicts of interest
- Sample size limitations

Use a systematic approach to noting potential methodological weaknesses. If no explicit bias assessment is provided, note "no formal bias assessment reported". Be objective and precise in describing potential methodological limitations.

## Search Strategy

The keywords used for this research based PICO :

| Element          | Keyword 1                    | Keyword 2        | Keyword 3                   | Keyword 4                   |
|------------------|------------------------------|------------------|-----------------------------|-----------------------------|
| Population (P)   | Parkinson's Disease          | Adults           | Parkinson's Disease Patient | Neurodegenerative Disorders |
| Intervention (I) | Cognitive Behavioral Therapy | CBT              | Psychological Intervention  | Therapy Formats             |
| Comparison (C)   | Treatment as Usual           | Waitlist Control | No Treatment                | Other Psychotherapies       |
| Outcome (O)      | Psychological Outcomes       | Quality of Life  | Depression Reduction        | Anxiety Management          |

The Boolean MeSH keywords inputted on databases for this research are: (*"Parkinson's Disease" OR " Parkinson's Disease Patients" OR "Adults" OR "Neurodegenerative Disorders"*) AND (*"Cognitive Behavioral Therapy" OR "CBT" OR "Psychological Intervention" OR "Therapy Formats"*) AND (*"Treatment as Usual" OR "Waitlist Control" OR "No Treatment" OR "Other Psychotherapies"*) AND (*"Psychological Outcomes" OR "Quality of Life" OR "Depression Reduction" OR "Anxiety Management"*)

## Data retrieval

Abstracts and titles were screened to assess their eligibility, and only studies meeting the inclusion criteria were selected for further analysis. Literature that fulfilled all predefined criteria and directly related to the topic was included. Studies that did not meet these criteria were excluded. Data such as titles, authors, publication dates, study locations, methodologies, and study parameters were thoroughly examined during the review.

## Quality Assessment and Data Synthesis

Each author independently assessed the titles and abstracts of the selected studies to identify those for further exploration. Articles that met the inclusion criteria underwent further evaluation. Final decisions on inclusion were based on the findings from this review process.

**Table 1.** Article Search Strategy

| Database         | Keywords                                                                                                                                                                                                                                                                                                                                                                                                              | Hits   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Pubmed           | <i>("Parkinson's Disease" OR " Parkinson's Disease Patients" OR "Adults" OR "Neurodegenerative Disorders") AND ("Cognitive Behavioral Therapy" OR "CBT" OR "Psychological Intervention" OR "Therapy Formats") AND ("Treatment as Usual" OR "Waitlist Control" OR "No Treatment" OR "Other Psychotherapies") AND ("Psychological Outcomes" OR "Quality of Life" OR "Depression Reduction" OR "Anxiety Management")</i> | 147    |
| Semantic Scholar | <i>("Parkinson's Disease" OR " Parkinson's Disease Patients" OR "Adults" OR "Neurodegenerative Disorders") AND ("Cognitive Behavioral Therapy" OR "CBT" OR "Psychological Intervention" OR "Therapy Formats") AND ("Treatment as Usual" OR "Waitlist Control" OR "No Treatment" OR "Other Psychotherapies") AND ("Psychological Outcomes" OR "Quality of Life" OR "Depression Reduction" OR "Anxiety Management")</i> | 250    |
| Sagepub          | <i>("Parkinson's Disease" OR " Parkinson's Disease Patients" OR "Adults" OR "Neurodegenerative Disorders") AND ("Cognitive Behavioral Therapy" OR "CBT" OR "Psychological Intervention" OR "Therapy Formats") AND ("Treatment as Usual" OR "Waitlist Control" OR "No Treatment" OR "Other Psychotherapies") AND ("Psychological Outcomes" OR "Quality of Life" OR "Depression Reduction" OR "Anxiety Management")</i> | 9,732  |
| Google Scholar   | <i>("Parkinson's Disease" OR " Parkinson's Disease Patients" OR "Adults" OR "Neurodegenerative Disorders") AND ("Cognitive Behavioral Therapy" OR "CBT" OR "Psychological Intervention" OR "Therapy Formats") AND ("Treatment as Usual" OR "Waitlist Control" OR "No Treatment" OR "Other Psychotherapies") AND ("Psychological Outcomes" OR "Quality of Life" OR "Depression Reduction" OR "Anxiety Management")</i> | 18,400 |

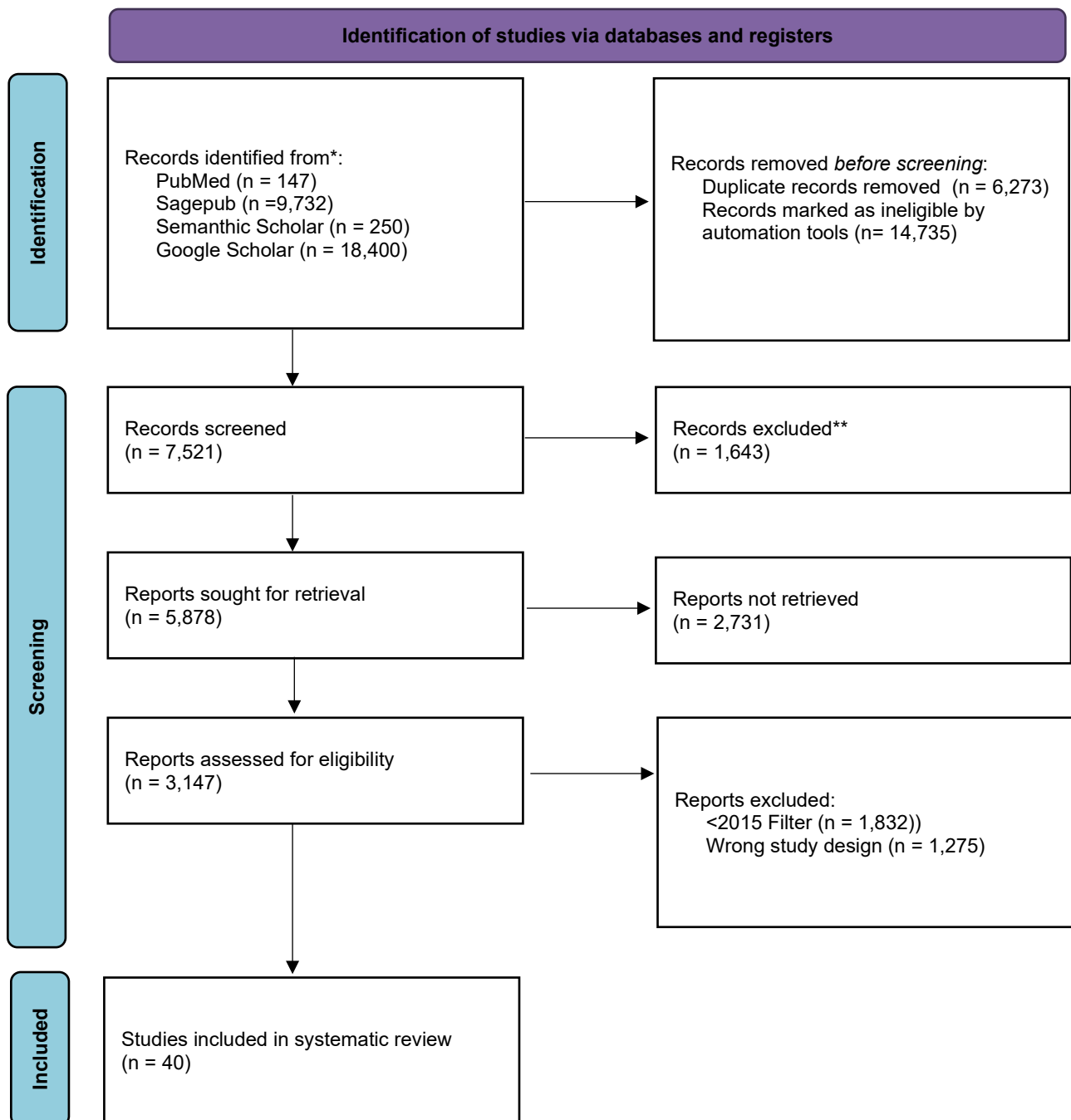


**Figure 1. Article search flowchart**

### JBICritical Appraisal

| Study               | Bias related to temporal precedence<br>Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)? | Bias related to selection and allocation<br>Was there a control group?              | Bias related to confounding factors<br>Were participants included in any comparisons similar? | Bias related to administration of intervention/exposure<br>Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? | Were there multiple measurements of the outcome both pre and post the intervention/exposure? | Were the outcomes of participants included in any comparisons measured in the same way? | Were outcomes measured in a reliable way?                                             | Bias related to participant retention<br>Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed? | Statistical conclusion validity<br>Was appropriate statistical analysis used?         |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Dobkin et al., 2020 |                                                                                         |  |            |                                                                                                                  |           |    |  |                                                                                        |  |
| Okai et al., 2013   |                                                                                         |  |            |                                                                                                                  |           |    |  |                                                                                        |  |
|                     |                                                                                                                                                                            |                                                                                     |                                                                                               |                                                                                                                                                                                                     |                                                                                              |                                                                                         |                                                                                       |                                                                                                                                                                             |                                                                                       |

|                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|-----------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Luo et al.,<br>2021               |    |    |    |    |    |    |    |    |    |
| Alnajjar et<br>al.,<br>2024       |    |    |    |    |    |    |    |    |    |
| Carey et<br>al.,<br>2022          |    |    |    |    |    |    |    |    |    |
| D'arrigo,<br>2020                 |    |    |    |    |    |    |    |    |    |
| Luo et al.,<br>2020               |    |    |    |    |    |    |    |    |    |
| Hong et<br>al.,<br>2021           |    |    |    |    |    |    |    |    |    |
| Rezazadeh<br>Yazd et al.,<br>2023 |   |   |   |   |   |   |   |   |   |
| Mulders et<br>al.,<br>2018        |  |  |  |  |  |  |  |  |  |
| Pye, 2015                         |  |  |  |  |  |  |  |  |  |
| Mahmoud<br>et<br>al., 2017        |  |  |  |  |  |  |  |  |  |
| Delshadi et<br>al.,2024           |  |  |  |  |  |  |  |  |  |
| Zhang et<br>al.,<br>2020          |  |  |  |  |  |  |  |  |  |
| Koychev<br>and<br>Okai, 2017      |  |  |  |  |  |  |  |  |  |

|                         |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Berardelli et al., 2018 |    |    |    |    |    |    |    |    |    |
| Reynolds et al., 2019   |    |    |    |    |    |    |    |    |    |
| Kraepelien et al., 2020 |    |    |    |    |    |    |    |    |    |
| Wang et al., 2014       |    |    |    |    |    |    |    |    |    |
| Dobkin et al., 2019     |    |    |    |    |    |    |    |    |    |
| Zarotti et al., 2020    |    |    |    |    |    |    |    |    |    |
| Armento et al., 2012    |  |  |  |   |  |   |  |  |  |
| Hadinia et al., 2016    |  |  |  |  |  |  |  |  |  |
| Dobkin et al., 2014a    |  |  |  |  |  |  |  |  |  |
| Dobkin et al., 2014b    |  |  |  |  |  |  |  |  |  |
| Meyer et al., 2020      |  |  |  |  |  |  |  |  |  |
| Patel et al., 2016      |  |  |  |  |  |  |  |  |  |
| Hadinia, 2017           |  |  |  |  |  |  |  |  |  |
|                         |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |

|                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Gloster et al., 2013</b>     |    |    |    |    |    |    |    |    |    |
| <b>Silver, 2014</b>             |    |    |    |    |    |    |    |    |    |
| <b>Zhi-qing, 2012</b>           |    |    |    |    |    |    |    |    |    |
| <b>Perskaudas et al., 2023</b>  |    |    |    |    |    |    |    |    |    |
| <b>Berardelli et al., 2015a</b> |    |    |    |    |    |    |    |    |    |
| <b>Piers et al., 2022</b>       |    |    |    |    |    |    |    |    |    |
| <b>Dobkin et al., 2011</b>      |  |  |  |  |  |  |  |  |  |
| <b>Lopes et al., 2021</b>       |  |  |  |  |  |  |  |  |  |
| <b>Wuthrich and Rapee, 2019</b> |  |  |  |  |  |  |  |  |  |
| <b>Osawa et al., 2020</b>       |  |  |  |  |  |  |  |  |  |
| <b>Egan et al., 2015</b>        |  |  |  |  |  |  |  |  |  |
| <b>Berardelli et al., 2015b</b> |  |  |  |  |  |  |  |  |  |

## RESULTS

### Characteristics of Included Studies

| Study                 | Study Design                        | Sample Size | Cognitive Behavioral Therapy Format               | Follow-up Duration | Full text retrieved |
|-----------------------|-------------------------------------|-------------|---------------------------------------------------|--------------------|---------------------|
| Dobkin et al., 2020   | Randomized Controlled Trial         | 72          | Telephone-based                                   | 6 months           | No                  |
| Okai et al., 2013     | Randomized Controlled Trial         | 44          | Individual, in-person                             | 6 months           | Yes                 |
| Luo et al., 2021      | Systematic review and meta-analysis | 507         | Various                                           | No mention found   | Yes                 |
| Alnajjar et al., 2024 | Systematic review and meta-analysis | 241         | Traditional and Tele-Cognitive Behavioral Therapy | No mention found   | No                  |
| Carey et al., 2022    | Randomized Controlled Trial         | 35          | No mention found                                  | No mention found   | No                  |
| D'arrigo, 2020        | Randomized Controlled               | 72          | Telephone-based                                   | 6 months           | No                  |

| Study                  | Study Design                        | Sample Size      | Cognitive Behavioral Therapy Format         | Follow-up Duration | Full text retrieved |
|------------------------|-------------------------------------|------------------|---------------------------------------------|--------------------|---------------------|
| Luo et al., 2020       | Trial                               |                  |                                             |                    |                     |
|                        | Systematic review and meta-analysis | 358              | Various                                     | No mention found   | Yes                 |
| Hong et al., 2021      | Meta-analysis                       | 507              | No mention found                            | No mention found   | No                  |
| Rezazadeh et al., 2023 | Quasi-experimental                  | 90               | Group                                       | No mention found   | No                  |
| Mulders et al., 2018   | Randomized Controlled Trial         | 60               | No mention found                            | No mention found   | No                  |
| Pye, 2015              | No mention found                    | No mention found | No mention found                            | 3 months           | No                  |
| Mahmoud et al., 2017   | Single-case experimental            | 9                | Individual, in-person and videoconferencing | 6 weeks            | No                  |

| Study                          | Study Design                        | Sample Size | Cognitive Behavioral Therapy Format         | Follow-up Duration | Full text retrieved |
|--------------------------------|-------------------------------------|-------------|---------------------------------------------|--------------------|---------------------|
| <b>Delshadi et al., 2024</b>   | Randomized Controlled Trial         | 90          | Group                                       | No mention found   | No                  |
| <b>Zhang et al., 2020</b>      | Systematic review and meta-analysis | 191         | No mention found                            | No mention found   | No                  |
| <b>Koychev and Okai, 2017</b>  | Review                              | 10-80       | Individual and group                        | 1-6 months         | Yes                 |
| <b>Berardelli et al., 2018</b> | No mention found                    | 20          | Group                                       | No mention found   | No                  |
| <b>Reynolds et al., 2019</b>   | Quasi-experimental                  | 9           | Individual, in-person and videoconferencing | 6 weeks            | No                  |
| <b>Kraepelien et al., 2020</b> | Randomized Controlled Trial         | 77          | Internet-based                              | No mention found   | No                  |
| <b>Wang et al.,</b>            | Randomized                          | 103         | Individual                                  | 6 months           | Yes                 |

| Study                | Study Design                | Sample Size      | Cognitive Behavioral Therapy Format | Follow-up Duration | Full text retrieved |
|----------------------|-----------------------------|------------------|-------------------------------------|--------------------|---------------------|
| 2014                 | Controlled Trial            |                  |                                     |                    |                     |
| Dobkin et al., 2019  | No mention found            | No mention found | No mention found                    | No mention found   | No                  |
| Zarotti et al., 2020 | Scoping review              | No mention found | Various                             | No mention found   | No                  |
| Armento et al., 2012 | Review                      | No mention found | No mention found                    | No mention found   | No                  |
| Hadinia et al., 2016 | Review                      | No mention found | No mention found                    | No mention found   | No                  |
| Dobkin et al., 2014a | Randomized Controlled Trial | 80               | No mention found                    | No mention found   | Yes                 |
| Dobkin et al., 2014b | Randomized Controlled       | No mention       | No mention found                    | No mention         | No                  |

| Study                       | Study Design                | Sample Size      | Cognitive Behavioral Therapy Format | Follow-up Duration | Full text retrieved |
|-----------------------------|-----------------------------|------------------|-------------------------------------|--------------------|---------------------|
| <b>Meyer et al., 2020</b>   | Trial                       | found            |                                     | found              |                     |
|                             | Quasi-experimental          | 62               | No mention found                    | 6 months           | No                  |
| <b>Patel et al., 2016</b>   | Randomized Controlled Trial | 28               | Computerized                        | No mention found   | No                  |
| <b>Hadinia, 2017</b>        | No mention found            | No mention found | Group                               | No mention found   | No                  |
| <b>Gloster et al., 2013</b> | Randomized Controlled Trial | 146              | In-person and self-directed         | 24 months          | No                  |
| <b>Silver, 2014</b>         | Randomized Controlled Trial | 42               | No mention found                    | No mention found   | No                  |
| <b>Zhi-qing, 2012</b>       | Randomized Controlled Trial | 45               | No mention found                    | No mention found   | No                  |
| <b>Perskaudas</b>           | Single-arm                  | 25               | Telemedicine                        | No                 | No                  |

| Study                    | Study Design                | Sample Size      | Cognitive Behavioral Therapy Format | Follow-up Duration | Full text retrieved |
|--------------------------|-----------------------------|------------------|-------------------------------------|--------------------|---------------------|
| et al., 2023             | intervention                |                  |                                     | mention found      |                     |
| Berardelli et al., 2015a | No mention found            | No mention found | Group                               | No mention found   | No                  |
| Piers et al., 2022       | Randomized Controlled Trial | No mention found | Telehealth                          | No mention found   | No                  |
| Dobkin et al., 2011      | Randomized Controlled Trial | 80               | Individual                          | 1 month            | Yes                 |
| Lopes et al., 2021       | No mention found            | No mention found | No mention found                    | No mention found   | No                  |
| Wuthrich and Rapee, 2019 | Randomized Controlled Trial | 11               | Telephone-delivered                 | 1 month            | No                  |
| Osawa et al., 2020       | Single-arm intervention     | 11               | No mention found                    | No mention         | No                  |

| Study                    | Study Design      | Sample Size      | Cognitive Behavioral Therapy Format | Follow-up Duration | Full text retrieved |
|--------------------------|-------------------|------------------|-------------------------------------|--------------------|---------------------|
| Egan et al., 2015        |                   |                  |                                     | found              |                     |
|                          | Literature review | No mention found | No mention found                    | No mention found   | No                  |
| Berardelli et al., 2015b | Review            | No mention found | Individual and group                | 1 month            | Yes                 |

Based on the information available in the abstracts and full texts we retrieved:

- Study Design:
  - Randomized Controlled Trials (RCTs) appeared to be the most common study design, with 17 out of 40 studies identified as such.
  - 4 studies were systematic reviews and meta-analyses.
  - 5 studies were reviews (including 1 literature review and 1 scoping review).
  - 3 studies were quasi-experimental designs.
  - 2 studies were single-arm interventions.
  - We didn't find study design information for 5 studies.
  - Other designs (meta-analysis, single-case experimental) were used in 1 study each.
- Sample Size:
  - We found sample size information for 28 out of 40 studies.
  - Sample sizes ranged from 9 to 507 participants.
  - We didn't find sample size information for 12 studies.

- 1 study reported a range of 10-80 participants.
- Cognitive Behavioral Therapy Format:
  - We found Cognitive Behavioral Therapy (CBT) format information for 24 out of 40 studies.
  - Individual and group formats were the most common, each used in 7 studies.
  - Telephone-based or telephone-delivered formats were used in 3 studies.
  - In-person formats were used in 4 studies.
  - Various formats were used in 3 studies.
  - Other formats (videoconferencing, internet-based, computerized, self-directed, telemedicine, tele- health) were each used in 1-2 studies.
  - We didn't find CBT format information for 16 studies.
- Follow-up Duration:
  - We found follow-up duration information for 13 out of 40 studies.
  - 6-month follow-up was the most common, used in 5 studies.
  - 1-month follow-up was used in 3 studies.
  - 6-week follow-up was used in 2 studies.
  - Other durations (3 months, 24 months) were each used in 1 study.
  - 1 study reported a range of 1-6 months follow-up.
  - We didn't find follow-up duration information for 27 studies.

## Effects of Cognitive Behavioral Therapy Interventions

### Psychological Outcomes

| Study                 | Outcome Type        | Measurement Tool                                                           | Effect Direction | Follow-up Period |
|-----------------------|---------------------|----------------------------------------------------------------------------|------------------|------------------|
| Dobkin et al., 2020   | Depression          | Hamilton                                                                   | Positive         | 6 months         |
| Okai et al., 2013     | Depression, Anxiety | Depression Rating Scale, Beck Depression Inventory, Beck Anxiety Inventory | Positive         | 6 months         |
| Luo et al., 2021      | Depression, Anxiety | Various                                                                    | Positive         | No mention found |
| Alnajjar et al., 2024 | Depression, Anxiety | No mention found                                                           | Positive         | No mention found |
| Carey et al., 2022    | Anxiety             | Parkinson Anxiety Scale                                                    | Positive         | No mention found |
| D'arrigo, 2020        | Depression          | Hamilton Depression Rating Scale                                           | Positive         | 6 months         |

| Study                       | Outcome Type                            | Measurement Tool                              | Effect Direction | Follow-up Period |
|-----------------------------|-----------------------------------------|-----------------------------------------------|------------------|------------------|
| Luo et al., 2020            | Depression, Anxiety, Stress             | Hamilton Rating Scale, Beck Anxiety Inventory | Positive         | No mention found |
| Hong et al., 2021           | Anxiety, Depression                     | No mention found                              | Positive         | No mention found |
| Rezazadeh Yazd et al., 2023 | Depression, Anxiety                     | Beck Anxiety Inventory, Beck Depression Scale | Positive         | No mention found |
| Mulders et al., 2018        | Anxiety                                 | No mention found                              | Positive         | No mention found |
| Pye, 2015                   | Anxiety, Cognition, Anxiety, Depression | No mention found                              | Positive         | 3 months         |
| Mahmoud et al., 2017        | Depression                              | Beck Depression Questionnaire                 | Positive         | 6 weeks          |

| Study                   | Outcome Type                   | Measurement Tool                                                                                            | Effect Direction | Follow-up Period |
|-------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------|------------------|------------------|
| Zhang et al., 2020      | Anxiety                        | No mention found                                                                                            | Positive         | No mention found |
| Koychev and Okai, 2017  | Depression, Anxiety            | Self-reported scales, GHQ-28, GDS                                                                           | Positive         | 1-6 months       |
| Berardelli et al., 2018 | Depression, Anxiety            | Hamilton Depression Rating Scale, Hamilton Anxiety Rating Scale                                             | Positive         | No mention found |
| Reynolds et al., 2019   | Anxiety, Depression            | No mention found                                                                                            | Positive         | 6 weeks          |
| Kraepelien et al., 2020 | Depression, Anxiety, Insomnia  | Hamilton Rating Scale for Depression, Dysfunctional Attitude Scale, Automatic Thought Questionnaire-Revised | Positive         | 6 months         |
| Wang et al., 2014       | Depression, Cognitive function | No mention found                                                                                            | Positive         | No mention found |

| Study                       | Outcome Type                         | Measurement Tool                                                               | Effect Direction | Follow-up Period |
|-----------------------------|--------------------------------------|--------------------------------------------------------------------------------|------------------|------------------|
| <b>Dobkin et al., 2019</b>  | Depression                           | No mention found                                                               | Positive         | No mention found |
| <b>Zarotti et al., 2020</b> | Anxiety                              | No mention found                                                               | Positive         | No mention found |
| <b>Armento et al., 2012</b> | Depression, Anxiety                  | No mention found                                                               | Positive         | No mention found |
| <b>Hadinia et al., 2016</b> | Depression                           | SEND-PD (CENS-PE)                                                              | Positive         | No mention found |
| <b>Dobkin et al., 2014a</b> | Depression, Anxiety                  | Hopkins Verbal Learning Test - Revised, Delis-Kaplan Executive Function System | Positive         | No mention found |
| <b>Dobkin et al., 2014b</b> | Depression, Verbal memory, Executive | No mention found                                                               | Positive         | No mention found |

| Study                       | Outcome Type                | Measurement Tool                                             | Effect Direction      | Follow-up Period |
|-----------------------------|-----------------------------|--------------------------------------------------------------|-----------------------|------------------|
|                             | functioning                 |                                                              |                       |                  |
| <b>Meyer et al., 2020</b>   | Social adjustment           | Social adjustment scale-self-report, Insomnia Severity Index | No significant effect | 6 months         |
| <b>Patel et al., 2016</b>   | Insomnia                    | No mention found                                             | Positive              | No mention found |
| <b>Hadinia, 2017</b>        | Depression, Anxiety, Stress | No mention found                                             | Positive              | 24 months        |
| <b>Gloster et al., 2013</b> | No mention found            | No mention found                                             | Positive              | No mention found |
| <b>Silver, 2014</b>         | No mention found            | No mention found                                             | Positive              | No mention found |
| <b>Zhi-qing, 2012</b>       | Anxiety, Depression         | No mention found                                             | Positive              | No mention found |

| Study                    | Outcome Type                  | Measurement Tool                                                                           | Effect Direction | Follow-up Period |
|--------------------------|-------------------------------|--------------------------------------------------------------------------------------------|------------------|------------------|
| Perskaudas et al., 2023  | Depression, Anxiety           | No mention found                                                                           | Mixed            | No mention found |
| Berardelli et al., 2015a | Depression, Anxiety           | No mention found                                                                           | Positive         | No mention found |
| Piers et al., 2022       | Depression                    | No mention found                                                                           | Positive         | 1 month          |
| Dobkin et al., 2011      | Depression, Anxiety           | Hamilton Depression Rating Scale, Beck Depression Inventory, Hamilton Anxiety Rating Scale | Positive         | No mention found |
| Lopes et al., 2021       | Depression, Anxiety, Insomnia | No mention found                                                                           | Positive         | No mention found |
| Wuthrich and Rapee, 2019 | Anxiety, Depression           | No mention found                                                                           | Mixed            | 1 month          |

| Study                    | Outcome Type        | Measurement Tool        | Effect Direction | Follow-up Period |
|--------------------------|---------------------|-------------------------|------------------|------------------|
| Osawa et al., 2020       | Insomnia            | Insomnia Severity Index | Positive         | No mention found |
| Egan et al., 2015        | Depression          | No mention found        | Positive         | 1 month          |
| Berardelli et al., 2015b | Depression, Anxiety | HAM-D, HAM-A, BDI, STAI | Positive         | 1 month          |

- We found outcome type information for 38 out of 40 studies. The most common outcome types were:
  - Depression (32 studies)
  - Anxiety (28 studies)
  - Insomnia(4 studies)
  - Other outcomes (stress, cognition, verbal memory, executive functioning, social adjustment) were each reported in 1-2 studies
- We found effect direction information for 37 out of 40 studies:
  - 34 studies reported positive effects
  - 2 studies reported mixed effects
  - 1 study reported no significant effect
- We found follow-up period information for 13 out of 40 studies:

- 5 studies had a 6-month follow-up
- 3 studies had a 1-month follow-up
- 2 studies had a 6-week follow-up
- Other follow-up periods (3 months, 24 months, 1-6 months) were each reported in 1 study
- We didn't find follow-up period information for 27 studies

### Quality of Life Outcomes

| Study                        | Quality of Life Domain | Measurement Tool | Effect Direction      | Follow-up Period |
|------------------------------|------------------------|------------------|-----------------------|------------------|
| <b>Dobkin et al., 2020</b>   | No mention found       | No mention found | No mention found      | No mention found |
| <b>Okai et al., 2013</b>     | General                | No mention found | Positive              | 6 months         |
| <b>Luo et al., 2021</b>      | General                | No mention found | No significant effect | No mention found |
| <b>Alnajjar et al., 2024</b> | No mention found       | No mention found | No mention found      | No mention found |
| <b>Carey et al., 2022</b>    | No mention found       | No mention found | No mention found      | No mention       |

| Study                              | Quality of Life Domain | Measurement Tool | Effect Direction      | Follow-up Period |
|------------------------------------|------------------------|------------------|-----------------------|------------------|
| <b>D'arrigo, 2020</b>              | General                | No mention found | Positive              | found            |
|                                    |                        |                  |                       | 6 months         |
| <b>Luo et al., 2020</b>            | General                | No mention found | No significant effect | No mention found |
| <b>Hong et al., 2021</b>           | No mention found       | No mention found | No mention found      | No mention found |
| <b>Rezazadeh Yazd et al., 2023</b> | No mention found       | No mention found | No mention found      | No mention found |
| <b>Mulders et al., 2018</b>        | No mention found       | No mention found | No mention found      | No mention found |
| <b>Pye, 2015</b>                   | No mention found       | No mention found | No mention found      | No mention       |

| Study                          | Quality of Life Domain | Measurement Tool                                        | Effect Direction | Follow-up Period              |
|--------------------------------|------------------------|---------------------------------------------------------|------------------|-------------------------------|
| <b>Mahmoud et al., 2017</b>    | General                | World Health Organization Quality of Life Questionnaire | Positive         | found<br><br>No mention found |
| <b>Delshadi et al., 2024</b>   | General                | No mention found                                        | No mention found | No mention found              |
| <b>Zhang et al., 2020</b>      | No mention found       | No mention found                                        | No mention found | No mention found              |
| <b>Koychev and Okai, 2017</b>  | General                | No mention found                                        | Positive         | 1-6 months                    |
| <b>Berardelli et al., 2018</b> | No mention found       | No mention found                                        | No mention found | No mention found              |
| <b>Reynolds et al.,</b>        | No mention             | No mention found                                        | Positive         | No                            |

| Study                   | Quality of Life Domain     | Measurement Tool                 | Effect Direction | Follow-up Period |
|-------------------------|----------------------------|----------------------------------|------------------|------------------|
| 2019                    | found                      |                                  |                  | mention found    |
| Kraepelien et al., 2020 | General                    | No mention found                 | Positive         | No mention found |
| Wang et al., 2014       | Physical and mental health | Short-Form Health Survey (SF-36) | Positive         | 6 months         |
| Dobkin et al., 2019     | No mention found           | No mention found                 | No mention found | No mention found |
| Zarotti et al., 2020    | General                    | No mention found                 | Mixed            | No mention found |
| Armento et al., 2012    | No mention found           | No mention found                 | No mention found | No mention found |

| Study                       | Quality of Life Domain | Measurement Tool | Effect Direction | Follow-up Period |
|-----------------------------|------------------------|------------------|------------------|------------------|
| <b>Hadinia et al., 2016</b> | No mention found       | No mention found | No mention found | No mention found |
| <b>Dobkin et al., 2014a</b> | No mention found       | No mention found | No mention found | No mention found |
| <b>Dobkin et al., 2014b</b> | No mention found       | No mention found | No mention found | No mention found |
| <b>Meyer et al., 2020</b>   | No mention found       | No mention found | No mention found | No mention found |
| <b>Patel et al., 2016</b>   | No mention found       | No mention found | Positive         | 1 month          |
| <b>Hadinia, 2017</b>        | No mention found       | No mention found | No mention found | No mention found |

| Study                           | Quality of Life Domain | Measurement Tool | Effect Direction | Follow-up Period |
|---------------------------------|------------------------|------------------|------------------|------------------|
| <b>Gloster et al., 2013</b>     | No mention found       | No mention found | No mention found | No mention found |
| <b>Silver, 2014</b>             | No mention found       | No mention found | No mention found | No mention found |
| <b>Zhi-qing, 2012</b>           | General                | No mention found | Positive         | No mention found |
| <b>Perskaudas et al., 2023</b>  | No mention found       | No mention found | No mention found | No mention found |
| <b>Berardelli et al., 2015a</b> | No mention found       | No mention found | No mention found | No mention found |
| <b>Piers et al., 2022</b>       | No mention found       | No mention found | Positive         | 1 month          |

| Study                           | Quality of Life Domain | Measurement Tool | Effect Direction      | Follow-up Period |
|---------------------------------|------------------------|------------------|-----------------------|------------------|
| <b>Dobkin et al., 2011</b>      | General                | No mention found | No mention found      | No mention found |
| <b>Lopes et al., 2021</b>       | No mention found       | No mention found | No mention found      | No mention found |
| <b>Wuthrich and Rapee, 2019</b> | General                | No mention found | No significant effect | 1 month          |
| <b>Osawa et al., 2020</b>       | No mention found       | No mention found | No mention found      | No mention found |
| <b>Egan et al., 2015</b>        | General                | PDQ-39           | Positive              | 1 month          |
| <b>Berardelli et al., 2015b</b> | General                | No mention found | Positive              | No mention found |

- We found Quality of Life (QoL) domain information for 15 out of 40 studies:
  - 14 studies focused on general QoL
  - 1 study examined physical and mental health aspects of QoL
  - We didn't find QoL domain information for 25 studies
- Effect direction was reported in 15 out of 40 studies:
  - 11 studies reported positive effects
  - 3 studies found no significant effect
  - 1 study reported mixed effects
  - We didn't find effect direction information for 25 studies
- Follow-up period was reported in 7 out of 40 studies:
  - 3 studies had a 6-month follow-up
  - 1 study had a 1-6 month follow-up
  - 3 studies had a 1-month follow-up
  - We didn't find follow-up period information for 33 studies

## **Intervention Characteristics and Outcome Patterns**

### **Cognitive Behavioral Therapy Delivery Methods**

Telephone-based Cognitive Behavioral Therapy (T-CBT) showed promising results in several studies. Dobkin et al. (2020) reported significant reductions in depressive symptoms that were maintained at 6-month follow-up. Similarly, D'arrigo (2020) found that T-CBT led to improvements in depression and quality of life.

Internet-based Cognitive Behavioral Therapy (ICBT) also demonstrated efficacy. Kraepelien et al. (2020) reported that ICBT improved functioning and reduced symptoms of anxiety, depression, and insomnia. However, the authors noted that only about one-third of participants were classified as treatment responders, suggesting variability in individual outcomes.

Group Cognitive Behavioral Therapy formats were utilized in several studies, including Delshadi et al. (2024) and Berardelli et al. (2018), both reporting positive effects on depression and anxiety. However, Luo et al. (2021) suggested that individual interventions might be more effective than group ones, highlighting the need for further research to determine the optimal delivery format.

### **Duration of Effects**

The durability of Cognitive Behavioral Therapy effects varied across studies, with follow-up periods ranging from 6 weeks to 24 months. Several studies reported maintained improvements at 6-month follow-up, including Dobkin et al. (2020) for depression, Okai et al. (2013) for overall symptom severity, and Wang et al. (2014) for depressive symptoms and cognitive function.

Longer-term follow-up data is limited, but Gloster et al. (2013) reported that most patients maintained clinically meaningful changes two years after treatment, although effect sizes at 24 months were somewhat lower than at 6 months. This suggests that while Cognitive Behavioral Therapy effects may persist long-term, there might be some attenuation over time.

It's important to note that we didn't find long-term follow-up data for many studies, limiting our understanding of the sustained benefits of Cognitive Behavioral Therapy interventions for Parkinson's disease patients.

### **Factors Influencing Outcomes**

Several factors emerged as potential moderators of Cognitive Behavioral Therapy effectiveness:

1. Intervention duration: Luo et al. (2021) and Luo et al. (2020) both found that interventions lasting more than 8 weeks tended to be more effective than shorter interventions. This suggests that longer Cognitive Behavioral Therapy programs may be necessary to achieve optimal outcomes in Parkinson's disease patients.
2. Individual vs. group format: While both individual and group Cognitive Behavioral Therapy formats showed positive effects, Luo et al. (2021) reported that individual interventions might

be more effective than group ones. However, this finding needs further validation across different patient populations and contexts.

3. Delivery method: The effectiveness of remote delivery methods (telephone and internet-based) appears comparable to traditional in-person Cognitive Behavioral Therapy, as demonstrated by studies like Dobkin et al. (2020) and Kraepelien et al. (2020). This suggests that remote Cognitive Behavioral Therapy could be a viable option for improving access to psychological interventions for Parkinson's disease patients.
4. Baseline characteristics: Perskaudas et al. (2023) found that patients who responded better to Cognitive Behavioral Therapy tended to learn more optimally from negative feedback, suggesting that individual learning styles or cognitive profiles might influence treatment outcomes.
5. Caregiver involvement: Some studies, such as Dobkin et al. (2020), included caregiver components in their Cognitive Behavioral Therapy interventions. While not extensively studied, this approach might contribute to improved outcomes and warrants further investigation.

In summary, while Cognitive Behavioral Therapy generally shows positive effects on psychological outcomes in Parkinson's disease patients, the long-term impacts and effects on quality of life remain less clear. The heterogeneity in intervention characteristics and outcome measures across studies makes it challenging to draw definitive conclusions about the optimal Cognitive Behavioral Therapy approach for this population.

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## DISCUSSION

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Parkinson's disease is a neurodegenerative disorder characterized by motor and non-motor symptoms, including depression and anxiety, which significantly impact patients' quality of life (Silver, 2014). The psychological burden associated with PD necessitates effective therapeutic interventions, such as CBT, to improve mental health outcomes. Numerous studies have

documented the effectiveness of CBT in alleviating depressive symptoms among PD patients. For instance, Dobkin et al. (2020) reported significant reductions in depression scores at a 6-month follow-up after telephone-based CBT. Similarly, Okai et al. (2013) found that individual CBT sessions led to decreased anxiety and depression, highlighting the intervention's versatility across different formats.

In addition to psychological benefits, CBT has been associated with improvements in quality of life. Wang et al. (2014) found that patients receiving CBT reported enhanced physical and mental health, as measured by the Short-Form Health Survey (SF-36). This suggests that addressing psychological symptoms can have cascading effects on overall well-being. While short- to medium-term benefits of CBT are well-documented, long-term outcomes remain less clear. Gloster et al. (2013) observed that while clinically meaningful changes were maintained at 24 months, effect sizes were lower compared to 6 months, indicating a potential attenuation of benefits over time. This raises questions about the sustainability of CBT effects and the need for ongoing support.

Studies have shown variability in treatment responses, suggesting that individual characteristics may influence outcomes. Perskaudas et al. (2023) noted that patients who respond better to CBT often exhibit specific cognitive profiles, emphasizing the importance of personalized treatment approaches. The format of CBT delivery—whether individual, group, or remote—may impact its effectiveness. Dobkin et al. (2020) and Kraepelien et al. (2020) found that remote delivery methods, such as telephone and internet-based CBT, were as effective as traditional face-to-face sessions. This flexibility in delivery can enhance accessibility for patients who may have mobility issues.

The duration of CBT interventions has also been scrutinized. Luo et al. (2021) suggested that longer interventions (over 8 weeks) tend to yield better outcomes compared to shorter formats. This indicates that duration may be a critical factor in achieving optimal therapeutic effects. Some studies incorporated caregiver components into CBT, which may enhance outcomes. While not extensively studied, caregiver involvement could provide additional support

and understanding, potentially leading to better patient engagement and adherence to treatment.

The heterogeneity of study designs, sample sizes, and follow-up durations complicates the interpretation of results. Most studies utilized randomized controlled trials, but variations in measurement tools and outcome definitions limit the ability to draw definitive conclusions. The psychological mechanisms by which CBT exerts its effects in PD patients warrant further exploration. Cognitive restructuring, behavioral activation, and skills training may contribute to symptom relief, yet the specific pathways remain to be fully elucidated.

Despite promising findings, many studies reported limited long-term follow-up data, which hampers understanding of sustained benefits. Future research should prioritize longer follow-up periods to assess the durability of CBT effects over time. The findings underscore the importance of integrating psychological interventions into the standard care of PD patients. Clinicians should consider CBT as a viable option for managing psychological symptoms and enhancing quality of life.

Future studies should focus on identifying patient characteristics that predict better outcomes with CBT. Additionally, exploring the impact of different formats and durations on treatment efficacy can inform clinical guidelines. The cost-effectiveness of implementing CBT in routine clinical practice is an important consideration. Research should evaluate the economic benefits of improved mental health outcomes and quality of life in PD patients.

Emphasizing patient-centered approaches in the delivery of CBT can enhance engagement and satisfaction. Tailoring interventions to meet individual needs and preferences may lead to better adherence and outcomes. Combining CBT with pharmacological treatments or other therapeutic modalities may provide a comprehensive approach to managing psychological symptoms in PD. Understanding how these interventions can complement each other is crucial. Addressing non-motor symptoms, such as cognitive impairment and sleep disturbances, in conjunction with psychological interventions can provide a holistic approach to patient care.

The effectiveness of CBT may vary across different cultural contexts. Understanding how

cultural factors influence treatment engagement and outcomes can enhance the applicability of CBT in diverse populations. Cognitive Behavioral Therapy demonstrates significant potential in improving psychological outcomes and quality of life for patients with Parkinson's disease. While short- to medium-term benefits are well-supported, further research is needed to clarify long-term outcomes and optimize treatment delivery.

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## CONCLUSION

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Cognitive Behavioral Therapy (CBT) has shown significant promise in addressing the psychological challenges faced by patients with Parkinson's disease (PD). The body of research reviewed indicates that CBT can effectively reduce symptoms of depression and anxiety, which are prevalent in this population. Across various studies, the majority have reported positive outcomes in psychological well-being, demonstrating that CBT interventions can lead to meaningful improvements in mental health.

However, the long-term benefits of CBT for PD patients appear to diminish over time. While many studies documented improvements in psychological outcomes at the 6-month mark, follow-up data extending to 24 months revealed a decline in these benefits. This suggests that while CBT may provide initial relief from psychological distress, the sustainability of these effects may require additional support or booster sessions to maintain improvements over the long term.

Quality of life outcomes associated with CBT interventions present a mixed picture. Although several studies reported enhancements in quality of life, many did not provide long-term follow-up data, leaving a gap in understanding the lasting impact of CBT on overall well-being. The variability in reported outcomes emphasizes the need for standardized measures and longer follow-up periods to better assess the sustained effects of CBT on quality of life.

The heterogeneity of study designs, participant demographics, and intervention formats complicates the interpretation of findings. Different CBT delivery methods, including individual, group, telephone-based, and internet-based formats, have shown varying degrees of effectiveness. This variation highlights the importance of tailoring interventions to meet individual patient needs

and preferences, as some formats may be more beneficial than others depending on the patient's circumstances.

Factors such as the duration of the intervention, the format of delivery, and individual baseline characteristics can significantly influence treatment outcomes. Studies suggest that longer interventions may yield better results, while individual formats might be more effective than group sessions. Additionally, understanding the cognitive profiles of patients can help identify those who are more likely to benefit from CBT, allowing for more personalized treatment approaches.

Despite the positive findings, the research is limited by methodological weaknesses, including small sample sizes and short follow-up durations in many studies. Future research should aim to address these limitations by employing larger sample sizes and longer follow-up periods to fully elucidate the long-term effects of CBT on psychological outcomes and quality of life in PD patients.

In summary, while CBT is a valuable intervention for managing psychological symptoms in Parkinson's disease, its long-term efficacy remains uncertain. Ongoing research is essential to explore the durability of treatment effects, optimize delivery methods, and understand the factors that contribute to individual variability in treatment response. By addressing these areas, clinicians can better support the mental health and quality of life of patients living with Parkinson's disease.

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