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Controlled pilot study of the effects of power yoga in Parkinson's disease

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ABSTRACT

Objectives: To evaluate the effects of a specially designed power yoga program (YOGA) on bradykinesia, rigidity, muscular performance and quality of life in older patients with PD.
Design: Randomized controlled trial.
Setting: University laboratory, US.
Intervention: Twenty-six patients with mild to moderate PD were randomly assigned to a YOGA or control group (CON). The YOGA program was three months, incorporating two sessions/wk of yoga classes.
Main outcome measures: Upper and lower limb bradykinesia and rigidity scores from the Unified Parkinson's Disease Rating Scale, one repetition maximums (1RM) and peak powers on biceps curl, chest press, leg press, hip abduction and seated calf, and quality of life (PDQ-39).
Results: The YOGA group produced significant improvement in both upper and lower limbs bradykinesia scores, rigidity score, 1RM for all 5 machines and leg press power ($p < .05$). Significant improvements were seen in the PDQ-39 overall score, mobility and activities of daily living domain for the YOGA group.
Conclusion: The 3-month YOGA program significantly reduced bradykinesia and rigidity, and increased muscle strength and power in older patients with PD. Power training is an effective training modality to improve physical function and quality of life for PD.

1. Introduction

Parkinson's disease (PD), a degenerative neurological disorder, affects .5–1% of older adults aged 65–69 years old and 1–3% of those above 80 years old,[1] with an average age of diagnosis being 62.[2] It primarily affects motor function, contributing to increasing disability over time. Patients commonly exhibit bradykinesia, rigidity, tremor, progressive postural instability,[3–5] and muscle weakness.[6,7] The declined movement function, along with the associated decrease in quality of life (QoL), necessitates the development of interventions that ameliorate these impairments.

Various exercise strategies,[8–10] including physical therapy, resistance or aerobic training, martial arts, and other complementary therapies, such as dance, have been suggested to address movement deficits in order to improve motor function and quality of life for individuals with PD. Yoga practice, becoming increasingly popular as a health-based activity, offer a highly refined, specifically delineated practice for affecting human behavior primarily through the close integration of the central and peripheral nervous systems during yoga performance.[11] The reported benefits of yogic training for healthy populations include improving muscle strength and endurance,[12–16] muscle power,[17] flexibility,[12,15,16] balance and coordination,[13,16] and health-related functions.[18] Additionally, yoga-based interventions have the potential to reduce the risk of falling[18,19] and improve quality of life[20] in individuals with musculoskeletal disorders. Although yogic therapeutic principles and interventions have been adopted by major rehabilitation clinics and hospitals across the country, very little controlled scientific research has been conducted to examine the efficacy of yoga as an intervention for PD.

One pilot study[21] indicated that a 12-week yoga intervention significantly improved motor Unified Parkinson's Disease Rating Scale (UPDRS) scores, balance function, flexibility, posture, and locomotion compared to a control group receiving no intervention. Another one reported positive symptom changes, including acute tremor reduction, and improved QoL.[22] However, there is no recent literature evaluating the effects of yoga on muscle function in older patients with PD.

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The purpose of this study was to examine the effects of a high-speed power yoga program on bradykinesia, muscle function and quality of life in older persons with mild to moderate PD, and to examine the relationship of clinical measures of bradykinesia to muscle power. Our research is novel in that we structured the power yoga program, using Vinyasa style, specifically designed to target bradykinesia, by using high-speed movement, and to muscle weakness by using strengthening postures. We hypothesized that this specially designed yoga program would significantly reduce bradykinesia, muscle strength and power, and quality of life for PD.

2. Methods

2.1. Participants

We performed a secondary analysis of results from a randomized controlled study examining the comparative impacts of power resistance training and power yoga on physical functions and quality of life in older individuals with PD over 3-month exercise interventions.[23] Baseline and 3-month post-training data was used for analysis. Methods for this study were approved by the University of Miami Subcommittee for the Use and Protection of Human Subjects, and all participants signed an informed written consent.

Patients with idiopathic PD participated in this study. The inclusion criteria included: 60–90 years old, diagnosed mild to moderate PD (Hoehn & Yahr stages I–III), capable of ambulation for at least 50 feet with or without an assistive device and able to get up and down from the floor with minimal assistance, and the Folstein Mini-Mental State Examination score ≥ 24 to ensure that participants could adequately understand the requirements during testing and training. Participants were excluded if they have PD symptoms greater than stage III symptoms on the Hoehn & Yahr Scale, have a decline in immune function such as pneumonia or systemic infection, or progressive degenerative disease besides PD; had orthopedic surgery in the past six months, and inability to make regular time commitments to the scheduled YOGA or engaging in regular practice (1–2 times weekly) of yoga within the past year.

The procedure of randomization was performed for the overall sample, using stratified randomization controlling for the Hoehn & Yahr stage employing Excel software (Microsoft Excel 2013; Microsoft Corp., Redmond, WA). Participants were assessed at the Laboratory of Neuromuscular Research and Active Aging, one hour after taking their usual PD medication ("on" state). The order of test administration was standardized among subjects and testing sessions. Pretests and post-tests were performed within a 2-week period before and after the intervention, respectively. All assessments were performed by the same testers.

2.2. Intervention

2.2.1. Yoga

The specially designed power yoga program (YOGA) was designed to improve movement speed, muscle strength and power specific to PD-related decrements. Power yoga is a yoga practice using Vinyasa style which incorporates vigorous, fitness-based positions.[24] Based on the characteristic of Vinyasa yoga (transitions between positions), the program used fast transitions from one posture to another,[25] thereby targeting bradykinesia and rigidity caused by PD. Additionally, strength, power, flexibility, and balance were addressed by stabilizing body extremities and strengthening core muscles through the YOGA intervention. This targeted yoga program was based on our earlier studies showing that muscle utilization patterns differed among Vinyasa yoga poses,[26,27] and that a 12-week, 2 times/week specially designed yoga program could improve balance function in older fallers to the same degree as an established balance training program and Tai Chi.[19] The specially designed yoga program for PD was given as group class for 12 weeks, 2 sessions/week, 1 h/session. During the practice, participants were instructed to perform fast transition of pose sequences, with holding one position no more than 3 breathes. This program incorporated three difficulty levels, which became progressively more challenging throughout the study. During the first four weeks, the training incorporated predominantly standing poses and a floor and balance series at mild to moderate intensity. For the next four weeks, the same pattern was used; however, more advanced poses were incorporated into the training. In the remaining weeks, the program incorporated progressively more difficult poses and transitions. The program was taught by three certified yoga instructors.

2.2.2. Control

For the control group (CON), participants continued receiving their usual care. And non-exercise health education classes were provided over the 12 weeks, with one class per month (totally 3 classes) on life style modification, medication, therapy and exercise, nutrition and long-term care.

2.3. Outcome measures

2.3.1. Bradykinesia

The bradykinesia score from the UPDRS motor exam was used to evaluate the effectiveness of the yoga intervention in addressing bradykinesia and improving movement speed. An upper limb bradykinesia score was derived by summing UPDRS motor exam items 23, 24 and 25[28]; while a lower limb bradykinesia subscore was calculated by summing UPDRS motor exam items 26, 27, 29 and 31.[7] The test was conducted by an experienced physical therapist.

2.3.2. Rigidity

Rigidity of the major joints, including neck, shoulder, elbow, wrist and knee, was measured using the item 22 from the UPDRS motor.

2.3.3. Strength and power

Measurements of strength and power were taken on five pneumatic resistance machines(Keiser A420, Keiser Sports Health Equipment, Fresno, CA), biceps curl, chest press, leg press, hip abduction, and seated calf. Muscle strength was measured using a one-repetition maximum (1RM). After measurement of the 1RM for each movement, power was assessed using the same pneumatic resistance machine. Peak power was assessed at seven relative intensities (30%, 40%, 50%, 60%, 70%, 80%, and 90% 1 RM) for each exercise. The testing order was randomized to reduce any fatigue or learning effects. For strength testing participants were provided a 2-min recovery between trials; while for power testing, a 1-min recovery was provided.

2.3.4. Parkinson's disease questionnaire (PDQ-39)

The PDQ-39 was used to measure the QoL of the PD patients before and after training. 39 items in this questionnaire and are categorized into 8 categories: mobility (10 items), activity of daily living (ADL) (6 items), emotional well-being (6 items), stigma (4 items), social support (3 items), cognitive impairment (4 items), communication (3 items), and bodily discomfort (3 items).

2.4. Data analyses

Power calculations (G-power, Universitat Dusseldorf, Germany) indicated that a sample size of 14 participants per group was required to detect an effect size of Cohen's $d = .56$ for reduction in the UPDRS motor score (5 point decrease) in the exercise groups