The effects of free dance versus hatha yoga on quality of life and motor and non-motor symptoms in people with Parkinson's disease: protocol study for a randomized clinical trial

Efectos de la danza libre versus hatha yoga sobre la calidad de vida y los síntomas motores y no motores en personas con enfermedad de Parkinson: estudio de protocolo para un ensayo clínico aleatorizado

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Abstract. Objective: To describe a protocol comparing the effects of free dance, hatha yoga, and a control group on quality of life, motor and non-motor symptoms in people with Parkinson's disease (PwP). Methods: This is a randomized three-arm study. Inclusion criteria will be people with clinically diagnosed Parkinson's disease (PD), ≥ 45 years old, and in stages I to IV of the *Hoehn and Yahr Disability Scale* (HY). Who do not reach the cut-off point of the *Montreal Cognitive Assessment* (MoCA) and classified in stage V of the HY will be excluded. The interventions will last 60 minutes, twice a week, progressing from light to vigorous intensity. The primary outcome will be quality of life assessed by the *Parkinson's Disease Questionnaire* (PDQ39). Secondary outcomes will include the *Unified Parkinson's Disease Rating Scale* (UPDRS), the evaluation of motor and physical function such as shoulder and hip range of motion (goniometer), cardiorespiratory fitness (*six-minute walk test*), balance (*MiniBESTest*), as well as non-motor aspects such as anxiety (*Beck Anxiety Inventory*), self-esteem *(Rosenberg Self-Esteem Scale)*, cognition (MoCA), hope (*Herth Hope Scale*), fecal incontinence (*Fecal Incontinence Quality of life*), urinary incontinence *(International Consultation on Incontinence Questionnaire - Short Form)*, and depressive symptoms (*Beck Depression Inventory*). Data will be collected at baseline and post-intervention. Discussion: If study interventions are deemed effective compared to standard of care (i.e. control group), the present study will advance current knowledge on non-pharmacological therapeutic strategies for People with Parkinson. Study registered RBR-54s92mh on 02/29/24.
Keywords: Parkinson disease, dancing, yoga, protocol, exercise, randomized clinical trial.

Resumen. Objetivo: Describir un protocolo que compare los efectos de la danza libre, el hatha yoga y un grupo de control en la calidad de vida, síntomas motores y no motores en personas con enfermedad de Parkinson (PwP). Métodos: Este es un estudio aleatorizado de tres grupos. Los criterios de inclusión serán personas con diagnóstico clínico de enfermedad de Parkinson (EP), ≥ 45 años de edad, y en las etapas I a IV de la Escala de Discapacidad de Hoehn y Yahr (HY). Aquellos que no alcancen el punto de corte de la Evaluación Cognitiva de Montreal (MoCA) y estén clasificados en la etapa V de la HY serán excluidos. Las intervenciones durarán 60 minutos, dos veces por semana, progresando de intensidad leve a vigorosa. El resultado principal será la calidad de vida evaluada por el Cuestionario de la Enfermedad de Parkinson (PDQ39). Los resultados secundarios incluirán la Escala Unificada de Calificación de la Enfermedad de Parkinson (UPDRS), la evaluación de la función motora y física como el rango de movimiento del hombro y la cadera (goniómetro), la aptitud cardiorrespiratoria (prueba de caminata de seis minutos), el equilibrio (MiniBESTest), así como aspectos no motores como la ansiedad (Inventario de Ansiedad de Beck), la autoestima (Escala de Autoestima de Rosenberg), la cognición (MoCA), la esperanza (Escala de Esperanza de Herth), la incontinencia fecal (Calidad de Vida de la Incontinencia Fecal), la incontinencia urinaria (Cuestionario de Consulta Internacional sobre Incontinencia - Formulario Corto) y los síntomas depresivos (Inventario de Depresión de Beck). Los datos se recogerán al inicio y después de la intervención. Discusión: Si las intervenciones del estudio son eficaces en comparación con el tratamiento estándar (es decir, el grupo de control), el presente estudio avanzará en el conocimiento actual sobre estrategias terapéuticas no farmacológicas para personas con Parkinson. Estudio registrado en RBR-54s92mh el 29/02/24.
Palabras clave: Enfermedad de Parkinson, baile, yoga, protocolo, ejercicio, ensayo clínico aleatorizado.

Introduction

The symptoms of Parkinson's disease (PD) are wide-ranging, including motor and non-motor symptoms. Motor symptoms are characterized by bradykinesia, resting tremor, rigidity, postural, and gait changes (Zafar & Yaddanapudi, 2023). Non-motor symptoms comprise of cognitive impairment, depression, anxiety, psychosis, apathy, fatigue, gastrointestinal complaints, sexual dysfunction, and sleep disorders (Cabreira & Massano, 2019). Currently, physical exercise is considered a safe and viable complementary strategy for the treatment of PD motor and non-motor symptoms (Feller et al., 2023).

Dance and yoga stand out among modalities of physical exercise that have been tested and found effective in people with Parkinson's disease (PwP) (Kwok et al., 2023; Andreazza Duarte et al., 2022). Dance is an activity that combines physical exercise, musicality, emotional processing and expression, motor coordination and creativity in a pleasant and safe environment. It also provides fun and stimuli to help explore and develop movement and body expression (Norton, Hemingway, & Ellis Hill, 2023). Recent studies indicate that dance interventions can result in improvements in motor symptoms (Duarte et al., 2023), non-motors (Moratelli et al., 2021) and the quality of life of PwP (Feenstra et al., 2022). In the study by Silva (Lirani-Silva, 2018) it was found that the intervention of rhythmic activities and dance, employed three times a week, for six months, was able to enhance discrete characteristics of walking, as well as promote the maintenance of some walking parameters, cognitive, and neuropsychiatric functions. The dance modality chosen for the present study was free dance, as it is flexible and allows different adaptations which are often needed when working with PwP. This makes it

possible to work with different rhythms, movements and explorations of the body, through dynamic classes that cover all skill levels (Oliveira, 2017).

To date, only two clinical trials have used hatha yoga as an intervention for PwP. The first study found improvements in static balance and in a biomechanical marker of standing posture (Elangovan et al., 2020), whereas the second did not find differences in motor function, quality of life, physical fitness, functional autonomy and balance in PwP (Ayán et al., 2023). Therefore, current findings are inconclusive with respect to the effectiveness of yoga for the treatment of PD symptoms. There are various styles of yoga practice, but hatha yoga was chosen for this study because it is widely disseminated in the west and offers a large range of psychophysical postures aimed at the integral balance of the participant. In view of this, it can be seen that there is an unknown field to be explored and deepened in the search for subsidies for other clinical trials and those interested in the subject, with the aim of verifying the effectiveness of these activities for PwP.

In the literature, there is evidence of the effectiveness of the modalities studied when used as complementary treatments, as in the study by Bearss and Desouza (2021) with emphasis on what dance provided for three years and reduced the expected decline in motor function and significant improvement in speech, tremors, balance and stiffness, as well as improvement in non-motor aspects such as depressive symptoms, cognition and anxiety; and on yoga another study (Kwok et al., 2019) who described the positive effects on stress management and PD symptoms, both of which show the effectiveness of the modalities to be studied and the safety of the activities, since there were no adverse events during the interventions. However, the choice of the two modalities in the study was due to the fact that free dance works on combining musical rhythm with body movement, using freedom of expression and creativity through motor gestures, and hatha yoga for working on the mind-body, expanding proprioception, differentiating itself from dance by not necessarily working on movement to the rhythm of music, but rather as an instrument of introspection and relaxation.

This protocol describes a randomized study comparing the effects of free dance and hatha yoga (twice a week, over 12 weeks) on quality of life, motor and non-motor symptoms in PwP in relation to a control group (only routine activities). The hypothesis is that this protocol will bring improvements in the primary outcome (quality of life) and secondary outcomes (motor and non-motor symptoms), offering two more non-pharmacological treatment options for PCP. About hatha yoga, we suggest that the improvement variables will be cognition, general disease status with total UPRDS, quality of life, anxiety, depression, urinary and fecal incontinence. Free dance, on the other hand, will improve cognition, balance, cardiorespiratory fitness, self-esteem, mobility, hope and quality of life.

Methods

Study design

This is a randomized, prospective, three-arm, single-center clinical trial designed to analyze the efficacy of free dance and hatha yoga on the primary outcome of quality of life, in addition to secondary outcomes related to motor and non-motor symptoms in PwP. The study will consist of three groups, namely, the free dance group (FDG), the hatha yoga group (HYG) and the control group (CG).

Ethical Approval

Ethical approval was granted by the Human Research Ethics Committee (CEPSH) of the University of the State of Santa Catarina (UDESC) under the protocol No. 6.555.252, and the study registered in the Brazilian Registry of Clinical Trials (ReBEC) with the identifier RBR-54s92mh. Any major changes or modifications to the protocol will be communicated to the CEPSH and the ReBEC for approval, except in situations where such changes are necessary to eliminate immediate dangers to study participants.

Participants and Study Environment

Participants will be recruited through social media, newspapers, radio, the University website, associations, educational, religious and health institutions, as well as health-related service providers in the area. The participating groups will receive a detailed explanation of all stages of the study and, after signing the informed consent form, will be directed to the first data collection session (questionnaires and tests) and the start of the assigned intervention.

Recruitment and Eligibility Criteria

The following inclusion criteria were established: a) PD diagnosis confirmed by a neurologist, following the Movement Disorders Society guidelines (Postuma et al., 2015); b) both sexes; c) residents of the study region; d) on stable doses of medication for the last four weeks; e) in the ON state of medication; f) aged 45 or over; g) no physical exercise in the month prior to data collection; h) classified in stages I to IV of the Hoehn & Yahr (HY) Disability Scale (Hoehn & Yahr, 1967). And, the exclusion criteria: a) scores below the cutoff point of the Montreal Cognitive Assessment (MoCA) instrument for screening, that is ≤ 22 points (Almeida et al., 2019); b) classified in stage V of the HY confined to bed or wheelchair unless helped; c) who did not complete all stages of the study; d) who performed other physical exercise concomitantly; e) who were not present in up to 75% of classes.

Adherence will be obtained by means of a percentage calculated as the number of completed/planned sessions x 100. An attendance list will be recorded daily before the start of the interventions (free dance and hatha yoga).

Sample calculation

The sample calculation was carried out using the G*Power 3.1.9.2 software with an effect size of 0.65, significance level of 5% and test power of 95%, and sample loss of 10%. Based on the primary outcome variable, quality of life (Choi & Cho, 2022), total of 33 participants were determined, with 11 people allocated to each research arm free dance group (FDG), hatha yoga group (HYG), and control group (CG). **Figure 1** shows the flowchart of participants, following the CONSORT standard, while **Figure 2** presents the stages of the study, from enrollment, data collection, interventions and evaluations according to standardized recommendations for SPIRIT protocol studies.

Randomization and blinding

Participants who voluntarily agree to take part in the study will sign the Informed Consent Form (ICF) and have their cognitive function assessed using the MoCA instrument. They will then be randomized into three groups: free dance, hatha yoga or control. The randomization process will be carried out a priori by two researchers (DYF and JAM) from the Laboratory, who will not be involved in the study, using the online software www.randomization.org. The stratified randomization method will be based on HY staging, with 1:1 allocation, in order to guarantee the homogeneity of the groups (i.e. groups have participants with similar disease severity). Participants data will be kept confidential by the principal investigator before, during, and after the interventions. The study evaluations will be conducted by trained researchers, who will be blinded to the group allocation in order to avoid bias. In addition, all data analysis will be carried out by an external researcher to avoid bias and interference in the results. Since it is not possible to blind the protocol to the participants and instructors, the study design is therefore open.
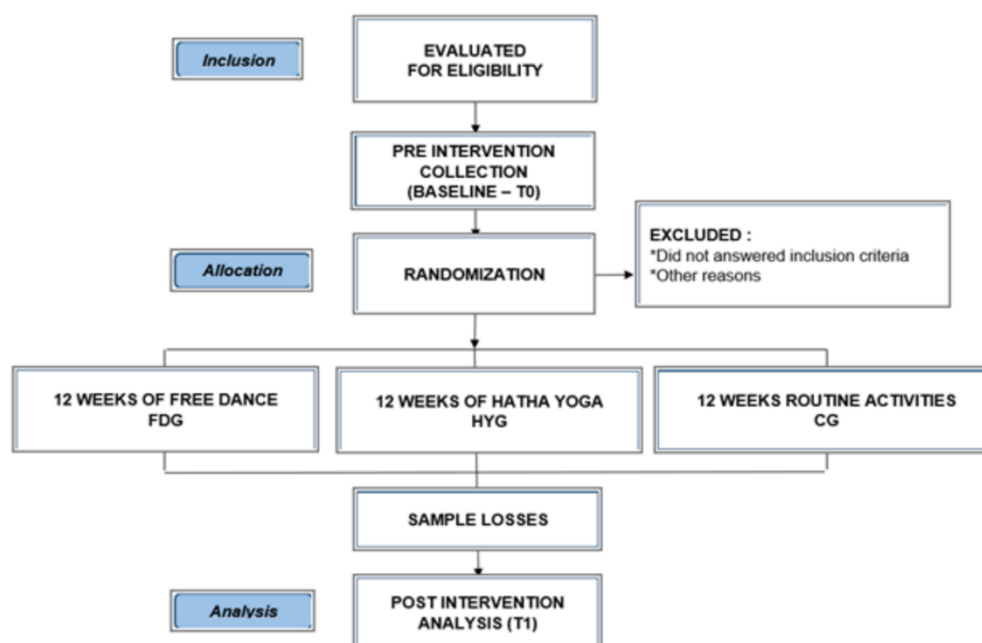

Figure 1. Flowchart of the participant selection process and protocol stages, following the Consolidated Standards of Reporting Trials (CONSORT 2010).

Interventions

The interventions will take place at a public university in southern Brazil. The hatha yoga classes will be held in a martial arts room and the free dance classes in a large gymnasium, simultaneously, on Tuesdays and Thursdays, lasting 60 minutes over 12 weeks. The classes will be taught by Physical Education professionals with experience in the application of activities/physical exercise for PwP, as well as having knowledge of free dance and hatha yoga. Project volunteers will also be present to help prevent falls and facilitate the use of materials and spaces adapted for this population. The classes will follow a three-stage format: warm-up, main part and cool down. It is worth noting that previous research recommends exercise weekly frequency ranging from 2 to 5 times a week, with sessions lasting 45 to 60 minutes (Balsanelli & Teixeira-Arroyo, 2015), thus the study protocol falls within established recommendations. In addition, the frequency of two times a week was chosen to increase feasibility, given that participants with PD might have difficulty getting to the study site.

Free Dance

The free dance sessions will increase in intensity from light to vigorous through changes in the rhythm of the music and the complexity of the movements, taking into account the individuality of each participant. In addition, the Subjective Scale of Perceived Exertion - Borg Scale 6 to 20 points will be used (Heath, 1998) to assess the intensity of the intervention. This scale describes sensations from rest to situations of maximum physical exertion, being each score associated with a heart rate, for example score 6

associated with 60 bpm (beats per minute) and score 20 with a heart rate of 200bpm.

The classes will be divided as follows: A) Initial warm-up and mobility (10 min - music around 80 bpms): at a slower pace, focused on movements to warm up the joints and prepare the body. There will be broad to specific joint movements including flexion, extension, abduction, adduction and internal and external rotations, starting with the upper body and working down to the lower limbs. B) Main part (40 min - 80bmps, 120bpms and up to 180bpms - moderate and vigorous rhythms): using free dance movements, motor coordination, rhythm and body awareness will be stimulated. The activities will be carried out individually, in pairs or in groups, according to the rhythm of the music (*forró*, electronic, *samba*, hiphop, *sertanejo*, *bolero*, among others), always respecting individual limitations. Adaptations will be made, when necessary, in order to stimulate each participant's body awareness. C) Relaxation and reflection (10 min - music up to 80 bpms and up to 120 bpms - slow and moderate rhythms): the end of the class, with a brief conversation about each participant's perceptions of the exercises taught. Massages, static stretching and relaxation techniques with breathing will also be performed, with slow-pace music to help slow down after the exercise.

The speed of the music selected is classified as follows: up to 80 bpm (slow tempo), up to 120 bpm (moderate tempo) and up to 180 bpm (vigorous tempo). The tempo of the songs is checked according to the measurement (bpm) made in the dance protocol who also adopted this methodology, with the counting being carried out by a metronome.

Table 1.
Free dance intervention protocol for people with Parkinson's disease.

			Training - Warm-up 10min 80 bpms- 120 bpms	Main Part 40min 80pbms - 120 bpms -180bpms	Relaxing and reflecting 10 min 80 bpms -120 bpms Objective
W E E K S	1	Classes 1 and 2 Axé and funk	Loosening up the body and warming up the joints. Songs: 1- Sá Marina/ Lança Perfume/ Na ilha Grande (70bpm) 2- Já É - Vixe Mainha (80bpm) 3- Só o Amor – Preta Gil; Glória Groove (95bpm)	Basic movements, performed to the rhythm of the music, with speed variations to introduce the dance. Performing swaying and back-and-forth movements. Songs: 4-Quero te Encontra –Claudinho e Buchecha (95bpm) 5- Spring love – Stevie B (120bpm) 6- Festa – Ivete Sangalo (135bpm) 7- Carro Velho – Banda Eva (150bpm) 8-Choreography of the week: Tchubirabirom – Parangolé (145bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 12- Coisas que eu sei – DanniCarlos (120bpm) 13- Se Eu Não Te Amasse Tanto Assim – Ivete Sangalo (100bpm) 14- Cruel – Nina Fernandes (120bpm) Objective: To develop rhythmicity and cardiorespiratory fitness
	2	Classes 3 and 4 National and Pop 80s	Loosening up the body and warming up the joints. Songs: 1-Um Pôr do Sol na Praia – Silva, LUDMILLA (70bpm) 2- Wake me Up before you go-go – Wham! (85bpm) 3- Só o Amor – Preta Gil; Glória Groove (95bpm)	Movements that require static and dynamic balance. Performing movements such as lateral slides with a support, "wave" and static balances in passé or arabesque positions. Songs: 4- Ragatanga (Asereje) -Rouge (90bpm) 5-Crazy In Love – Beyoncé e Jay-Z (99bpm) 6- Dig Dig Joy – Sandy e Junior (118bpm) 7- I Will Survivor – Gloria Gaynor (117bpm) 8- Choreography of the week: I Want to Break Free – Queen (109bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9- De janeiro a janeiro – Roberta Campos e Nando Reis (80bpm) 10- Apenas Mais Uma de Amor – Lulu Santos Ao Vivo (84bpm) 11-It Must Have Been Love –Roxette (81bpm) Objective: Developing balance.
	3	Classes 5 and 6 Forró Samba/Pagode	Loosening up the body and warming up the joints. Songs: 1- Rindo A Toá – Falamansa (80bpm) 2- É no Pagode – Art Popular (89bpm) 3-Andar Com Fé – Gilberto Gil (95bpm)	Movements that require greater motor coordination due to the increased speed of movement, through faster songs. Performing individual movements of paused cross and samba, and in pairs of forró lateral base, handcuff and simple turn. Songs: 4- Eu Sò Quero Um Xodó - Dominguinhos (98bpm) 5- Dança da Vassoura – Grupo Molejo (102bpm) 6- Esperando na Janela – Gilberto Gil (152bpm) 7- Samba Diferente – Grupo Molejo (102bpm) 8- Choreography of the week: Tá escrito- Grupo Revelação (130bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 12- Três das onze – Adoniran Barbosa (95bpm) 13- Anunciação – Alceu Valença (110bpm) 14- Noturna (Nada de Novo Na Noite) – Silva (120bpm) Objective: Develop cardiorespiratory fitness and motor coordination.
	4	Classes	Loosening up the body and warming up the joints. Songs: 1- Al mismo tiempo – Rauw Alejandro (70bpm) 2- Felices Los 4 – Maluma (94bpm) 3- X – Nicky Jam eJ Balvin (90bpm)	Increase in the number of choreographic movements in the same sequence. Performing cumbia movement, cha cha cha dance and "beto schufle". Songs: 4-I'm still in love with you – Sean Paul, Sasha, Jeremy Harding e Murray Elias (90 bpm) 5-Taki Taki – Dj Snake; Selena Gomez; Ozuna e Cardi B (96bpm) 6- Hips Don't Lie – Shakira e Wyclef Jean (100bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9-Se preparó - Ozuna (88 bpm) 10- Anoche sone contigo- Kevin Johansen (92 bpm) 11- Noturna (Nada de Novo Na Noite) – Silva (120bpm) Objective: Developing agility.

		7 and 8 Reggaeton/Zumba		7- Don't go yet – Camila Cabello (109bpm) 8- Choreography of the week: Mi gente – J Balvin e Willy William (109 bpm)	
1 2 W E E K S	5	Classes 9 and 10 Hip Hop	Loosening up the body and warming up the joints. Songs: 1- I See Fire – Ed Sheeran (79bpm) 2- Where is the love? - Black Eyed Peas (90bpm) 3- So Sick – Ne-Yo (94bpm)	Movements varying the use of limbs on the same side and/or crossed. Performing "slide", "bounce", "freeze" and "grouve" movements. Songs: 4-Get Right – Jennifer Lopez (98bpm) 5-Baby, I'm Back – Bay Bash e Akon (104 bpm) 6- My Humps - Black Eyed Peas (120bmp) 7 – Where is the love? - Formation – Beyoncé (120bpm) 8- Choreography of the week: Watch Me (Whip / Nae Nae) – Silentó (140bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9- Best Friend – 50 Cent e Olivia (90bpm) 10- Envolvidão - Rael (86bpm) 11- Let Her Go – Passenger (75bpm) Objective: Develop motor coordination.
	6	Classes 11 and 12 Mix of dances learned	Loosening up the body and warming up the joints. Songs: 1-Um Pôr do Sol na Praia – Silva, LUDMILLA (70bpm) 2- Al mismo tiempo – Rauw Alejandro (70bpm) 3-Andar Com Fé – Gilberto Gil (95bpm)	Memorizing choreographic sequences. Songs: 1- Choreography of the week: Tchubirabirom – Parangolé (145bpm) 2- Choreography of the week: I Want to Break Free – Queen (109bpm) 3- Choreography of the week: Mi gente – J Balvin e Willy William (109 bpm) 4- Choreography of the week: Watch Me (Whip / Nae Nae) – Silentó (140bpm).	Movements that involve recognizing the body in space (proprioception). Songs: 5- De janeiro a janeiro – Roberta Campos e Nando Reis (80bpm) 6- Anoche sone contigo- Kevin Johansen (92 bpm) 7- Cruel – Nina Fernandes (120bpm) Objective: Develop memory.
	7	Classes 13 and 14 Tango	Loosening up the body and warming up the joints. Songs: 1-To Tango Tis Nefelis – Haris Alexiou (70 bpm) 2-Under the Moon – Seoan e Ekaterina (85 bpm) 3- Essa – Otros Aires (120 bpm)	Movements in pairs, performing the movements "la salida", "la caminada" and "el giro" in a variety of ways. Songs: 4-Reflejo de Luna – Alacran (120 bpm) 5-Habanera – Great Tango Artists (121 bpm) 6-Por uma cabeza – Angelito Martinez (123 bpm) 7–Milonga del ayer – Craig Einhorn (131 bpm) 8- Choreography of the week: La cumparsita – Juan D'Arienzo (136 bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9-Tormento – Mariana Mazú (112 bpm) 10-Tango D'amor - Tango Jointz, Bellma Cespedes (92 bpm) 11-Sentimientos – Tango Project (80 bpm) Objective: Developing sociability.
	8	Classes 15 and 16 Forró Samba/Pagode	Loosening up the body and warming up the joints. Songs: 1- Rindo A Toá – Falamansa (80bpm) 2-Cheia de Manias - Raça Negra (80 bpm) 3- Ai que Saudade D'oce - Elba Ramalho, Zé Ramalho e Geraldo Azevedo (112 bpm)	Movements that require greater motor coordination by increasing the speed of movement through faster music. Performing individual movements of paused cross and samba, and in pairs front and back step, comb, collar and "chuveirinho". Songs: 4-Deixa acontecer – Grupo Revelação (93 bpm) 5-Deixa tudo como tá - Thiaguinho (143bpm) 6- Cara valente – Maria Rita (158 bpm) 7-Esperando na Janela – Gilberto Gil (128 bpm) 8- Choreography of the week: Xote da alegria – Falamansa (80 bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9-Chega de saudade - João Gilberto (88 bpm) 10-Me apaixonei pela pessoa errada – Exaltasamba (70 bpm) 11-Oh! Chuva – Falamansa (70 bpm) Objective: Develop motor coordination.
	9	Classes 17 and 18 Jazz	Loosening up the body and warming up the joints. Songs: 1-Fly me to the Moon – Angelina Jordan (70bpm) 2-Time After time – Theresa Sokyrka e Jesse Brown (105 bpm) 3- I don't care – Ed Sheeran e Justin Bierber (102 bpm)	More fluid and lighter movements, performing "cake walk", "cat walk", "chassé", "skate" and "moonwalk". Songs: 4.The Story's Not Over – Jeremy Camp (110 bpm) 5.Treasure – Bruno Mars (116 bpm) 6.Rain on me – Lady Gaga e Ariana Grande (123 bpm) 7.Easy on me – Adele (142 bpm) 8- Choreography of the week: Beat it – Michael Jackson (139 bpm).	Movements that involve recognizing the body in space (proprioception). Songs: 9-Love Yourself – Justin Bieber (100bpm) 10-Billionaire – Bruno Mars (87 bpm) 11-Requiem for a dream – Scott Benson Band (67 bpm) Objective: Developing flexibility.
1 2 W E E K	10	Classes 19 and 20 Waltz	Loosening up the body and warming up the joints. Songs: 1- A thousand years – Christina Perri (93 bpm) 2- Perfect - Ed Sheeren (95 bpm) 3-Partilhar – Rubel e ANAVITÓRIA (124 bpm)	Movements in pairs performing the front base, side base, square and inverted front. With the need for static balance at key points in the music. Songs: 4-Like I'm Gonna Lose You- Meghan Trainor e John Legend (108 bpm) 5-Can I have this dance – Hihgh School Musical (136 bpm) 6-Sentido – MAR ABERTO (142 bpm) 7- Potter Waltz – Patrick Doyle (176 bpm) 8- Choreography of the week: You'll be in my heart – Phil Collins (97 bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 9- Coisas que eu sei – DanniCarlos (120bpm) 10-I won't tell a soul – Charlie Puth (77bpm) 11-La Valse del'amour - Patrick Doyle (59 bpm) Objective: Developing balance.
			Loosening up the body and warming up the joints. Songs: 1-Clareiamô – Anavítoria e Saulo Fernandes (100bpm)	Movements following one another in a short time interval. Performing movements such as "rock soltinho" and "pas de bourre". Songs: 4- Abalou – Ivete Sangalo	Movements that involve recognizing the body in space (proprioception). Songs: 9 -Rise Up -Andra Dey (119bpm)

S	11	Classes 21 and 22 National and Pop 80s	2-Amado – Vanessa da Mata (74bpm) 3- Billionaire – Bruno Mars & Travis Scott (89bpm)	(140bpm) 5-Thriller – Michael Jackson (118bpm) 6- It's Raining Man – The Weather Girls (136bpm) 7- I Will Survivor – Gloria Gaynor (117bpm) 8- Choreography of the week: Everybody – Back-street Boys (110 bpm)	10 - Tudo de bom – Pk e Luisa Sonsa (94 bpm) 11- Mais Uma de Amor – Lulu Santos Ao Vivo (84bpm) Objective: Develop cardiorespiratory fitness and motor coordination.
	12	Classes 23 and 24 Mix of all the dances learned	Loosening up the body and warming up the joints. Songs: 1-Under the Moon – Seoan e Ekaterina (85 bpm) 2-Amado – Vanessa da Mata (74bpm) 3-Partilhar – Rubel e ANAVITÓRIA (124 bpm)	Memorizing choreographic sequences. Songs: 1- Choreography of the week: La cumparsita – Juan D'Arienzo (136 bpm) 2- Choreography of the week: Xote da alegria – Falamansa (80 bpm) 3- Choreography of the week: Beat it – Michael Jackson (139 bpm) 4- Choreography of the week: You'll be in my heart – Phil Collins (97 bpm) 5- Choreography of the week: Everybody – Back-street Boys (110 bpm)	Movements that involve recognizing the body in space (proprioception). Songs: 6-Chega de saudade - João Gilberto (88 bpm) 7-Tango D'amor - Tango Jointz, Bellma Cespedes (92 bpm) 8- Apenas Mais Uma de Amor – Lulu Santos Ao Vivo (84bpm) Objective: Develop memory.

Hatha Yoga

The participants allocated to this group will take part in a hatha yoga program adapted for PwP, with the classes organized progressively. Practices ranging from light to vigorous will be included, covering postures and activities inherent to yoga philosophy. In terms of theory, the initial sutras of Patanjali's Yoga Sutras, 1:1; 1:2; 1:3 and 1:4, will be covered (Patanjali, 2015) basic teachings on *gunas*, which are models of mental states: tamas, rajas and sattva.

As for the practices of the psychophysical postures (asanas), they will be adapted for the audience targeted in this protocol. The therapeutic sequences of the Sun (Surya Namaskar), mentioned in another protocol, have been included because they can be performed in different ways by this population (Kwok et al., 2017) and the Moon (Chandra Namaskar) also mentioned in a guide to integral yoga postures applicable to hatha yoga (Joseph & Page, 2015). During the interventions, auxiliary accessories such as chairs, blocks, poles, belts and bolsters can be used, as well as bells, bowls and other resources commonly used in Indian culture and also mentioned as tools applicable to PwP (Kwok et al., 2019). The professional applying the interventions and assistants may ask participants to use personal equipment, such as towels, water bottles, cushions, yoga mats and mats, both to ensure proper practice and hygiene. The hatha yoga classes will be divided into three defined parts, in the following order: 1 - Mind: joint warm-up (*pavanamuktasana*) and breathing exercises (*pranayamas*); 2 - Body: Variation of hatha yoga postures (asanas), with standing postures, stabilizations, hip openings, twists, extensions, lateral and frontal flexions, balances and inverts (all adapted, with the necessary support for execution); 3 - Energy: postures for perceiving the benefits of practice in the supine position (*savasana*), seated (*siddhasana*) or on a chair. A moment of pause to reflect on daily purposes and strategies (*sankalpa*) for a more equitable life. The suggested time for each part is shown in Table 2.

Table 2.
Hatha yoga intervention protocol for people with Parkinson's disease.

		Training - Warm-up/mind	Main part/body	Closing goal/energy
	1	Classes 1 and 2	Introduction to hatha yoga: What the purpose of yoga? What is Hatha Yoga? What is yogic breathing (ujjayi)? What is the importance of cultivating a healthy and contemplative mind? Where should the mind be? - 20'.	Mountain pose (tadasana), cat movement (marjaryásana), forward bend (uttanasana), lateral half-moon (ardha chandrasana), standing twist with legs apart (parivrtta prasarita padottanasana), dog looking down (adho mukkha shvanasana), child (gasbhasana), reverse process gesture (viparita karani mudra) all with the necessary adjustments and adaptations (chair, wall, blocks, belt, cushion) - 30'.	In savasana, sitting on the floor or on a chair. Sutra 1.1 (atha yogasusasanam): Now to the teachings of Yoga. This sutra indicates the existence of a well-structured method for reaching the goal[24]. Ending: Short meditation with mantra/ Asatoma - 10'. Objective: Focus on intention.
1 2 W E E K S	2	Classes 3 and 4	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Viloma (can be performed standing, sitting and lying down). Om mantra for opening. What is the symbol and sound of this mantra? - 10'.	Mountain pose (ardhasana) - How do we start the practice? Initiation to Sun Salutation adapted with wall/block/chair supports (Surya Namaskar), child (gasbhasana), twisting lying on the abdomen (jathara parivartanasana), reverse process gesture (viparita karani mudra) - 35'.	In savasana, sitting on the floor or on a chair. Sutra 1.2 (yoga cittavrtti nirodhah) - Yoga means controlling the fluctuations of the mind [21]. Conclusion: How do you hope to apply yoga in your daily life? Short meditation with mantra: Om Sahanah Vavatu - 15'. Objective: Proprioception.
				Trunk rotation movements while sitting or standing (chakki chancalasana). The three bandhas: Mulabandha: contraction of the perineum, with	In savasana, sitting on the floor or on a chair. Sutra 1.3 (tada drastuh svarupe avasthanam) - "The mind is a friend and well-wisher, for

3	Classes 5 and 6	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Viloma (can be done standing, sitting and lying down). Mantra Om for opening - 10'.	elevation of the pelvic floor; Uddiyanabandha: contraction of the abdominal area, with compression of the abdominal viscera; Jalandarabanhdha: contraction of the cervical area, with compression of the glottis and throat; Salutation to the Sun applying the bandhas (Surya Namaskar), gesture of the reverse process (viparita karani mudra) - 40'.	whoever is unable to control it, the mind itself, as an enemy, will remain busy, constantly in its disservice" [24]. What has been easy? What has been difficult? Finish: Relaxation (savasana/yoganidra) - 10'. Objective: Self-knowledge through movement.
4	Classes 7 and 8	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Surya Bheda (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Trunk rotation movements while sitting or standing (chakki chancalasana), adapted Sun Salutation (Surya Namaskar), triangle pose (trikonasana), chair pose (utkatasana), boat pose (navasana), lying on the abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or on a chair. Sutra 1.4 (vrtti sarupyam itaratra) - If you don't having the functions of the mind under control, you will become confused by the confusions of your own mind. Who is the perceiver of the mind? Are you the mind? THE BODY SPEAKS, "DOES IT LISTEN? Finish: Relaxation (savasana/yoganidra) - 10'. Objective: Proprioception.
5	Classes 9 and 10	Pavanamuktasana and pranayama: Ujjayi joint and breathing warm-up exercises (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), Hero I and II (virabhadrasana I and II), sun bird (cacoravakasana), chair (utkatasana), staff (dandasana), seated boat (paripurna navasana), tongs (pascimottanasana), Sage Marichi in twist (parivrtta maricyasana), knee on chest (apasana), twist lying on abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or on a chair, create the San Kalpa - a phrase conjugated in the present tense. Example: - I'm on the path! Help us to fulfill life's purposes - 10'. Objective: Visualize and mentalize strategies.
6	Classes 11 and 12	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Viloma (can be done standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), Sun Salutation adapted with wall/block/chair supports (Surya Namaskar), staff (dandasana), seated boat (paripurna navasana), pinch (pascimottanasana), bending with legs apart (upavista konasana), reverse process gesture (viparita karani mudra) - 40'.	In savasana, sitting on the floor or on a chair. Sutra 1.1 (atha yogasusasanam): Now, to the Yoga teachings. This sutra indicates the existence of a well-structured method for reaching the goal [24]. Conclusion: Short meditation with Mantra: Asatoma - 10'. Objective: Contentment with movement
12 WEEKS	7 — Classes 13 and 14	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Viloma (can be done standing, sitting and lying down). Mantra Om for opening - 10'.	Trunk rotation movements while sitting or standing (chakki chancalasana). Initiation to the adapted Moon Salutation with wall/block/chair supports (Chandra Namaskar), triangle posture (trikonasana), chair posture (utkatasana); boat posture (navasana), lying twist on the abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or on a chair. Sutra 1.2 (yoga cittavrtti nirodhah) – Yoga means controlling the fluctuations of the mind [21]. Conclusion: How do you hope to apply yoga in your daily life? Short meditation with mantra: Sahanah Vavatu - 10'. Objective: Flexibility of body and mind.
	8 — Classes 15 and 16	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Surya Bheda (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), Hero I, II and III (virabhadrasana I, II and III), sun bird (cacoravakasana), staff (dandasana), seated boat (paripurna navasana), pincer (pascimottanasana), knee on chest (apasana), lying twist on abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or chair. Relaxation (savasana/yoganidra) and brief meditation with mantra: Sahanah Vavatu - 10'. Objective: Resilience.
	9 — Classes 17 and 18	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Surya Bheda (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain posture (ardhasana), Goddess posture (deviasana), Hero I and II (virabhadrasana I and II), triangle pose (trikonasana), chair pose (utkatasana); boat pose (navasana), sun bird (cacoravakasana), chair (utkatasana), staff (dandasana), half wheel (ardha mandalasana), bridge (setubandhasana), lying twist on the abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or chair. Relaxation (savasana/yoganidra) and brief meditation with mantra: Sahanah Vavatu - 10'. Objective: Polarity.
	10 — Classes 19 and 20	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Ujjayi (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), standing forward bend with legs together (uttanasana) forward with legs together (uttanasana), Moon Salutation adapted with wall/block/chair supports (Chandra Namaskar), butterfly flexion (baddakonasana), sun bird (cacoravakasana), boat pose (navasana), lying twist on the abdomen (jathara parivartanasana) - 40'.	In savasana, sitting on the floor or on a chair. Objective: Perception Relaxation (savasana/yoganidra) and brief meditation with mantra: Sahanah Vavatu - 10'. Objective: Strength (mind, body, energy).
	11 — Classes 21 and 22	Pavanamuktasana and pranayama: joint and breathing warm-up exercises - Nadi Shodhana (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), Goddess pose (deviasana), Hero I, II and III (virabhadrasana I and II), triangle pose (trikonasana), chair pose (utkatasana), tree pose (vrksasana), staff (dandasana), half-wheel (ardha mandalasana), bridge (setubandhasana), child (gasbhasana), lying twist on the abdomen (jathara parivartanasana) - 40'.	Polarity Meditation with the Tibetan bowl. Mantra: Sahanah Vavatu and San Kalpa - 10'. Objective: Satisfaction and happiness (choices).

W E E K S	12	Classes 23 and 24	Pavanamuktasana and pranayama: Nadi Shodhana joint and breathing warm-up exercises (can be performed standing, sitting and lying down). Mantra Om for opening - 10'.	Mountain pose (ardhasana), Sun Salutation adapted with wall/block/chair supports (Surya Namaskar , Hero I, II and III (virabhadrasana I and II), triangle pose (trikonasana), chair pose (utkatasana), inverted pranha (purvottanasana), tree pose (vrksasana), child (gasbhasana)- 40'.	Oneness Meditation with the Tibetan bowl. Mantra: Sahanah Vavatu and San Kalpa - 10'. Objective: Orientation (mind, body, energy).

Control Group

Participants randomly assigned to the control group (CG) will undergo assessments before the start of the intervention (baseline) and after 12 weeks. They will be instructed to maintain their usual lifestyle and activities and not to engage in any other form of physical exercise during the 12 weeks of the study. This group will not perform any type of physical exercise during the study. During this period, contact will be made by telephone every month, on the first day of the month, at a time previously scheduled by the researchers, who will organize the follow-ups in spreadsheets and verify what the participants have agreed to. At the end of the study, these participants will be offered the opportunity to participate free of charge in a physical exercise extension program with yoga and free dance promoted by a public university.

Evaluations

Demographic and clinical information

The sociodemographic and clinical variables will be divided into personal and clinical. Personal: education, marital status, age, gender and duration of illness. Clinical: level of disability on the HY scale (Hoehn & Yahr, 1967); most affected side; previous physical activity; presence of other diseases; use of medication (anxiety, depression, urinary and fecal incontinence), body mass index (BMI). For BMI classification, the protocol of the (World Health Organization, 2016), thinness, BMI<18.5; eutrophy, BMI 18.5-24.9; overweight, BMI 25.0-29.9; and; pre-obesity and obesity (BMI>30.0). Hoehn and Yahr Disability Stages Scale (HY) - Indicates the general disease stage of PwP. It is divided into five stages which include measures of signs and symptoms such as postural instability, rigidity, tremor and bradykinesia, classifying disability from mild to moderate in stages I, II and III and severe in stages IV and V (Hoehn & Yahr, 1967).

Primary Outcome Measure

Quality of lifewill be assessed using the Parkinson's Disease Questionnaire (PDQ 39), an instrument that provides information on the impact of the disease in eight dimensions (mobility, activities of daily living, emotions, stigma, social, cognition, communication and bodily pain), with 39 items in total, ranging from 0=never to 4=always, with a maximum score of 100 points, the higher the value the worse the quality of life (Jenkinson et al., 1997).

Secondary Outcome Measures
General symptoms
Unified Parkinson's Disease Rating Scale (UPDRS) - The UPDRS assesses various aspects of PwP and is considered a gold standard assessment method frequently used for clinical and research purposes. It consists of 42 questions and is divided into four parts: I- Mental state, behavior and emotional state; II- Activities of daily living; III- Motor exploration and IV- Complications of therapy. The score on this scale ranges from 0 to 199, with a lower score indicating less severe symptoms and a higher score indicating more severe symptoms (Anon, 2003).

Motor aspects
a) Shoulder range of motion in flexion, abduction and extension - Goniometer - Goniometry will be used to assess shoulder range of motion. To evaluate shoulder flexion, the PwP will be in the supine position, placing the fixed arm of the goniometer on the mid axillary line of the trunk, pointing towards the greater trochanter of the femur, the movable arm on the lateral surface of the body of the humerus facing the lateral epicondyle and the axis close to the acromion. In abduction, they will be assessed standing with one arm in extension with the fixed arm of the goniometer on the posterior axillary line of the trunk, the movable arm on the posterior surface of the arm and the axis close to the acromion. In extension, they will also be standing with one arm in extension with the goniometer's fixed arm on the mid-axillary line pointing towards the greater trochanter of the femur, the mobile placed on the lateral surface of the body of the humerus facing the lateral epicondyle and the latero-lateral axis of the glenohumeral joint (Ace, 2016).

b) Hip range of motion - Goniometer - This will be used to analyze hip range of motion, assessed in extension and flexion. To assess the hip flexion movement, the PwP will lie supine, with the hip flexed and one knee bent, placing the fixed arm of the goniometer on the axillary line of the trunk and the mobile arm parallel to the lateral surface of the thigh, towards the lateral femoral condyle and the axis approximately at the level of the greater trochanter. Subsequently, the hip flexion position will be maintained, with the knee extended to take the same measurement. Hip extension will also be assessed lying down, but in the prone position, with one leg in extension, placing the fixed arm of the goniometer on the mid axillary line of the trunk, the movable arm on the side of the thigh towards the lateral condyle of the femur and the axis approximately at the level of the greater trochanter (Ace, 2016).

c) Cardiorespiratory fitness - The six-minute walk test (6MWT) will be used to analyze cardiorespiratory fitness, as it is a safe instrument for submaximal evaluation of the cardiorespiratory system, with no need for medical supervision. The materials involved will be a stopwatch, a blood pressure meter and an oximeter, and the distance covered

will be calculated in meters, as well as measuring heart rate, blood pressure and oxygen saturation at the pre- and post-test moments. To analyze the distance traveled variable, the delta percentage (Δ%) will be used to calculate the variations (Holland et al., 2014).

d) Balance - The Mini BESTest (MBT) is a 14-item test focused on the assessment of dynamic balance (anticipated transitions), postural responses, sensory orientation and dynamic gait. It has been used to monitor changes in balance. The score varies between 0 and 2; a score of 2 indicates normal balance and 0 indicates that the person is unable to perform the task. The maximum score is 28 points.(Maia et al., 2013).

Non-motor aspects

a) Anxiety — The Beck Anxiety Inventory (BAI) is composed by 21 self-reported questions that address the symptoms of anxiety in somatic, affective and cognitive signs. Each question has four answers with scores ranging from 0 to 3: 0 = none; 1 = Mild, but it didn't bother me much; 2 = Moderate, it wasn't pleasant sometimes; 3 = Severe, it bothered me a lot. Thus, the higher the score, the greater the degree of anxiety. The total score is 63 points (Beck et al., 1988).

b) Self-esteem — The Rosenberg Self-Esteem Scale (RSS) is a one-dimensional measure which consists of ten statements related to a set of feelings of self-esteem and self-acceptance that determine overall self-esteem. 50% of the items are stated positively and 50% negatively. The total score on the scale ranges from 10 to 40 points and is categorized as follows: (1) scores above 31 points characterize satisfactory or high self-esteem; (2) scores between 21 and 30 points are classified as average self-esteem; and (3) scores below 20 points are deemed unsatisfactory or low self-esteem (Hutz & Zanon, 2011).

c) Cognition - The Montreal Cognitive Assessment (MoCA) examines eight cognitive domains: executive function, visuospatial ability; memory; attention; concentration and working memory; language, temporal and spatial orientation. It is used as a standard cognitive screening instrument for clinical trials related to PD, as it is a test widely used in cognitive screening and its main advantage is its effectiveness in analyzing executive function, the first domain affected by PD. It has a maximum score of 30 points, with a cut-off point of ≤ 22 points, indicative of greater damage to cognitive function in PwP (Almeida et al., 2019).

d) Hope - The Herth Hope Scale (HHE) has 12 items written in an affirmative way, where the items are graded using a 4-point Likert scale. The total score ranges from 12 to 48 and, the higher the score, the higher the level of hope (Sartore & Grossi, 2008).

e) Fecal incontinence - The Fecal Incontinence Quality (FIQ) of life consists of 29 questions that assess bowel function from the perspective of quality of life. The questions are divided into 4 domains: lifestyle, behavior, depression and embarrassment. The score for each item is given as a value from 1 to 4, with the exception of questions 1 (values from 1 to 5) and 4 (values from 1 to 6). To calculate the total score for each domain, it is necessary to calculate the average of its items, with the total score being equivalent to 5 (Rockwood et al., 2000).

f) Urinary incontinence - The International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF) is consisted of four questions which assess the frequency, severity and impact of urinary incontinence (UI), as well as a group of eight items relating to causes or situations of UI experienced by the respondents and the overall score is obtained by adding the scores of questions 3, 4 and 5. The score ranges from 0 to 100; the higher the score, the worse the quality of life related to that domain (Caetano et al., 2009).

g) Depressive symptoms - Beck Depression Inventory (BDI), contains 21 multiple-choice objective questions related to depressive symptoms such as hopelessness, irritation, cognition, guilt and feelings of punishment, as well as physical symptoms such as fatigue, weight loss and sexual interest. The highest score is 63, which indicates a high degree of depressive symptoms (Beck et al., 1996).

Data collection

Data will be collected at two different times, at baseline (T0) and after 12 weeks of intervention (T1). These will be conducted by trained researchers, in order to avoid bias in the research, keeping the allocation of the groups unknown. The data collection process, including the application of the questionnaire (paper and pen) and physical tests, will last approximately 60 minutes, at a time previously defined by the researchers on an individual basis.

Research participants will be contacted regularly by the researchers throughout the study to maintain follow-up and motivation for the best continuity of the research. The researchers will use resources such as *WhatsApp, Google Calendar* and *Google Drive* to monitor, organize and provide logistical support for the interventions. Participants who drop out will be called after the end of the interventions to collect data, which will be included in the intention-to-treat analysis. A summary of all the collection stages is shown in Figure 2.

Adverse events

During the course of the research, it is possible that adverse events may occur, such as embarrassment during the application of the questionnaires (as they contain questions of an intimate nature), falls, reports of pain, fatigue, discomfort and/or withdrawal. In these cases, the researchers applying the interventions (hatha yoga and free dance) will record the adverse events and report them to the principal investigators. The principal investigators will assess whether or not the participants will be allowed to continue in the intervention. All Physical Education professionals, are instructed to carry out immediate and appropriate interventions, prioritizing the safety and well-being of the participants, who will be able to stop the activities at any stage of the research, i.e. both at the time of collection and interventions. The proposed movements will be adapted to the limits of each participant in order to avoid embarrass-

ment due to possible physical or even psychological limitations. Likewise, any physical ailments (pressure drop, dizziness, chest pain, blurred vision, irregular pulse, fainting, shortness of breath, falls or other adverse events) participants suffering from adverse events will be referred by the investigator in charge and the team to the appropriate health services to receive appropriate health care.

It should also be noted that the researchers will be present at all stages of the study and be assisted by support staff to prevent falls and other incidents, as well as having a rapid messaging group (via *WhatsApp*) to speed up the essential communication between all those involved, including the research participants.

STUDY PERIOD			
	Enrolment	Allocation	Post-allocation
TIMEPOINT**	-t_1	0	t_1
ENROLMENT:			
Eligibility screen	X		
Informed consent	X		
Randomization		X	
INTERVENTIONS:			
Free Dance		●——————●	
Hatha Yoga		●——————●	
Control Group		●——————●	
ASSESSMENTS:			
Quality of life – UPDRS/ PDQ 39 Range of movement of shoulders Range of hip movement Cardiorespiratory fitness Balance Fecal incontinence Urinary incontinence Anxiety Self-esteem Cognition Hope Depressive symptoms		X	X
Analysis of study outcomes			X

Figure 2. Summary of collection stages - SPIRIT

Statistical Analysis

An electronic spreadsheet will be prepared in the Microsoft Excel program and the data will be tabulated and transferred to the SPSS statistical package, version 20.0. Firstly, descriptive statistics (mean, standard deviation and percentage) will be carried out. After the 12 weeks of interventions, efficacy analyses will be carried out, both intragroup and inter-group, considering all the hypotheses of the detailed project, checking mainly the aspects of the outcome variable and other variables compared to the results of the control group. *One-way ANOVA tests*, *two-way ANOVA tests* for repeated measures, *Sydak's* comparison test and other statistical tests and analyses that the researchers deem necessary to include in the study in order to detail, strengthen and provide relevant data for the research may be used. The significance level adopted will be 5%.

Discussion

This protocol describes a randomized clinical trial comparing the effects of free dance and hatha yoga (twice a week for 12 weeks) to a control group without intervention. The researchers have named their hypotheses after other studies of protocols developed with the same population, but investigating different physical exercises such as functional training and Mat Pilates (Moratelli et al., 2022), binary dance rhythm and quaternary dance rhythm (Moratelli et al., 2021) e Brazilian samba (Tillmann et al., 2017) all with the aim of finding safe, effective and viable interventions for PwP. The protocol articles demonstrated feasibility, adherence and safety, as well as positive benefits in the variables they set out to analyze (Fonseca et al., 2021; Moratelli et al., 2021; Souza Severo et al., 2023; Tillmann et al., 2017) (Fonseca et al., 2021). These are fundamental to the planning and development of this study, since they deal with similar criteria for the progression of activities, adaptability, safety and motivation to develop the best practices and exercise possibilities for PwP.

The choice of dance and yoga interventions for the study was to broaden and verify the effectiveness of physical exercises in the complementary treatment of PwP. By analyzing clinical studies applied to dance and yoga in PwP (Feenstra et al., 2022; Walter et al., 2019), it can be seen that the modalities are low-cost, low-risk and have good adherence. Since there are no cure treatments available for PD and that people in advanced stages of the disease might be less responsive to medication or have debilitating side effects (e.g. dyskinesias), the development of complementary as well as new therapy strategies is highly desirable (Vendrik et al., 2023).The advantage of the low cost and the possibility of adapting the exercises to different physical and motor limitations stand out between stages I and IV, and it is not possible to adapt the exercises for those in stage V because they are bedridden PwP (Hoehn & Yahr, 1967; Feng et al., 2020).

Furthermore, Omar et al. (2023) analyzed the effect of physical exercise on PwP symptoms, including dance and yoga. Qualitatively, the study showed that there was no difference between aerobic and non-aerobic forms of exercise. However, there is a lack of clinical trials assessing the impact of exercise on PD symptoms, including using the specific instruments for assessing disease severity (UPDRS), as the benefit of specific forms of exercise requires further investigation.

What's more Dommershuijsen et al. (2023) bring to light the need to broaden discussions based on scientific studies and to strengthen doctors and health professionals in terms of what is recommended to patients with PD in the various stages of the disease. Education on survival, complementary and non-pharmacological treatments, the benefits of exercise and advance care planning are all subjects that need to be studied, shared and disseminated, so that new strategies and greater public awareness of PD treatment can emerge. In this way, we can anticipate uncertainties about the disease and bring important benefits to quality of life. In addition, physical exercise intervention sessions offer social interaction and support, potentially reducing social isolation and withdrawal in people with PD, positively affecting participants' quality of life, and may bring

various benefits in the non-motor symptoms of PD (Feenstra et al., 2022). Therefore, it is of the utmost importance to develop quality clinical trials so that high-quality evidence can be produced and thus consolidate dance and hatha yoga as complementary therapies in PD, incorporating the modalities as practices within the standard of care.

In conclusion, this study can become a reference for other clinical trials, as it is organized in a simple, clear and objective way. It is believed to be reliable, since it was drawn up by researchers with experience in caring for PwP and aims to help reduce physical and psychological suffering, especially in relation to the variables that will be analyzed in subsequent clinical trials (quality of life and motor and non-motor symptoms). This protocol will serve as the basis for a randomized controlled clinical trial, with the interventions expected to end in October 2024.

Abbreviations

BAI - Beck Anxiety Inventory
BDI = Beck Depression Inventory
BMI = Body Mass Index
CEPSH = Committee for Ethics in Research on Human Beings
CG = Control Group
FDG = Free Dance Group
FIQ = Fecal Incontinence Quality
HHE = Herth Hope Scale
HY = Hoehn and Yahr Disability Scale
HYG = Hatha Yoga Group
ICIQ-SF = International Consultation on Incontinence Questionnaire - Short Form
MBT = Mini BESTest
MoCA = Montreal Cognitive Assessment
PD = Parkinson's Disease
PDQ39 = Parkinson's Disease Questionnaire
PwP = People with Parkinson's Disease
RSS = Rosenberg Self-Esteem Scale
UDESC = University of the State of Santa Catarina
UPDRS = Unified Parkinson's Disease Rating Scale
6MWT = Six-minute walk test

Ethics declarations

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Conflicts of interest
The authors declare no conflicts of interest, financial or otherwise. The results of the study are presented clearly, honestly and without falsification or incorrect manipulation of the data.

Ethics Approval
Ethical approval was granted by the Human Research Ethics Committee (CEPSH) (6.555.252) on 12/05/24 and

the study registered in the Brazilian Registry of Clinical Trials (ReBEC) (RBR-54s92mh) 54s92mh on 02/29/24.

Data and code availability
There are no data associated with this manuscript.

Consent to Participate
Not applicable.

Consent for Publication
Not applicable.

Availability of Data and Material
Not applicable.

Author contributions

A.G.L and A.A.G.M conceived the idea for the manuscript and have written the first draft of the manuscript. A.C.A.G., P.R.G, J.A.M and C.R.A.S. read and revised multiple drafts of the manuscript. All authors approved the final version of the manuscript.

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