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Original Research Article

Relationship among Kinesiophobia, Physical Function and Dynamic Balance in Patients with Lower Limb Pathologies

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Abstract: ***Background*:** Kinesiophobia can significantly impact physical function and dynamic balance in patients with lower limb pathologies. Understanding the relationships between these variables is crucial for developing effective rehabilitation strategies. ***Objective*:** The aim of this study was to assess the relationship among kinesiophobia, physical function, and dynamic balance in patients with lower limb pathologies. ***Method*:** 114 participants with lower limb pathologies, were recruited for the Cross-sectional survey study. The variables were assessed using the Tampa Scale for Kinesiophobia (TSK), WOMAC scale, and standardized balance assessment tools (TUG test) respectively. Descriptive and Inferential statistics of Pearson's Correlation coefficiency were used to analyse the data obtained. ***Results*:** Descriptives of the population (age and gender) were done using the mean score for Kinesiophobia on the Tampa Scale. Mean score for kinesophobia on the Tampa scale was 40.40 +/- 7.78. Physical function of the patients on WOMAC scale was 47.53 +/- 18.49 while the dynamic balance 32.93 +/- 42.80 Seconds. There was significant correlation between age and physical function ($r = 0.34$, $p = 0.001$). There was also significant correlation between kinesophobia and physical function of the patients with lower limb pathologies ($r = 0.21$, $p = 0.03$) and dynamic balance ($r = 0.22$, $p = 0.03$). ***Conclusion*:** Patients with lower limb pathologies had high level of kinesiophobia, moderate to severe limitations in physical functions, and significant limitations in dynamic balance. Also, higher kinesiophobia scores were associated with lower physical function. Age had significant correlation with physical function but not with kinesiophobia and dynamic balance.

Keywords: Kinesiophobia, Physical Function, Dynamic Balance, Lower Limb Pathologies, Rehabilitation.

INTRODUCTION

Lower limb pathologies are a leading cause of disability and impaired quality of life worldwide [1]. The consequences of these conditions extend beyond physical dysfunction, as they can also have a profound impact on an individual's psychological and emotional well-being [2]. Kinesiophobia, or the fear of movement, is a common psychological response to chronic pain and injury, which can exacerbate physical dysfunction and disability [3].

Kinesiophobia is a condition characterized by an excessive and irrational fear of movement, which can lead to avoidance behaviors and decreased physical activity [4]. In patients with lower limb pathologies, kinesiophobia can be triggered by the fear of exacerbating pain, injury, or disability [5]. The Tampa Scale for Kinesiophobia (TSK) is a widely used self-report questionnaire that assesses an individual's fear of movement and avoidance behaviors [6].

Physical function refers to an individual's ability to perform daily activities and tasks, such as walking, climbing stairs, and rising from a chair [7]. In patients with lower limb pathologies, physical function can be significantly impaired due to pain, weakness, and limited range of motion [8, 9]. The Western Ontario and

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McMaster Universities Osteoarthritis Index (WOMAC) is a widely used self-report questionnaire that assesses an individual's physical function, pain, and stiffness [10].

Dynamic balance refers to an individual's ability to maintain balance and control while moving or performing physical activities [11]. In patients with lower limb pathologies, dynamic balance can be significantly impaired due to weakness, limited range of motion, and decreased proprioception [12]. The Berg Balance Scale (BBS) is a widely used clinical assessment tool that evaluates an individual's balance and risk of falling [13].

Research suggests that kinesiophobia, physical function, and dynamic balance are interrelated in patients with lower limb pathologies. Kinesiophobia can lead to avoidance behaviors and decreased physical activity, which can exacerbate physical dysfunction and disability [14]. Decreased physical function can, in turn, contribute to decreased dynamic balance and increased risk of falling [15]. Also, the Timed Up and Go test is also used to evaluate the risk of falling [16].

The fear-avoidance model of musculoskeletal pain proposes that kinesiophobia is a key factor in the development and maintenance of chronic pain and disability [17]. According to this model, kinesiophobia leads to avoidance behaviors and decreased physical activity, which can exacerbate physical dysfunction and disability [14].

Numerous studies have investigated the relationship among kinesiophobia, physical function, and dynamic balance in patients with lower limb pathologies. A systematic review found that kinesiophobia was significantly associated with decreased physical function and dynamic balance in patients with osteoarthritis. Another study found that kinesiophobia was a significant predictor of falls in patients with total knee replacements. [14].

Kinesiophobia, physical function, and dynamic balance are interrelated in patients with lower limb pathologies [18]. Kinesiophobia can lead to avoidance behaviors and decreased physical activity, which can exacerbate physical dysfunction and disability [19]. Further research is needed to fully understand the relationship among kinesiophobia, physical function, and dynamic balance in patients with lower limb pathologies.

This study aims to explore the complex relationship among kinesiophobia, physical function, and dynamic balance in patients with lower limb pathologies.

METHODOLOGY

Participants:

The study recruited participants/patients with lower limb pathologies who were not presently active; either with no ambulation at all or minimally, aged 18-80 years, from orthopaedic and physiotherapy clinics of tertiary health institutions in Rivers State (Rivers State University Teaching Hospital and University of Port Harcourt Teaching Hospital).

Inclusion Criteria:

The inclusion criteria were 114 patients who were either managed conservatively or have had some form of surgery on the lower limb due to some pathology (eg Osteoarthritis, Sprain and Fractures). Age range for this study were 18 to 80 years who were also mentally active to be able to give answers to the questions on the questionnaire and give consent for the research.

Exclusion Criteria:

Children with lower limb pathologies were excluded as they were not able to give answers to questions on the questionnaire, and not allowed to give consent.

Also, the mentally ill will be excluded even if they have lower limb pathologies.

Site of the Study:

This study was carried out at the Orthopaedic and Physiotherapy clinics of both tertiary health institutions in Rivers State (Rivers State University Teaching Hospital and University of Port Harcourt Teaching Hospital).

Instruments

i. Tampa Scale for Kinesiophobia (TSK) which is a 17-item questionnaire assessing fear of movement and activity (Appendix I)
ii. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) which is a 24-item questionnaire assessing pain, stiffness, and functional ability (Appendix II)
iii. Timed Up and Go (TUG) test which is a standardized test assessing mobility and balance. (Appendix III)

Research Design:

This study employed a quantitative approach, cross-sectional design. A Cross-sectional design allowed for the collection of data from a sample of participants at a single point in time.

Sampling Technique:

The sampling technique for the study was a non-probability, convenience sampling method. Participants were recruited from the orthopaedic and physiotherapy clinics of Rivers State University Teaching Hospital and University of Port Harcourt Teaching Hospital based on the inclusion criteria.

Determination of Sample Size:

The sample size for this study was determined using a Power Analysis. A Power Analysis is a statistical method used to determine the required sample size to detect a statistically significant effect. To determine the sample size, the following parameters were used;

i. Alpha level: 0.05
ii. Power: 0.8
iii. Effect size: 0.3 (Medium Effect Size)

Using a Power analysis software (e.g G*Power), the required sample size was calculated. Based on the parameters above, a sample size of approximately 100 participants is expected to be sufficient to detect a statistically significant effect.

Procedure:

Firstly, letter of ethical approval was obtained from the Rivers State University Teaching Hospital with No. RSUTH/REC/2024679 and then two (2) young physiotherapists with Bachelors of Medical Rehabilitation (BMR) and three years of practice were trained in the data collection procedure as assistants to ease the work load on the researcher and to meet up with the timelines required to conclude the research. The researchers and their assistants recruited participants from the othorpaedic and physiotherapy clinics of Rivers State University Teaching Hospital and University of Port Harcourt Teaching Hospital through flyers, posters, announcements and health promotion. Secondly, potential participants were screened for eligibility based on the inclusion criteria.

The next step was that the eligible participants were provided with an informed consent form which explained the purpose, risks and benefits (if any) of the study. The participants completed 3 questionnaires, namely: Tampa Scale for Kinesiophobia (TSK) which is a 17-item questionnaire assessing fear of movement and activity [6]; Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) which is a 24-item questionnaire assessing pain, stiffness, and functional ability [20], and Timed Up and Go (TUG) test which is a standardized test assessing mobility and balance [21].

Data Analysis:

Data collected from the questionnaire was analysed using descriptive and inferential statistics. Description Statistics was used to summarize the demographic characteristics of the participants while Inferential Statistics of Pearson's correlation co-efficient was used to determine the relationships among kinesiophobia, physical function and dynamic balance.

RESULT

The mean score for kinesiophobia on the Tampa scale was 40.40 ± 7.78. The minimum score was 6.0 and the maximum was 70.0. The Physical function of the patients on WOMAC scale was 47.53 ± 18.49 while the dynamic balance 32.93 ± 42.80 Seconds. Other details of the Kinesiophobia, Physical functions and Dynamic Balance are presented in Table 3.

Table i: Age, Sociodemographic and Clinical Data of the Patients

	F	%
Gender		
Male	54	47.3
Female	60	52.6
Qualifications		
University	74	64.9
Secondary	26	22.8
Primary	14	12.3
Occupation		
Civil servant	42	37.2
Technical	5	4.4
Construction	8	7.1
Transportation	2	1.8
Others	55	48.7
Walking Aids (N=108)		
Usage	53	49.1
Non usage	55	50.9
Type of walking Aids (N= 81)		
Crutches	31	38.2
Zimmer's Frame	22	27.2
Walking Stick	28	34.6
Previous Surgery		
Yes (N= 109)	53	48.6
No	56	51.4

Table ii: Frequency Distribution of Lower Limb Pathologies

Pathologies	F	%
Below Knee Amputation secondary to Trauma	2	4.4
Flat feet	1	2.2
Fracture in the lower limbs	5	11.1
Paraperesis secondary to Gullain Barren Syndrome	1	2.2
Hip dislocation	2	4.4
Genu Valgum	1	2.2
Knee OA	7	15.6
Lumbar Radiculopathy	15	33.3
Limb Length Discrepancy	1	2.2
Hip OA	3	6.6
Knee OA	1	2.2
Ankle Sprain	3	6.7
Paraparesis secondary to TBI	3	6.6
Non-specific lower limb pathology	69	60.5

Table iii: Kinesophobia, Physical Functions and Dynamic Balance of the Patients

	F	Minimum	Maximum	Mean	Std. Deviation
Kinesophobia	114	6.00	70.00	40.39	7.78
Physical Function	114	23.96	101.04	47.53	18.48
Dynamic Balance (Seconds)	99	.00	330.00	32.93	42.80

Table iv: Relationship among Age, Kinesiophobia, Physical Functions and Dynamic Balance

		AGE	Kinesophobia	Physical Function	Dynamic Balance
Age	r	**1**			
	p				
	N	114			
Kinesophobia	r	-.002	1		
	p	.984			
	N	114	114		
Physical Function	r	.337**	.208*	1	
	p	.000	.026		
	N	114	114	114	99
Dynamic Balance	r	.112	.014	.215*	1
	p	.269	.889	.032	
	N	99	99	99	99

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results of the Pearson's Correlation Co-efficiency showed that there was significant correlation between age and physical function (r = 0.34, p = 0.001). There was also significant correlation between kinesiophobia and physical function of the patients with lower limb pathologies (r = 0.21, p = 0.03) and dynamic balance (r = 0.22, p = 0.03), (Table iv). The result of the multiple regression analysis showed that age was a significant predictor of physical function only (F = 14.39, Pp = 0.001), (Table 4).

Table v: The Result of Analysis of Variance on Prediction of Kinesiophobia using Age

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	P
1	Regression	4247.637	1	4247.637	14.394	.0001
	Residual	33051.801	112	295.105		
	Total	37299.439	113			
a. Dependent Variable: AGE						
b. Predictors: (Constant), KINESOPHOBIA						

DISCUSSION

Kinesiophobia has remained a significant determinant of function and recovery in patients with lower limb pathologies. Its association with other biological markers such as physical function and dynamic balance presents a means for clinicians to assess

and optimize therapeutic interventions and improve prognosis in patients, as it significantly influences rehabilitation outcomes [22]. The mean age of the study participants is consistent with research findings that indicate a higher prevalence of lower limb pathologies in adults and increasing age. This is due to the increased likelihood of degenerative disorders in adults and older adults [23]. As observed in this study, the prevalence of chronic degenerative pathologies such as low back pain and osteoarthritis are indicative of the increased likelihood of age as a predicator of bone and joint health [24].

Epidemiological data of lower limb pathologies obtained from the results of this study reveal a high prevalence of unspecific lower limb pathologies (60.5%). This finding indicates a significant gap in patients' knowledge of their conditions, and the limitation of determining appropriate diagnosis. Determining diagnosis and improving patients' comprehension of their medical conditions is important in achieving high levels of patient-centered care [25]. This approach of care is central to achieving optimal services and improving patients' understanding and participation in their treatments [25]. For the specified diagnosis, difficulty in ambulation associated with low back pain was seen to be the most prevalent type of lower limb pathology. This is consistent with results from other studies that explains chronic low back pain as a key predictor of lower limb functions [26, 27]. Degenerative conditions such as knee OA was also observed in 15.6% of the participants making it one of the common pathologies of the lower limb, and the most prevalent form of osteoarthritis generally [28]. Kinesiophobia has been shown to be associated with lower limb pathologies as patients demonstrate an increased fear of movement due to a psychological fear of increasing pain intensity, which could further affect their dynamic balance and overall physical function [29, 30].

The present study demonstrated results consistent with other research [31, 32] that has examined the levels of kinesiophobia in lower limb pathologies. The mean score for kinesiophobia as recorded by the study participants was 40.39 indicating an above average incident of kinesiophobia associated with lower limb pathologies. The TSK was used to determine the levels of kinesiophobia with higher scores indicating increased levels of fear of movement [33]. Association of kinesiophobia with lower limb pathologies has been linked to various factors such as decreased balance, fear of fall, and an overall reduction in the quality of life of patients [32].

In terms of physical function, participants in this study recorded a mean score of 47.53 indicating moderate to severe functionally impaired levels of physical functioning associated with their pathologies. Physical function (PF) is an important aspect in assessing an individual's overall quality of life. It indicates an ability to carry out basic and instrumental activities of daily living [34]. The average scores of PF in this study show patients with lower limb pathologies may face an affectation in their abilities to carry out daily activities resulting in an overall restriction in optimal quality of life. The average levels of physical functioning recorded in this study are aligned with the common factors associated with a decrease in mobility in patients with lower extremity pathologies. These factors present as either pain, kinesiophobia, chronic diseases, and reduced physical activity due to fear of fall [35, 36].

Dynamic balance was recorded at 32.93 seconds mean time in the study participants. This value represents an above the 30 seconds threshold indicating poor levels of dynamic balance and significant mobility impairments [37]. Patients with lower limb pathologies are known to have reduced dynamic balance. In patients with musculoskeletal pathologies involving the lower limbs, such as knee osteoarthritis, ankle sprains, ligament injuries, and plantar fasciitis, there is an impairment of dynamic balance causing pain, joint stiffness, postural deficits, balance and proprioception deficits, and reduced stability [38, 39]. This could be responsible for the mobility impairments recorded in the study and the use of assistive devices by about half (49.1%) of the study participants. As such, there is a need to optimize intervention approaches to improve mobility in patients with lower limb pathologies.

In the assessment of the correlations between the various constructs and the age of the patients, there was a positive correlation between age and physical function. Not surprisingly, the associated lack of correlation between patient's age and kinesiophobia lends support to the psychological component of fear, irrespective of age, in patients with lower limb pathologies. The biopsychosocial paradigm explains negative psychological factors such as fear to be a key component in contributing to the experience and impact of pain [40]. The pain associated with lower limb pathologies carry not only a sensory component but could also include a cognitive and emotional component that may influence treatment outcomes [41], and thus may lead to a fear of movement to avoid the effect of further pain. Significant patients' factors that show a correlation with kinesiophobia levels in patients with musculoskeletal pathologies are recorded to be exercise habits, pain duration, and history of previous treatment [42]. However, these variables where not included in the present study. The results from this study indicating an association between age and physical functioning are consistent with findings from [43, 44]. Aging impacts PF, leading to a gradual decline in strength, endurance, flexibility, and coordination, which can increase the risk of falls and other health issues [45]. As such, engaging adults in regular physical activities can help mitigate some of the age-related decline in physical function, improving strength, balance, and overall health [43].

This study also found that kinesiophobia was significantly correlated with physical function and dynamic balance. Kinesiophobia is deeply rooted in psychological and emotional factors. Individuals may develop heightened anxiety and fear related to movement, often stemming from previous painful experiences or injuries. This fear can become pervasive, leading to a cycle of avoidance and increased disability which can affect their physical function through reduction in motion [38]. Kinesiophobia is also associated with reduced walking speed, shorter stride length, and increased gait variability [26-46]. These variables are important in achieving appropriate physical function of a person. High levels of kinesiophobia may indicate poor physical function [38].

Dynamic balance also showed a significant association with physical function in participants of this study. Physical function and dynamic balance are known to have correlative results on lower limbs performances. In a study by [47], they report lower limb muscle strength as an important factor in improving both static and dynamic balance in older adults. Dynamic balance is crucial for physical function, closely linked to mobility and allows for effective activities of daily living. With this association, intervention strategies to improve dynamic balance in patients with lower limb pathologies may prove beneficial in achieving appropriate levels of physical function. The aim of these interventions can be to maintain and improve the patients' ability to carry out ADLs without difficulties in movement [48].

Lower limb pathologies often lead to pain, reduced mobility, and impaired balance, affecting daily activities and quality of life of the patients. However, these symptoms can be exacerbated by kinesiophobia which is a psychological condition where patients fear movement due to pain or the possibility of injury, which can lead to reduced physical activity and slower recovery [49]. The effect of kinesiophobia on other patients' recovery factors such as physical function and dynamic balance calls for an understanding of these variables in patients with lower limb pathologies to optimize rehabilitation interventions and outcomes. Therefore, there became an apparent need to investigate this because knowledge of their levels and relationship may help in mitigating the growing levels of their prevalence and easily tackling the problems posed by high levels of kinesiophobia and reduced physical function and dynamic balance. Some studies have explored the relationship between some of the variables; kinesiophobia and physical function [50,51], kinesiophobia and dynamic balance [52, 30] physical function and dynamic balance [47], and kinesiophobia, physical function and dynamic balance [53,54]. However, there exists a limitation in studies exploring all three variables together, particularly in patients with lower limb pathologies. This study fills that literature gap, lends credence to the growing body of evidence around kinesiophobia, and is essential for improving rehabilitation strategies, ensuring that both mental and physical aspects of recovery are addressed for better patient outcomes.

The impact of kinesiophobia in patients with lower limb pathologies remain multifaceted, especially with its association with other variables like dynamic balance and physical function, which are predictive of improved patients' outcomes and treatment prognosis. This study underscores the need for clinicians to consider these variables while assessing and managing patients with lower limb pathologies. The study found evidences that kinesiophobia, poor physical function and dynamic balance still remain prevalent in lower limb pathologies. Addressing the effects of these variables through targeted interventions are essential for improving rehabilitation outcomes and improving the overall quality of life of affected individuals. This study also shows the necessity of the biopsychosocial model in the overall assessment of clinical conditions. Adopting a holistic assessment of a patient beyond their physical symptoms can show other psychological and social dimensions of their overall quality of life. Interventions should aim to address all areas of the model combining rehabilitation techniques with psychological support for optimal patient care.

There were associated high levels of kinesiophobia, moderate to severe levels of functional limitations, and reduced dynamic balance among the study participants. The study also recorded significant associations between age and physical function, kinesiophobia and physical function, and physical function and dynamic balance.

CONCLUSION

1) The participants of the study have high levels of kinesiophobia, moderate to severe impairments in their levels of physical function, and an overall poor dynamic balance.
2) There was significant correlation between the variables including each pair of kinesiophobia and physical function, and physical function and dynamic balance.
3) Age was significantly correlated with physical function but not with kinesiophobia and dynamic balance in patients with lower limb pathologies.
4) Mobility impairments from chronic low back pain and other degenerative musculoskeletal conditions like arthritis are the most prevalent forms of lower limb pathologies among the study participants.
5) Interventions targeted at each variable can improve the outcomes of others based on their associations.

Conflict of Interest: There is no conflict of interest in the conduct of this study.

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Ethical Approval: Ethical approval was granted by the Research Ethics Committee of the Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria (RSUTH/REC/2024679)

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