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A Novel Boot Camp Program to Help Guide Personalized Exercise in People with Parkinson Disease

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Abstract: Given the variety of exercise programs available for people with Parkinson’s disease (PD), such individuals may struggle to make decisions about what exercise to perform. The objective of this study was to assess the usefulness, satisfaction, and preferences regarding participation in a PD-personalized educational and exercise boot camp program. Attendees participated in a four-day program consisting of exercise sessions, workshops, and social activities. We collected demographic and clinical information. We assessed satisfaction and preferences immediately after. At one-month follow-up, participants assessed usefulness and changes in exercise habits. Eight individuals diagnosed with PD, with a mean age of 59.5 ± 6.8 years, participated. All participants felt “very satisfied” and likely to attend future events. The two favorite sessions were: cognitive stepping and dance-based movements. At one-month follow-up, participants considered the program “very useful” and reported changes in their exercise routine. Our results suggest that the boot camp program was considered useful and capable of influencing participants’ exercise habits.

Keywords: Parkinson disease; personalized medicine; clinical exercise; exercise prescription; boot camp; physiotherapy

1. Introduction

Parkinson’s disease (PD) is a neurodegenerative disease that results in a gradual reduction in activities of daily living and quality of life [1]. Increasing evidence suggests that individuals with PD benefit from continuous ongoing exercise to improve and maintain physical functioning and help them better manage the disease [2,3].

As such, people with PD are currently encouraged to play an active role in self-management and acquire the exercise tools in their community to manage their disease [4]. Yet, there is a variety of rehabilitation, exercise, and physical activity programs that are now available for individuals with PD. Some of the more common approaches highlighted in recent literature include amplitude-based movements [5–8], dance [9–11], Tai Chi [12,13], Qigong [14,15], Nordic walking [16,17], boxing [18–20], and aquatic exercise [21,22].

Translation of therapies into practice in the community setting has, however, proven difficult. Engaging in a regular rehabilitation and clinical exercise interventions and guaranteeing ongoing adherence requires finding the proper program that really fits the
patients’ needs and preferences, as well as bypasses common perceived barriers to exercise in PD [23,24].

Just telling people about the benefits of these exercises and expecting them to make decisions is debatable. Making the choice about which type of exercise programs to perform, understanding the evidence, safety issues, and the adaptations needed for each program [25] may be difficult. Considering the benefits of such programs, there is a need to overcome these translation issues.

Several lines of evidence have suggested that boot camps represent an effective and useful means of teaching [26,27]. Despite knowledge of this success, few studies have investigated the usefulness of delivering exercise education via boot camps for individuals with PD.

No study has attempted to encompass the range of these different approaches all in one intervention or program in PD. Providing access to a boot camp program that provides participants the opportunity to familiarize themselves with types of exercise programs while guiding them as to what works best and potentially guiding their exercise choices may be of critical importance. Here, we present a PD-personalized educational and physical activity boot camp program that provides participants the opportunity to familiarize themselves with common evidenced exercise programs.

Our primary objective was to assess the patients’ perceived usefulness (or helpfulness) and utilization (or how much they changed their exercise routines and made use of the knowledge) of the program to facilitate exercise choice and lifestyle behavior over time. Secondary objectives included the assessment of satisfaction, preferences, and adverse events.

2. Methods

2.1. Design

We used a single group pre-test and post-test design.

2.2. Sampling and Recruitment

The sampling method selection was non-probabilistic by convenience. Following European Parkinson guidelines regarding the recommended number of individuals per group [3], we included eight individuals with PD, invited via email from a Parkinson’s patient association. All participants had to be able to ambulate independently, able to tolerate a minimum 1 h of exercise, and able to attend all 4 days of the boot camp. Care partners were also invited to attend.

2.3. Participants

Eight individuals with PD (5 women) participated in the program with a mean age of 59.5 ± 6.8 years. All participants were participating for the first time in a boot camp. The participants’ demographics and clinical characteristics can be found on Table 1.
Table 1. Participants’ general and clinical characteristics.

| Participant | Gender | Age | Time since Diagnose | Main Problems                                                                 | Perceived Health (Now and Compared to Last Year) | Fall History                      |
|-------------|--------|-----|---------------------|-------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------|
| 1           | F      | 66  | 10 years PD         | My inability to help my husband in a casual spontaneous way                   | Poor, the same as last year                       | 1 fall outdoors, 2 months ago     |
|             |        |     |                     | The lack of reliability and independence                                       |                                                   | Near falls occasionally           |
|             |        |     |                     | Fear of loss of mind, dignity, feeling powerlessness                           |                                                   |                                  |
|             |        |     |                     | Fear of falling                                                                 |                                                   |                                  |
|             |        |     |                     | Dyskinesia and appearing to be drunk                                           |                                                   |                                  |
| 2           | F      | 61  | 2.8 years PD        | Slowness                                                                       | Very good and about the same                      | 1 fall outdoors 6 months ago,    |
|             |        |     |                     | Balance and walking                                                            |                                                   | couldn’t get up.                 |
|             |        |     |                     | Speech & swallowing                                                            |                                                   | Near falls occasionally          |
|             |        |     |                     | Apathy                                                                         |                                                   |                                  |
| 3           | M      | 59  | 8 years PD          | Stiff neck and bad posture                                                     | Good, about the same                              | No falls                          |
|             |        |     |                     | Walking                                                                        |                                                   | Near falls occasionally          |
| 4           | M      | 60  | 8 years PD          | Walking indoors                                                                | Good, somewhat worse than one year ago           | Frequent falls. Weekly, don’t    |
|             |        |     |                     | Walking outdoors                                                               |                                                   | pick my feet up.                 |
|             |        |     |                     | Time management & relaxing                                                     |                                                   | Daily near falls                 |
|             |        |     |                     |                                                                               |                                                   | A little fear of falling         |
| 5           | F      | 57  | 4 years PD          | Walking                                                                        | Good, somewhat worse than one year ago           | No Falls                          |
|             |        |     |                     | Walking and talking                                                            |                                                   | No Near falls                     |
| 6           | F      | 70  | 6.5 years PD        | Imbalance                                                                       | Fair, much less now than a year ago              | 2 Falls last 6 months            |
|             |        |     |                     | Walking coordination                                                           |                                                   | Near falls once per week         |
|             |        |     |                     | Anxiety, frustration, self-confidence                                          |                                                   |                                  |
|             |        |     |                     | Driving, being able to see in the dark                                         |                                                   |                                  |
| 7           | F      | 60  | 1.8 years PD        | Night (early morning) and morning stiffness (pre-medication) OFF phases Lower  | Fair, much less now than a year ago              | No Falls                          |
|             |        |     |                     | back and sometimes neck pain                                                    |                                                   | No near falls                     |
|             |        |     |                     | Memory / Concentration—recalling names or a particular word                    |                                                   | Some fear of falling             |
|             |        |     |                     | Being able to stay focused on one thing                                        |                                                   |                                  |
| 8           | M      | 45  | 9 years PD          | Lack of sleep, Restlessness                                                     | Good, about the same                              | No Falls                          |
|             |        |     |                     | Freezing/walking                                                               |                                                   | Near falls occasionally          |
|             |        |     |                     | Unfit/overweight                                                               |                                                   |                                  |
|             |        |     |                     | Stiffness                                                                       |                                                   |                                  |

2.4. Ethics and Procedures

This study follows the principles of the Declaration of Helsinki. The study was approved by the Egas Moniz Research Ethics Board. Participants completed an informed consent form before starting the program and received an information sheet explaining how their data would be used.

2.5. Program

The boot camp program consisted of four days of training featuring sessions that were 30–60 min each for a total average of 4 h per day. The boot camp began with an overview of general group goals based on a pre-assessment questionnaire. After, it focused on alternating between exercise, educational sessions, and social patient–family interactions. See Table 2 for topics presented on each day. To provide an engaging educational experience, therapists used various formats to teach, including multimedia presentations, hands-on activities during lectures, exercise sessions, and interactive discussions (question-and-answer periods that allowed participants to learn from the therapists but also from each other). The tips and tricks sessions, for example, included trying the cueing strategies taught and exploring solutions for better management of issues associated with PD reported on a pre camp questionnaires. Presenters’ slides and tangible information to easily reference later were shared with all participants.

Table 2. Description of the boot camp educational and exercise sessions’ topics.

| Days      | Educational and Exercise Sessions                                           | Format   |
|-----------|------------------------------------------------------------------------------|----------|
|           | One-on-one brief assessments and introductions                              | Education|
| Day 1     | Exercise in Parkinson Disease: why, what and how.                           | Education|
|           | Introduction to variety of exercises.                                       | Practice |
|           | New exercise ingredient in PD: cognitive-motor training.                    | Education|
|           | Cognitive Stepping with amplitude-based movements.                          | Practice |
| Day 2     | Review of Day 1, goals for the day                                          | Education|
|           | Changes in voice, communication and swallowing in PD                       | Education|
|           | Voice, Breathing & Movement session                                         | Practice |
|           | Educational session: Walking/freezing/talking difficulties                  | Education|
|           | Walk & Talk dual task program                                               | Practice |
|           | Nordic walking with integrated voice training session                       | Both     |
| Day 3     | Review of Day 2, goals for the day                                          | Education|
|           | Hydrotherapy: impact on mobility                                            | Education|
|           | Exercise Session: Using boxing for mobility and voice training in PD         | Practice |
|           | Tips & Tricks for transfers in daily life and exercise                       | Both     |
|           | Exercises for transfers: rhythm, amplitude & speed                          | Practice |
| Day 4     | Review of the Camp, future goals & community resources                      | Education|
|           | Tips & Tricks for bypassing barriers to exercise.                           | Education|
|           | Goodbye Drum-based dancing activity                                         | Practice |
|           | Adapted Tai Chi                                                             | Practice |
|           | ‘Take home messages’ test activity                                          | Education|

The exercise sessions included practicing examples of amplitude-based interventions [5–8], Nordic walking [16,17], multitask cognitive and motor exercise challenges [2,28–30], hydrother-
apy [21,22,31] and tai-chi [12,13], dance-based movements [9–11], as well as a boxing session [18–20].

All sessions were delivered in a group format. To guarantee safety, two volunteers were available to provide support to people if needed. The intensity of the physical activity sessions was delivered according to patient’s tolerance and started ranging from a low to moderate intensity of aerobic exercise (40–60% HRR (or VO2R). Due to the group format, patients were taught to self-assess and monitor their effort throughout each session. The volumes of the aerobic based sessions were ≥30/40 min of continuous or intermittent exercise per session based on the exercise recommendations in European guideline for physiotherapy for Parkinson’s disease [3]. The program was led by a physiotherapist and a speech therapist with specialized training and experience in PD (Josefa Domingos and John Dean). A local physiotherapist was invited to the program to be able to carry on exercise classes if requested by participants.

Social activities (e.g., mealtimes, resting breaks) promoted interaction with peers and contributed to peoples’ feeling more acquainted with each other, adding to a positive group dynamic.

2.6. Data Collection

Participants completed an online pre-assessment structured questionnaire before the program, a post-assessment immediately after, and a one-month follow-up.

The pre-assessment collected general information on demographics, top 5 clinical problems, past medical conditions, disease management strategies used, current exercise, preferred exercise modalities, and perceived barriers/facilitators to performing exercise. The pre-assessments also inquired about the participant’s goals and expectations for attending the boot camp.

Immediately after the program, we assessed satisfaction, preferences, and any adverse events via online anonymous questionnaire. Patients were asked to rate on 4-point scales how satisfied they were with boot camp (1 = not satisfied, 2 = neither, 3 = satisfied, and 4 = very satisfied), whether they would recommend the program to a friend (1 = Yes, 2 = No, 3 = Maybe), and how likely are they to return to a similar program (1 = very likely, 2 = likely, 3 = neither, and 4 = unlikely). They were also asked which sessions they preferred (1 = Educational sessions; 2 = Dance-based amplitude movements; 3 = Voice & Breathing; 4 = Boxing session; 5 = Walk & Talk dual task training; 6 = Cognitive stepping program; 7 = Hydrotherapy activity; 8 = Nordic walking; 9 = On the floor activities; 10 = Drum-based dance activity) and if there was any type of problem encountered during the program.

A follow-up anonymous questionnaire emailed to each participant one month after the boot camp asked the participants to assess the perceived usefulness of the program in the management of the current participant’s exercise habits, as well as to assess the utilization (or how much they changed their exercise routines and made use of the knowledge and experience of the bootcamp). Usefulness was assessed based upon the patients’ perceived (self-reported) usefulness of the program. Patients were asked to rate on 4-point scales how useful the boot camp was in helping them manage their current exercise habits (1 = not useful, 2 = neither useful, nor useless, 3 = useful, and 4 = very useful). Utilization was based upon changes in exercise habits that were made after the program.

2.7. Data Analysis

Data were extracted to a spreadsheet. Using the IBM Statistic Package for the Social Sciences software, version 26.0 descriptive statistics were adopted to analyze data.

3. Results

Participants most frequently reported their expectation for the boot camp was to learn more about specialized exercise. See patients’ exercise habits and expectations for the boot camp in Table 3.
Table 3. Participants’ current exercise habits, perceived exercise barrier’s, facilitators and expectations for the boot camp.

| Participant | Current Exercise Habits | Perceived Barriers to Exercise | Perceived Factors That Would Facilitate Exercising | Expectations for the Exercise Camp Program |
|-------------|-------------------------|--------------------------------|--------------------------------------------------|-------------------------------------------|
| 1           | Current: yes            |                                | Caregiver/partner are supportive, accessing instructors with PD expertise | “To try to find a way back, relearn how to exercise, get a shared goal. Learn from others. Reduce need to take pills” |
|             | Which: stretching       |                                |                                                  |                                           |
|             | Frequency: daily        |                                |                                                  |                                           |
|             | Average time: 15 min    |                                |                                                  |                                           |
| 2           | Current: yes            | Fluctuations in health         | Perceived benefit and visible improvement after exercising, able to work out during working hours | “Improve my coordination and health without the use of drugs” |
|             | Which: walking, ball activities. |                               |                                                  |                                           |
|             | Frequency: every other day |                               |                                                  |                                           |
|             | Average time: 20 min    |                                |                                                  |                                           |
| 3           | Current: yes            | Poor coordination              | Perceiving benefit and visible improvement after exercising, accessing instructors with PD expertise | “To understand what exercises would be best for me, also being with fellow sufferers of similar abilities” |
|             | Which: cycling, walking |                                |                                                  |                                           |
|             | Frequency: cycling twice a week, walking every day. | Fluctuations in health | Perceiving the benefit after exercising | “To access the “feel good factor” & challenge myself more, see what I should do for exercise” |
|             | Average time: 60 min    | Not easy to access specialized exercises |                                            |                                           |
| 4           | Current: yes            | Fluctuations in health         | Perceiving benefit and improvement after exercising, easy access to the gym or exercise facility, accessing instructors with PD expertise, fun things in group with people fitness same as me | “To boost confidence and fitness levels, in fun environment” |
|             | Which: Cycling          | Lack of time to exercise       | Perceiving benefit and improvement after exercising, easy access to the gym or exercise facility, accessing instructors with PD expertise, fun things in group with people fitness same as me | “To boost confidence and fitness levels, in fun environment” |
|             | Frequency: 1 per week   | Always something to do for Parkinson society |                                               |                                           |
|             | Average time: 45 min    |                                |                                                  |                                           |
| 5           | Current: yes            | Fluctuations in health         | Accessing instructors with PD expertise | “I would like to gain knowledge and further my skills in managing the disease through exercise” |
|             | Which: walking the dog  | Lack of time to exercise       |                                            |                                           |
|             | Frequency: Daily        | Job restrictions               |                                                |                                           |
|             | Average time: 30 min    |                                |                                                  |                                           |
| 6           | Current: yes            | Fluctuations in health         | Caregiver/partner being supportive, easy access to the gym or exercise facility, accessing instructors with PD expertise | “To identify a daily/weekly exercise regime with ones that will be more beneficial to me” |
|             | Which: golf, walking    | Lack of confidence exercising outside of rehab setting |                                               |                                           |
|             | Frequency: 2 times a week | Weather conditions             |                                                |                                           |
|             | Average time: 60 min    | Living in a rural area without access to specialized care |                                               |                                           |
| 7           | Current: yes            | Fluctuations in health         | “Get tips for getting fitter and do more specific exercises” |                                           |
|             | Which: Parkinson Choir, Conductive Education | Fear of falling, effect of weather conditions |                                            |                                           |
|             | Frequency: choir 1 per week; education 1 per month | Average time: 75 min |                                                |                                           |
| 8           | Current: yes            | Fluctuations in health         | Easy accessing to the gym or exercise facility, accessing instructors with PD expertise, able to workout during working hours |                                           |
|             | Which: Jiu-jitsu        | Lack of time to exercise       |                                            |                                           |
|             | Frequency: once a week  | Lack of interest               |                                                |                                           |
|             | Average time: 60 min    | Job restrictions               |                                                |                                           |
3.1. Perceived Usefulness and Utilization

Participants considered the boot camp very useful (seven in eight; 87.5 %) and useful (one in eight; 12.5%) in managing their current exercise habits. At one-month follow-up, seven participants reported making changes in their exercise routine after the boot camp, and one participant said, “Not really changed anything; I need more time in my day”. The participants that made changes mentioned specifically: “I do exercise more frequently now”; “Introduced the “power” breathing that I learnt in the program”, “Taking daily commitment to exercise seriously”, “Joined a gym to do more exercise”, “I do more walking periods and cognitive games”, “I started Nordic walking” and, “started sessions with the physiotherapist involved in the program”.

3.2. Satisfaction

After the program, all participants had favorable feedback, with all (100%) feeling very satisfied, likely to attend future events, and “would recommend to another person with PD”.

3.3. Preferences

About six in eight (75 %) participants felt that many of the exercises and activities were new to them. The two training sessions that participants enjoyed the most were: dual task cognitive stepping (six in eight; 75 %) and dance-like movements (six in eight; 75 %). The two sessions that participants enjoyed less were: Nordic walking (two in eight) and boxing training (two in eight).

3.4. Safety

No falls, major injuries, or adverse events occurred during the program. One patient could not attend boxing sessions due to a superficial finger injury.

4. Discussion

Our study aimed to assess the usefulness, utilization, satisfaction, and preferences regarding participation in a PD-personalized educational and clinical exercise boot camp program. Based on our results, the boot camp was perceived to be useful by all eight participants with mild and moderate PD. Overall, seven out of eight participants referred they had made changes in their exercise routines one month after. The patients reported high satisfaction levels and there were no severe adverse events. Given the benefits of ongoing exercise in PD and the number of current options, the importance of offering guidance for safe, PD-specific, exercise programs for this population cannot be underestimated [18,25]. Importantly, this paper could help pave the way forward to delivering personalized exercise education through online boot camps during the COVID-19 pandemic crisis.

After the program, the patients were highly satisfied. Several positive aspects may have contributed to the high patient satisfaction reported. First, the information from the questionnaire prior to the program allowed for better tailoring of the program to all the participants’ needs. Besides clinical information on health status, the questionnaires also provided with logistical information based on questions such as “What would be a good time for you to start the activities?”, “If you are bringing someone, please tell us who and what would you like them to learn from the boot camp?”, and “What topics and activities would you like to be addressed in the boot camp?”. Personalized exercise programs that are appropriately designed and delivered increase patient satisfaction with care options [32].

Shared goal setting should always be considered during the initiation and implementation of exercise interventions. Second, intrinsic motivation, via experiencing the actual benefit of each exercise, and enjoying participation are important factors for long-term training adherence [33,34].

The ability to try out the exercises can make a significant difference in one’s ability to judge the preference, usefulness, and long-term utilization of the varied exercise options. It ultimately determines the degree to which individuals can judge information effectively
and use it to make smart exercise selections. Third, delivering the program in a group format allowed participants to experience the beneficial effects of social support and motivation from fellow patients [35]. Fourth, most of the participants (six in eight; 75%) felt that many of the exercises and activities were new to them, even though all participants were already doing some sort of exercise on a weekly basis. They reported initially having clear expectations for the boot camp to gain more knowledge on specific PD exercises. Accessing specialized care was considered initially as one of the most common factors that would facilitate exercising (six in eight participants).

Implementing such a program was not without some limitations. First, some patients might not have future access to personalized exercise programs presented. As such, we invited a local physiotherapist to the program to help ensure that participants would have an opportunity to access specialized care if needed. This was an innovated solution to facilitate access to personalized care. Interestingly, most participants preferred to include changes in their daily routine activities with only one preferring to book sessions with the physiotherapist after completing the program. However, measuring the knowledge of participants immediately after the program would have brought better insights concerning reasons for change or no change (utilization) one month after. Second, even though participants were told to invite their families and caregivers, only one participant decided to bring a caregiver. Nevertheless, all participants were confident that they could contact the physiotherapist any time they needed additional information or insight. The influence of the caregiver should be a key factor to be better explored in future programs. Third, the group format imposed some safety concerns. We limited registrations to eight people with PD to assure a safe and efficient setting according to current recommendations [3]. Fourth, the nature of the study, with a small sample size and single center design, imposes restrictions on the generalizability of the findings. We included a heterogeneous group of people with PD with different backgrounds and did not specifically include participants with more advanced stages of PD. Further research is needed to measure its effectiveness on other subtypes and profiles of people and against other educational programs.

5. Conclusions

Our findings demonstrate that trying out different exercises can support judgments and decisions and thus may be a viable tool for more effective exercise prescription programs for the PD community. It is easily replicable, improves patients’ knowledge about exercise, and based on the reported interest of participants in attending another similar program as well as the benefits they perceived of the usefulness of the program, is likely to be well-received by health care professionals world-wide.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board of Egas Moniz Higher School of Health Board of Directors (ID 70; 17/02/2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the first author.

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