

# **Impact of Dance/Music and Meditation on the progression of Parkinson's Disease with mild/moderate severity: A Protocol of a PILOT study**

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# Impact of Dance/Music and Meditation on the progression of Parkinson's Disease with mild/moderate severity: A Protocol of a PILOT study

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## Abstract

**Background:** Parkinson's Disease (PD) is a multi-factorial disease that impacts various aspects, including motor and non-motor behaviours such as mood, cognition, behaviour and quality of life. Evidence suggests that therapies alternative to surgical procedures and medication can help in reducing the progression of Parkinson's Disease without any side effects. Engaging in leisure activities such as music, dance and physical exercise is seen to have neuroprotective effects on people with neurodegenerative disorders. However, limited research exists on the non-motor aspects of PD, with primary focus being on the gait and balance of PD. Prior research primarily focuses on the motor aspects of PD such as gait and balance, with limited evidence on the non-motor presentations of PD. Furthermore, the limited studies that exist do not take into account the long-term impact on participants' and caretakers. There is also a paucity in current literature assessing the effect of alternative therapies on PD in an Indian setup.

**Objective:** The primary aim is to study the impact of dance/music and meditation on mild and moderate PD progression and Quality of Life. The secondary aims of the project include detecting the impact of therapy on cognition, mood and behaviour. The impact on the quality of life of the caretaker will also be assessed.

**Methods:** This is a prospective randomized controlled pilot study with 30 PD participants (mild to moderate severity) randomized into intervention (therapy with usual care) and reference group (usual care) at a ratio of 15:15. The patients in intervention group will be enrolled to take part in three weekly sessions of dance/music and meditation for 6 months. Within dance and music, the patients will be given options to choose an activity of their interest. The clinical measures will be completed by blinded assessors at baseline, 3 months and 6 months' post randomization.

**Results:** Currently, the project is in its data analysis phase, with a tentative completion date of 20th June 2024.

**Conclusions:** This study will be significant in exploring alternative therapies that can improve the quality of life of patients with PD and their care-givers. Current treatment options such as medication can lead to side effects resulting in a poor quality of life. Clinical Trial: Registered with Clinical Trials Registry India (CTRI) dated 27/03/2023, CTRI No: CTRI/2023/03/051064, <http://ctri.nic.in>

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## Original Manuscript

# **Impact of Dance/Music and Meditation on the progression of Parkinson's Disease with mild/moderate severity: A Protocol of a PILOT study**

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## Abstract

### Background:

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor dysfunctions and non-motor symptoms. Current treatments do not alter disease progression, highlighting the need for alternative therapies. Music, dance, and mindfulness meditation have shown the potential to improve symptoms and quality of life (QoL) in PD patients.

### Objective:

To evaluate the effectiveness of dance/music and meditation on PD progression, cognitive functions, mood, behavior, and caregiver burden.

### Methods:

**Design:** Single-blinded, longitudinal, parallel, randomized controlled trial.

**Participants:** 30 patients with mild to moderate PD residing in Mumbai who can physically participate in the activities. Exclusion criteria include advanced PD, severe balance issues, age above 80, and other movement disorders.

**Interventions:** Participants in the intervention group will engage in dance/music sessions and guided meditation thrice weekly for six months. The control group will continue their usual activities and medication.

### Outcome Measures:

**Primary:** Progression of PD symptoms using the Unified Parkinson's Disease Rating Scale (UPDRS) I-III and QoL using the Parkinson's Disease Questionnaire (PDQ-39).

**Secondary:** Cognitive functions (Mini-Mental State Examination - MMSE), mood (Beck Depression Inventory - BDI, Parkinson's Anxiety Scale - PAS), mobility (Timed Up and Go - TUG, Berg Balance Test - BBT), behavioral disorders (Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease Rating Scale - QUIP-RS), and caregiver burden (Zarit Burden Interview - ZBI, Parkinson's Disease Questionnaire-Carer - PDQ-Carer).

## Results:

The fund for the study was received from Jaslok Hospital and Research Center in February 2023. Data collection was completed in February 2024, with 28 participants finishing the study (15 in the intervention group and 13 in the control group). Final results will be published upon completion of statistical analysis, probably by Early next year.

**Current Status:** Data analysis is underway, with results expected to be published later this year. The study was registered with the Clinical Trials Registry India (CTRI/2023/03/051064).

## Conclusion:

This study aims to provide significant insights into the effectiveness of dance/music and meditation in improving the quality of life and slowing the progression of PD. The findings are anticipated to support using these non-pharmaceutical therapies as complementary approaches to managing PD.

**Trial Registration:** CTRI/2023/03/051064

## INTRODUCTION:

Parkinson's disease (PD) is the second most common neurodegenerative disease, with over 10 million people worldwide suffering from PD [1]. PD is highly prevalent in Asia with a frequency of 70 PD patients per 100,000 people in India [2,3]. PD is a progressive multi-dimensional disorder characterized by the degeneration of dopaminergic neurons, resulting primarily in motor dysfunctions including Bradykinesia, rigidity, tremors and postural instability [4]. PD can also result in concurrent Non-Motor Manifestations (NMS) including psychiatric and mood-related alterations such as apathy, depression and anxiety [5,6]. Cognitive involvement is prevalent as well with a high occurrence of slow processing speed, deficits in learning and attention in PD patients [7,8]. They are also seen to experience behavior disturbances [9].

Previous research suggests that medical or surgical treatments does not change the progression of PD [10]. It is seen that alternative therapies such as music, dance and mindfulness might help delay the progression of PD symptomatology while improving the quality of life (QoL) [11,12]. In addition, therapies such as exercise and aerobic dance can have neuroprotective effects led by neuroplasticity [13]. Exercise is further seen to modulate dopamine neurotransmission [14].



## Music Therapy:

It has been observed that music modulates the brain regions related to movement, behavior and cognitive processes [15]. Musical rhythm offers time-based groupings of sounds that provide auditory cueing and signaling strategies. This can help in restoring internal synchronization mechanisms and enable easier control of motor rhythmicity [15]. Evidence suggests that music exposure can enhance balance and functional mobility in patients with PD [16]. Listening to different musical genres has also been shown to induce spatiotemporal sense and trunk oscillations in the gait of PD patients [17]. Music further activates the amygdala related pathways and is seen to reduce depression and elevate mood in PD patients [18]. Abell et al. (2000) conducted a study demonstrating that choral singing for a minimum of 6 months led to improvement in both motor and non-motor symptoms in patients with PD [19].

## Dance Therapy:

Dance therapy uses sensory-motor methods such as visual and spatial focus to facilitate improvement in one's physical and mental health [11]. Dancing entails the practice of movements, postures and body control which might address the Bradykinesia, postural instability and rigidity associated with PD [20]. Duncan and Earhart (2014) [21] conducted a two-year longitudinal study, wherein significant improvements in motor measures were observed post weekly Tango dance sessions, reflected through the assessments of the outcome measures at 12 and 24 months. Dance is also seen to enhance mood, socialization, self-esteem and QoL in patients with PD [22]. Additionally, high levels of commitment are observed in training program offering American tango versus traditional exercise [23]. Dance programs amongst PD patients can further improve the quality of life of caretakers [23].

Certain dance forms and particular cultural dances are seen to have varied influences on PD symptoms [24,25]. For instance, a study claims that Ball Dancing might be more effective than Tango [24]. Furthermore, there is evidence that Amazonian Dances have distinct cultural peculiarities such as knee flexion and accentuated hip movements that can improve PD motor symptoms [25]. However, there is limited research on the effect of Indian art forms on the PD symptomology and progression.

## Meditation:

Meditation is a mental state of quiescence that affects the body functioning and helps patients gain attentional

control and maintain focus on their intentions rather being controlled by external environmental factors [26,27]. Mindfulness meditation stimulates the parasympathetic nervous system of the body through deep breathing exercises and positively impacts concentration and emotion regulation [28]. A mindfulness meditation research conducted in Korea, on patients with depression, anxiety disorders, and drug abuse, showed that meditation has positive effects on emotional and psychological stability, depression, anxiety, and memory loss [29].

Most of the studies till date have either been conducted over a short duration of time and/or on a small group of patients and/or have evaluated limited parameters. There has been no comprehensive review exploring the effect of dance/music and meditation on QoL and limited studies take the QoL of caretakers into consideration. Additionally, there is limited research on effectiveness of alternative therapies on the Indian population. The aim of this study is to evaluate the effectiveness of music/dance and meditation on quality of life and progression of symptoms in PD patients.

## Methods

The study is a single-blinded longitudinal randomized controlled trial (RCT) that will take place over a 6-month time period at Jaslok Hospital and Research Center, Mumbai. Participants will be randomly allocated into two groups: the reference and intervention group, having 15 participants in each arm. The intervention group will be further divided into dance or music as per the participant's choice. Refer to the Consolidated Standards of Reporting Trial (CONSORT) chart summarizing the enrolment and allocation of the participants (Figure 1).

## Aims:

### *Primary End Point:*

- 1) Examine the effect of dance/music and meditation on progression of mild and moderate PD using the Unified Parkinson's Disease Rating Scale I-III and Parkinson's Disease Questionnaire scores in PD patients.

### *Secondary End Point:*

- 2) Detect the impact of these therapies on cognition, mood and behaviour through neuropsychological batteries

- 3) Assess the impact on the QoL of the care-givers of PD patients

## **Participants:**

### ***Inclusion Criteria:***

1. Patients with a confirmed diagnosis of mild – moderate PD (Motor UPDRS III- 43 or below)
2. Patients should be residents of Mumbai (the city where the research is conducted)
3. All patients should be physically able to take part in the activities

### ***Exclusion Criteria:***

1. Patients with advanced PD
2. Participants with extreme balance related problems or the inability to move
3. Age above 80 years
4. Patients with other movement related disorders such as atypical Parkinsonism and Essential Tremors
5. Post-Deep Brain Stimulation patients
6. All patients with secondary Parkinsonism

## **Randomization:**

Eligible participants will be randomized into the experimental and control group through a randomized allocation sequence devised by an independent statistician.

## **Blinding:**

This is a single blinded study as the assessors measuring the outcomes will be blinded to the allocation of groups.

## **Assessments:**

All assessments will be conducted during the “on phase” i.e. during the phase when the Parkinson’s medication is in effect. The outcomes will be assessed by a specialist nurse, a neuro-consultant and a consultant psychologist. For the re-assessments, the marker who conducted the initial assessment will conduct subsequent assessments.

## Attrition and Missing Data:

Due to the long duration of the study, it is expected that there will be a moderate attrition rate. To reduce the attrition rate and maintain commitment towards the project, the importance of complete participation and consistency during the sessions will be conveyed to the team members and participants. The re-assessments will be arranged at participants' convenience to minimize the possibility of missing data.

## Intervention Group:

The patients will be given the option to choose from dance and music modalities. Meditation will be provided in every session. Active engagement for therapy is required for up to 6 months. All the activities will be improvised as per the abilities of the patients. The duration of each class will be around 1 hour. Both music and dance modalities follow a similar structure. All the classes will be followed by a 3-part format.

*Part 1:* Classes will begin with 10 minutes of warm-up activities that will cover a wide range of stretching and hand-leg-eye coordination exercises.

*Part 2:* The 45-minutes dance or music sessions will follow a different format during this stage.

The dance sessions will begin with warm-up activities with focus on Indian classical dance steps. The classical dance focuses on gait and balance related tasks, intending to reduce Bradykinesia, shuffling gait and tendency to freeze in PD (31). Classical dance emphasize greatly on hand-motor coordination and eye-movement [31,32]. The eye-movement exercises might further improve lower gaze palsy in patients with PD. Alongside this, the patients will be engaged in the dance form of their choice. They will be offered various options of dance forms such as Bollywood dance, Group dance and Garba. Patients can follow the choreography of the dance invigilator or perform free-style. Following this, provided that every session has at least 2 couples, the patients will practice waltz for 10 minutes.

Meanwhile, in the music sessions, the patients will engage in vocal exercises and will be given the choice of playing a musical instrument, singing the karaoke or auditory stimulation i.e. listening to the karaoke. They will be encouraged to actively participate in the sessions.

*Part 3:* The sessions will conclude with 15-minutes of guided meditation. The meditation will be administered by a professional trained in conducting meditation classes for the general population. Participants will be asked to close their eyes and sit in a relaxed posture either cross legged or on a chair. Hands will be on knees with palms open. The mindfulness meditation will include guided instructions for deep

breathings followed by body scan and then guided instructions to take attention to their thoughts and feelings. All participants will be instructed to follow their daily routine and normal medication schedule. They will be instructed to keep the program coordinator informed if they make any significant changes to their treatment or their medication dosage or/and schedule. The participants in the intervention group will be asked to commit to the program and to take part music/dance and meditation sessions thrice, weekly, for 6 months. On a weekly basis, patients should attend at least one session in physical presence, while the other sessions will be monitored through video conferencing and home-based logs.

The patients will also be provided with the recordings of videos with instructions and break-down of each activity taught during the face-to-face sessions, making it easier for the participants to practice at home. A complete audio of the guided meditation schedule will be shared with the patients as well. The patients will be instructed to maintain an activity log book documenting their adherence to home-based practice. Class attendance will be monitored and documented.

## **Control Group:**

Participants in control group will be instructed to continue their regular activities and medication during the study period. They will be offered to enroll in the dance/music sessions after the completion of the study. During the study, the patients from control group will not interact with participants in the intervention group.

## **Re-assessments:**

Re-assessments for all participants will take place 6 months of allocation (this is a deviation from the originally submitted protocol, which had assessments at two-time points, viz. 3 and 6 months. The deviation was incorporated considering the fact that major changes were likely to be noted only at six months).

## **OUTCOMES MEASURES:**

### ***Primary Measures:***

**Progression of Parkinson's Symptoms:** The Unified Parkinson's Disease Rating Scale (UPDRS) I-III constitutes of 31 items assessing the severity of non-motor and motor aspects of daily living and motor examination [33]. The responses will be scored from '0' to '4', '0' indicating no impairment and '4' representing severe impairment. Higher scores indicate higher severity (Maximum score: 124). This measure has

demonstrated a strong internal consistency with  $\alpha = 0.96$  and high concurrent validity against other similar constructs [33].

**Quality of Life:** PDQ-39 (The Parkinson's Disease Questionnaire) is a 39 item self-report measure that measures the functional impairments in the following modalities: Parkinsonism symptoms, Systemic symptoms, Emotional and Social functioning [34]. Each item will be scored on a categorical scale from '0' to '4', with '0' representing 'Never' and '4' indicating 'Often'. A summary index is further calculated ranging from 0 to 100. Higher scores indicate worse QoL. PDQ-39 is widely used with a good internal consistency of  $\alpha = 0.72$ -0.93 [35] and good concurrent validity against Hoehn and Yahr Index and other similar constructs ( $\alpha > 0.60$ ) [36].

### ***Secondary Measures:***

**Mood:** Becks Depression Inventory (BDI) is a 21 items measure that is used worldwide to assess the severity of depression [37]. The items can be grouped into distinct symptoms of depression: cognitive, somatic, affective and vegetative symptoms. This scale has a strong internal consistency of 0.88 and strong concurrent reliability with the depression subscale of the SCL90 [38].

Additionally, Parkinsons' Anxiety Scale (PAS) is 12 items measure that assesses 3 categories of anxiety: Persistent anxiety, Episodic anxiety and Avoidance behaviour [39]. Each item will be scored on a categorical scale from '0' to '5' with '5' representing 'Often' and '0' signifying 'Never'. Higher scores indicate worse anxiety (Maximum score: 63). This measure has a strong internal consistency of  $\alpha = 0.87$ -0.89 and good known-group and convergent validity [39].

**Balance and Mobility:** Timed Up and Go (TUG) and Berg Balance Test (BBT) assess mobility and risk of falls. TUG is an observational test testing the gait, style and time taken for the participant to get up from a chair, move for 3 meters, turn around and return to the seat [40]. TUG is seen to have a good retest and inter-rater reliability in patients with PD [41]. Additionally, BBT is an assessor rated scale that records mobility through 14 tasks, with their performance being rated on a five-point scale ranging from '0' to '4', with '0' indicating poor performance and '4' indicating good performance [42]. BBT has good internal consistency of  $\alpha = 0.93$  and strong concurrent validity as strongly correlated with the Mini-BESTest [43].

**Caregiver Scale:** The Zarit Caregiver Burden Scale (ZBI) is a 29-item self-report measure assessing burden of the caregiver, measuring the psychological wellbeing, financial and overall burden [44]. Each item is to be scored from 0 to 4, with '0' denoting 'Never' and '4' signifying 'Always'. ZBI has good reliability with  $\alpha =$

0.89-0.95 and good external validity with PD related carer scales [44]. Parkinson's Disease Questionnaire-Carer is a 29-item measure further assessing mood, social life and relationships of the caregiver with a good test-retest reliability [45]. This scale will be rated from '0' to '4', with '0' indicating 'Never' and '4' indicating 'Always'. Higher scores indicate worse QoL (Maximum score: 100).

**Cognition Scale:** Mini-Mental State Examination (MMSE) evaluates performance at various cognitive components including orientation, attention and recall [46]. Higher score signifies better cognitive abilities (Maximum score: 30). This measure has good test-retest reliability (0.80-0.95) and satisfactory construct validity against various gold standards used to diagnose cognitive impairment [46].

**Behavioural Disorders:** Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease Rating Scale (QUIP-RS) is a 28 item scale that records impulsions, compulsions and compulsive medication usage [47]. Responses will be recorded on 5-point Likert scale with '0' signifying 'Never' and '4' denoting 'Often'. This measure demonstrated high sensitivity and specificity across all sub-scales [47].

## DATA ANALYSIS:

IBM SPSS software will be used for the statistical analysis. Descriptive statistics will summarize the demographics, health conditions and clinical outcomes at all three time points. Categorical variables including the Likert rating scales will be expressed in percentages and frequencies. Median and mode will also be ascertained for this data. Additionally, Chi Square tests will be conducted and p values will be ascertained to decipher the difference between the two groups against each outcome variable throughout the three time points.

## SCIENTIFIC COMMITTEE AND IRB APPROVAL:

The study was approved by the scientific committee of the Jaslok Hospital and Research Centre, vide letter dated 18 Feb 2023, Ref No: -EC/1156/2023 (Amendment 1). It was further approved by the Ethics committee of Jaslok Hospital, vide letter dated 18/02/2023. It was also registered with Clinical Trials Registry India (CTRI) dated 27/03/2023, CTRI No: CTRI/2023/03/051064. All participants provided informed consent. (See Multimedia Appendix 1). All data will be anonymized. The participants were provided travel compensation.

## RESULTS:

The data collection for this paper was completed in February 2024 and is currently being analyzed. Twenty-eight participants completed the study, 15 in the intervention group and 13 in the control group. The results will be published after the statistical analysis.

Participants in the intervention group are anticipated to show significant improvements in both motor and non-motor aspects of Parkinson's Disease. Improvements in gait and balance are expected, alongside positive changes in quality of life, mood, cognition, and behavior. Caregivers of participants in the intervention group are also likely to report an enhanced quality of life due to the improved condition and mood of the patients they care for.

## DISCUSSION:

This randomized controlled trial explores the effects of dance, music, and meditation on functional mobility, balance, quality of life, cognition, mood, anxiety, behavior, and caregiver burden in individuals with PD. Till date, there have been no research comprehensively investigating the benefit of dance/music and meditation on the quality of life of PD patients or the caretakers in Asian and Indian population. This will be the first study of its kind to be conducted in an Indian setup. It is also to be noted that none of the earlier studies offered the participants the choice to choose a modality of their preference. This will be the first paper that offers the participant to choose from music and dance.

The randomized controlled trial, including ten PD patients, by Duncan et al., aimed to examine the effects of a 2-year community-based dance class on disease severity and functional mobility in PD patients. Assessments at baseline, 12 months, and 24 months showed that the intervention group had lower scores on the Movement Disorder Society-Unified Parkinson Disease Rating Scale (MDS-UPDRS) III, Mini-BESTest, and other measures than the control group. The study concluded that participating in community-based dance classes over two years improved motor and nonmotor symptom severity, activities of daily living, and balance in individuals with Parkinson's disease [13].

The recent study by Hashimoto involved 46 mild-moderate Parkinson's disease (PD) patients who participated in a 12-week intervention. The patients were divided into a dance group, a PD exercise group, and a non-intervention group. The primary outcome measures included TUG and BBT for motor assessment, the Frontal Assessment Battery at bedside (FAB) and Mental Rotation Task (MRT) to assess cognitive function, the



Apathy Scale (AS) and Self-rating Depression Scale (SDS) to assess mental symptoms, UPDRS for general assessment. The results showed that the dance group exhibited significant improvements in all the outcome measures, highlighting dance's positive impact on the mental well-being, self-esteem, and social engagement of those with PD [48]. The guided meditation component may further contribute to stress reduction and relaxation.

The study by Katlen Da Silva et al. aimed to evaluate the effects of music-based physical therapy on individuals with PD in terms of muscle strength [Medical Research Council (MRC) Test and Sitting-Rising Test], cognition (Trail Making Test), muscle strength, balance (BBT), and functional mobility (TUG). It was a controlled, non-randomized clinical trial with an A-B-A design involving 13 individuals with PD. The results showed that music-based physical therapy helped improve balance and functional mobility in individuals with PD. However, these improvements were not maintained after the therapy was discontinued [12].

The study by Lihala et al. in India examined the impact of dance therapy on cognition, quality of life, and motor symptoms in 10 mild-to-moderate PD patients. The results showed improved cognitive function and quality of life, as indicated by increased MOCA and decreased PDQ-39 scores [49].

Lee NY et al. examined the effects of virtual reality dance exercises on Parkinson's disease patients. They found that after six weeks of treatment, the experimental group showed significant improvements in BBT ( $46.0 \pm 1.3$  to  $48.1 \pm 3.0$ ;  $p < 0.05$ ), activities of daily living ( $87.9 \pm 1.4$  to  $91.1 \pm 3.0$ ;  $p < 0.05$ ), and BDI ( $20.4 \pm 0.9$  to  $18.2 \pm 2.0$ ;  $p < 0.05$ ) compared to the control group highlighting a positive impact on these aspects for Parkinson's disease patients [50].

The studies mentioned above highlight that dance, music, and mindfulness have improved motor and nonmotor symptoms, activities of daily living, balance, cognitive function, and quality of life in PD patients.

## Limitations and future implications:

However, the study might be subject to some limitations. Two limitations to consider are the small sample size and the short duration of the study. A six-month timeframe may not be sufficient to observe changes in non-motor symptoms. Future larger, randomized, controlled longitudinal studies are warranted to verify results. Motor and non-motor symptoms of Parkinson's disease such as motor disability, gait and balance difficulties, speech disability and pain are likely to hinder participation in activities such as dance and music. To compensate for this, each session will be customized according to the participants' needs and abilities. Additionally, the results might be confounded by factors such as changes in medication or differences in

baseline medication taken by the patient. Therefore, any changes made to lifestyle and medication over the course of the study will be constantly monitored. This paper will build upon previous research and delve into the effectiveness of non-pharmaceutical therapies in possibly delaying the progression of Parkinson's Disease.

## Conclusion

This study aims to provide significant insights into the effectiveness of dance/music and education in improving the quality of life and slowing the progression of Parkinson's Disease. The findings are expected to support the use of non-pharmaceutical therapies as a complementary approach to managing Parkinson's Disease, offering potential benefits to both patients and their caregivers.

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## Data Sharing Policy:

The data sets generated during or analyzed during this study will be available from the corresponding author upon reasonable request.

## Author Contributions:

Conceptualization, Methodology: Doshi P.

Investigation: All authors.

Data Curation, Formal Analysis, Software, Visualization: Agarbattiwala R, Doshi P.

Funding Acquisition: Doshi P.

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Supervision, Verification: All authors.

Writing-Original Draft: Agarbattiwala R, Mehrotra B, Doshi P.

Writing- Review and Editing: All authors.

## Conflict of Interest:

None declared.

## Role of the Funder/Sponsor:

The funding source had no role in the design and conduct of the study, the collection, management, analysis, and interpretation of the data, the preparation, review, or approval of the manuscript, or the decision to submit the manuscript for publication.

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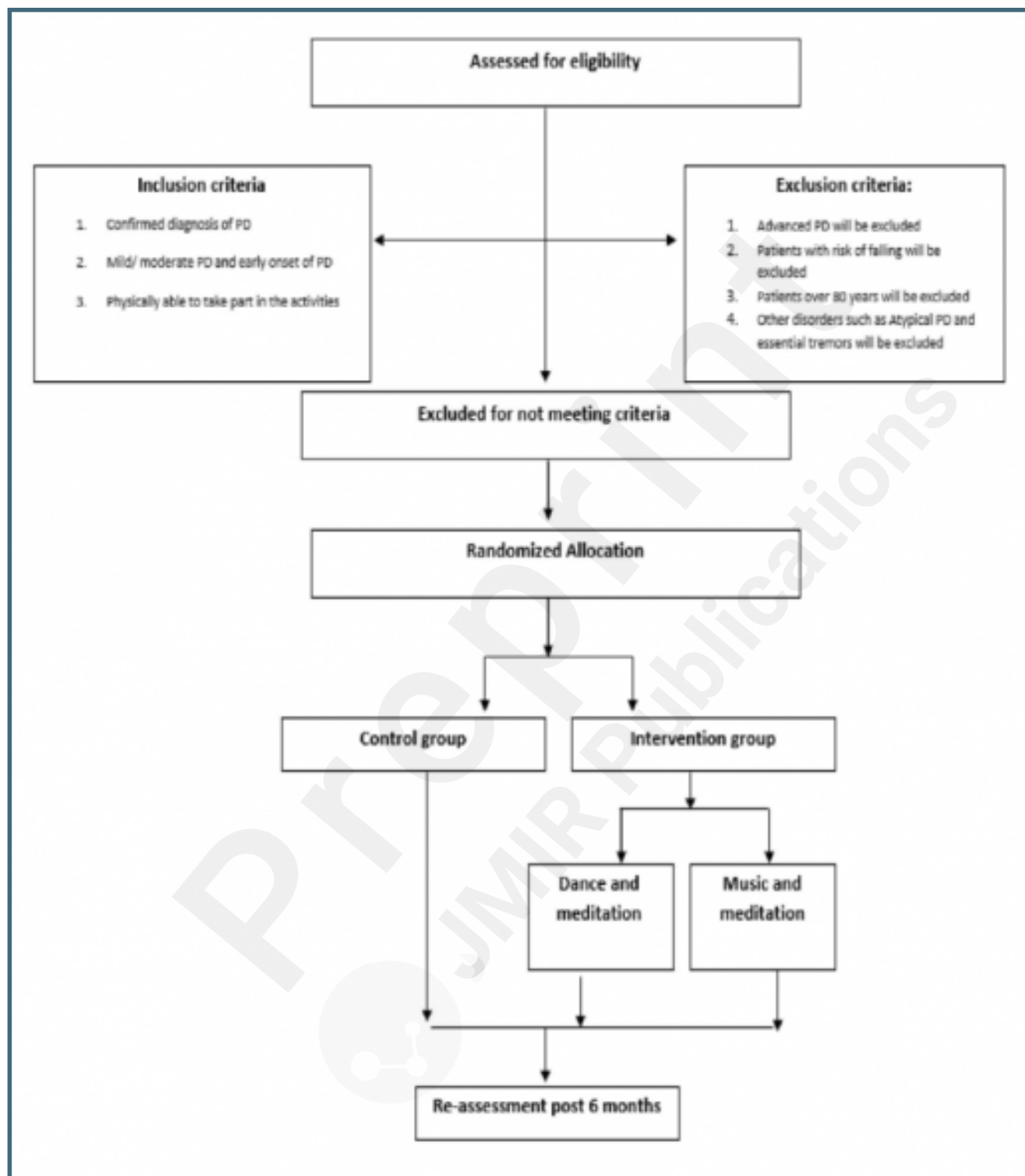
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## Supplementary Files

## Figures

CONSORT flow chart summarizing the format of the study.



## **Multimedia Appendixes**

A Consent Form.

URL: <http://asset.jmir.pub/assets/e09c04046dd85e8d135f4ab0f28b6314.pdf>



## **Related publication(s) - for reviewers eyes onlies**

Approval of Protocol by Ethics Committee.

URL: <http://asset.jmir.pub/assets/4bf22d45069e4cc52ee78bf269219a33.pdf>