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RESEARCH ARTICLE

Adherence rate, barriers to attend, safety and overall experience of a physical exercise program via telemonitoring during COVID-19 pandemic for individuals with Parkinson's disease: A feasibility study

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Abstract

Background: Telemonitoring can maintain daily exercise routine during the COVID-19 pandemic of individuals with Parkinson's disease (PD). However, there are barriers to adherence and attendance with remote physical rehabilitation. The main objective of this study was to evaluate adherence rate, barriers to attendance, and safety of a telemonitoring program for individuals with PD; and secondarily to evaluate the individual and their family members perceived overall experience when performing the telemonitoring physical exercise program.

Methods: This was a phase 1 of a clinical trial, engaging 19 individuals with idiopathic PD of an in-person community rehabilitation program. For 24 weeks an asynchronous telemonitoring physical exercise program delivered two sessions per week by video including warm-up, balance, aerobic and resistance exercises, and cool-down. During the remote program were verified: adherence rate at entrance, attendance rate, barriers to attend, safety, and overall experience of the program.

Results and conclusion: Only one participant did not perform any session and 18 participants completed between 2 and 34 sessions. Participants with a caregiver showed higher attendance rates. The most frequently cited barriers to attend the program were: pain; lack of motor skills; and reduced physical fitness. In relation to safety of the program, the most frequently reported was fear of falling. Although participants reported the telemonitoring program induced health benefits and they had positive experiences for themselves and for their families, most of participants prefer an in-person program. In this sense, the asynchronous telemonitoring physical exercise program was safe, showed moderate adherence, with attendance rate depending on the presence of a companion.

KEYWORDS
barriers, COVID-19, Parkinson's disease, physical activity, physical exercise, sedentary behavior, social isolation, telemonitoring, telerehabilitation

1 | BACKGROUND

Telemonitoring is a telerehabilitation tool, which aims to prescribe a program of guided exercises without the presence of a professional or with remote monitoring at a distance for the treatment of patients with musculoskeletal and neurological disorders (Hosseiniravandi et al., 2020), to manage daily living (ADL), and community activities (Block et al., 2016) and to overcome barriers. Telemonitoring is the remote gathering of information about a patient which is used to inform healthcare providers (van den Bergh et al., 2021).

Individuals with neurological disorders face barriers to attend and to adhere into rehabilitation programs such as time constraints (Appleby et al., 2019), limited resources (Appleby et al., 2019), geographic isolation (Appleby et al., 2019; Quinn et al., 2020), fear of falling (FOF; Afshari et al., 2017), and motor restrictions (Katz, 2020), and the expectation of poor results (Afshari et al., 2017a). The SARS-COV-2 (COVID-19) pandemic has shaken the traditional health care services. In rehabilitation, an urgent readiness for disruptive events (Middleton et al., 2020) and the call for telehealth options have emerged (Hosseiniravandi et al., 2020). Remote activities under supervision are an option for persons with Parkinson's disease (PD) to remain physically active and healthy (Rothan & Byrareddy, 2020). On the other hand, there is no information whether some features of PD such as severity of disease, FOG, or having a caregiver might affect persons with PD's attendance in a remote physical activity program.

How safe is a telemonitoring-based physical exercise for individuals with PD? Which barriers might affect their adherence and attendance? Although in-person programs allow social interaction, engagement, and may generate more satisfaction for the participants, this is not a safe choice during the pandemic. A recent guideline from the American Physical Therapy Association (APTA) suggested more research is needed with robust study designs to examine the benefits of telerehabilitation and mHealth technology for safety and feasibility (and usability for patients and providers; Osborne et al., 2021).

Thus, the primary aim of this study was to evaluate the adherence rate, barriers to attend and safety of a telemonitoring program for individuals with PD; the secondary aim was to assess the individuals, and their family member's, perceived overall experience of performing such a telemonitoring-based physical exercise program.

2 | METHODS

This is a phase 1 of a clinical trial, and the CONSORT checklist was used. This study was approved by the Human Ethics Committee. The consent terms were sent by mobile phone and email to all participants who agreed to join this research project. The health instructor team called and explained all the procedures to the participants and their caregivers before consenting to participate in the project.

2.1 | Participants

We invited individuals diagnosed with idiopathic PD who had been engaged in an in-person community rehabilitation program at the School of Physical Education and Sport at USP, Brazil, to attend a telemonitoring-based physical exercise program. The inclusion criteria were a) older than 18 years old; b) no orthopedic or cardiac diseases that prevent safe physical activity, or which are risk factors for other neurological diseases; c) Montreal Cognitive Assessment (MoCA) score higher than 14, indicating no dementia (Phannarus et al., 2020); and d) modified Hoehn & Yahr scale (H&Y) score between 1 and 3. As a standard procedure for the in-person program that this group took part in before the COVID-19 pandemic, participants had been evaluated by a physician between January and February 2020, and they were in health conditions for physical training. Although, any participant would be excluded if during the remote activities to present any physical, cardiovascular, or respiratory condition.

2.2 | Procedures

The goals of this telemonitoring-based physical exercise program were to reduce physical inactivity, to improve aerobic capacity, muscle strength, mobility, balance and gait, and to improve balance confidence, and cognition. This program last 24 weeks, and the detailed development of the protocol has been previously published (Torriani-Pasin et al., 2022).

The sessions were entirely online, and the asynchronous format was chosen to ensure the participants would be able to perform the physical exercises with a caregiver or family member at home as safely as possible, also each participant could perform the activities at a comfortable speed (due to bradykinesia, freezing of gait (FOG), tremor of upper limbs, slower gait speed and difficulties with transfers), and perform the activities during their on-medication period.

Safety was encouraged, especially in the balance component of the session. The exercise sessions were based on two sets exercise videos, which were sent weekly (every Monday and Wednesday), and their features are presented in Table 1. Participants were encouraged to exercise on non-consecutive days during the week.

All exercises were presented with different levels of intensity and complexity to allow participants to tailor the exercises to their level and skills. The everyday items to do exercises were a broomstick, a chair, cushions, bottles with water or sand.

TABLE 1 Videos' features: aims, description of the activities, practice duration, and video duration

Aims	Description	Practice duration	Video duration
Warm up	Low intensity exercises with dual task, cognition, or training hand skills.	5 min	1–2 min
Balance	Dynamic or static balance exercise with reduced base of support, unstable surface, visual restriction and change of center mass.	15 min	3–5 min
Aerobic capacity	Low to moderate cyclic and rhythmic exercises with large muscle groups which demands the cardiorespiratory system.	20 min	8–10 min
Resistance training	Dynamic and isometric exercise to trunk, lower and upper limb. The prescription 3 series between 15 and 20 repetitions, depends on the muscle.	15 min	5–8 min
Transfers	It includes the training of postural transfers most used in daily life (e.g., climbing stairs, getting in the car, getting out of bed, sit-to-stand), aiming at the use of explicit memory. The training includes: 1) understanding of each phase of the movement, through guided reading; 2) demonstration of the movement (made by the therapist); 3) skill training.	5 min	1–2 min
Cool down	Stretching and breathing exercises to decrease heart rate and blood pressure.	5 min	1–2 min

Telemonitoring occurred as follows. The working team for this telemonitoring-based exercise program was composed by a team leader (faculty member), a physical education instructor (faculty member), a health instructor team (4 graduate students, responsible for supervising the intern team), and an intern team (20 undergraduate students). The team leader and the physical education instructor should weekly meetings with the team members to track participants attendance, adverse effects and possible events that needed decision making. In addition, they should prepare the videos to the participants. The health instructors' team was in charge of monitoring the interns, checking adherence weekly and the completion of weekly questionnaires. Finally, the interns' team was in charge of recording the videos and submit them for approval by the team leader and physical education instructor. They should also weekly contact the participants, filling in the weekly and monthly questionnaire online.

To ensure adherence rate, we have set three actions to support each video session: 1) To text messaging each participant to ensure they could perform the session (intern team); 2) To provide them online assistance and to receive and collect their feedback (health instructor team and intern team); 3) To ask for the participants to record their performance and send it to the instructor to receive feedback intern team and physical education instructor.

2.3 | Data extraction procedures

Demographic information (age, sex, schooling, and time since PD diagnosis) was recorded, and every participant performed the physical and cognitive assessment based on the domains of the International Classification of Functioning, Disability and Health (WHO, 2001a). Health professionals did all evaluations during the on-medication period. The Activity-specific balance confidence scale (ABC) and the Mini-Balance Evaluation Systems test (MiniBESTest) were used to characterize the perception of balance and balance itself; the 6-min walk test (6MWT) to characterize aerobic capacity; the 10-m walk test (10 m) to characterize gait speed; the timed up and go (TUG) to characterize mobility; the five-repetitions sit to stand (FTSTS) to measure the lower limb strength; the Dynamic Gait Index to assess qualitative aspects of gait; the FOG questionnaire to depict FOG, the MoCA to characterize cognitive deficits, and the Parkinson's disease questionnaire-39 was used to measure quality of life.

The intern team called each participant weekly to record attendance, safety, and barriers to completing the exercise sessions. A questionnaire (Table 2) was applied to assess barriers, and safety to exercise (pain, dizziness, motion sickness, insecurity in performing exercises, and accidental falls). Non-participations were described in open-ended questions. Participants were also asked about participation frequency and barriers to exercise. All questions were collected and transcribed into an online form. These barriers were collected in open questions, and from the answers obtained, we classified and grouped into personal-related, telemonitoring-related, Parkinson-related, pandemic-related, and environmental-related themes. After clustering all responses into constructs, these constructs were grouped according to their meaning into categories.

The personal-related barriers are personal factors for avoiding exercising, such as pain, lack of motor skills, reduced physical fitness, and behavioral issues. The telemonitoring-related barriers were Internet connection or technology-related issues, the need to exercise with someone for safety reasons, and exercise program-related issues. The Parkinson-related barriers were the PD related limitations to exercise, such as dual-task exercises, FOG and tremor. The pandemic-related barriers were the current COVID-19 pandemic issues for the participant or caregiver. The environmental-related barriers refer to extrinsic factors to the individuals, such as a lack of a safe space to exercise.

This method was based on Schreier (2013). Although our coding was not tested for reliability and reproductivity, our coding process were based one-dimensionality, mutual exclusiveness, exhaustiveness, and saturation.

Once a month, the intern team called the participants and their family members or caregivers to evaluate the overall experience for the past 4 weeks. The Overall Experience is a questionnaire (based on 5 levels Likert scale) composed by 12 questions about

TABLE 2 Weekly questionnaire

Weekly questionnaire
Did you do the sessions this week?
What prevented you from performing the sessions?
How many days in the week did you exercise?
Did you do this week's sessions accompanied? If yes, with whom?
Did you have any difficulty to do the exercises this week? Was there anything that prevented you from doing the video exercises?
Was there a falling episode during this week's sessions?
Did you experience pain during this week's sessions?
Did you have pain the day after this week's sessions?
Did you feel dizzy during this week's sessions?
Did you have nausea during this week's sessions?
Are you afraid or insecure to perform the exercises during this week's sessions?
Did you have any other uncomfortable symptoms during this week's sessions?

participant's perception about quality of life, interpersonal relationships, and the telemonitoring program, and 6 questions about caregiver's activities from "totally disagree (1 point)" to "totally agree (5)"] (Torriani-Pasin et al., 2021).

2.4 | Statistical analysis

Data information was described using mean, mode, and median. Standard deviation and 95% interval of confidence were used to describe data variability.

Parametric and non-parametric one-way analyses were run to analyze the effect of severity of disease (mild and moderate), FOG (yes or no), and caregiver (with or without) on participation. We created plots using Origin (v.2020, OriginLab Corp, Northampton, MA, USA) and performed statistical analysis with SPSS (v.20, IBM Corp, USA).

The adherence rate was defined as the relative frequency of individuals who engaged in the remote exercise program (Ellis et al., 2019; Landers & Ellis, 2020). Individual attendance is the frequency of participation of each attendee in the exercise program, and the group median is the attendance rate. The barriers and concerns (safety issues) to attend this exercise program were recorded in the weekly report, and their relative frequencies were analyzed. Individual median responses for the Overall Experience Questionnaire were grouped and ranged, and first and third quartiles interval responses were presented.

3 | RESULTS

Figure 1 shows a flowchart describing every step developed during this study. Adherence rate was 65.5%, that is, 19 participants joined the telemonitoring based program (Figure 1), while other 10 persons did not attend the remote program (three participants had technological problems, five did not accept to participate to the program, and two participants had medical issues). During the study, five participants did not answer any team member's phone call and thus 14 gave their last Overall Experience. Six family members or caregivers were included in this study.

In Table 3 participants' and family members' or caregivers' characteristics are depicted. Eight participants (42.1%) were women and 11 (57.9%) were men, from 53 to 86 years old, and from 1 to 3 on the H&Y score (stage 1%–10.5%, 1.5%–15.8%, 2%–5.8%, 2.5%–36.8%, and 3%–21.0%).

The mean MoCA was 25.31 ± 4.78 and all scores was above 14, therefore no individuals with dementia (Phannarus et al., 2020). However, three participants scored below 21, indicating mild impairment for PD (Dalrymple-Alford et al., 2010). For these three, just one had caregiver (his attendance rate was 27.08%, 13 sessions), while for the other two, their attendance rate was below 4% (which represents one or two sessions). Then, the cognition may be a barrier if the participant does not have a caregiver to support him/her.

3.1 | Attendance

The average participation was 20.7 ± 14.9 sessions (47.1 ± 33.8%, 95% CI 14.0–27.4 sessions). Just one participant (5.3%) skipped all sessions. Every participant finished each exercise session. Five (26.3%) participants attended at least 80% of all sessions and six (31.5%) participants attended <20% sessions. Active participants did 95.0 ± 21.6 min/week of physical activity with this program. Total sessions were 394, accounting for 23,640 min of physical activity.

For severity, the Shapiro-Wilk test showed data distribution was not normal. A Kruskal-Wallis one-way ANOVA showed no differences in participation for severity ($H(1,18) = 0.01$, $p < 0.74$). For FOG, one-way ANOVA showed no differences in participation for

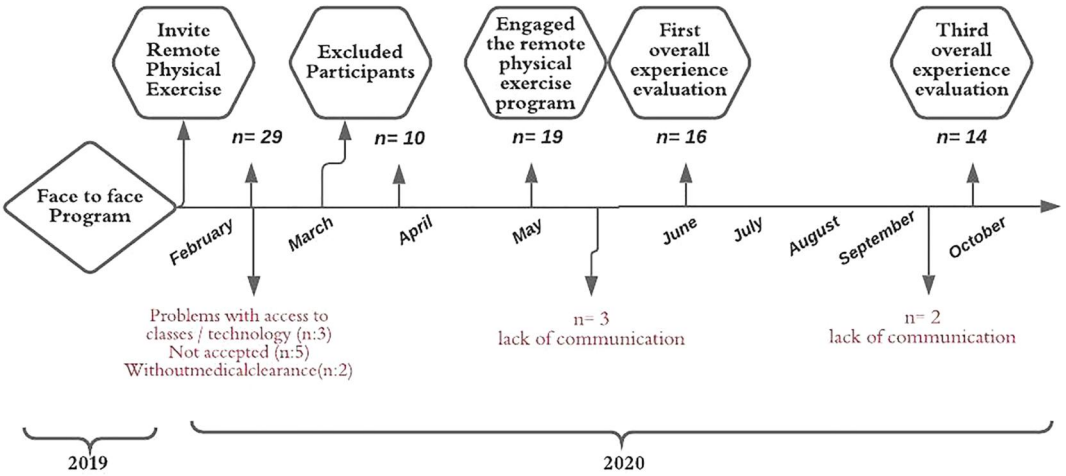

FIGURE 1 Study's flowchart

TABLE 3 Participants and family member or caregivers' characterization

	PD (n = 19)	Family member or caregivers (n = 6)
Age (year)	69.80 ± 10.12	62.35 ± 22.31
Men - *N* (%)	11 (57.89%)	3 (50%)
Schooling (year)	13.33 ± 3.58	
Time since diagnosis (year)	7.0 ± 4.13	
H&Y		
1.0	2 (10.53%)	
1.5	3 (15.79%)	
2.0	3 (15.79%)	
2.5	7 (36.84%)	
3.0	4 (21.05%)	
ABC Scale (%)	56.48 ± 21.21	
MiniBESTest (score)	24.68 ± 5.39	
MoCA (score)	25.31 ± 4.78	
6 MWT (m)	462.18 ± 57.97	
10 m (m/s)	9.18 ± 2.27	
TUG (s)	8.92 ± 1.71	
FTSTS (s)	13.69 ± 3.11	
DGI (score)	18.11 ± 5.12	
NFOGQ (score)		
Freezing of gait (*N* = 7)	18.79 ± 4.42	
No-freezing of gait (*N* = 12)	0	
PDQ-39 (%)	34.54 ± 10.08	

Abbreviations: ABC Scale, Activities-specific balance confidence scale; DGI, dynamic gait index; FTSTS, five times sit to stand test; HY, Hoehn and Yahr; MiniBESTest, Mini-Balance Evaluation Systems test; NFOGQ, new freezing of gait questionnaire; PD, Parkinson's disease; PDQ-39, Parkinson's disease questionnaire – 39; TUG, Timed up and go.

participants with or without FOG ($F(1,18) = 3.6$, $p = 0.73$). Participants with a family member or a caregiver assisting them had higher attendance (35.1 ± 7.2 sessions) than participants without personal assistance (14.0 ± 12.5 sessions) ($F(1,18) = 14.3$, $p = 0.001$).

3.2 | Barriers

Figure 2 shows the total account of perceived barriers during the monitoring based physical exercise program. Over 24 weeks, there were 288 weekly reports describing barriers, concerns, and opinions. More than half of the responses (153, 53%) reported a barrier, 89 (31%) reported no difficulties to exercise, and 46 (16%) were blank responses.

Twenty barriers (Figure 2) were identified. The most cited barrier (39 citations) was Pain. Common pain locations were shoulder, lumbar, leg, and knee. The second most cited barrier (33 citations) was Lack of motor skills and reduced physical fitness.

Behavioral issues and Health conditions had 27 citations. Behavioral Issues included lack of motivation, laziness, and tiredness. Health conditions was related to medical appointments, medication effects and recovery from an injury. The infrequently cited barriers were Telemonitoring Issues, Lack of safe space to exercise, and Grief, with one answer for each construct. Coronavirus Pandemic Issues and Lack of Time appeared twice, while freezing of gait and Fear of Injury were cited three times.

These barriers were grouped by authors into domains. The domains frequency is showed in Table 4. Personal-related barriers domain is the personal barriers to exercise, and 77.9% of all barriers were included in it. The most common were Pain, Lack of motor skills and reduced physical fitness, Behavioral Issues and Health Conditions (Figure 2). The least mentioned barriers were: Travelling commitments, Seizure, Tremor, Lack of time, Domestic life, and Grief, which represent 5% of the sample in total.

Telemonitoring-related barriers domain contains issues related to Internet connectivity, technology, need to have a companion for safety reasons and related issues to the program. This domain accounted for 12.3% of all barriers.

Parkinson-related barriers domain is associated with PD's symptoms, such as dual-task performance difficulty (5.5%), FOG (3%) and tremor (1.1%). This domain accounted for 8.3% of all barriers.

Pandemic-related barriers domain refers to the COVID-19 pandemic. In this domain, only one barrier was cited: the caregiver was diagnosed with Covid-19 (0.6%).

Environmental-related barriers domain refers to extrinsic factors to the individual. These factors were impacting negatively on the participant's participation as a citizen, on the individual's ability to do tasks, or on the person's body function or structure (WHO, 2001). This domain is 0.6% of the barriers and included Lack of a safe space to exercise.

3.3 | Program safety

Most of participants reported at least one type of complaint that could be associated with safety (15 participants, 78.94%). Participants reported pain during the sessions (13 participants, 55 sessions, 14.0%), and pain presented on the day after the session (10 participants, 62 sessions, 15.7%); while most of who felt pain during the session reported pain on the next day (9 participants, 69.23%). Only

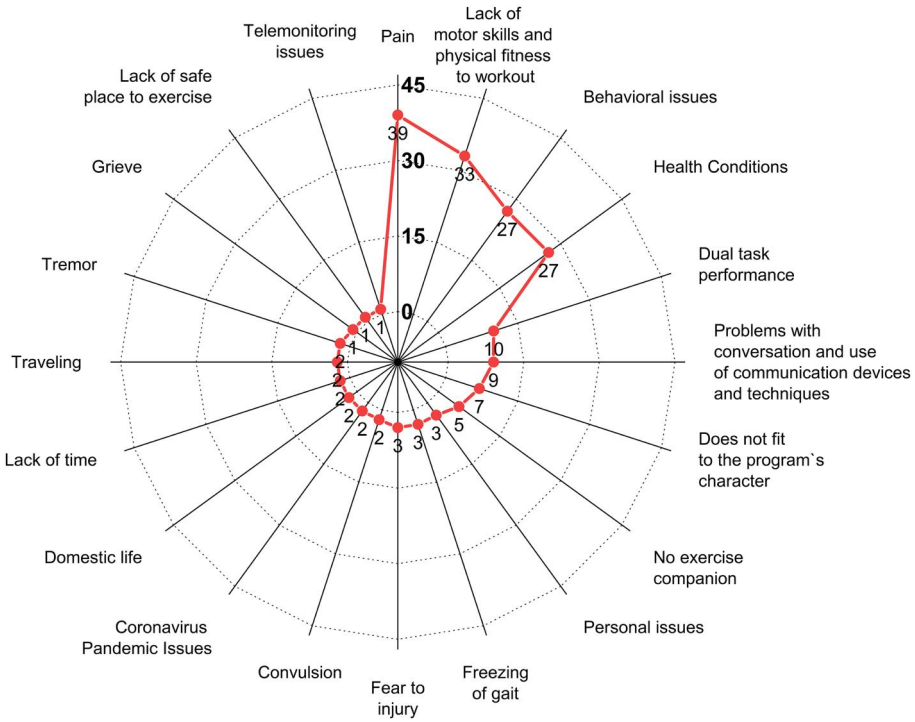

FIGURE 2 Radar plot showing the relative frequency distribution of perceived barriers. These barriers are depicted from the highest to the lowest

TABLE 4 Percentages of barriers domains and constructs identified by the participants

Barriers domains and its constructs	*N* (%)
Personal-related	141 (77.8)
Pain	39 (21.5)
Lack of motor skills and physical fitness to workout	33 (18.2)
Behavioral issues	27 (14.9)
Health conditions	27 (14.9)
Personal issues	3 (1.7)
Fear of injury	3 (1.7)
Travelling	2 (1.1)
Seizure	2 (1.1)
Domestic life commitments	2 (1.1)
Lack of time	2 (1.1)
Grieve	1 (0.6)
Telemonitoring-related	**22(12.3)**
Problems with team communication and the use of communication devices and tools	9 (5.0)
Does not fit the characteristics of the program	7 (3.9)
No exercise companion	5 (2.8)
Telemonitoring issues	1 (0.6)
Parkinson-related	**15(8.3)**
Dual-task performance	10 (5.5)
Freezing of gait	3 (1.7)
Tremor	2 (1.1)
Pandemic-related	**1(0.6)**
Caregiver was diagnosed with Covid-19	1 (0,6)
Environmental-related	**1 (0.6)**
Lack of safe place to exercise	1 (0.6)

one participant reported pain on the next day without feeling pain during the session and four participants reported pain during the session without feeling pain after the session. One participant reported one episode of fall (1 participant, 1 session, 0.3%). Regarding other safety issues, we had the following results: dizziness (6 participants, 19 sessions, 48%), motion sickness (1 participant, 1 session, 0.3%), and felt fear of exercising (7 participants, 49 sessions 12.4%) during the exercise sessions. The participant who reported fall episode did not complaint about dizziness, motion sickness or fear of exercising. Only four participants did not present complaints, but their adherence rate was between 2.08% (1 session) and 14.58% (7 sessions).

3.4 | Overall experience questionnaire results

For questions 1, 6, 7, 8, 12, 13, 14, 16, 17, and 18, the median opinion was equal (5) in the last monthly evaluations. For questions 6, 12, 13, 14, and 18, most participants reported complete satisfaction answers; while for questions 1, 2, 7, 8, 11, 16, and 17, most participants reported satisfaction and complete satisfaction as answers (Table 5).

For questions 3, 5, 9, 10, and 15, the median opinion was equal (1) in the six monthly-evaluations. For questions 3, 9, and 15, most participants reported complete dissatisfaction as their answer (Table 5).

For question 2, the median opinion was 4 and for question 4, the median opinion was 3 (Table 5).

The representation of the negative cycle is established with low participation in a physical exercise program is illustrated in Figure 3.

4 | DISCUSSION

We aimed to evaluate the adherence rate, barriers to attendance and safety of a telemonitoring program. We also have identified the individual's and their family members' perceived overall experience when performing the telemonitoring physical exercise program.

TABLE 5 Results of overall experience questionnaire

Question	Median	First quartil	Third quartil	Range
1. The format of this online program allowed me to participate and get involved in a satisfactory way.	5	4	5	2
2. The program made me feel safer in activities at home, such as walking.	4	4	5	4
3. The program interfered negatively in my mood and general health.	1	1	1	3
4. I was not able to carry out all the activities and exercises the professionals prescribed to me.	3	1	3	4
5. I liked the online program and I think it could replace the in-person program.	1	1	2	4
6. The contact of the professional during the program made me feel assisted and welcomed.	5	5	5	3
7. During the online exercise program I had an easy communication with the professional team.	5	4	5	4
8. During the sessions, the professional in charge of me showed empathy, saying he understood my difficulties and trying to manage exercise adaptations and corrections to help me.	5	4	5	3
9. I would not go back to doing online activities with this professional or with this team.	1	1	1	4
10. During the online exercise program I had difficulties connecting with technology and I had problems with my Internet connection.	1	1	4	4
11. The online exercise program positively interfered with my family/friend's relationship.	5	4	5	4
12. I Did not feel comfortable in the presence of my caregiver or relative to perform the exercises online.	5	5	5	2
13. My relative felt comfortable doing physical exercises online in my presence.	5	5	5	4
14. According to the instructions received by the professional team on each session, it was possible to help my family to carry out the exercises.	5	5	5	4
15. Helping my family member during the program interfered negatively in my routine, because it took a lot of time.	1	1	1	4
16. Monitoring my family member was easy and did not physically require an exaggerated effort on my part.	5	4	5	4
17. I Consider that my family member and I have fun doing physical exercises every session.	5	4	5	4
18. I Think that the online physical exercise program positively interfered with my family's life during the COVID-19 pandemic period.	5	5	5	4

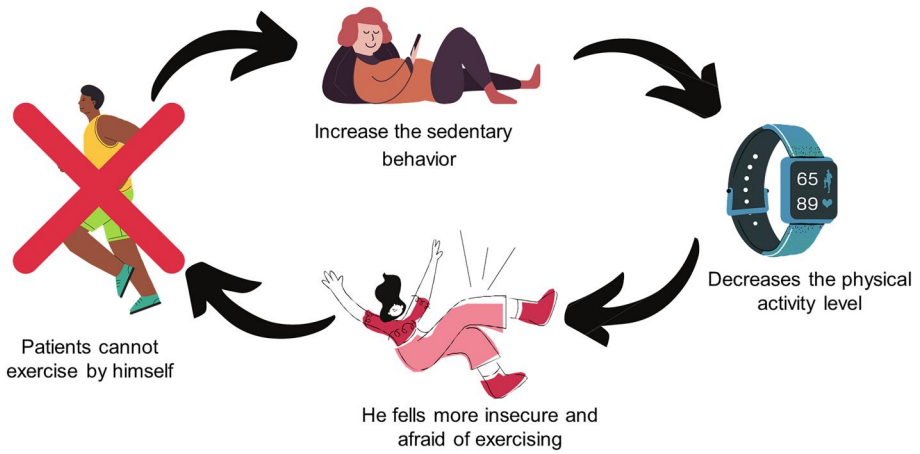

FIGURE 3 Negative cycle is established with low participation in a physical exercise program

Therefore, the program adherence was moderate (65,5%), 19 out of 29 participants from our in-person existing physical exercise program agreed to join the telemonitoring-based program.

Under the social isolation to mitigate the COVID-19 pandemic, individuals with PD (Papa et al., 2020) have a high risk of increased fragility, with deteriorating motor and non-motor PD symptoms (Helmich & Bloem, 2020). Thus, individuals with PD should be informed about the importance of staying active for their physical and mental health. The active healthy lifestyle can be guaranteed when they engage in physical exercise-based telemonitoring programs or self-monitor their physical activity level. In our study, adherence was negatively affected by technological problems, such as poor Internet link, lack of technological knowledge or inadequate quality of mobile devices. Public health policies should include ensuring easy access to a fast Internet connection for vulnerable populations.

Attendance was positively influenced by the caregiver, but negatively associated with FOG. Participants scoring more than 1 NFOGQ (Nieuwboer et al., 2009) had a lower attendance rate compared to the individuals who scored 0. Although most of our participants ($n = 12$) scored 0, FOG is a common disabling symptom in PD, affecting their social participation (Cucca et al., 2016). FOG is associated with a greater number of falls (Cucca et al., 2016), cognitive condition (Paul et al., 2018), and attenuating it is crucial for a safe remote physical exercise program. FOG might also require a caregiver or a relative to help with the exercise activities. Alternatively, a synchronous online program could be developed for those individuals with FOG who exercise with a family member.

The lack of someone to support individuals with PD to exercise at home is a barrier. Individuals with FOG showed a (Cucca et al., 2016) lower attendance rate. This is an issue to overcome, demanding strategies to improve safety, such as the presence of a caregiver or family member (Cucca et al., 2016). Non-pharmacological treatment, such as patient-centered physical therapy programs, are essential to decrease the number of freezing episodes (Cucca et al., 2016). However, it is important to state that this study was not intended to investigate the effectiveness of the remote intervention in the presence or absence of FOG, and this factor should be considered in future studies.

Afshari et al. (2017) identified not having a person to exercise with or to motivate as a barrier to increase the frequency of physical exercise in PD. Then, the presence of a family member or caregiver might have a positive effect on attendance rate with a remote program, particularly for individuals with FOG, demotivation, or apathy (Afshari et al., 2017). However, such a need exposes how hard it is to be independent. A lack of independence can lead to increasing deterioration, with an increase in sedentary behavior, decreased physical activity levels, increased insecurity, and fear of exercising, relying further on caregivers or family members, and reduced the self-efficacy for exercise.

Individuals with PD without a caregiver or family member to assist them during the home-based exercises presented lower attendance rates. We believe these results are impacted by self-efficacy. Self-efficacy is the belief that the desired behaviors can be successfully accomplished (Bandura, 1977), and the self-efficacy expectation is more of a determinant to attend a program than the outcome expectation. Asynchronous activities might have affected attendance rates because online supervision was absent, relying on a family member's or caregiver's efforts to engage in exercise alongside. Thus, we recommend future studies evaluate the effects of synchronous and non-synchronous exercise programs on the attendance rate.

Exercise itself may enhance the fear of having problems while exercising in individuals with PD. Participants' self-efficacy is related to fall-related self-efficacy. Our participants in baseline showed TUG, FTSTS and MiniBESTest average scores related to the low risk of falls. However, the ABC (a self-reported score) average score indicated a high risk of falls (Mak & Pang, 2009). The ABC scale is not a validated scale for self-efficacy related to falls, but it demonstrates the individual's perception related to balance in ADLs. Although a no-risk of falls based on physical measures (TUG, FTSTS and MiniBESTest scores), the individual perception of a risk of falls was high. In this way, the group overreacts to the risk of falling. For this reason, we believe there may be decreased self-efficacy related to falls.

The most frequently cited barriers to attend the telemonitoring program were personal-related. Pain was the most mentioned barrier, followed by lack of motor skills and reduced physical fitness, behavioral issues, and health conditions. Afshari et al. (2017) identified pain as a barrier to increase the frequency of physical exercises in PD. Pain is common at all stages in Parkinson's disease, even as a premotor manifestation (Antonini et al., 2018a; Blanchet & Brefel-courbon, 2017). Antonini et al. (2018) found pain decreases after 150 mins of moderate equivalent physical activity per week. Since exercise prevents pain, and our results have shown pain as the most cited barrier to practice the remote program exercise to individuals with PD, we face a negative cycle contributing to sedentarism and a painful life. For that reason, pain might confuse the perception around the difficulties of exercise.

The second most cited barrier was lack of motor skills and reduced physical fitness. This barrier refers to muscle weakness, lack of balance and lack of motor coordination, and these three aspects are related to PD motor symptoms causing postural instability and a risk of falls. These factors can be attenuated by engaging in a physical exercise program (Martignon et al., 2020). Our participants were mostly individuals with a moderate H&Y score (Goetz et al., 2004), with previous complaints of pain. Rossi et al. (2018) report that the main barrier to participation in a physical activity program was fatigue.

Two domains were the third most cited barrier: behavior issues and health conditions. Behavior issues were related to motivation and tiredness, which can be explained by social isolation or the asynchronous format. The asynchronous mode has positive (e.g., does not require online activities, allowed to exercise when they prefer to), and negative aspects (e.g., participation demands commitment with family members or caregivers), affecting motivation. Another motivation issue is the loss of the in-person program, which they were

engaged in before the COVID-19 pandemic, with group-based exercises, and the loss of the related social interaction. Social isolation has created barriers to social interaction, and future remote physical exercises programs should address this need.

The study by Claesson et al. (2020) found that being part of an intervention group can make training more motivating and joyful and participants can meet new friends with these limitations, making them able to learn from each other, share each other's progress, and it spurred to work harder. Rossi et al. (2018) also report the importance of the group during the intervention.

Health conditions barrier was related to medical appointments, medication effects and recovery from injury or disease. These feelings may have been magnified during the social isolation caused by the COVID-19 pandemic, as well as the health implications of the pandemic itself. The asynchronous mode should not be impacted by any unexpected medical appointments, permitting completion of the exercise sessions at another time during the day.

Based on information about TUG, MiniBESTest and 5TSTS, the risk of falls in our sample was low. However, according to the ABC scale, there is a high perception of risk of falling among the participants. Their self-perception may be related to FOF and low self-efficacy, which created barriers to attend the telemonitoring program. It is important to empower and improve their self-efficacy to perform the exercises, adjusting the exercise's level of complexity, and reducing FOF, especially for those who perform the program alone.

Regarding program safety, 16 of all 19 participants reported pain during the session or after the session, dizziness during the sessions, motion sickness or fear of exercising. Pain was the most common complaint, both during and after the exercise. Pain is common in all stages of PD and can range from 35% to 85% of people with PD (Keus et al., 2014). The most common pain in PD is musculoskeletal, with estimated prevalence is 45%–74% and is related to hypokinesia, akinesia, rigidity, and long-term postural changes (Keus et al., 2014).

Despite many complaints about the telemonitoring program, we had only one fall episode with no serious injuries and non-other serious event during all sessions. In addition, who has reported the fall episode during the session had no complaint about dizziness, motion sickness or fear of exercising. Besides, he had 68.75% attendance. Thus, we can suggest such telemonitoring physical exercise program was safe to people with PD.

Based on the participants' perception, the in-person program was more attractive than the telemonitoring program, although they have agreed to shift from the in-person program to the remote mode. Our participants felt a positive effect on health and quality of life doing exercises at home and reported improvement of their social relationships. Participants believed the remote program was important to support their home exercise program commitment. They mentioned how important it was to keep contact with the team members in between sessions to improve communication, to allow for recognition of personal difficulties, and make it possible to apply exercise adaptations and feedback.

For most of our participants, having a family member or caregiver during the remote program is essential to make them feel safe, and to encourage them to exercise. This person is a facilitator to attend the telemonitoring program and if the participant has cognitive deficits. The presence of a person during physical exercise motivates individuals with PD (Paul et al., 2018). The family member or caregiver's perception showed they did not feel their routine negatively affected by helping the participant. They reported that the communication with the team member was easy, and this task did not require much effort from their side. Most of the family members have reported the program positively affected their family's life and relationships during the COVID-19 pandemic.

This study did not aim to investigate the effectiveness of a remote program, and future studies should address this, including the differences between the modes of delivery. Although this innovates and provides important clinical applications, we are aware about several limitations. Due to the pandemic of COVID-19, the sample was selected by convenience, all participants were engaged in an in-person program, and as such, they already engaged and used to practice physical exercise. This might have reduced the number of barriers related to the lack of knowledge or experience to perform these exercises at home. The sample size was small and covers an extensive range of H&Y scores. Additionally, not having a control group (in-person intervention) increases the risk of bias. Some of these limitations also suggest future studies. We foresee studies followed by the present study that is, the validation of the questionnaires created by the authors; to investigate the effectiveness of this intervention on postural control, mobility, quality of life and another outcome measures. Another future study could address different telemonitoring program modes, that is, synchronously, and asynchronously.

Regarding the costs, the remote program is more affordable than the face-to-face program since there is no need for materials and no need of transportation. However, it takes a lot of human resources since the participants need to be monitored individually, which is a possible limitation of clinical applicability.

In conclusion, this telemonitoring physical exercise program was largely feasible despite some barriers and may be considered as an alternative to in-person program for selected patients during a pandemic. The attendance rate was negatively impacted by the presence of FOG and the lack of a family member or caregiver. The most frequently cited barriers for attendance were pain, lack of motor skills and reduced physical fitness, behavioral issues, and health conditions. The telemonitoring was safe, with only one fall episode and the most complaints reported were pain during or after exercise and fear of exercising. Participants perceived health benefits engaging in a remote exercise program, although most of them prefer the in-person program. The asynchronous delivery mode was satisfactory, but a family member or caregiver, as well as the personal need for exercise adjustments were essentials for the participants' satisfaction and pain must be a concern before the implementation of this type of program in people with PD.

5 | IMPLICATIONS FOR PHYSIOTHERAPY PRACTICE

The COVID-19 pandemic showed us the real need to have programs carried out remotely. In this sense, this study has direct implications for clinical practice, since the remote program, in addition to being effective, needs to be safe, with good adherence and without adverse effects, which are the proposals of this study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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