Multivariate Analysis of Risk Factors Predisposing to Kinesiophobia in Persons With Chronic Low Back and Neck Pain

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Abstract

Objective: The purpose of this study was to analyze the interaction between kinesiophobia and pain-related variables classified according to International Classification of Functioning in individuals with chronic neck and low back pain by using multivariate analysis.

Methods: The 504 persons with chronic neck and low back pain filled out questionnaires assessing impairments in body functions and structures, limitations in activities of daily living, participation, and personal factors. Univariate analyzes were performed to investigate whether there are differences between individuals with and without kinesiophobia or not. Binary logistic regression analysis was used to evaluate whether independent variables were statistically significant predictors.

Results: In the univariate analyses, the persons who had high-level kinesiophobia had a significantly lower level of education and had significantly higher scores for the Million Visual Analogue Scale, Neck Disability Index, Hospital Anxiety and Depression Scale, and Nottingham Health Profile ($P < .001$). In the final logistic regression analysis, only educational level ($P = .01$), Million Visual Analogue Scale ($P = .002$) and Hospital Anxiety and Depression Scale ($P = .008$, $P = .012$) were retained significantly as the predictors of kinesiophobia.

Conclusion: In this group of people with chronic neck and low back pain, educational level, low back pain-associated disability, and emotional states like depression and anxiety were associated with kinesiophobia. (J Manipulative Physiol Ther 2019;42:565-571)

Key Indexing Terms: *Chronic Pain; Fear; Multivariate Analysis; Risk Factors*

Introduction

Kinesiophobia is defined as the fear of a person being misinterpreted by the harmless body senses, including pain, and occurs in 2 processes. First, it arises with avoidance behavior toward pain-related movement and physical activity and even free-time activities. Second, the fear associated with pain occurs in the form of increased body awareness and alertness to pain.[1,2] The presence of kinesiophobia or fear of movement is an important factor in the chronicization of neck and low back pain or other musculoskeletal pain and in the development of long-term inactivity.[3] A nationwide multicenter cohort observational study confirms that kinesiophobia is frequent in neck and low back pain, with a score of defined kinesiophobia in almost 80% of the patients.[4,5]

Clinical diagnosis of kinesiophobia is crucial for the success and efficacy of the treatment program. The Tampa Scale of Kinesiophobia (TSK) has been developed to be used in the clinic environment to objectively determine kinesiophobia in people with prolonged musculoskeletal pain.[6] The TSK is a 17-item questionnaire developed to identify fear of (re)injury owing to movement or activities. The items are scored on a 4-point Likert scale with scoring possibilities ranging from strongly disagree (score = 1) to strongly agree (score = 4). If the TSK is above the cutoff of 37, it indicates high levels of kinesiophobia.[7]

To cope with kinesiophobia, the patient is required to be investigated on the basis of the biopsychosocial approach model. For this, patients' functioning can be described according to the International Classification of Functioning, Disability and Health (ICF), which uses this biopsychosocial model.[8] The ICF has 2 parts, with 2 components each. Part 1 includes the components body functions and

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structures, in addition to activities and participation, and can be described in terms of functioning and disability. Part 2, contextual factors, includes the components environmental and personal factors. Each component is related to the overall health condition of the patient, which forms the basis of the ICF model. Body structures are anatomical parts of the body, such as organs, limbs, and their components. Patients with kinesiophobia may be impaired in how they experience pain. Activity is described as the execution of a task or action by an individual. Patients with pain may be limited in performing activities of daily living. Participation is described as involvement in a life situation, the societal perspective of functioning. Patients with pain may be restricted in daily functioning, such as recreation, sports, or social life, or in participation at work. Personal factors are the particular background of an individual's life and living. In patients with pain, educational level, occupation, age, sex, depression, anxiety, and working duration are personal factors that may influence disability and functioning. Investigating the interaction between kinesiophobia and the pain-related variables classified according to the ICF will allow a better understanding of the pain experience.

There have been no studies in the literature on the multivariate analysis of the interaction between kinesiophobia and pain-related variables. There are a lot of studies about univariate analysis, but these results can be misleading for clinicians. To be able to give valid and reliable results, it is necessary to evaluate all variables related to pain as much as possible in all its aspects. The aim of the study was to analyze the interaction of kinesiophobia with pain-related variables classified according to ICF in individuals with chronic neck and low back pain by using multivariate analysis.

Methods

Study Design

The current study was a cross-sectional study with 504 adults with chronic neck or low back pain from Ankara, Turkey.

Population and Sample

Five hundred four persons with chronic neck or low back pain who worked at the Hacettepe University Hospital in Turkey agreed to participate in this study. These persons perceived recurrent back or neck problems for years, or had new episodes of back or neck pain over 3 months' duration. Patients were included if they were between 18 and 55 years of age and were still at work or less than 1 year out of work owing to chronic neck or low back pain. Exclusion criteria were low back pain and neck pain with an underlying specific cause; neuropathic pain because of neurologic and systemic illness; neurologic, cardiovascular, or pulmonary diseases; pregnancy; or psychological disorders.

Data Collection

The purpose and the method of this study were clarified to the individuals and written informed consent was obtained from all participants. The questionnaires collected information regarding all pain-related variables classified according to the ICF and are presented in Table 1. The participants filled out questionnaires assessing health status, impairments in body functions and structures, limitations in activities of daily living, participation, and personal factors, which were all collected by the same research assistant. Ethical approval for this study was obtained from Hacettepe University's Non-invasive Clinical Research Ethics Committee (permission no: GO 16/572).

Demographic data of all participants, such as age, sex, body mass index, educational status, occupation, and working years, were recorded. Kinesiophobia status (kinesiophobia or non- kinesiophobia) was used as an outcome measure. If the TSK is above the cutoff of 37, it indicates high levels of kinesiophobia.[9] The following were used: Million Visual Analog Scale (MVAS) for assessing pain and disability for low back pain, Neck Disability Index (NDI) for assessing disability in patients with neck pain, Nottingham Health Profile (NHP) for assessing quality of life, and Hospital Anxiety and Depression Scale (HADS) for assessing psychosocial status.

The MVAS is a 15-item visual analog measure of spinal pain disability related to low back pain: no reported disability (0), mild disability (1-40), moderate disability (41-70), severe disability (71-100), very severe disability (101-130), and extreme disability (131-150). Like other "disability inventories" such as the Oswestry and Roland-Morris, the MVAS differs from a "pain inventory" in that the focus is on disability and function, as opposed to self-reported pain. The MVAS may be the strongest functional rating scale because all questions relate to the patients' ability to perform activities of daily living. In addition, this instrument has the advantage of a visual analog format, which is typically considered more effective than other commonly used self-report formats.[10]

The NDI contains 10 subsections consisting of severity of pain, personal care, lifting, reading, headache, concentration, work, driving, sleeping, and pleasure. The score of each item varies between 0 (no pain and functional limitation) and 5 (worst pain and maximal limitation), resulting in a total score of 0 (no disability) to 50 (totally disabled). As the total score increases, the severity of the disability increases as well, namely, 0 to 4 score means no disability, 5 to 14 minimal disability, 15 to 24 moderate disability, 25 to 34 several disabilities, and $\geq$35 means completely restricted.[11]

Table 1. *All Variables Were Classified According to the International Classification of Functioning*

ICF Domain Variable	Measurement Instrument	Scoring Range
Body functions/structures		
Pain	–	Lasting more than 12 week
Activity		
Limitations in ADL	Neck Disability Index	0-50
	MVAS	0-100
Participation	Nottingham Health Profile	0-600
Personal		
Age	–	y
Sex	–	Female/male
Educational level	–	Primary school
	–	Secondary school
	–	High school
	–	University
Fear of movement	Tampa Scale of Kinesiophobia	17-68
Symptoms of depression and anxiety	Hospital Anxiety Depression Scale-Anxiety	>7
	Hospital Anxiety Depression Scale-Depression	>10
Working duration	–	y

ADL, activities of daily living; *ICF*, International Classification of Functioning; *MVAS*, Million Visual Analog Scale.

The HADS consists of 7 items for anxiety and 7 for depression. The items are scored on a 4-point scale from 0 (not present) to 3 (considerable). Because of the validity and reliability study performed by Aydemir et al, the cutoff score for anxiety was found to be 10 and for depression was found to be 7. Scores above this indicate that there is risk of anxiety and depression.[12]

The NHP consists of 38 items that evaluated emotional, social, and physical health problems of the patients. The total score ranges from 0 to 600 (minimum and maximum values). As the total score decreases, the quality of life increases.[13]

Data Analysis

Descriptive statistics were calculated for all variables, for both individuals with kinesiophobia and without kinesiophobia (Table 2). An independent samples *t* test was performed to compare the means of 2 groups for continuous variables. A χ^2 test was used to examine difference between groups for categorical variables. Binary logistic regression was used to evaluate independent variables (age, education, MVAS, NDI, etc) that were statistically significant predictors of the binary dependent variable (kinesiophobia). Using the logistic models, odds ratios and their respective 95% CIs were calculated. Data analysis was performed by the IBM SPSS Statistics 21.0 software package. A P value of .05 was accepted as statistically significant.

Results

All variables, classified according to the ICF, are presented in Table 1. A total of 269 (53.4%) of 504 persons included in the study had high levels of kinesiophobia (TSK > 37). In the univariate analyses (Table 2), the persons who had high-level kinesiophobia had a significantly lower level of educational ($P < .001$) and had a significantly higher scores for MVAS, NDI, HADS, and NHP ($P < .001$).

The results of the binary logistic regression analysis are shown in Table 3. After adjustments for founding variables, only educational level ($P = .01$), MVAS ($P = .002$), and HADS ($P = .008$, $P = .012$) outcomes were retained significantly as the predictors of kinesiophobia. As the

Table 2. *Univariate Analyses According to the State of Kinesiophobia*

Variable	TSK ≤ 37	TSK > 37	*P*
Patients, n (%)	235 (46.6)	269 (53.4)	.11 [a]
Age			
(X ± SD)	34.46 ± 8.36	35.94 ± 8.70	.20 [b]
Sex n (%)			
Female	90 (38.6)	102 (38.1)	.89 [a]
Male	143 (61.4)	166 (61.9)	
Body mass index			
(X ± SD)	24.64 ± 3.40	25.65 ± 4.08	.22 [b]
Occupation, n (%)			
1	73 (31.3)	58 (21.6)	.54 [a]
2	55 (23.6)	117 (43.7)	
3	105 (45.1)	93 (34.7)	
Education level, n (%)			
Primary school	24 (10.3)	48 (17.9)	<.001 [a]
Secondary school	17 (7.3)	46 (17.2)	
High school	124 (53.2)	116 (43.3)	
University	68 (29.2)	58 (21.6)	
Working year			
(X ± SD)	8.69 ± 6.85	9.06 ± 7.25	.34 [b]
MVAS	14.68 17.00	31.59 22.95	<.001 [a]
NDI (X ± SD)	12.41 ± 11.61	18.75 ± 13.59	<.001 [b]
HADS (X ± SD)			
Anxiety	4.82 ± 3.72	7.90 ± 3.81	<.001 [b]
Depression	3.60 ± 3.24	6.66 ± 3.98	<.001 [b]
NHP (X ± SD)	231 (68.38 ± 83.57)	266 (151.34 ± 117.55)	.001 [b]

1: secretaries, 2: cleaning workers, 3: security officers.
HADS, Hospital Anxiety Depression Scale; *MVAS*, Million Visual Analog Scale; *NDI*, Neck Disability Index; *NHP*, Nottingham Health Profile; *TSK*, Tampa Scale of Kinesiophobia; *X* ± *SD*, mean ± standard deviation.
[a] Independent samples *t* test.
[b] χ^2 test.

educational level lowered, the risk of kinesiophobia increased by 0.74 times; as the MVAS value increased by 1 unit, the risk of kinesiophobia increased by 1.03 times. As the anxiety increased by 1 unit, the risk of kinesiophobia increased by 1.11 times; as the depression increased by 1 unit, the risk of kinesiophobia increased by 1.10 times (Table 3).

Discussion

This study was conducted to investigate the interaction of kinesiophobia with pain-related variables classified according to ICF in individuals with chronic neck and low back pain. As a result of the study, multivariate analysis has showed that educational level, low back pain-associated disability, and emotional problems like depression and anxiety may have an impact on kinesiophobia. This is the first study investigating the multivariate analysis of the interaction between kinesiophobia and pain-related variables.

The comparative studies of low back pain and neck pain stated that the level of disability, kinesiophobia, and emotional state are affected more in individuals with chronic low back pain than in those with neck pain. Soysal et al,[14] in their study where they compared the emotional, life quality, and physical activity state in patients with chronic low back pain and neck pain, indicated that patients with chronic low back pain who had higher levels of disability also had lower physical activity levels and more depressive symptoms. Another study showed that although the pain severity was similar in the low back pain and neck pain groups, the level of physical activity was lower and the kinesiophobia was more severe in the low back pain group.[15] Researchers have stated that the restriction of physical activities requiring the activation of major muscles, such as walking, could trigger the movement-related fear in the low back pain group. Altug et al[16] have compared pain, emotional status, and disability level in patients with chronic neck pain and low back pain. When the emotional situation and the impairment level are compared in both groups, there are more depressive symptoms in patients with low back pain and herewith there is a higher impairment level. Researchers have reported that the mobility loss of individuals with low back pain within the home and in the community worsened the emotional and disability levels of individuals more.[17] In this study, according to the simple logistic regression analysis, the factors that seemed to be associated with kinesiophobia were neck and low back pain-associated disability, quality of life, and emotional state. The multiple logistic regression analysis showed that only low back pain−associated disability and emotional problems had significant associations. These results support previous results indicating low back pain causes more disability than neck pain. We think that restricted physical activity in those with a high level of low back disability leads to the individuals' inability to achieve their own goals and expectations in daily life. This situation is related to the

Table 3. *Results of Logistic Regression Analysis of Risk Factors for Kinesiophobia*

Variable	95% CI for Exp(B)	*P*
Age	0.99 (0.96-1.02)	.37
Sex	0.81 (0.50-1.30)	.39
BMI	1.05 (0.97-1.12)	.17
Occupation	0.89 (0.68-1.15)	.36
Education	0.74 (0.59-0.94)	.01
Working year	1.01 (0.97-1.05)	.50
MVAS	1.03 (1.01-1.04)	.002
NDI	0.98 (0.96-1.00)	.11
Anxiety	1.11 (1.03-1.20)	.008
Depression	1.10 (1.02-1.19)	.012
NHP	1.00 (1.00-1.00)	.393

Binary logistic regression was used to evaluate independent variables.
BMI, body mass index; *CI,* confidence interval; *MVAS*, Million Visual Analog Scale; *NDI*, Neck Disability Index; *NHP*, Nottingham Health Profile.

development of reinjury and fear of movement concomitantly. Vlaeyen et al found that fear of movement and reinjury was more related to depressive symptoms.[17] The recent guidelines emphasize that psychological factors, such as fear of movement and depression, should be identified and treated early in patients with chronic low back pain because they are the determinant for poor improvement.[18]

Previous studies in the literature have shown that level of education could be an important parameter in determining pain severity, functional level, and quality of life in the individuals with musculoskeletal system problems.[19-24] In these studies, the functional status and the quality of life scores of college graduates with musculoskeletal system problems have been found to be higher and pain severity was lower than primary, secondary, and high school graduates. They suggested that financial and social opportunities acquired by education positively affected the lifestyle of individual, and this condition could be associated with the increase of the quality of life.[21] However, there has been no study investigating the effect of educational level on kinesiophobia in the literature. However, because it is known that the functional level of people with a higher educational level is higher, the kinesiophobia will be lower. In this study, we found that the fear of movement was higher in the individuals with a lower educational level. Individuals with higher levels of education can access pain management methods easier due to having more financial opportunities, and that they can adapt these methods to daily life easier[25-28] (faster access to opportunities such as visiting a doctor to alleviate the pain or using the internet, or putting the pain on the back burner by participating in social activities more frequently).

Consequently, the relationship between kinesiophobia and chronic pain is multidimensional, as shown using the biopsychosocial model of ICF. This study has shown that educational level, low back pain-associated disability, and emotional problems may have an impact on kinesiophobia. Although treating patients with chronic pain, besides alleviating pain and improving functional capacity in rehabilitation programs, it is necessary to carefully address these factors that are effective in the development of kinesiophobia. Although exercise education is given to individuals with a low educational level, exercises should be in a more simple and descriptive way and, if necessary, visual materials should be used. In addition, long-term follow-up of individuals with low educational levels may be important to maintain the exercise programs in preventing kinesiophobia and additional problems. Clinicians should consider that patients with lumbar problems may tend to inactivity more than patients with cervical problems and should well analyze the additional complications that may arise accordingly. We think that it may be more beneficial to support exercise education with biopsychosocial and behavioral treatment approaches (such as dance therapy, music therapy, cognitive therapy, etc) to break the cycle of restricted physical activity, fear of movement, and depression.

Limitations

This study was not a prospective design. The results of this study do not make clear that the variables mentioned in this study are risk factors that predisposed to kinesiophobia.

Conclusion

In this group of people with chronic neck and low back pain, educational level, low back pain-associated disability, and emotional states like depression and anxiety were associated with kinesiophobia. These factors should be considered when prevention and treatment programs are developed for chronic neck and low back pain.

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Contributorship Information

Concept development (provided idea for the research): S.B., N.K.
Design (planned the methods to generate the results): S.B., N.K.
Supervision (oversight, organization and implementation, writing of the manuscript): S.B., H.C.
Data collection/processing (experiments, organization, or reporting data): S.B., H.C.
Analysis/interpretation (statistical analysis, evaluation, and presentation of the results): J.K.
Literature search (performed the literature search): S.B., H.C.
Writing (responsible for writing a substantive part of the manuscript): S.B., H.C.
Critical review (revised manuscript for intellectual content, not spelling, grammar): S.B.

Practical Applications

- This study suggests that educational level, low back pain-associated disability, and emotional state might play an important role in kinesiophobia in patients with chronic pain.
- The results of this study encourage clinicians to consider these factors in their kinesiophobia assessment.
- With a multicentered sample and a prospective design, these results should be supported by future studies.

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