

Physiotherapy Theory and Practice

An International Journal of Physical Therapy

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/iptp20>

The effect of kinesiophobia on physical activity, balance, and fear of falling in patients with Parkinson's disease

Semra Oğuz, Gamze Ertürk, Mine Gülden Polat & Hülya Apaydın

To cite this article: Semra Oğuz, Gamze Ertürk, Mine Gülden Polat & Hülya Apaydın (2022): The effect of kinesiophobia on physical activity, balance, and fear of falling in patients with Parkinson's disease, *Physiotherapy Theory and Practice*, DOI: [10.1080/09593985.2022.2028325](https://doi.org/10.1080/09593985.2022.2028325)

To link to this article: <https://doi.org/10.1080/09593985.2022.2028325>



Published online: 18 Jan 2022.



Submit your article to this journal [↗](#)



Article views: 379







View related articles [↗](#)



View Crossmark data [↗](#)



The effect of kinesiophobia on physical activity, balance, and fear of falling in patients with Parkinson's disease

Semra Oğuz PT, PhD ^a, Gamze Ertürk PT, MSc ^b, Mine Gülden Polat PT, PhD ^a, and Hülya Apaydın PhD, MD ^c

^aFaculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Marmara University, Istanbul, Turkey; ^bFaculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul Kültür University, Istanbul, Turkey; ^cCerrahpaşa Medical Faculty, Department of Neurology, Istanbul University - Cerrahpaşa, Istanbul, Turkey

ABSTRACT

Purpose: Kinesiophobia is defined as the fear of movement and activity resulting from a feeling of vulnerability to painful injury or re-injury. This study aimed to determine the effect of kinesiophobia on physical activity, balance, and fear of falling in patients with Parkinson's disease.

Methods: The study, which was designed as a cross-sectional type, was conducted with 86 patients with Parkinson's disease (age 61.25 SD [9.72] years old) by face-to-face interviews with the patients. The Tampa Scale of Kinesiophobia, International Physical Activity Questionnaire-Short Form, Berg Balance Scale, Falls Efficacy Scale, Visual Analog Scale – Fear of Falling, Unified Parkinson's Disease Rating Scale – motor score, and the Hoehn and Yahr scale were used to evaluate the patients.

Results: Patients with Parkinson's disease who had high levels of kinesiophobia had lower levels of physical activity, worse balance, and higher disease severity and fear of falling. A correlation was found between the Tampa Scale score and physical activity, balance, fear of falling, falls efficacy, and disease motor score ($p < .001$; $r = -0.38, -0.54, 0.67, 0.57, \text{ and } 0.37$, respectively). According to multiple linear regression analysis, kinesiophobia explained the dependent variables to varying degrees ranging from 13% to 44% ($p < .001$).

Conclusions: Patients with Parkinson's disease may have kinesiophobia. Rehabilitation programs to support functional capacity for these patients should be developed considering the presence of kinesiophobia.

ARTICLE HISTORY

Received 19 March 2021
Revised 5 October 2021
Accepted 4 December 2021

KEYWORDS

Balance; fear of falling; kinesiophobia; Parkinson's disease; physical activity

Introduction

Parkinson's disease (PD) is a chronic neurodegenerative disease characterized by progressive disability and decreased quality of life (Poewe and Mahlknecht, 2009). Due to the long course and progressive nature of the disease, over time negative effects occur related to patients' motor function, balance, activity level, and quality of life (Debû, De Oliveira Godeiro, Lino, and Moro, 2018). Activity limitations, participation restrictions, psychosocial problems, and some fear-based avoidance behaviors may develop in patients with PD as a result of these effects (Bello-Haas, Klassen, Sheppard, and Metcalfe, 2011; Giladi and Balash, 2006; Julien, Rimes, and Brown, 2016).

A review of studies regarding fear associated with PD found that the most examined issue was fear of falling which causes a decrease in functional capacity (Adkin, Frank, and Jog, 2003; Haertner et al., 2018; Mak, Pang, and Mok, 2012). Although social, cognitive, emotional, and environmental factors were shown to explain inconsistencies between physical impairment and function, it

was reported that the fear of falling may also be another factor contributing to this situation (Choi, Jeon, and Cho, 2017). However, these factors are not yet clear. Therefore, additional assessment methods that identify factors preventing patients from participating in activities and reaching their optimal level of activity are needed to encourage patients to increase their physical activity level. Kinesiophobia, defined as "an excessive and irrational fear of movement that can occur after painful injury or re-injury" (Kori, Miller, and Todd, 1990) has come to the forefront in recent years in patients with PD (Monticone et al., 2015). While kinesiophobia is one of the most important limitations of motor activity and is seen as a component of an individual's personality (Knapik, Saulicz, and Gnat, 2011), its presence and effects are not well defined in patients with PD. However, the presence of kinesiophobia has been shown in the geriatric population, and it has been reported that older individuals with high kinesiophobia have a lower activity of daily living and a high level of dependence (Ahangari and Abdolrahmani, 2020).

Kinesiophobia is likely to be a serious and common problem associated with PD which led to a decrease in balance function and physical activity and an increase in fear of falling. Similarly, a decrease in balance function and activity level and an increase in fear of falling may increase kinesiophobia. Therefore, determining the presence of kinesiophobia and its effects, if any, may help support functional capacity such as improving balance, increasing activity level in PD, and improving rehabilitation programs to include multimodal treatment strategies. This study thus aimed to investigate the presence of kinesiophobia in patients with PD and its effect on their physical activity, balance, and fear of falling.

Methods

The study was approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee with the protocol number 09.2017.226 and clinical trial number NCT03827746.

Participants

A total of 86 patients with PD who attended Istanbul University Cerrahpaşa Medical Faculty Neurology Department Movement Disorders Unit were included in the study. Inclusion criteria were as follows: (1) diagnosed with Parkinson's disease according to the UK Parkinson's Disease Society Brain Bank criteria (Clarke et al., 2016); (2) in stage 1–3 of the Hoehn and Yahr scale; and (3) receiving antiparkinsonian treatment. Exclusion criteria were as follows: (1) presence of other neurological disorders (e.g., stroke and muscle disease); (2) presence of visual and auditory problems; (3) presence of psychiatric disorders; and (4) cognitive impairment (<24 points from Mini-Mental Test). Informed consent forms were obtained from all patients. Hoehn and Yahr stages (Hoehn and Yahr, 1967) and the motor section of the Unified Parkinson's Disease Rating Scale (UPDRS III) scores were completed by a neurologist. After the participants' demographic information (i.e., age, gender, marital status, educational status, and initial symptom) was recorded, the other measurements were performed by a researcher/physiotherapist.

Tampa Scale of Kinesiophobia

The Tampa Scale of Kinesiophobia (TSK) was validated for PD in Monticone et al.'s (2015) study that was a cross-sectional design and includes evaluating the adapted questionnaire's psychometric properties. Cronbach's alpha was 0.94, and 95% confidence interval (95% CI) was 0.82–0.94 (Tomioka, Iwamoto, Saeki, and

Okamoto, 2011). It consists of 17 statements assessing kinesiophobia or fear of moving such as “I'm afraid that I might injure myself if I exercise; I am afraid that I might injure myself accidentally; and It's really not safe for a person with a condition like mine to be physically active” (Lundberg, Styf, and Carlsson, 2004). Each question is scored according to a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). The scoring of the 4th, 8th, 12th, and 16th questions are reversed. The total score can range from 17 to 68, with a higher score denoting high-grade kinesiophobia. The test's cutoff point was 37 (Vlaeyen et al., 1995). Those below 37 points were grouped as low kinesiophobia, and those above 37 points were grouped as high kinesiophobia.

International Physical Activity Questionnaire – Short Form

The International Physical Activity Questionnaire – Short Form (IPAQ-SF) evaluates the patient's physical activity level for the last 7 days by providing information on time spent walking and moderate-to-vigorous activities. The calculation of the total score includes the total duration (minutes) and frequency (days) of walking, moderate activity, and vigorous activity. A Metabolic Equivalent – minute (MET-min) score is achieved by multiplying the duration of activity with MET score. The score achieved was used to categorize patients into the subgroups as follows: (1) inactive (≤ 600 MET-min/week); (2) minimum active (> 600 up to ≤ 3000 MET-min/week); and (3) active (> 3000 MET-min/week) (Abrantes et al., 2012). The intraclass correlation coefficient (ICC) was 0.50 and 0.57; 95% CI was 0.23 to 0.68 and 0.31 to 0.73, for men and women, respectively.

Berg Balance Scale

The Berg Balance Scale (BBS), used previously in studies of PD, consists of 14 questions, each scored from 0 to 4, evaluating balance. Internal consistency (Cronbach's alpha) was 0.85–0.89, 95% CI was 0.47–0.52, and ICC was 0.94 (Steffen and Seney, 2008). Total scores can range from 0 to 56 with a high score implying good balance (cutoff point = 45) (Berg, Wood-Dauphinee, Williams, and Maki, 1992). The BBS, which takes approximately 10–15 minutes to complete, is applied using auxiliary devices such as a ruler, stopwatch, chair, and steps.

Falls Efficacy Scale

The Falls Efficacy Scale (FES) consists of 10 questions that evaluate how much people trust themselves during daily activities without fear of falling. Each question is scored from 1 (I trust myself a lot) to 10 (I do not trust

myself at all). A total score >70 indicates that the person has a fear of falling (Tinetti, Richman, and Powell, 1990). The scale has been used previously in studies conducted with patients with PD (Cronbach's alpha >0.8, ICC >0.9) (Thomas, Rogers, Amick, and Friedman, 2010).

Visual Analog Scale – Fear of Falling

A Visual Analog Scale – Fear of Falling (VAS-FOF) was used to determine the patients with PD's fear of falling in their daily life, as stated in the study by Mehdizadeh et al. (2019). Participants were asked to rate their fear of falling on a scale from 0 (not afraid of falling at all) to 10 (very afraid of falling). The ICC for VAS-FOF was 0.57 (95% CI = 0.49–0.64) (Scheffer et al., 2010).

Statistical analyses

Our sample (86 participants) was above the minimum sample size calculated with G*Power 3.1 software with a 0.20 effect size, at a significance level of 5% and power of 95%, based on information from previous studies about TSK and IPAQ correlations (Erim, 2019). Results were evaluated with the SPSS Statistics 25 software program. The compliance of the data to normal distribution was evaluated with a Kolmogorov–Smirnov test and histogram drawing. Parametric/nonparametric tests were used according to their suitability for normal distribution. In the analysis of differences between the two groups, an independent *t*-test was used for UPDRS and VAS-FOF results, while a Mann–Whitney *U* test was used for other parameters. In the correlation analysis, Spearman's rank correlation coefficient test was used for UPDRS and VAS-FOF scores, and Pearson's correlation coefficient was used for FEF, BBS, and IPAQ scores. To determine the strength of the correlation, Portney and Watkins' (2000) description was utilized. The correlation strength of relationships was accepted as recommended that 0.00 to 0.25 = little or none; 0.25 to 0.50 = fair; 0.50 to 0.75 = moderate to good; and 0.75 to 1 = good to excellent. Multiple linear regression analysis was performed to determine the relationship between TSK score (independent variable) and BBS, FEF, VAS-FOF, and IPAQ (dependent variables). The values in the IPAQ scores of four participants were determined as outliers and winsorized. The significance level was set at $p < .05$.

Table 1. Participants' sociodemographic characteristics ($n = 86$).

Information	n (%)
Gender	
Female	41 (47.67)
Male	45 (52.33)
Age	
≤65	55 (63.95)
>65	31 (36.05)
Duration of disease (years)	
0–5	44 (51.16)
6–10	21 (24.42)
>10	21 (24.42)
Marital status	
Married	80 (93.02)
Single	6 (6.98)
Educational status	
Illiterate	5 (5.81)
Primary school	47 (54.65)
Middle school	14 (16.28)
High school	13 (15.12)
University	7 (8.14)
Initial symptom	
Tremor	56 (65.11)
Bradykinesia	30 (34.89)

n : number of participants; %: percent.

Results

Among 90 patients with PD who applied to the Istanbul University Cerrahpaşa University Neurology Department Movement Disorders unit, 86 participants (41 women and 45 men) who met the inclusion criteria were included in the study. The participants' demographic data were as follows: mean age 61.25 ± 9.72 years (range 36–80), mean BMI 28.46 ± 4.78 kg/m² (range 18.75–43.51), duration of disease 7.16 ± 5.39 years (range 1–25); mean Hoehn & Yahr stage 1.77 ± 0.77 (range 1–3), and mean UPDRS motor score 14.16 ± 9.63 (range 0–52). The participants' sociodemographic data are shown in Table 1.

The participants' mean scores were as follows: TSK 40.91 ± 9.62 , IPAQ 1331.32 ± 1516.93 MET × Min, BBS 45.87 ± 10.49 , FES 32.66 ± 24.52 , and VAS 3.89 ± 3.13 . Participants were examined in two groups as low and high kinesiophobia according to their TSK score. Physical activity level was lower, balance status was worse, and fear of falling was higher in the group with high kinesiophobia score. The differences between the groups are shown in Table 2.

Correlations between variables

A positive moderate-to-good correlation was found between the TSK and the VAS-FOF scores ($p < .001$, $r = 0.67$); a positive moderate-to-good correlation between the TSK and FES scores ($p < .001$, $r = 0.57$);

Table 2. Differences between groups according to kinesiophobia presence.

	High kinesiophobia ^a (n = 64) Mean (SD)	Low kinesiophobia ^b (n = 22) Mean (SD)	p-Value
Age	61.81 (9.59)	59.63 (10.14)	0.36
H & Y	1.93 (0.77)	1.31 (0.56)	0.001
Years of PD	7.29 (5.44)	6.77 (5.33)	0.5
UPDRS III	15.95 (9.63)	8.95 (7.71)	0.003
TSK	45.26 (5.70)	30.13 (3.52)	<0.001
IPAQ	1050.96 (1170.01)	2146.90 (2092.92)	0.003
BBS	43.85 (9.15)	51.90 (5.14)	<0.001
FES	43.76 (24.30)	21.81 (20.36)	<0.001
VAS-FOF	4.93 (2.53)	1.81 (2.10)	<0.001

H & Y : Hoehn and Yahr; PD: Parkinson's disease; UPDRS III: Unified Parkinson's disease rating scale of motor score; TSK :Tampa Scale for Kinesiophobia; IPAQ: International Physical Activity Questionnaire; BBS: Berg Balance Scale; FES: Falls Efficacy Scale; VAS-FOF: Visual Analog Scale – Fear of Falling; SD: Standard deviation; n: number of participants.

^aTSK points >37.

^bTSK points <37.

a negative moderate-to-good correlation between the TSK and BBS scores ($p < .001$, $r = -0.54$); a negative fair relationship between the TSK and IPAQ scores ($p < .001$, $r = -0.38$); and a positive fair relationship between TSK and UPDRS III scores ($p < .001$, $r = 0.37$).

Multiple linear regression analysis between dependent and independent variables

Kinesiophobia (dependent variable) was found to be significantly associated with BBS, FES, VAS-FOF, and IPAQ (independent variables). As indicated in the kinesiophobia ΔR^2 column, it explained 13–44% of the variances in the measurements (Table 3 and Figure 1).

Discussion

This study, which examined patients with PD with presence of kinesiophobia and the effect of kinesiophobia on physical activity, balance, and fear of falling, determined that kinesiophobia is high in patients with PD and increases as disease severity and symptoms increase. In addition, it was determined that patients with PD with high kinesiophobia have a higher fear of falling and higher disease motor severity and worse balance and lower physical activity levels than those with low kinesiophobia. Regression analysis showed that kinesiophobia explained the physical activity level, Falls Efficacy Scale score, balance state, and fear of falling at different rates (17%, 29%, 30%, and 44%, respectively).

Fear of falling in patients with PD is one of the most important factors affecting independence in everyday life (Jonasson, Nilsson, Lexell, and Carlsson, 2018).

Table 3. Multiple linear regression analysis.

Independent variables	Dependent variable	R ²	Beta (95% CI)	p-Value	ΔR^2
BBS	TSK	0.305	-0.553 (-0.68 to -0.38)	<0.001	0.297
FES	TSK	0.301	0.548 (0.37 to 0.68)	<0.001	0.292
VAS-FOF	TSK	0.449	0.67 (0.53 to 0.79)	<0.001	0.442
IPAQ	TSK	0.18	-0.30 (-0.03 to -0.01)	<0.001	0.17
UPDRS	TSK	0.14	0.37 (0.15 to 0.50)	<0.001	0.13
Years of PD	TSK	0.02	-0.03 (-0.37 to 0.30)	0.83	0.01
Model summary		0.52		<0.001	0.48

BBS: Berg Balance Scale; FES :Falls Efficacy Scale; VAS-FOF: Visual Analog Scale – Fear of Falling; IPAQ: International Physical Activity Questionnaire; TSK :Tampa Scale for Kinesiophobia; R² :R-squared, ΔR^2 :R-square change.

Progression of the disease leads to limitation of mobility, decrease in functional ability, and social isolation (Rahman, Griffin, Quinn, and Jahanshahi, 2011). Fear of falling, which has been frequently examined in association with PD in the literature, is associated with decreased confidence in mobility (Schoene et al., 2019). Kinesiophobia seen in patients in this context may lead to worse balance and movement abilities and, thus, a higher fear of falling. Avoiding activity is one of the elements of kinesiophobia (Monticone et al., 2015). Nilsson, Jonasson, and Zijlstra (2020) reported in their study with patients with PD that avoiding activity associated with falling increased with the progression of the disease. In the same study, it was recommended to clinically follow up the avoidance of activities related to this fear of falling. According to our regression analysis, kinesiophobia predicts the fear of falling at the highest rate among the dependent variables evaluated. Thus, our results support the theory that kinesiophobia is closely related to the fear of falling. In addition, according to FES results, the confidence of patients with high kinesiophobia regarding their ability to move without falling was low. Previous studies have shown that patients with PD have reduced confidence in their ability to move without falling, even if they have not fallen before (Rahman, Griffin, Quinn, and Jahanshahi, 2011), which might be related to kinesiophobia. Therefore, evaluating patients with PD for the presence of kinesiophobia can be a step to change negative cognitive thinking and prevent the avoidance of activity.

The number of studies in the literature examining the relationship between balance and kinesiophobia is limited. Ishak, Zahari, and Justine (2017) reported there is

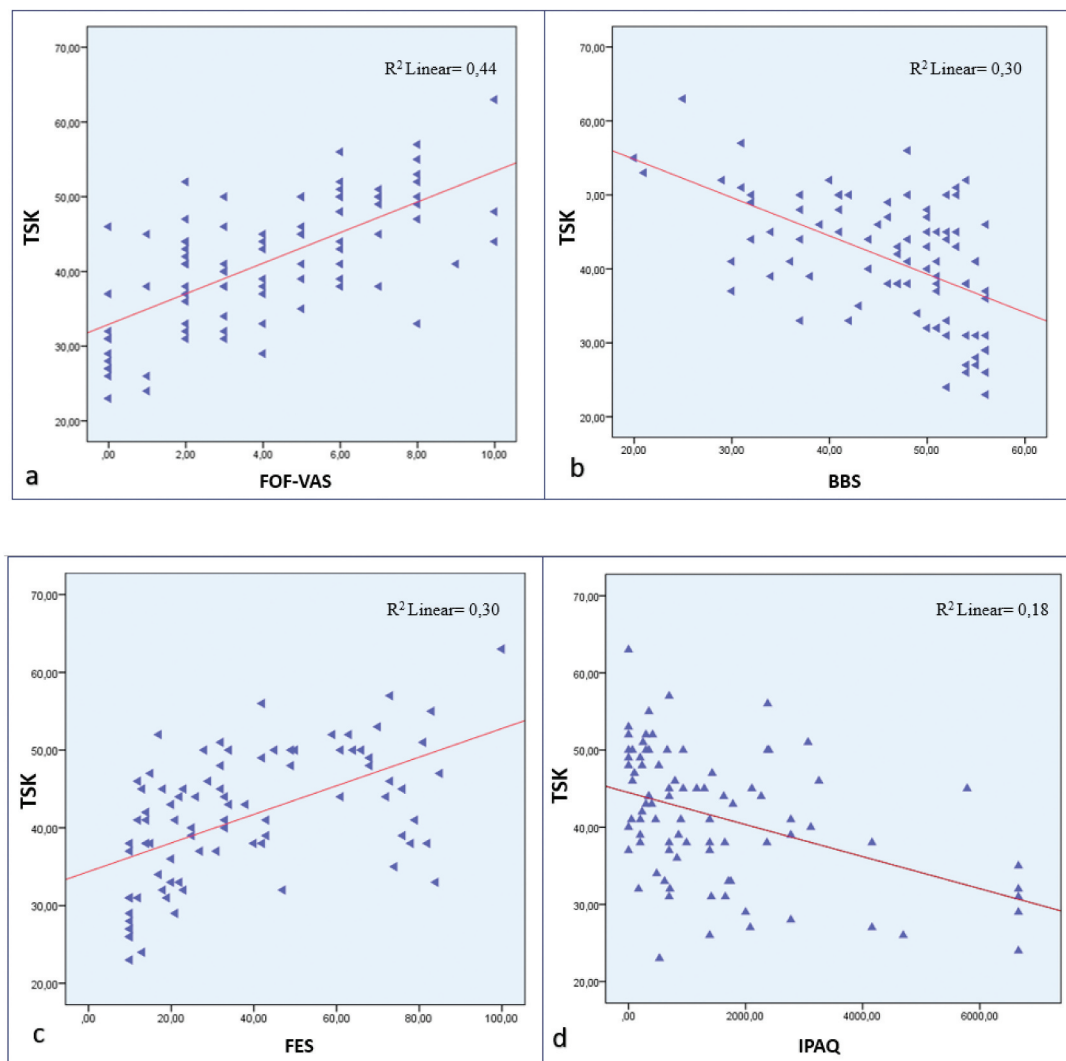


Figure 1. Scatterplots and regression analysis: (a) TSK score with VAS-FOF, (b) TSK score with BBS, (c) TSK score with FES, and (d) TSK score with IPAQ. TSK: Tampa Scale for Kinesiophobia; VAS-FOF: Visual Analog Scale – Fear of Falling; BBS: Berg Balance Scale; FES: Falls Efficacy Scale; IPAQ: International Physical Activity Questionnaire.

a relationship between kinesiophobia, mobility, and balance in elderly individuals. Bryant, Rintala, Hou, and Protas (2015) examined and explained the relationship between balance and fear of falling. PD is a disease related to balance disorder (Debû, De Oliveira Godeiro, Lino, and Moro, 2018). A progressive balance disorder can cause loss of mobility and a decrease in physical activity levels in patients over time. Similarly, a decrease in mobility and physical activity levels leads to further increase balance problems in patients (Bryant, Rintala, Hou, and Protas, 2015; Debû, De Oliveira Godeiro, Lino, and Moro, 2018). In the current study, it was determined that patients with high kinesiophobia had worse physical activity and balance levels, a higher FES score, and a higher fear of falling. Our results support the relationship of kinesiophobia, which consists of activity avoidance and fear/harmful sub-dimensions,

with balance problems. Therefore, the presence of kinesiophobia may increase the problems associated with balance that accompany PD and can further increase the limitation of daily life activities.

Like balance, it is known that the level of physical activity decreases gradually during PD. Low physical activity has been associated with fear of falling, impaired balance, and, consequently, reduced participation in activities of daily life (Bryant, Rintala, Hou, and Protas, 2015). At the same time, fear of falling and of injury has been shown as one of the barriers to physical activity in older individuals (Rasinaho et al., 2007). Fear-induced movement avoidance may cause long-term habits of not moving, immobilization, and ultimately a lack of physical activity. Accordingly, already existing balance problems may increase and lead to disability. In addition to the literature stating that physical activity should be

increased in patients with PD, our results indicate that kinesiophobia should also be taken into consideration (Bouça-Machado et al., 2020). Thus, a supportive strategy can be established to break the vicious circle of physical inactivity–limitations–physical inactivity.

Jiménez-Cebrián et al. (2021) in their study comparing Parkinson's patients and healthy controls reported that kinesiophobia was higher in the PD group, and PD had a negative effect on the kinesiophobia score. As far as we know, our study is the first study evaluating the effect of kinesiophobia in PD on physical activity, balance, and fear of falling. Due to kinesiophobia in PD, the balance could negatively be affected, and the fear of falling and the level of inactivity could be increased. Kinesiophobia impacted by balance problems, thus resulting in fear of falling and inactivity, can increase the dysfunction of patients with PD by affecting their independence to perform daily life activities.

Since one of the rehabilitation approaches for PD is to increase physical activity, it is important to evaluate the presence of kinesiophobia from the early stages of the disease. As a result, multidisciplinary rehabilitation programs that support functionality and include cognitive-behavioral strategies and approaches for secondary effects due to fear of falling, balance, physical activity level, and kinesiophobia may be beneficial for Parkinson's patients to reduce the negative effects of kinesiophobia and the perceived level of disability. Acceptance and commitment therapy-based exercise programs such as BEWARE, which are currently being studied, may also be beneficial in reducing kinesiophobia in patients with PD (Ghielen et al., 2015).

There are some limitations of our study. The first is due to the cross-sectional nature of the study, and significant correlations do not imply causation. The other is the lack of measurements of other variables such as freezing, orthostatic disorders, and anxiety. Future studies should broadly evaluate the relationship of motor and non-motor symptoms seen in patients with PD with kinesiophobia.

Our findings suggest that kinesiophobia can occur in patients with PD and that kinesiophobia can worsen as the disease progresses. Therefore, rehabilitation programs that include multimodal therapies such as behavioral and exercise therapy to support functional capacity for these patients should be developed considering its presence.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The authors reported that there is no funding associated with the work featured in this article.

ORCID

Semra Oğuz PT, PhD  <http://orcid.org/0000-0002-7148-4562>

Gamze Ertürk PT, MSc  <http://orcid.org/0000-0002-5038-9005>

Mine Gülden Polat PT, PhD  <http://orcid.org/0000-0002-9705-9740>

Hülya Apaydın PhD, MD  <http://orcid.org/0000-0003-2808-9353>

References

- Abrantes AM, Friedman JH, Brown RA, Strong DR, Desaulniers J, Ing E, Saritelli J, Riebe D 2012 Physical activity and neuropsychiatric symptoms of Parkinson disease. *Journal of Geriatric Psychiatry and Neurology* 25 (3): 138–145. doi:10.1177/0891988712455237.
- Adkin AL, Frank JS, Jog MS 2003 Fear of falling and postural control in Parkinson's disease. *Movement Disorders* 18(5): 496–502. doi:10.1002/mds.10396.
- Ahangari A, Abdolrahmani M 2020 Kinesiophobia dilemma for older adults: A systematic review. *Geriatric Care* 6(3): 9056. doi:10.4081/gc.2020.9056.
- Bello-Haas VD, Klassen L, Sheppard S, Metcalfe A 2011 Psychometric properties of activity, self-efficacy and quality-of-life measures in individuals with Parkinson disease. *Physiotherapy Canada* 63(1): 47–57. doi:10.3138/ptc.2009-08.
- Berg KO, Wood-Dauphinee SL, Williams JI, Maki B 1992 Measuring balance in the elderly: Validation of an instrument. *Canadian Journal of Public Health* 83: 7–11.
- Bouça-Machado R, Rosário A, Caldeira D, Castro Caldas A, Guerreiro D, Venturelli M, Tinazzi M, Schena F, Ferreira JJ 2020 Physical activity, exercise, and physiotherapy in Parkinson's disease: Defining the concepts. *Movement Disorders Clinical Practice* 7(1): 7–15. doi:10.1002/mdc3.12849.
- Bryant MS, Rintala DH, Hou JG, Protas EJ 2015 Relationship of falls and fear of falling to activity limitations and physical inactivity in Parkinson's disease. *Journal of Aging and Physical Activity* 23(2): 187–193. doi:10.1123/japa.2013-0244.
- Choi K, Jeon GS, Cho SI 2017 Prospective study on the impact of fear of falling on functional decline among community dwelling elderly women. *International Journal of Environmental Research and Public Health* 14(5): 469. doi:10.3390/ijerph14050469.
- Clarke CE, Patel S, Ives N, Rick CE, Woolley R, Wheatley K, Walker M, Zhu S, Kandiyali R, Yao G, et al. 2016 Clinical effectiveness and cost-effectiveness of physiotherapy and occupational therapy versus no therapy in mild to moderate

- Parkinson's disease: A large pragmatic randomised controlled trial (PD REHAB). *Health Technology Assessment* 20(63): 1–96. doi:10.3310/hta20630.
- Debù B, De Oliveira Godeiro C, Lino JC, Moro E 2018 Managing gait, balance, and posture in Parkinson's disease. *Current Neurology and Neuroscience Reports* 18(5): 23. doi:10.1007/s11910-018-0828-4.
- Erim P 2019 Effect of kinesiophobia on functional level and quality of life in multipl Skleroz. Master Thesis, Ondokuz Mayıs University.
- Fahn S, Elton RL 1987. Members of the UPDRS development committee 1987 Unified Parkinson's disease rating scale. In: Fahn S, Marsden CD, Goldstein M, and Calne DB (Eds) *Recent developments in Parkinson's disease* (2nd ed), p. 153–163. Florham Park, NJ: MacMillan Healthcare Information.
- Ghielen I, van Den Heuvel OA, de Goede CJ, Houniet-de Gier M, Collette EH, Burgers-Bots IA, Rutten S, Kwakkel G, Vermunt K, van Vliet B, et al. 2015 BEWARE: Body awareness training in the treatment of wearing-off related anxiety in patients with Parkinson's disease: Study protocol for a randomized controlled trial. *Trials* 16(1): 283. doi:10.1186/s13063-015-0804-0.
- Giladi N, Balash Y 2006 The clinical approach to gait disturbances in Parkinson's disease; maintaining independent mobility. *Journal of Neural Transmission Supplement* 70: 327–332.
- Haertner L, Elshehabi M, Zaunbrecher L, Pham MH, Maetzler C, van Uem JM, Hobert MA, Hucker S, Nussbaum S, Berg D, et al. 2018 Effect of fear of falling on turning performance in Parkinson's disease in the lab and at home. *Frontiers in Aging Neuroscience* 10(5): 78. doi:10.3389/fnagi.2018.00078.
- Hoehn M, Yahr M 1967 Parkinsonism: Onset, progression, and mortality. *Neurology* 17(5): 427–442. doi:10.1212/WNL.17.5.427.
- Ishak NA, Zahari Z, Justine M 2017 Kinesiophobia, pain, muscle functions, and functional performances among older persons with low back pain. *Pain Research and Treatment* 2017: 3489617. doi:10.1155/2017/3489617.
- Jiménez-Cebrián AM, De-Bengoa-Vallejo R, Losa-Iglesias ME, de Labra C, Calvo-Lobo C, Palomo-López P, Martínez-Jiménez EM, Navarro-Flores E 2021 Kinesiophobia levels in patients with Parkinson's disease: A case-control investigation. *International Journal of Environmental Research and Public Health* 18(9):4791. doi:10.3390/ijerph18094791.
- Jonasson SB, Nilsson MH, Lexell J, Carlsson G 2018 Experiences of fear of falling in persons with Parkinson's disease – A qualitative study. *BMC Geriatrics* 18: 44. doi:10.1186/s12877-018-0735-1.
- Julien CL, Rimes KA, Brown RG 2016 Rumination and behavioural factors in Parkinson's disease depression. *Journal of Psychosomatic Research* 82: 48–53. doi:10.1016/j.jpsychores.2016.01.008.
- Knapik A, Saulicz E, Gnat R 2011 Kinesiophobia – Introducing a new diagnostic tool. *Journal of Human Kinetics* 28(2011): 25–31. doi:10.2478/v10078-011-0019-8.
- Kori SH, Miller RP, Todd DD 1990 Kinisophobia: A new view of chronic pain behavior. *Pain Management* 3: 35–43.
- Lundberg MK, Styf J, Carlsson SG 2004 A psychometric evaluation of the Tampa Scale for Kinesiophobia – From a physiotherapeutic perspective. *Physiotherapy Theory and Practice* 20: 121–133. doi:10.1080/09593980490453002.
- Mak MK, Pang MY, Mok V 2012 Gait difficulty, postural instability, and muscle weakness are associated with fear of falling in people with Parkinson's disease. *Parkinson's Disease* 2012: 901721. doi:10.1155/2012/901721.
- Mehdizadeh M, Martinez-Martin P, Habibi S, Fereshtehnejad S, Abasi A, Khatoun J, Saneii S, Taghizadeh G 2019 Reliability and validity of fall efficacy scale-international in people with Parkinson's disease during on- and off-drug phases. *Parkinson's Disease* 2019: 6505232.
- Monticone M, Ferrante S, Ambrosini E, Rocca B, Secci C, Foti C 2015 Development of the Tampa scale of kinesiophobia for Parkinson's disease: Confirmatory factor analysis, reliability, validity and sensitivity to change. *International Journal of Rehabilitation Research* 38(2): 113–120. doi:10.1097/MRR.0000000000000095.
- Nilsson MH, Jonasson SB, Zijlstra GA 2020 Predictive factors of fall-related activity avoidance in people with Parkinson disease – A longitudinal study with a 3-year follow-up. *Journal of Neurologic Physical Therapy* 44(3): 188–194. doi:10.1097/NPT.0000000000000316.
- Poewe W, Mahlknecht P 2009 The clinical progression of Parkinson's disease. *Parkinsonism and Related Disorders* 15: 28–32. doi:10.1016/S1353-8020(09)70831-4.
- Portney LG, Watkins MP 2000 *Foundations of clinical research: Applications to practice* (2nd ed). Upper Saddle River: Prentice Hall Health.
- Rahman S, Griffin HJ, Quinn NP, Jahanshahi M 2011 On the nature of fear of falling in Parkinson's disease. *Behavioural Neurology* 24(3): 219–228. doi:10.1155/2011/274539.
- Rasinaho M, Hirvensalo M, Leinonen R, Lintunen T, Rantanen T 2007 Motives for and barriers to physical activity among older adults with mobility limitations. *Journal of Aging and Physical Activity* 15(1): 90–102. doi:10.1123/japa.15.1.90.
- Scheffer AC, Schuurmans MJ, vanDijk N, van der Hooft T, de Rooij SE 2010 Reliability and validity of the visual analogue scale for fear of falling in older persons. *Journal of the American Geriatrics Society* 58: 2228–2230.
- Schoene D, Heller C, Aung YN, Sieber CC, Kemmler W, Freiberger E 2019 A systematic review on the influence of fear of falling on quality of life in older people: Is there a role for falls? *Clinical Interventions in Aging* 14: 701–719.
- Steffen T, Seney M 2008 Test-retest reliability and minimal detectable change on balance and ambulation tests, the 36-item short-form health survey, and the Unified

- Parkinson disease rating scale in people with Parkinsonism. *Physical Therapy* 88(6): 733–746. doi:[10.2522/ptj.20070214](https://doi.org/10.2522/ptj.20070214).
- Thomas AA, Rogers JM, Amick MM, Friedman JH 2010 Falls and the falls efficacy scale in Parkinson's disease. *Journal of Neurology* 257(7): 1124–1128. doi:[10.1007/s00415-010-5475-x](https://doi.org/10.1007/s00415-010-5475-x).
- Tinetti ME, Richman D, Powell L 1990 Falls efficacy as a measure of fear of falling. *Journal of Gerontology* 45(6): 239–243. doi:[10.1093/geronj/45.6.P239](https://doi.org/10.1093/geronj/45.6.P239).
- Tomioka K, Iwamoto J, Saeki K, Okamoto N 2011 Reliability and validity of the International Physical Activity Questionnaire (IPAQ) in elderly adults: The Fujiwara-Kyo Study. *Journal of Epidemiology* 21(6): 459–465. doi:[10.2188/jea.JE20110003](https://doi.org/10.2188/jea.JE20110003).
- Vlaeyen JW, Kole-Snijders AM, Boeren RG, van Eek H, van Eek H 1995 Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. *Pain* 62(3): 363–372. doi:[10.1016/0304-3959\(94\)00279-N](https://doi.org/10.1016/0304-3959(94)00279-N).