

Investigation of the Relationship Between Kinesiophobia, Physical Activity Level and Functionality in Young Adults with Pes Planus

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Abstract

Pes planus (PP) is a common condition among young adults and is often associated with musculoskeletal pain. Individuals with PP may also exhibit low physical activity levels, reduced functionality, and kinesiophobia. The aim of this study was to investigate the relationship between physical activity level, kinesiophobia, and functionality in young adults aged 18–24 years diagnosed with PP. A total of 112 participants were included in the study. Demographic data were recorded. The severity of PP was assessed using the Feiss Line method, physical activity level using the International Physical Activity Questionnaire (IPAQ), kinesiophobia using the Tampa Kinesiophobia Scale, and functionality using the Foot Function Index. No significant relationship was found between physical activity level and kinesiophobia ($p=0.956$) or functionality ($p=0.486$). However, a significant positive relationship was observed between kinesiophobia and loss of functionality ($p<0.001$). Although physical activity level was not associated with either kinesiophobia or functionality in young adults with PP, increased kinesiophobia was strongly linked to decreased foot function. These findings highlight the importance of targeting fear of movement as a modifiable psychological factor to prevent functional deterioration and improve outcomes in this population.

Keywords: Pes planus, physical activity, kinesiophobia, functionality.

Pes Planus Tanılı Genç Yetişkinlerde Kinezyofobi, Fiziksel Aktivite Düzeyi ve Fonksiyonellik Arasındaki İlişkinin İncelenmesi

Özet

Pes planus (PP), genç yetişkinler arasında yaygın bir durumdur ve genellikle kas-iskelet sistemi ağrıları ile ilişkilidir. PP tanısı konan bireylerde düşük fiziksel aktivite düzeyi, azalmış fonksiyonellik ve kinezyofobi (hareket korkusu) da görülebilir. Bu çalışmanın amacı, 18–24 yaş arasındaki genç yetişkinlerde PP tanısı almış bireylerde fiziksel aktivite düzeyi, kinezyofobi ve fonksiyonellik arasındaki ilişkiyi araştırmaktır. Çalışmaya toplam 112 katılımcı dahil edilmiştir. Demografik veriler kaydedilmiştir. PP şiddeti, Feiss çizgisi yöntemi ile fiziksel aktivite düzeyi Uluslararası

Fiziksel Aktivite Anketi (IPAQ) ile, kinezyofobi Tampa Kinezyofobi Ölçeđi ile, fonksiyonellik ise Ayak Fonksiyon İndeksi ile deđerlendirilmiřtir. Fiziksel aktivite düzeyi ile kinezyofobi ($p=0,956$) veya fonksiyonellik ($p=0,0486$) arasında anlamlı bir iliřki bulunmamıřtır. Ancak kinezyofobi ile fonksiyon kaybı arasında anlamlı pozitif bir iliřki gözlenmiřtir ($p<0,001$). PP tanılı genç yetiřkinlerde fiziksel aktivite düzeyinin kinezyofobi ve fonksiyonellikle iliřkili olmamasına rađmen artan kinezyofobinin ayak fonksiyonunda belirgin bir azalmayla güçlü řekilde bađlantılı olduđu görülmüřtür. Bu bulgular, hareket korkusunun modifiye edilebilir bir psikolojik faktör olarak hedef alınmasının, fonksiyonel bozuklukları önleme ve bu popülasyondaki sonuçları iyileřtirme ađısından önemini vurgulamaktadır.

Anahtar Kelimeler: Pes planus, fiziksel aktivite, kinezyofobi, fonksiyonellik.

INTRODUCTION

Pes planus (PP) is a prevalent foot deformity among young adults (1). PP can cause postural abnormalities, impaired balance, fatigue, and pain. These issues negatively affect daily functioning (26). Increasing severity of PP has been linked to higher risks of functional limitations and disability (36). Various factors including musculoskeletal disorders, age, sex, and overweight status contribute to the development of PP (22). Clinically, PP is categorized into flexible and rigid types. In flexible PP, the height of the navicular bone—the apex of the medial longitudinal arch (MLA)—varies under weight-bearing conditions, whereas in rigid PP, such variability is absent (23).

Beyond structural alterations, recent research has increasingly focused on the psychological sequelae of PP. Notably, kinesiophobia, defined as the fear of movement, has garnered attention (37). This fear manifests as avoidance or reluctance toward physical activities and can negatively impact not only psychological well-being but also the functional utilization of the foot (29). Diminished foot function can disrupt proper weight transfer during gait and other movements (28). Studies have demonstrated associations between reduced physical activity and compromised foot functionality (10, 16).

While most PP-related investigations have prioritized physical parameters such as pain, balance, joint range of motion, and agility, research on the psychological determinants influencing PP remains scarce (12). However, psychological status is strongly intertwined with physical activity levels; decreased activity can precipitate muscle weakness, balance deficits, and functional decline, thereby adversely affecting foot health (34).

This study aims to comprehensively examine the interaction between kinesiophobia, physical activity, and functional foot capacity in young adults diagnosed with flexible pes planus. By addressing both the physical and psychological dimensions of the condition, it seeks to fill a significant gap in the current literature, which has predominantly focused on biomechanical factors while often overlooking psychosocial determinants. Clarifying these relationships will not only enhance the understanding of impairments associated with PP but also guide the development of personalized, targeted, and multidisciplinary rehabilitation strategies.

METHOD

This study was designed as a cross-sectional observational study. Volunteer participants were selected using a convenience sampling method from associate degree students enrolled at Kırřehir Ahi Evran University Vocational School of Health Services between February and April 2025. Eligibility for participation was determined based on predefined inclusion and exclusion criteria. A total of 112 students who had been diagnosed with flexible PP by a physician were included in the sample. Inclusion criteria were being between 18 and 24 years of age, having a diagnosis of flexible PP, and having no other foot-related conditions that could potentially affect gait or functional outcomes. Participants with metabolic diseases that could impact movement or a history of fractures were excluded from the study.

Assessment Tools and Procedures

Clinical assessments were performed by a physiotherapist, while participants' responses to the other questionnaires were completed under the supervision of the researchers.

Sociodemographic Data: The personal information of the students participating in the study, including gender, age, height, body weight, and place of residence, was recorded.

Pes Planus Assessment: The Feiss line method was used to establish the diagnosis of PP and to determine its severity. The Feiss line is defined as a line extending between the first metatarsophalangeal joint and the medial malleolus. In a healthy individual, the navicular bone is expected to be located on this line. The assessment was conducted based on the procedure described by Aydoğdu et al (3). Participants who exhibited a drop in the navicular tubercle after weight-bearing on a firm surface compared to the non-weight-bearing condition were classified as having flexible PP (6).

Physical Activity: The IPAQ test was used to assess the physical activity levels of the participants. They were informed to base their responses on activities performed within the past week. The results were expressed as the total MET value calculated according to the intensity of the activities (9). The Turkish validity and reliability of the IPAQ were established by Sağlam et al (30).

Kinesiophobia: The Tampa Scale for Kinesiophobia (TSK) was used to measure participants' levels of kinesiophobia. The scale consists of 17 items, each rated on a scale from 1 to 4. An increase in the total score is interpreted as a greater fear of injury during movement. It is used to assess kinesiophobia in foot injuries and deformities. The Turkish validity and reliability of the TSK were established by Yılmaz et al. (36)

Foot Functionality: The Foot Function Index (FFI) was used to determine the level of foot functionality. The index consists of 23 questions assessing pain, disability, and activity limitations. Higher scores on the index indicate a decrease in functional capacity. The FFI is a tool commonly used in clinical settings to evaluate foot injuries (8). The Turkish validity and reliability of the FFI were established by Külünkoğlu et al. (18).

Statistical Analysis

Data analysis was carried out using SPSS version 22.0. Normally distributed variables are presented as mean ± standard deviation, while non-normally distributed variables are presented as median and interquartile range. The Shapiro-Wilk test was used to assess normality. Categorical data are presented as percentages. Pearson correlation analysis was conducted to evaluate the relationships between physical activity, kinesiophobia, and foot functionality. A significance level of $p < 0.05$ was set for all analyses. The effects of the parameters on one another were evaluated using multiple linear regression analysis.

Ethical approval and institutional permission

Ethical approval for the study was granted by the Scientific Research Ethics Committee of Kırşehir Ahi Evran University, Faculty of Health Sciences (Decision No: 2025-03/31; Date: 04.02.2025). All participants provided both written and verbal informed consent prior to enrolment in the study.

FINDINGS

Table 1. Descriptive characteristics of the participants

Variables	Category	N	Mean ± SD/%
Age (years)	-	112	19.43± 1.34
Height (cm)	-	112	159.10± 31.62
Weight (kg)	-	112	64.55± 15.08
Gender	Male	86	76.8
	Female	26	23.2
	Total	112	100.0
BMI (kg/m ²)	Underweight	12	10.7
	Normal	62	55.4
	Overweight	24	21.4
	Obese	14	12.5
	Total	112	100.0
Pes planus degree	Grade 1	52	46.4
	Grade2	45	40.2
	Grade3	15	13.4
	Total	112	100.0

Based on the descriptive data, the majority of the participants were female (76.8%), of normal weight (55.4%), and had Grade 1 pes planus (46.4%) [Table 1].

Table 2. Effects of gender on physical activity level, kinesiophobia and functioning

Variables	Gender	N	X	Ss	t	df	p
Physical activity	Female	86	2556.15	1899.91	-0.370	110	0.369
	Male	26	2734.54	2855.93			
Kinesiophobia	Female	86	15.65	8.052	-1.030	110	0.440
	Male	26	17.62	9.956			
Functionality level	Female	86	29.74	28.89	0.581	110	0.066
	Male	26	25.69	37.86			

X: Mean; Ss: Standard deviation; t: Independent samples t-test value; df: Degrees of freedom; p: Significance level. *p < 0.05.

There were no statistically significant gender-based differences in physical activity level, kinesiophobia, or functional scores [Table 2].

Table 3. Effects of place of residence on physical activity level, kinesiophobia and functioning

Variables	Place of residence	N	X	Ss	t	sd	p
Physical activity	Dorm	86	2796.81	2315.453	1.805	110	0.165
	Home	26	1938.50	1279.796			
Kinesiophobia	Dorm	86	16.49	7.634	0.860	110	0.392
	Home	26	14.85	11.062			
Functionality level	Dorm	86	29.21	29.265	0.250	110	0.803
	Home	26	27.46	37.022			

X: Mean; Ss: Standard deviation; t: Independent samples t-test value; df: Degrees of freedom; p: Significance level. *p < 0.05.

Similarly, when comparing these variables based on participants' living environments, no significant differences were observed [Table 3]. This finding indicates that living environment does not have a significant effect on the physical activity level, functionality, or kinesiophobia in young individuals with pes planus.

Table 4. The relationship between physical activity level and kinesiophobia and functionality

Variables	Physical activity	Kinesiophobia	Functionality level
Physical activity	r	1	-0.006
	r ²		0.000036
	p		0.956
Kinesiophobia	r	1	-0.352
	r ²		0.12390
	p		<.001*
Functionality level	r		1
	r ²		-

*p < 0.05; r: Pearson correlation coefficient; r²: coefficient of determination

Although physical activity level was not significantly correlated with kinesiophobia (r = -0.006, p = 0.956) or foot function (r = 0.075, p = 0.486), a moderate and meaningful negative correlation emerged between kinesiophobia and functionality (r = -0.352, p < 0.001), indicating that increased fear of movement may compromise the functional use of the foot. When the effect sizes of the parameters were examined, the relationship between kinesiophobia and functionality level showed a moderate effect size (r² = 0.12390), whereas the relationships involving physical activity demonstrated negligible (r² = 0.000036) and small effect sizes (r² = 0.00562), respectively [Table 4].

Table 5. Multiple linear regression analysis for factors associated with kinesiophobia

Dependent variable	Independent variables	b	SE	95% CI (Lower)	95% CI (Upper)	β	t	p	Tolerance	VIF	CI
	Constant	17.462	1.404	14.680	20.245	-	12.440	<0.001	-	-	1.000
Kinesiophobia	BMI	1.757	0.000	0.000	0.000	0.077	1.233	0.220	0.998	1.002	1.643
	Functionality level	0.062	0.018	0.028	0.097	0.227	3.555	<0.001	0.963	1.038	2.579
	Pes planus degree	8.220	0.775	6.684	9.756	0.677	10.608	<0.001	0.964	1.038	5.764

b: Unstandardized coefficient; SE: Standard error; β : Standardized coefficient; CI: Confidence interval; VIF: Variance inflation factor.

$F(3, 108) = 48.847, p < 0.001$; Adj. $R^2 = 0.564$; Durbin-Watson = 2.080

A multiple linear regression analysis was performed to examine the effects of BMI, functionality, and PP severity on kinesiophobia. When the table was examined, the established regression model was found to be statistically significant ($F(3, 108) = 48.847, p < 0.001$), and the independent variables of functionality and BMI explained 56.4% of the variance in kinesiophobia (Adj. $R^2 = 0.564$). According to the results, the factors contributing to increased kinesiophobia were,

respectively, increased PP severity ($\beta = 0.677, p < 0.001$) and decreased foot functionality ($\beta = 0.227, p < 0.001$). BMI, which was another factor examined, was found to have no statistically significant effect on increased kinesiophobia ($\beta = 0.077, p = 0.220$) [Table 5].

DISCUSSION AND CONCLUSION

The results of this study showed that there was no statistically significant relationship between physical activity level and kinesiophobia or functional status. In addition, gender and living environment did not have a statistically significant effect on the probability of PP occurrence.

Differences in gender, excess weight, genetic, and environmental factors are effective in the prevalence of PP (31, 14). Individuals with PP may experience many physical and psychological problems in daily life (5). When the prevalence of PP is examined, it has been observed that the majority consists of women (29, 32). Similarly, in our study, the majority of participants were women. This situation can be explained by the fact that men have a stronger musculoskeletal structure compared to women. In individuals with PP, physical activity level, kinesiophobia, and foot functionality level were used to compare the levels of physical and psychological impact between women, who constituted the majority, and men. In their study, Joanna et al. reported that women were physically less active and exhibited higher levels of kinesiophobia compared to men (4). As a result of our study, no significant difference was found according to gender. This result may have been influenced by differences in individuals' daily life habits, economic status, and genetic differences. One of the factors effective in the development of PP is environmental differences. Therefore, in our study, to evaluate this factor, comparisons were made according to the participants' living environments, and it was found that staying at home or in a dormitory did not have a significant effect on physical activity, kinesiophobia, or functionality. The lack of difference may be due to the fact that not all dormitories and houses have the same facilities and differences in group distributions.

The physical and psychological problems experienced by individuals with PP may affect each other. Studies have reported that PP is an important risk factor for physical injury and that increased injury risk leads to an increase in the tendency toward kinesiophobia (6,7). In separate studies conducted by Tajdini and Yıldız, the presence of kinesiophobia in individuals with PP was reported (35,37). Increased levels of kinesiophobia in individuals diagnosed with PP can be explained by a high fear tendency that develops in relation to long-term pain complaints and increased risk of injury. It has also been suggested that this condition may be associated with reductions in prefrontal cortex volume (27). Current studies show a relationship between low physical activity levels and high levels of kinesiophobia (34). Similarly, Aydemir et al. found a positive relationship between kinesiophobia and decreased physical activity levels in patients with osteoarthritis (2). However, in the present study, unlike the literature, no significant relationship was found between physical activity and kinesiophobia. This finding may be attributed to the presence of environmental factors that can

negatively affect physical activity levels (24) and to the high muscle strength of the young individuals who constituted the study sample. Young individuals may be able to maintain their physical activities even in the presence of kinesiophobia, and the level of fear may not have reached a level that would significantly restrict activity.

In addition to being associated with physical activity, kinesiophobia is also an important factor affecting functional status. Studies conducted in individuals with rheumatic diseases have shown that high levels of kinesiophobia are associated with decreased functionality (17, 36). The findings of the present study are consistent with previous research and reveal that decreased foot function is associated with increased kinesiophobia. This relationship can be explained by impairments in the processing of sensory inputs due to kinesiophobia, which negatively affect the goal-directed functional use of the foot (25).

Physical activity is one of the main factors affecting functionality. Lopez et al. reported a significant relationship between physical activity and functional capacity (19). However, in the present study, no statistically significant relationship was found, and the effect size of the relationship was small. This may be explained by the young age of the participants. Young individuals with PP may be able to compensate for the increased energy demands during movement thanks to their higher maximal oxygen consumption capacities (15). This physiological advantage may explain why PP did not have a significant effect on physical activity levels in our sample. In addition, physical activity level is determined by many factors, and foot functionality may not have shown a dominant or determining effect compared to other factors.

As a result of the study, a significant relationship was found between kinesiophobia and functional level. When factors other than functionality affecting kinesiophobia were examined, it was found that an increase in PP severity also negatively affected kinesiophobia. Ferdia et al. concluded in their study that impairments in foot arches increase the risk of injury (11). It can be suggested that the increased risk of injury may also play a role in the development of kinesiophobia. The lack of effect of increased weight on kinesiophobia may be due to the fact that most participants were of normal weight and that the strong muscle structure of young individuals increases self-confidence during movement.

In conclusion, although physical activity level was not associated with kinesiophobia or functionality in the presence of flexible PP in young adults, increased fear of movement was found to be associated with decreased foot functionality. This finding emphasizes the importance of considering the interaction between kinesiophobia and foot function in the clinical management of PP. Data obtained from such evaluations may contribute to the development of individualized and holistic rehabilitation programs not only for young adults but also especially during childhood, a period in which PP is very common (33).

Limitations

Following the completion of the study, several limitations were identified. Larger sample sizes are needed to enable more comprehensive assessments and to diversify the range of evaluable parameters. The extent to which young adults diagnosed with PP are affected by this condition was not examined in detail using a broader set of parameters. The unequal distribution of participants according to living environment and gender may have influenced the findings. Additionally, seasonal variations during the data collection period may have affected participants' responses, particularly with respect to reported physical activity levels.

Clinical Recommendations

The absence of a significant relationship between physical activity and kinesiophobia and functionality shows us that physical activity is a complex structure and can be influenced by many factors. Therefore, instead of stating that individuals with high physical activity levels do not have kinesiophobia or functional insufficiency, preventive measures should be taken regarding the risk of possible future development. In addition, the relationship between decreased foot functionality and increased PP severity with kinesiophobia indicates that physical and psychological effects may be observed together in individuals with PP.

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