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Physical activity in people living with Parkinson's during the COVID-19 pandemic

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Abstract

It is not known whether people living with Parkinson's (PlwP) were actually achieving the recommended level of physical activity before and during the COVID-19 lockdown in the UK. This study aimed to find out: 1) whether PlwP are aware of the UK Chief Medical Officer's physical activity recommendations for older adults, and if PlwP were following these recommendations before and subsequently during the COVID-19 pandemic; 2) what modes of exercise were used by PlwP to keep exercising during the COVID-19 restrictions; and 3) the preferences of PlwP in terms of self-managed exercise programmes to inform the design of future intervention studies. An online questionnaire was developed by the research team, focusing on physical activity level and mode before the quarantine, during the pandemic, and on their preference in terms of future self-management mode of exercise. Adults who had been diagnosed with Parkinson's and were receiving emails from Parkinson's UK Research Support Network were eligible to participate. Any person unable to read English was excluded. There were 416 responders to the questionnaire. There was a decrease in physical activity in PlwP during the pandemic. People mostly missed the social contact in exercise groups. Online virtual exercise classes, stationary cycling, treadmill running, and DVD exercises were the preferred modes of remote/indoor exercise methods. These findings indicate the importance of designing remote or minimally supervised exercise trial interventions, taking into consideration people's preferences regarding mode of exercise and social contact.

Keywords: COVID-19, Exercise preferences, Indoor exercises, Parkinson's, Physical activity.

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1. Introduction

COVID-19 caused a global pandemic due to severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) [1]. Typically, COVID-19 patients present with symptoms such as fever, pain, respiratory issues, fatigue, and sometimes digestive symptoms [2, 3]. Older adults are considered to be at higher risk for severe COVID-19 symptoms, which can lead to acute respiratory distress syndrome [4] and, in some cases, death [2]. Given that Parkinson's disease is a prevalent neurodegenerative disorder, particularly among older adults, people living with Parkinson's disease (PLwP) are considered a vulnerable group for COVID-19 [5]. Furthermore, both motor and non-motor symptoms have been reported to worsen significantly in people living with Parkinson's disease who contract COVID-19, sometimes progressing to acute respiratory distress syndrome (ARDS) and, unfortunately, death [6]. While it may still be too early to fully understand the long-term effects of COVID-19 on Parkinson's symptoms, there is a risk that acute COVID-19 symptoms, such as loss of smell, dyspnoea, and sore throat, may be overlooked because they overlap with pre-existing Parkinson's symptoms. This could result in the disease progressing silently until more severe symptoms appear, including the development of ARDS [7]. Therefore, it is crucial to implement precautionary measures for this population.

One of the measures implemented to protect people from COVID-19 infection was social distancing, with the UK government's initial recommendation being to "Stay at home," followed by "Stay alert." The "Stay at home" directive limited the number of times individuals could go outside for exercise, allowing only one outing per day during the lockdown period. This restriction on outdoor physical activity and mobility likely contributed to a more sedentary lifestyle for people who were typically more active, which could have led to the worsening of their symptoms [8].

The most recent physical activity guidelines for older adults recommend engaging in 150 minutes of moderate exercise per week [9]. However, it is unclear whether people living with Parkinson's disease (PlwP) were meeting this level of activity before the pandemic and how the COVID-19 lockdown impacted their physical activity and exercise habits. Additionally, it is important to determine whether PlwP participated in any indoor group exercises, either before or during the pandemic, such as virtual exercise or fitness groups, DVD exercise programs, or video games involving physical activity. This information is crucial, particularly if future lockdowns are imposed, as it will help guide and support individuals in reaching the target of 150 minutes of moderate exercise per week. Furthermore, understanding PlwP's current home exercise practices will be valuable in developing future exercise trials that focus on indoor exercises and self-managed physical activity approaches. This knowledge could also support the recent recommendations advocating for the implementation of self-management trials for Parkinson's [8].

This study aimed to: 1) determine whether people living with Parkinson's disease (PlwP) are aware of the UK Chief Medical Officer's physical activity guidelines for older adults [9] and whether they were following these recommendations before and during the COVID-19 pandemic; 2) explore the methods or types of exercise that people living with Parkinson's disease (PlwP) used to maintain physical activity during the COVID-19 restrictions; and 3) gain insight into the exercise preferences of PlwP regarding self-managed exercise programs, with the goal of incorporating these preferences into the design of future studies.

2. Methodology

Design: online self-administered questionnaire survey.
Ethics: ethical approval was received from Keele University Ethical Review Panel (ref: MH- MH-200139).

2.1. Survey development

The research team developed an online questionnaire comprising 26 questions (25 closed-ended and one open-ended), with an estimated completion time of approximately four minutes. The questionnaire design followed the process and steps recommended by Bowling [10]. A link to the Participant Information Sheet was included, along with a section requiring respondents to provide informed consent.

A pilot study was conducted with 12 individuals living with Parkinson's disease (PlwP) who had previously consented to be contacted for research purposes at Keele University. The objective of the pilot was to assess the wording and clarity of the questions to ensure their comprehensibility for PlwP.

2.2. Population and Sample

The study population comprised individuals living with Parkinson's disease (PlwP), sampled from the 6,000 members of the Parkinson's UK Research Support Network who receive research-related emails. To achieve a margin of error no greater than ±5% when estimating proportions, with a 95% confidence level, a minimum sample size of 362 responses was required. Eligibility criteria included adults diagnosed with Parkinson's disease who were recipients of emails from the Parkinson's UK Research Support Network. Individuals unable to read English were excluded from participation.

2.3. Data Collection

An invitation email, including an information sheet and a link to the online questionnaire, was distributed via the Parkinson's UK Research Network Email Group. Data collection took place between September 7, 2020, and October 22, 2020. The key sections of the questionnaire are outlined in Table 1.

Table 1.
Main sections of the questionnaire.

Section title	Questions
Section 1: A question to understand what people living with Parkinson's do to protect themselves from COVID-19.	• What precautions did you use to protect yourself from getting the Coronavirus?
Section 2: Questions about familiarity with physical activity recommendations.	• The physical activity guidelines and recommendations are for people with Parkinson's to do 150 minutes of aerobic exercise per week. 'Aerobic' exercise includes physical activity that makes you breathe harder or makes your heart beat faster. Are you familiar with these recommendations, and were you doing exercise according to the recommendations before the quarantine?
Section 3: Questions regarding physical activity levels and modes (types of exercise) before the pandemic, during the "Stay at Home" regulations, and during the "Stay Alert" recommendations during the COVID-19 pandemic.	• How many minutes of aerobic exercise per week were you performing, on average, before the COVID-19 period? • Please state the types of aerobic exercise you were performing before the COVID-19 period (for example: walking in the community, cycling, jogging, running, etc.): • Did you use any of the following devices/machines normally for indoor aerobic exercise, before the COVID-19 period? • How much did you feel that the advice for everybody to "Stay at Home" affected your physical activity • How much did you feel that the advice for everybody to "Stay Alert" affected your physical activity? • Have you used any of the following to undertake physical activity during the COVID-19 period? • Before the COVID-19 period, how regularly were you attending a Parkinson's UK exercise or fitness group on a regular basis? • Because of COVID-19 social distancing regulations, have you missed attending your Parkinson's UK exercise group?
Section 4: A question about preferences in terms of future self-managed modes of exercise.	• Which of the following might help you to exercise more at home? • Once the lockdown has been lifted, will you return to the Parkinson's UK exercise groups?
Section 5: Questions about any Parkinson's symptoms (if found) that deteriorated during the COVID-19 period.	• Since the start of the COVID-19 period, have you noticed that any of the following Parkinson's symptoms have worsened?
Section 6: A final opportunity to add any comments about the study.	• If you would like to, please add any additional comments about how the COVID-19 period and social distancing regulations have affected your life.

To reduce non-response, the survey questionnaire provided clear instructions, and two follow-up reminders were sent via the Parkinson's UK Research Network Email Group, five days after the initial email and seven days after the first reminder.

2.4. Data Analysis

Quantitative data were analyzed using SPSS, Version 21 (SPSS, Chicago). Descriptive statistics, including frequencies, proportions, counts, and medians/modes, were used to examine responses to individual questionnaire items. No summative scores were calculated from the questionnaire items.

The final question (Q26) included qualitative data: *"If you would like to, please add any additional comments about how the COVID-19 period and social distancing regulations have affected your life."* Thematic analysis was conducted on these responses following the six-step framework outlined by Braun and Clarke [11]:1) Familiarization with data: two researchers (AA and SMH) repeatedly read the transcripts to ensure deep engagement with the data; 2) generating initial codes: key features of the dataset were systematically coded; 3) searching for themes: coded data were organized into potential themes; 4) reviewing themes: identified themes were refined, combined, or separated as necessary; 5) defining and naming themes: the final themes were agreed upon by the researchers and clearly defined; and 6) reporting themes: themes were presented with supporting quotations from the transcripts.

3. Results

A total of 441 participants submitted the online questionnaire. Of these, 25 respondents completed only the consent section without answering any subsequent questions. Consequently, 416 fully completed questionnaires were included in the analysis, surpassing the target sample size and representing 6.93% of the sampled population. Demographic data are presented in Table 2. Among the respondents, 191 identified as male, 221 as female, and 4 as "other." Participants reported

being aware of the physical activity recommendations for Individuals with Parkinson's to engage in 150 minutes of exercise per week, with a reported median of 203 minutes per week.
The mean (SD) time per week spent exercising was 203.83 (175.54) minutes (Table 2 and Figure 1).

Table 2.
Demographics of respondents.

	Age (years)	Time since diagnosis (years)	Average time spent performing aerobic exercise per week before the COVID-19 period (minutes)
Mean (SD)	70.43 (7.26)	6.22 (5.05)	203.83 (175.54)
Minimum	55	2 months	0.00
Maximum	85	33 years	1200.00

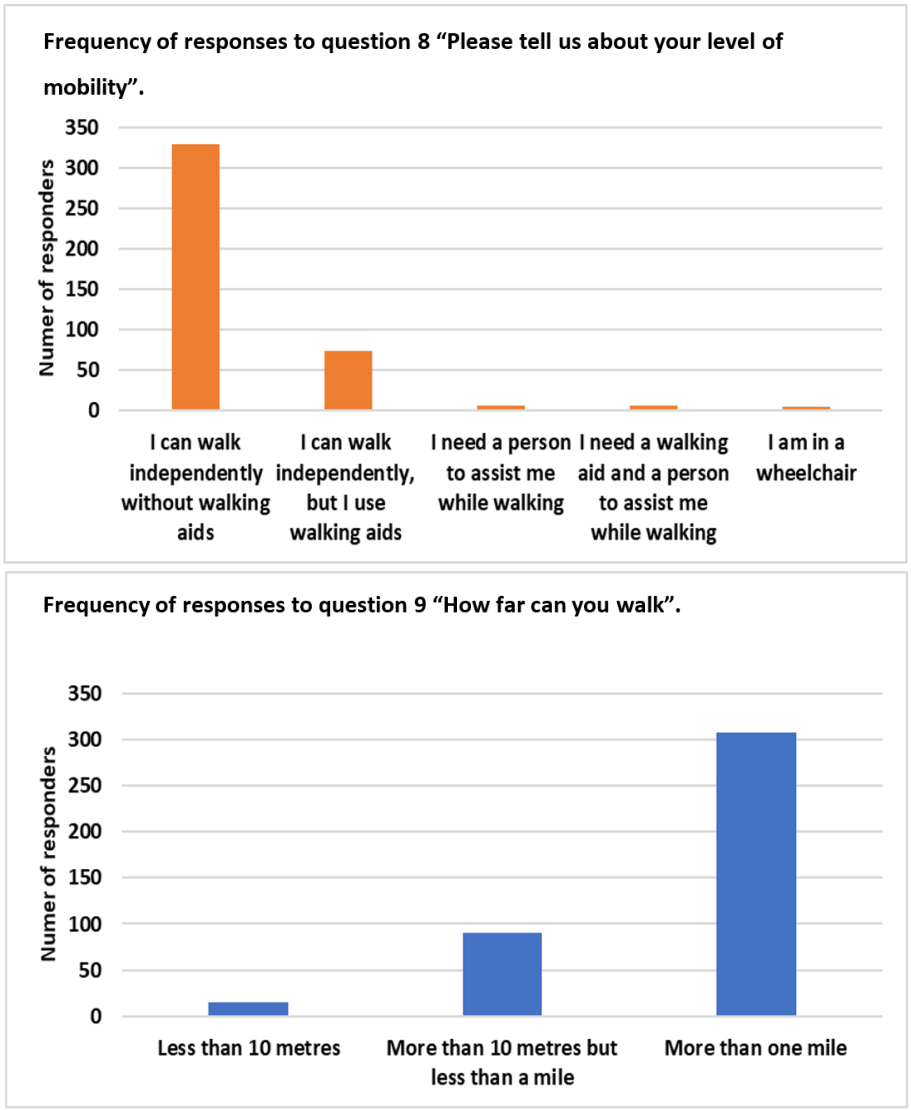

Figure 1.
Level of mobility reported by respondents.

Respondents reported implementing various precautionary measures to protect themselves from the virus, including practicing social distancing, frequent handwashing, using hand sanitizer, staying at home, maintaining a healthy diet, ensuring adequate rest and sleep, and shielding at home (Figure 2).

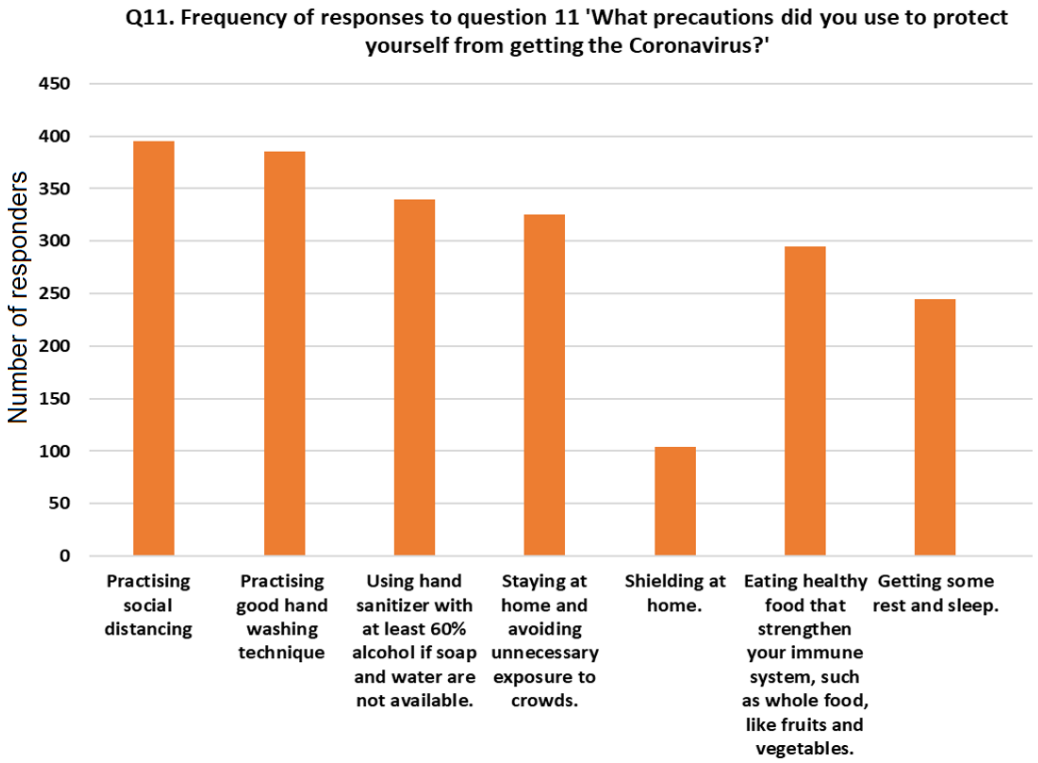

Figure 2.
Precautionary measures to protect from COVID-19.

Before the pandemic, 343 respondents (82%) reported engaging in outdoor walking, while 234 (56%) identified gardening as their primary form of exercise. Additionally, 130 respondents (31%) indicated that they did not own any of the exercise equipment listed in the questionnaire options (Figure 3).

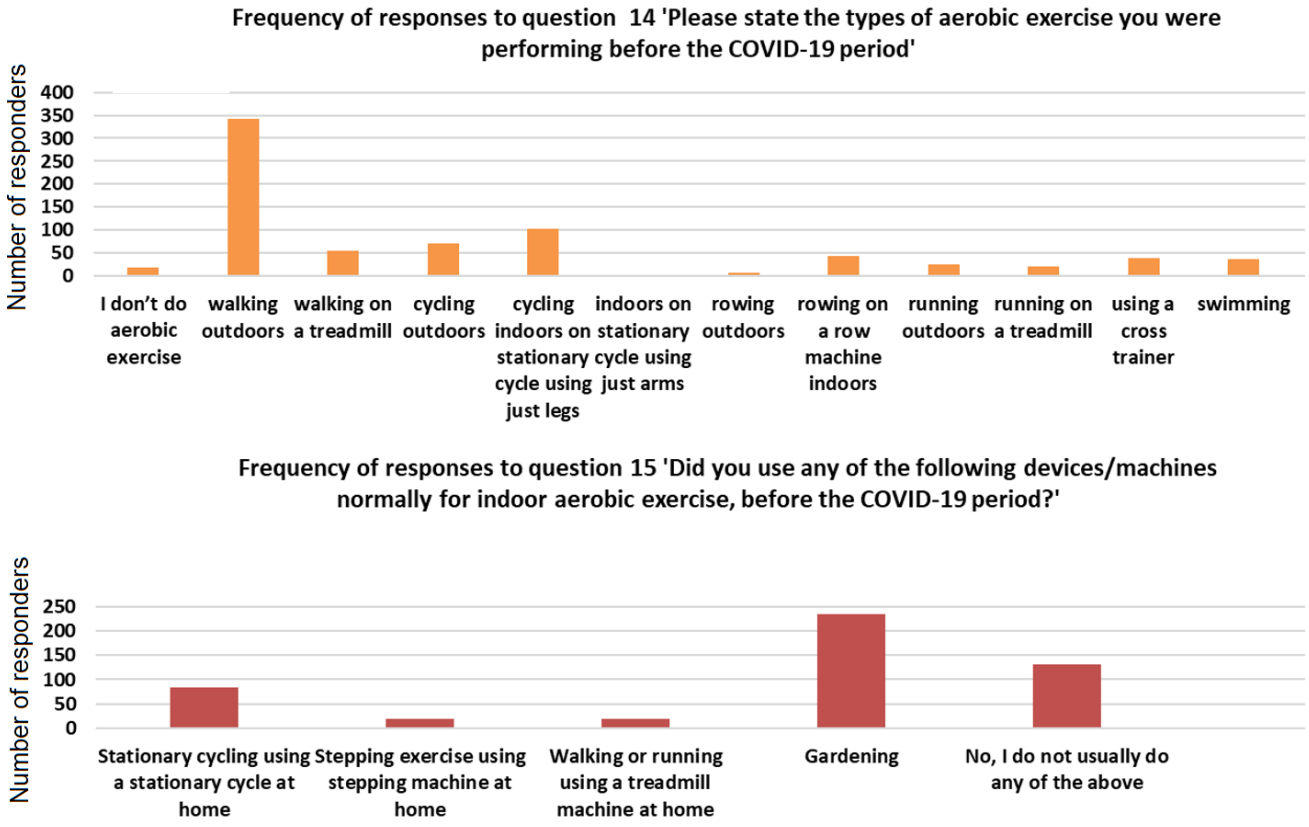

Figure 3.
Usual physical activity before and during the pandemic.

A total of 170 respondents (41%) indicated that the "Stay at Home" directive somewhat restricted their physical activity, while 159 respondents (38%) reported no change in their physical activity levels under the "Stay Alert" directive (Figure 4).

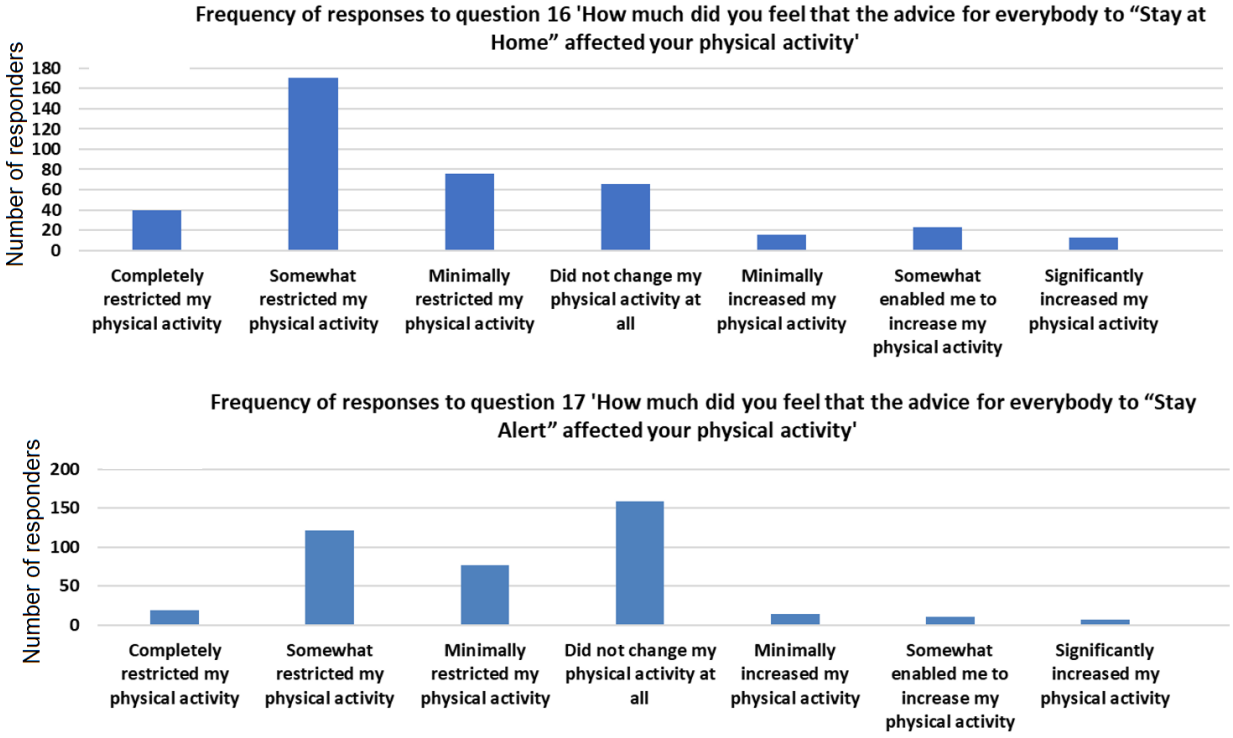

Figure 4.
Responses to questions regarding the response to Government advice.

During the COVID-19 period, 181 (44%) respondents reported using web-based virtual exercise classes, 52 (13%) used a web information portal for exercising, 51 (12%) engaged with TV exercises, and 36 (9%) reported using DVD

exercises (Figure 5). Gardening, followed by web-based virtual classes, were reported as activities that might help PlwP to exercise more at home (Figure 5).

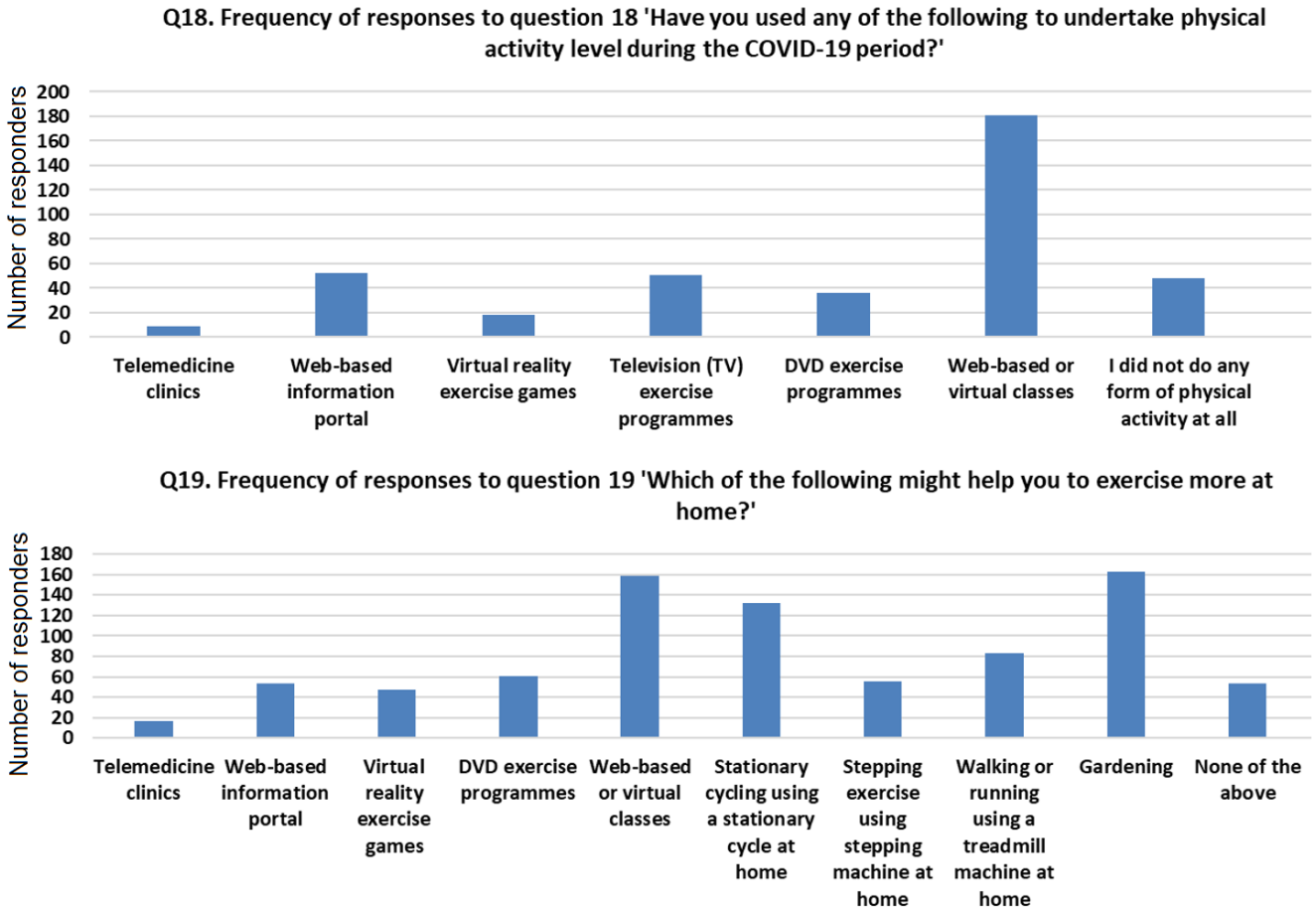

Figure 5.
Adapting exercise during the pandemic.

The symptoms most commonly reported to have worsened since the onset of the COVID-19 period were bradykinesia, stiffness, tremor, and fatigue.

3.1. The Impact of the COVID-19 Period and Social Distancing Regulations on the Lives of People with Parkinson's Disease (PWP) - Q26

Four key themes emerged from the qualitative data regarding the effects of the COVID-19 period and social distancing regulations on PwP's lives: Factors that hindered exercise, factors that promoted exercise, affected symptoms, and social interactions. Table 3 displays the themes and subthemes.

Table 1.
Topics and themes were identified from the last question in the questionnaire.

Themes	Sub-themes
Factors that limited exercise	Social distancing and loss of freedom Closure of exercise groups and sports centres Environment and equipment for exercise
Factors that increase exercise	More time to exercise Online and virtual classes
Symptoms affected	
Social contact	

3.2. Theme 1: Factors That Limited Exercise

This theme includes three subthemes: social distancing and the loss of freedom, closure of exercise groups and sports centres, and the environment and equipment available for exercise.

3.3. Subtheme: Social Distancing and Loss of Freedom

Respondents noted that the types of exercise available and the restrictions on where people could exercise, imposed by the lockdown and social distancing regulations, limited their ability to engage in physical activity.

The social distancing regulations are restricting the range and location where exercise can be performed, and individuals are unable to exercise.

One comment indicated that this limitation on choice was impacting their mental health.

The lack of freedom of choice to choose when you want to do any activity is very restrictive and can be depressing.

3.4. Sub-Theme: Closure of Exercise Groups and Sport Centres

Some participants mentioned that the closure of Parkinson's UK exercise groups, fitness clubs, sports centres, and community-based exercise opportunities was the reason they did not engage in physical activity during the COVID-19 period.

Closure of swimming pools for several months; closure of Parkrun on Saturday mornings; both of those have reduced my exercise since March.

Reduced my attendance at my local sports centre for several months as it was closed, and my aerobics class was cancelled. My yoga class closed and will not be restarting!

Unable to attend the fortnightly Parkinson's group meetings (they still have not restarted)

Additionally, some classes were no longer available due to funding issues that impacted charity centres for Parkinson's during the pandemic, further limiting opportunities to continue exercising during this time.

I cannot return to dance classes as funding has been withdrawn.

Some comments also emphasized the benefits of group exercise and peer support, highlighting the importance of the psychosocial advantages of exercising in a group, as well as the greater sense of enjoyment it provides.

Exercising in a group is not only good physically but also gives great support for each other.

*I realize how important the ballet and exercise classes have become to me since losing them. Also now aware of the importance of social contact of work, generally going out and even group therapy - Exercise *much* easier when done in a group.*

3.5. Subtheme: Environment and Equipment for Exercise

Some comments also emphasized the benefits of group exercise and peer support, highlighting the importance of the psychosocial advantages of exercising in a group, as well as the greater sense of enjoyment it provides.

I have missed being able to go out walking as freely as I was used to. We usually walk along a canal towpath not far away (because it is flat), but it has not felt safe to do so – too many people.

Lack of motivation to exercise alone was also noted:

Also difficult to motivate myself to do exercise even though I know the importance of exercise.

…am completely demotivated regarding exercise.

Very restrictive. Exercise almost stopped and difficult to motivate myself to do on my own.

Exercising in a gym setting provides a structured routine and dedicated time for physical activity, along with access to equipment, instructors, and motivation.

I find attending my normal gym gives me the discipline of having a set time to myself to exercise, and my instructor's enthusiasm and personal knowledge of my health and family circumstances keep me motivated and help address any issues that I have, including social contact.

The trend of online exercise classes during the pandemic lockdown, such as those held on Zoom, was seen as beneficial by some; however, there were still challenges in accessing the equipment that had been used in these classes previously.

Parkinson's exercise class went online (Zoom), which has been very helpful, but the equipment we used to use (rowing machine, punch ball, etc.) in the village hall was obviously unavailable.

3.6. Theme 2: Factors That Increased Exercise

Two key factors that encouraged increased exercise were identified as subthemes: having more time to exercise and participating in online and virtual exercise classes.

3.7. Subtheme: More Time to Exercise

The lockdown period and the advice to stay at home provided respondents with more time to exercise, despite some of the limiting factors mentioned earlier. Some individuals found the extra time at home beneficial and increased their physical activity during the lockdown.

I got significantly more exercise during lockdown – approximately 25 miles on my bike (nearly 3 hours) per week.

I have discovered "Reach Your Peak Online," with that, five times a week, plus the stretch routines they provide, as well as cycling, badminton, online live Zumba, walking, hill walking, and basketball training. I have a lot to do.

3.8. Subtheme: Online and Virtual Classes

Primarily, online or virtual exercise classes were described as "better than nothing" and were mentioned in comments from those who reported an increase in their exercise levels.

During lockdown, I established a routine of starting the day with exercise: PD Warrior warm-up and Joe Wicks for seniors on YouTube.

I have added Pilates and Tai Chi to my exercise regimen as they are taught by my PD Dance teacher through Zoom. I walked with a friend once.

Online classes were also beneficial for some people with Parkinson's who were unable to join exercise groups before COVID due to location or travel limitations.

Stopped live dance classes but enabled Zoom live PD Warrior with Hallamshire Physiotherapy. I live near Hertford and searched in vain for three years for a local PD Warrior class. Lockdown enabled me to join the Sheffield-based Zoom classes, which greatly benefited and improved my symptoms.

I believe that the COVID crisis has actually created more opportunities to exercise from home, leading to a new market for exercise options. Besides the regular, excellent PD Warrior classes conducted by trainers in Bristol (I'm in London), I have participated in yoga classes from Bridlington and weight-bearing training from the United States.

3.9. Theme 3: Symptoms Affected

In addition to physical activity levels and exercise, respondents reported other effects of the COVID-19 period on their lives, including symptoms such as mental wellbeing, cognitive, and physical symptoms, as well as disease progression. The fear of contracting COVID-19 caused anxiety and prevented one respondent from spending time outdoors.

Fear of contracting a deadly virus meant less time spent outdoors.

Others reported experiencing more panic attacks, low mood, and stress, which affected their sleep patterns, with some needing medication to cope.

Very anxious, prescribed propranolol. Low mood, under more stress, not sleeping.

Others reported feeling weaker, lacking energy, and experiencing fatigue or lethargy. With reduced exercise participation, some noted an increase in stiffness, decreased flexibility, and heightened back pain.

As I exercised less, my walking became harder and my backaches became worse. A vicious circle!!

Others observed a general worsening of Parkinson's symptoms, which at times necessitated an increase in medication.

I found that my progression of Parkinson's caused me to ask for an urgent appointment to start medication,

My Parkinson's became much worse, very quickly. I was surprised at this as it is supposed to be a slowly progressing disease.

3.10. Theme 4: Social Contact

Along with exercise limitations, the COVID-19 restrictions impacted social interactions, leading to social isolation and loneliness in some cases. This loss of social contact was frequently mentioned in the comments.

Increased sense of isolation and loneliness from not being able to meet friends and family and other group participants in person.

Some missed physical contact with their family members, some of whom lived abroad, and the restrictions on international travel prevented them from seeing each other.

I miss not being able to hug my children and grandsons and other members of my family.

I also have family abroad and can not see them due to risk and restrictions.

One responder described feeling "*alive but not living".*

4. Discussion

This survey of people with Parkinson's disease (PlwP) revealed that the COVID-19 pandemic and its subsequent restrictions had a significant impact on their lives, affecting them socially, physically, and mentally. The survey's findings also provide valuable insights for future clinical trials, particularly in designing physical activity or exercise interventions for PlwP. It is crucial to develop and incorporate interventions that can withstand future COVID-19 outbreaks, as well as other pandemics or crises, and the associated restrictions on activity.

The UK government's "Stay at home" directive significantly impacted exercise and physical activity engagement among people with Parkinson's disease (PlwP). This is supported by responses from 343 participants (82% of the sample), who reported outdoor walking as their primary form of aerobic exercise before the pandemic. Following the directive to "Stay at home" (initially, and later, only allowing one outing per day for exercise), individuals who had been walking, cycling, or participating in outdoor exercise ceased these activities. Furthermore, the closure of sports/fitness clubs and exercise groups contributed to the decline or restriction of physical activity. Comments also highlighted the lack of freedom to choose the type, location, space, or timing of exercise. As previously noted in the literature [12] the ability to choose preferred exercise modes is a key factor influencing motivation, adherence, and compliance with physical activity and physiotherapy programs. This factor was significantly impacted by the restrictions during the pandemic.

The participants in this survey, who were people with Parkinson's disease (PlwP), were generally aware of the physical activity recommendations for their condition, which suggest 150 minutes of exercise per week. They reported a median of 203 minutes of exercise per week, surpassing the recommended amount. This suggests a strong awareness of the importance of exercise within this population. However, 135 respondents (32%) were not familiar with these recommendations or the physical activity guidelines. Therefore, it is essential for clinicians and Parkinson's organizations to disseminate more information to promote physical activity and exercise among PlwP.

During the pandemic, people with Parkinson's disease (PlwP), who exercised most frequently, participated in web-based and virtual exercise classes as their primary indoor activity at home. They engaged with various websites, online groups, and television programs that offered guided exercise opportunities. Research studies conducted during the COVID-19 period on physical exercise in older adults also highlighted the success of virtual reality programs [13], social media exercise groups [14] and television exercise programs [15].

During the pandemic, gardening and web-based exercise were the most preferred forms of physical activity for this group of people, followed by stationary cycling, treadmill walking, and DVD exercises. These preferences are crucial and should be considered when designing future exercise trials, self-management programs, and physiotherapy interventions for people with Parkinson's disease (PlwP), to improve exercise opportunities and adherence to trial protocols. Future research is strongly recommended to explore self-managed and minimally supervised exercise programs for PlwP, promoting sustainability and continuation of exercise beyond the trial period [16]. This approach is especially important if the trial exercise program proves to be effective. The benefits of establishing exercise habits are well-documented, and any behavior change that is sustained and aligns with the recommended exercise frequency and intensity is likely to benefit PlwP [16]. Additionally, with many hospitals and outpatient centres limiting in-person sessions, particularly in the post-pandemic era, there is a need for sustainable solutions and platforms that shift the current physiotherapy care model to better serve this population, overcoming the challenges posed by pandemics or similar future situations. However, when planning these types of interventions for future trials, several factors need to be considered, including access to internet/telehealth, training for both patients and physiotherapists, availability of exercise equipment, and safety measures for minimally supervised or unsupervised exercise sessions.

This survey highlighted numerous comments regarding social contact and how the COVID-19 pandemic impacted respondents' social lives with family, friends, and other people with Parkinson's disease (PlwP). Additionally, comments mentioning depression and loss of confidence due to reduced social interaction suggest that anxiety and mental health were significantly affected by this lack of social contact. Some respondents expressed feelings of deep sadness and depression, while others shared experiences of loneliness and isolation during the 'lockdown' period. These findings align with studies examining mental and sleep health during the pandemic [8]. Physical inactivity during the pandemic may have contributed to the worsening of these symptoms, as previous research has shown that exercise can help reduce anxiety, depression, cognitive impairment, and improve sleep quality in PlwP [17-19].

Even before the pandemic, it was reported that people with Parkinson's disease (PwP) experienced isolation, a decline in social activity, and a decrease in quality of life [20, 21]. This social isolation was often linked to feelings of shame related to speech impairments, slow movements, freezing of gait, tremors, or the lack of facial expressions caused by the "Parkinson’s mask" [20, 21]. During the COVID-19 pandemic, self-isolation, shielding at home, and social distancing regulations exacerbated the loneliness and social challenges that people living with Parkinson's (PlwP) had already been experiencing pre-pandemic. Given the uncertainty brought on by the pandemic, it is crucial to reconsider the current model of care for the psychological and mental health needs of PlwP.

Although the primary focus of this survey was exercise and physical activity during the pandemic, rather than mental health, understanding the mental and social effects experienced by people with Parkinson's disease (PlwP) could help enhance exercise duration and intensity for this population. For instance, trials involving group-based exercise interventions have reported higher engagement and adherence compared to those where participants exercised alone [22, 23]. These findings are valuable for shaping future research. One potential idea to explore could be a virtual online group exercise trial that also includes opportunities for social interaction.

Bradykinesia, stiffness, tremor, and fatigue were the symptoms most commonly reported as having worsened since the onset of the COVID-19 period. Previous research has shown that the progression of these symptoms is slower in individuals who engage in aerobic exercise and physical activity interventions [24-27]. Therefore, these findings underscore the importance of exploring remote exercise as a means to reduce symptoms, improve quality of life, and maintain care management in confined environments or under restricted circumstances.

4.1. Strengths and limitations

This is the first study to examine how the COVID-19 pandemic impacted exercise and physical activity in people with Parkinson's disease (PlwP), offering insights into their preferences for indoor exercise. The findings of this study are valuable for planning future research that incorporates exercise for PlwP.

However, the results may be affected by non-response bias. The survey was distributed via email, and there are several limitations associated with this method. For example, participants may not have opened the email, or it may have ended up in a different folder (such as junk or spam). Some individuals may have lacked internet access, or their connection could have been disrupted during the survey completion period. Additionally, some participants may have changed their email address without notifying Parkinson's UK, which distributed the survey to its email list, or may have faced challenges completing the survey online due to cognitive, visual, or technological issues.

5. Conclusions

This survey revealed a decline in physical activity among people with Parkinson's disease (PlwP) during the COVID-19 pandemic. This reduction may have been due to limited freedom in choosing exercise modes and types, as well as the closure of Parkinson’s UK exercise groups and sports clubs. The survey also highlighted a significant impact on the social aspect of exercise, with participants expressing a strong sense of loss regarding social contact, particularly within exercise groups. Additionally, the survey indicated a preference for online virtual exercise classes, stationary cycling, treadmill

walking, and DVD exercises as effective indoor or remote exercise options, which participants felt could benefit them during the pandemic. Based on these findings, the survey emphasizes the need to design remote or minimally supervised exercise interventions that consider participants' preferences for exercise modes and social interaction.

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