



# BMJ Open Pranayama (yogic breathing practices) in Parkinson's disease: protocol for a scoping review of literature

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## ABSTRACT

**Introduction** Parkinson's disease is a neurodegenerative disorder that presents with motor symptoms such as tremors, slowness and gait difficulties, in addition to various non-motor symptoms such as anxiety, depression and autonomic and sleep disturbances. Pranayama (yogic breathing practices) has been studied as a part of yoga interventions in Parkinson's disease. Previous systematic reviews and meta-analyses have not detailed the pranayama practices used in clinical studies, and there is no clarity on the pranayama practices that would be most beneficial for Parkinson's disease. This scoping review aims to map the available scientific evidence on the effect of pranayama interventions for Parkinson's disease and identify the potential gaps in the literature.

**Methods and analysis** A literature search will be conducted in major databases (JBI evidence synthesis, MEDLINE, Cochrane Library, including Cochrane Complimentary Medicine, and Scopus) from 1990 to date. Relevant grey literature will be searched. Two independent reviewers will initially review the extracted articles and will be further adjudicated by two independent reviewers. Data management will be done using Rayyan software throughout the review. Data extracted will include specific details of the population, concept, context and study methods specific to the scoping review objectives. The extracted data will be presented in tabular/diagrammatic form, reporting on items aligning with the review objectives, such as details of the pranayama intervention and its clinical outcomes. A narrative summary will accompany the tabulated results, identifying the gaps in evidence and areas for future research.

**Ethics and dissemination** Ethics approval is not required for this scoping review. The findings will be disseminated through publications in peer-reviewed journals and conference presentations.

**Trial registration number** Protocol Registration in Open Science Framework - [https://osf.io/jdwga/?view\\_only=82aa5afd46974416a402fa1a0ac39fce](https://osf.io/jdwga/?view_only=82aa5afd46974416a402fa1a0ac39fce)

## BACKGROUND

Parkinson's disease (PD) is a neurological condition with motor symptoms such as tremors, slowness (bradykinesia), stiffness (rigidity) and balance difficulties. The motor symptoms may be associated with non-motor symptoms such as depression and anxiety, constipation, urinary disorders and sleep

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This collaborative review brings in multidisciplinary experts, including practising neurologists and yoga and public health researchers.
- ⇒ By incorporating various study designs, a wide range of evidence regarding pranayama practices and their impact on Parkinson's disease will be investigated.
- ⇒ Wide dissemination of the results may guide clinicians in making informed decisions and counselling patients with Parkinson's disease about pranayama practices.
- ⇒ A limitation of the protocol is that only English language studies will be included, which may lead to a language bias.

disturbances.<sup>1</sup> The global burden of PD has been estimated to have increased by 155.5% from 1990 to 2019.<sup>2</sup> Treatment options for PD consist mainly of medications such as levodopa and dopamine agonists and occasionally deep brain stimulation surgery in select patients.<sup>3</sup> Physical therapies, including yoga-based interventions, are used for rehabilitative care.<sup>4 5</sup>

Pranayama, a part of ancient yoga practices, consists of breathing techniques. Pranayama is of various types, including basic practices such as nadi shodhan (alternate nostril breathing), bhrumari (humming bee breath), kapalbhati (skull shining breath), bhastrika (bellows breath), among others. More advanced practices employ holding of breath in full inhalation (kumbhaka) and exhalation (shoonyaka) for various durations. Together with asanas (postures) and dhyana (meditation), pranayama has been reported to have several health benefits in patients with cardiovascular and respiratory disorders, as well as in patients with malignancies.<sup>6</sup> Pranayama has been reported to affect brain functions, including reaction times, reduced mind wandering and improvements in insight, anxiety and language functions.<sup>7</sup> Furthermore, pranayama has been observed

to alter brain activity, as demonstrated by functional brain imaging and electroencephalography.<sup>8,9</sup>

Yoga practices comprising various body postures (yoga asanas) may generally be difficult in PD patients due to stiffness. However, breathing exercises can be easily performed in all stages of PD. As pranayama does not require any challenging postures, it is a feasible mind-body practice for people living with PD. Yoga interventions, with and without pranayama, have been studied for their effects on motor as well as non-motor functions in PD. Previous meta-analyses on yoga and PD report improvement in motor symptoms, balance functions, functional mobility, anxiety, depression and overall quality of life.<sup>4,10,11</sup>

### Study rationale

In yogic science, breathing practices have an important role, and a distinction between breathing techniques and their principles is described.<sup>12</sup> Specific types of breathing practices are recommended for specific health and disease conditions. The pace, depth and duration of inhalation/exhalation, whether active/passive inhalation, rhythm, patterns of movements of respiratory muscles and attention during breathing practice vary among the pranayama types.<sup>12</sup> However, there is no clarity on the type of pranayama techniques that benefit PD patients. To our knowledge, there have been no meta-analyses and systematic reviews investigating the specifics of pranayama interventions for PD. Pranayama is one of the components of a comprehensive Yoga therapy protocol, and extracting one component may risk the holistic approach of yoga and result in the oversimplification of an ancient practice. However, we feel that appropriate characterisation of the specifics of pranayama practices studied in PD is crucial to translating the evidence on potential beneficial effects to clinical practice. Therefore, this scoping review of literature is planned with the goal of guiding therapeutic applications and future investigations of pranayama in PD and possibly in other neurological conditions.

### Review aim and objectives

This review aims to scope published literature on the effect of pranayama on PD. The specific objectives of this review are as follows:

1. To characterise pranayama practices and their effects on PD.
2. To identify the potential gaps in the literature on the effects of pranayama in PD such as specifics of pranayama practices, duration of practice and the effect on symptoms.

## METHODS AND ANALYSIS

### Protocol registration

The protocol has been registered in the Open Science Framework.

[https://osf.io/jdwga/?view\\_only=82aa5afd46974416a402fa1a0ac39fce](https://osf.io/jdwga/?view_only=82aa5afd46974416a402fa1a0ac39fce)

### Protocol development

The Joanna Briggs Institute guidance for scoping reviews has been followed in the design of this protocol.<sup>13</sup> They describe six stages in a scoping review, namely identifying the research question, identifying relevant studies, selecting studies, charting data, summarising and collating results and consulting with stakeholders. In line with this framework, the key steps in the review are described below.

#### Stage 1: identifying the research question

Based on the preliminary scrutiny of the literature and felt need from clinical practice, this review was planned to answer the question—‘what is the evidence on pranayama practices in patients with PD?’.

#### Stage 2: identifying relevant studies

We will follow the following steps to identify studies relevant to this review.

#### Information sources

International databases will be used as sources of literature; additionally, selected grey literature sources relevant to yoga therapy will be searched. The databases searched will be JBI evidence synthesis, MEDLINE (PubMed), Cochrane Library, including Cochrane Complimentary Medicine, and Scopus.

#### Eligibility criteria

The studies included will be on populations of PD with the intervention of pranayama breathing practices in community and hospital-based settings. Study designs eligible for inclusion in this review are randomised controlled trials, case-control, cohort, case series, case reports, and qualitative and mixed-method studies. Searches will begin from 1990 onwards. Studies in the English language published in peer-reviewed journals will be included. We will exclude studies that do not include pranayama practices in the yoga protocol. Review articles, editorials, meta-analyses, systematic reviews, and articles that are not written in English will be excluded.

#### Search strategy

The initial search strategy will be done in MEDLINE and subsequently in other listed electronic databases. The proposed search strategies for PUBMED, Scopus and Cochrane are available in (online supplemental file 2). Bibliographies of eligible studies will be examined to identify other relevant studies. Grey literature will be searched in conference proceedings in Scopus and Google Scholar. Search results will be imported and stored in Rayyan software.<sup>14</sup>

#### Draft search strategy for PubMed

Parkinson disease[MeSH] OR Parkinson\*[tiab] OR Paralysis Agitans[tiab] OR PD[tiab]  
AND  
Yoga[MeSH] OR Relaxation Therapy[mesh] OR yoga[tiab] OR Yogic[tiab] OR meditat\*[tiab] OR

**Table 1** Data extraction items

Publication detail	<ul style="list-style-type: none"> <li>▶ Author, year</li> <li>▶ Publication type (published/unpublished)</li> <li>▶ Publication source (journal/website)</li> <li>▶ Country of origin</li> </ul>
Study characteristics	<ul style="list-style-type: none"> <li>▶ Study design</li> <li>▶ Aim(s)/objective(s) of the study</li> <li>▶ Study location/setting</li> </ul>
Participant characteristics	<ul style="list-style-type: none"> <li>▶ Age/age distribution</li> <li>▶ Sex</li> <li>▶ Number of participants</li> <li>▶ Stage of Parkinson's disease</li> <li>▶ Medication</li> </ul>
Type of intervention	<ul style="list-style-type: none"> <li>▶ Type/s of pranayama practices               <ul style="list-style-type: none"> <li>– Description of the pranayama practiced (pranayama protocol)</li> <li>– Frequency of practice</li> <li>– Duration of individual practice sessions</li> </ul> </li> <li>▶ Total duration of intervention</li> <li>▶ Only pranayama intervention used</li> <li>▶ Practices or interventions used in addition (co-interventions) to pranayama</li> <li>▶ Method of training patients/participants in pranayama</li> <li>▶ Adherence report (%)</li> <li>▶ Method for monitoring adherence</li> </ul>
Reported outcome	<ul style="list-style-type: none"> <li>▶ Time points of monitoring outcome</li> <li>▶ Benefit</li> <li>▶ Efficacy</li> <li>▶ Scores/scales               <ul style="list-style-type: none"> <li>– UPDRS (Unified Parkinson's Disease Rating Scale)<sup>16</sup></li> <li>– TUG (Timed Up and Go test)<sup>4 17</sup></li> <li>– BDI (Beck Depression Inventory)<sup>18 19</sup></li> <li>– HADS (Hospital Anxiety and Depression Scale)<sup>4 17</sup></li> <li>– Other relevant scales</li> </ul> </li> <li>▶ Individually reported symptom outcomes               <ul style="list-style-type: none"> <li>– Motor functions including tremors, slowness, balance and falls</li> <li>– Speech</li> <li>– Swallowing</li> <li>– Cognition</li> <li>– Hallucinations</li> <li>– Mood/affect including anxiety and depression</li> <li>– Quality of life</li> <li>– Sleep</li> <li>– Other outcomes</li> </ul> </li> <li>▶ Adverse effects</li> <li>▶ Reported limitations of the study</li> <li>▶ Potential mechanisms of action</li> <li>▶ Suggested future directions</li> </ul>

pranayama[tiab] OR asana\*[tiab] OR mindful\* [tiab] OR breathing exercises[mesh] OR (breath\*[tiab] AND exercise\*[tiab]) OR (relax\*[tiab] AND (therap\*[tiab] or treat\*[tiab]))

### Stage 3: selecting studies

The titles and abstracts of individual studies will be screened against the eligibility criteria and categorised as 'include', 'exclude' or 'uncertain'.

We will undertake training at each step (100 randomly selected titles/abstracts or 50 full-text papers will be screened independently by PR and DA (repeated until agreement exceeds 90%). After an initial sift to exclude obviously irrelevant titles, the two reviewers will screen the titles and abstracts and then undertake full-text screening of potentially relevant papers. Disagreements will be resolved by discussion between researchers and arbitrated by reviewers SR and SC. We will follow-up on references of selected papers and will group papers from the same study, if any.

The process of study selection will be reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) flow chart.<sup>15</sup>

### Stage 4: charting the data

Two reviewers (PR and DA) will independently extract data onto a piloted customised data extraction form. The data extracted will include publication details, study characteristics, participant characteristics, details of the pranayama intervention, reported outcomes, limitations of the studies and suggested future directions. The details of the data extraction items are presented in table 1.

The data-extraction sheet will be piloted initially on a few studies and modified if needed in line with the review objectives. We will attempt to contact the authors of the included papers for missing or unclear essential information. Multiple publications from the same study will be grouped.

The data collected will be managed throughout the review using Microsoft Excel and Rayyan software.

### Stage 5: collating, summarising and reporting the results

The data will be summarised by the pranayama practices and protocols used and reported outcomes in the form of tables and graphs. The gaps identified in the literature will be reported. Future directions based on the scoping review will be suggested. The reporting standards for scoping reviews (PRISMA-ScR) will be followed.<sup>15</sup>

### Stage 6: consultation with stakeholders

To make our results more applicable to practitioners and patients, we will consult with a yoga expert and trainer. We will seek his input to better understand the concepts of pranayama in yogic sciences and identify the specific information needed when using pranayama in PD patients. We will also seek inputs from peer neurologists involved in treating PD patients to align our review with the needs of practitioners and patients.

## Ethics and dissemination

We will not be conducting primary research and, hence, do not require approval from an ethics committee. We will publish our findings in a peer-reviewed journal following the reporting standards for scoping reviews (PRISMA-ScR).<sup>15</sup> The PRISMA-ScR checklist was used in the development of the protocol to ensure methodological rigor. An online supplemental file 1 containing this checklist is available for reference. We will disseminate our findings widely through professional networks, conference presentations and briefs for patient information.

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**Contributors** PR and SC led the conceptualisation of the study. PR and SC developed the search strategy for the protocol. PR, DA and SC drafted the initial version of the protocol. PR, DA, SC and SR critically reviewed the version prior to submission. PR is the guarantor for this work.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research. Though it is ideal to involve the public and patients in the design, conduct or reporting of scoping reviews, given the highly technical nature of this review topic, we were unable to do so. However, we will attempt to disseminate lay language summary of the review findings for public and patients information.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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