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STRUCTURAL EQUATION MODELLING TO EXAMINE THE AFFECTED FACTORS OF KINESIOPHOBIA IN POSTMENOPAUSAL WOMEN WITH CHRONIC LOW BACK PAIN

ORIGINAL ARTICLE

ABSTRACT

Purpose: The pragmatic aim of this study was to show affected factors including pain, disability level, and anxiety of kinesiophobia using structural equation modeling (SEM) in postmenopausal women with chronic low back pain (CLBP).

Methods: The study was conducted with 200 women aged 45–75 years. Tampa Scale for Kinesiophobia 11, Hospital Anxiety and Depression Scale, Roland Morris Disability Questionnaire, and Visual Analog Scale were used. The SEM was also used to analyze the direction and power of complex interactions between kinesiophobia and anxiety, pain intensity, and disability level by using hypothetically designed models. The average pain intensity was 5.98 (2.39).

Results: The average age of the women was 58.00±8.39 years. The average menopausal age was 45.75±5.95. The average kinesiophobia point was 25.97±8.57. Anxiety risk score was 14.74±11.27; depression risk score was 12.39±10.51. The SEM analysis outcome showed that the final model was expository kinesiophobia with pain, anxiety, and disability level (chi-square=21.37; df=28; p=0.810). Anxiety was found as a strong mediator in the relationship between kinesiophobia and pain intensity and disability.

Conclusion: This study showed that SEM was appropriate method to explain relationships between kinesiophobia and pain, anxiety, and disability. The created model also showed that anxiety was a strong mediator in postmenopausal women with CLBP.

Key Words: Chronic Low Back Pain, Kinesiophobia, Structural Equation Modelling.

POSTMENAPOZAL DÖNEMDEKİ KRONİK BEL AĞRILI KADINLARDA KİNEZYOFOBİYİ ETKİLEYEN FAKTÖRLERİN YAPISAL EŞİTLİK MODELİ İLE İNCELENMESİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın amacı, postmenopozal dönemdeki kronik bel ağrılı (KBA) kadınlarda ağrı, özür, kinezyofobi ve anksiyete düzeyini etkileyen faktörleri yapısal eşitlik modeli (YEM) ile incelemekti.

Yöntem: Çalışma 200 kadınla gerçekleştirildi. Tampa Kinezyofobi Ölçeği Kısa formu 11, Hastane Anksiyete ve Depresyon Ölçeği, Roland Morris Engellilik Anketi ve Vizüel Analog Skalası kullanıldı. YEM hipotetik olarak modeller tasarlanarak kinezyofobi ile anksiyete, ağrı şiddeti ve özür düzeyi arasındaki karmaşık etkileşimlerin yönünü ve gücünü analiz etmek için kullanıldı. Ağrı şiddeti ortalamaları 5,98±2,39 idi.

Sonuçlar: Kadınların yaş ortalaması 58,00±8,39 yıldı. Katılımcıların menapoza girdikleri yaş ortalaması 45,75±5,95 idi. Kinezyofobi puan ortalaması 25,97±8,57. Anksiyete risk ortalaması 14,74±11,27; depresyon risk ortalaması 12,39±10,51 idi. Yapısal eşitlik analizi sonucunda oluşturulan son model; ağrı şiddeti, anksiyete ve özürlülük düzeyiyle kinezyofobi etkileşimini açıklamada yeterli bulundu (ki-kare=21,37; df=28; p=0,810). Anksiyete; kinezyofobi, ağrı şiddeti ve özürlülük arasındaki ilişkide güçlü bir mediatör olarak bulundu.

Tartışma: Çalışma, YEM'in kinezyofobi ile ağrı şiddeti, anksiyete ve özür arasındaki ilişkileri açıklamak için uygun bir yöntem olduğunu gösterdi. Bu çalışmada oluşturulan model, anksiyetenin postmenopozal dönemdeki kronik bel ağrılı kadınlarda güçlü bir mediatör olduğunu ortaya koydu.

Anahtar Kelimeler: Kinezyofobi, Kronik Bel Ağrısı, Yapısal Eşitlik Modeli.

INTRODUCTION

Chronic low back pain (CLBP) is a common condition in the postmenopausal term. It affects an estimated 70 per 1000 women in the world (1). In this period, increased pain over a long period causes fear-avoidance or kinesiophobia behavior during rest and activity (2). Kinesiophobia is an important component of CBP, which leads to challenges in the emotional status (3). Responses to pain due to the kinesiophobia, in which negative emotional thoughts and beliefs develop about chronic pain depending on the pain experience. Also one of the most negative parameters is anxiety in this period. Anxiety seriously affects quality of life and prevents the fulfillment of functional and social participation. Flores-Ramos et al emphasized that anxiety was very common and related with several factors such as hormonal changes and premenopausal condition in the postmenopausal term (4).

Kinesiophobia and related factors are needed to investigate deeply more in postmenopausal women with CLBP. Because CLBP is more common in postmenopausal term than before (5). It is usually followed by kinesiophobia. Also the CLBP associated with gender, age, life conditions, job issues, genetic factors, musculoskeletal structures, and hormones. Thus it has a specific characteristics and related factors in postmenopausal period. There are few researches which analyze kinesiophobia in this period. So it is important to establish a new model to explain the effect of kinesiophobia on pain, anxiety, depression, and functional disability in the postmenopausal period.

Structural Equation Modelling (SEM) is a clear and appropriate approach to developing a model. This modelling method did not studied in physiotherapy. Its usage has nearly started to explain underlying causes deeply more. SEM is a statistical method that continues to evolve, allowing the analysis by known statistical methods such as factor analysis, regression analysis, and variance analysis. The SEM could be used to develop and test hypotheses using empirical data. The most important feature of SEM is that it provides an easy and illustrative graphical environment by combining the complementary aspects of these statistical methods. Also the modelling could be described as a generalization, integration, and extension of these combined known statistical methods (6). It allows us to test the model or models created with the help of hypotheses that could explain the phenomenon. We selected SEM method since the research subject had multivariate variables and complex interrelationships. Another important reason was that the research question included in hypothetical latent variables that could not be obtained with observations.

In our study, we aimed to create a SEM model to explain the roles of related factors for kinesiophobia in the postmenopausal women with CLBP and to reveal which variable played a key role in this period.

METHODS

Participants and Study Design

The descriptive study was performed in Private Bağcılar SAFA Hospital in İstanbul in Turkey between January 2018 and March 2019. Study sample was 200 postmenopausal women aged between 45–75 years, with nonspecific CLBP (>3months) in Physiotherapy and Rehabilitation Department of the hospital. Non-specific CLBP is a CLBP type where pain cannot be attributed to a specific cause. The participants gave permission to participation in the study and signed the informed consent documents. Ethic committee approval was obtained from Trabzon Kanuni Educational and Research Hospital Clinical Research Ethical Committee (Approval Date: 25th October 2017 and Approval Number: 2017/47). Permissions were obtained from the authors who made the Turkish validity and reliability of the questionnaires to use the questionnaires.

The women who had been experiencing non-specific CLBP for at least 3 months, had no menstrual bleeding last 12 months, had no visual, verbal, orthopedic, or neurological problems that could hinder assessments were included in the study. Those who had undergone surgery because of severe pain, as well as those with radiculopathy, infections, ankylosing spondylitis, rheumatoid arthritis or inflammatory diseases, scoliosis, fractures, or cauda equine syndrome were excluded from the study.

Sample size was calculated in accordance with reference literature suggestion as “at least 5 per observed variable" (7). As the number of implicit variables increases, the required sample size increases. There was one implicit variable and 17 observed variables. So the sample size was calculated as 153 at least. In case of loss of data the study was completed with 200 people. In order to avoid bias, another physiotherapist administered the scales and questionnaires. The researchers were not aware of the results until the study ended.

Outcome measurements

Visual Analog Scale (VAS)

The VAS was used to evaluate pain intensity. This scale allows evaluation of pain over a 10 centimeter line, where 0= no pain and 10= intolerable pain (8).

Tampa Scale of Kinesiophobia-11 (TSK-11)

The kinesiophobia level was assessed using by the TSK-11. The 11 itemed scale was 4-pointed Likert scale (1=strongly disagree; 2=disagree; 3=agree; and 4=strongly agree). The total score ranged from 11 to 44. A high score indicated a high level of kinesiophobia. Validity and reliability analyses of the Turkish version of Tampa Scale of Kinesiophobia was previously made by Yılmaz et al. (Intraclass correlation coefficient= 0.806) (9).

Hospital Anxiety and Depression Scale (HADS)

The scale was developed to identify and measure a patient's risk of anxiety and depression. There were 14 items: 2, 4, 6, 8, 10, 12, 14 items for depression and 1, 3, 5, 7, 9, 11, 13 items for anxiety. It was 3-pointed Likert scale. The cut-off scores of the Turkish version of the HADS were 10 for the anxiety subscale and 7 for the depression subscale. The Turkish validity and reliability analysis of the scale was performed by Aydemir et al. (10).

Roland Morris Disability Questionnaire (RMDQ)

The 24 itemed questionnaire was scored as 0=yes, 1=no. The higher the score showed the lower the participation in activities of daily living because of LBP. Total score was used to assessment. The Turkish validity and reliability analysis of the scale was performed by Küçükdeveci et al. (11).

Statistical Analysis (SEM analysis)

IBM Statistical Package for the Social Sciences (SPSS) 23 and Analysis of Moment Structure (Amos) 24 Software (Amos Development Corporation 3000 Village Run Road Unit 103, #315 Wexford, PA 15090 USA) were used for modelling.

The SEM framework was summarized as suggested in the literature that we examined in this study (6). The anxiety complex structure was determined as a latent variable. Four steps were described in below:

1st step- Data acquisition and preparation: Participants' sociodemographic data were recorded. Visual Analog Scale (VAS) was used to evaluate pain intensity, Tampa Scale of Kinesiophobia (TSK-11) was used to evaluate kinesiophobia, Roland Morris Disability Questionnaire (RMDQ) was used to evaluate functional disability, Hospital Anxiety and Depression Scale (HADS) were used to evaluate anxiety and depression risk level. Pain duration and Body Mass Index (BMI) were also recorded.

2nd step- Specification and identification: The identification of a SEM model was the less known-unknown parameter balance required to estimate the unknown parameters from the known parameters of the observational variables. If this balance was not achieved, then the model would have identified as unidentified (as in the first model of this study). Chi-square statistic was used to evaluate overall fit of the model to the data. P value was calculated using chi-square and degree of freedom (df) values to show the significance of the model fit. Evaluation of the fit indexes of the current model was used to decide whether to identify a new model. Seven initial hypotheses were determined using observational data and literature. Hypotheses were:

Hypothesis 1. Kinesiophobia has an important effect on the emotional status of women in postmenopausal period.

Hypothesis 2. Emotional status has an important effect on pain intensity in postmenopausal women.

Hypothesis 3. Emotional status has an important effect on the functional disability level of postmenopausal women.

Hypothesis 4. Pain intensity has an important effect on the functional disability level of postmenopausal women.

Hypothesis 5. Emotional status is a mediator of the effect of kinesiophobia on pain and functional disability in postmenopausal women.

Hypothesis 6. BMI has an important effect on kinesiophobia.

Hypothesis 7. Pain history (duration) has an important effect on anxiety.

3rd step- Estimation: The basic data items of the SEM analysis were the sample variances and covariance of the observed variables. When a SEM model was designed based on hypotheses, individually observed variables could be written as a function of unknown parameters (i.e., path coefficients or factor loads) and other observed or hidden variables in the model. The estimation procedure was mainly to estimate unknown parameters using observational data. Finally, a predicted covariance matrix was obtained using a mathematical approach appropriate to the characteristics of the observational data. There were many estimation methods, such as the maximum likelihood estimators (MLE), least squares estimators, and Bayesian estimation. Choosing the appropriate estimator would significantly affect the results of the SEM analysis. Software tools supported by most of these methods. In this study, MLE was selected as

Table 1: Sociodemographics and Clinical Features

Features	**Mean+SD (n=200)**	**Min- Max**
Age (years)	58.00±8.39	40-76
Menapeusal age (years)	47.55±5.95	18-61
Job experience (years)	19.17±11.64	0-44
VAS score (VAS)	5.98±2.39	1-10
TSK-11 total score	25.97±8.57	6-44
RMDI total score	14.37±7.91	0-27
HADS Anxiety score	14.74±11.27	1-49
HADS Depression score	12.39±10.51	1-42
BMI (kg/m²)	31.48±6.51	15-42
	n (%)	
BMI classification	**Normal (19-24.9)**	21 (11)
	Overweight (25-29.9)	63(32)
	Obese (upper than 30)	113 (57)
Pain History	**Last 3 month**	15 (8)
	Last 6 month	25 (13)
	Last 1 year	47 (24)
	Last 5 years	66 (33)
	Last 10 years	47 (24)
Educational Status	**No Illiterate**	53 (27)
	Primary school	121 (61)
	High school	19 (10)
	University and higher	7 (4)
Job	**Unoccupied**	12 (6)
	Occupied	188 (94)

VAS: Visual Analog Scale, TSK-11: Tampa Scale for Kinesiophobia-11, RMDI: Roland Morris Disability Questionnaire. HADS: Hospital Anxiety Depression Scale, BMI: Body mass index, n:number, X: mean, SD: Standart Deviation.

the most convenient method. NFI, RFI, IFI, TLI, CFI indexes (>0.9) and thresholds (< 0.08) were used as criteria to include and to retain variables for ideal model. For this reason, the statistical significance p value was taken into consideration (p<0.05). The b coefficients are calculated showing the level of relation between variables. These coefficients, also called standardized regression coefficients or beta weights, were the estimates resulting from a regression analysis for standardization. So the variances of dependent and independent variables were 1. In addition, the relationship between all these latent and observed variables were decided by evaluating the expert knowledge. Because, statistical knowledge of critical values was also important as much as SEM analysis. According to the graphic model of SEM, latent variables were shown with ellipses, observed variables were shown as rectangles, and error terms (e) were shown as circles.

4th step-Evaluation of model fit and re-specification: SEM tests the statistical validity of the model fit indices based on the parameter estimation derived from the sample data. Here the normed-fit index (NFI), relative fit index (RFI), incremental

Table 2: Analysis of Estimated Parameters' Significance

Hypothesis	**Relations**			**Est.**	**S.E.**	**C.R.**	**P**
Modified model (Model 2)							
Hypothesis 1	**HADS Anxiety score**	←	**TSK-11**	.02	.00	4.30	<0.001**
Hypothesis 2	**Pain intensity**	←	**HADS anxiety score**	.64	.33	1.92	0.031*
	HADS item1	←	**HADS anxiety score**	1.00			
	HADS item 3	←	**HADS anxiety score**	1.31	.19	6.91	<0.001**
	HADS item 5	←	**HADS anxiety score**	1.22	.18	6.65	<0.001**
	HADS item 7	←	**HADS anxiety score**	.52	.13	3.84	<0.001**
	HADS item 9	←	**HADS anxiety score**	.92	.14	6.37	<0.001**
	HADS item 11	←	**HADS anxiety score**	1.00	.17	5.75	<0.001**
	HADS item 13	←	**HADS anxiety score**	1.00	.16	6.03	<0.001**
Hypothesis 3	**RMDI score**	←	**HADS anxiety score**	2.98	1.03	2.88	0.004*
Hypothesis 4	**RMDI**	←	**VAS**	1.42	.20	6.89	<0.001**
Hypothesis 5	**RMDI**	←	**TSK-11**	-.007	.06	-.12	0.902
	VAS		**TSK-11**	.003	.019	.147	0.883
Hypothesis 6	**TSK-11**	←	**BMI**	.08	.09	.88	0.375
Hypothesis 7	**HADS Anxiety score**	←	**Duration of Pain**	.12	.03	3.05	.002*
Last model (Model 3)							
Hypothesis 1	**HADS anxiety**	←	**TSK-11**	.02	.006	4.28	<0.001**
Hypothesis 2	**VAS**	←	**HADS anxiety score**	.87	.31	2.77	0.005*
	HADS item 1	←	**HADS anxiety score**	1.00			
	HADS item 2	←	**HADS anxiety score**	1.32	.19	6.87	<0.001**
	HADS item 3	←	**HADS anxiety score**	1.22	.18	6.68	<0.001**
	HADS item 4	←	**HADS anxiety score**	.50	.13	3.77	<0.001**
	HADS item 5	←	**HADS anxiety score**	.91	.14	6.35	<0.001**
	HADS item 6	←	**HADS anxiety score**	1.01	.17	5.81	<0.001**
	HADS item 7	←	**HADS anxiety score**	1.00	.16	6.04	<0.001**
Hypothesis 3	**RMDI**	←	**HADS anxiety score**	2.87	.95	3.02	0.003*
Hypothesis 4	**RMDI**	←	**VAS**	1.42	.20	6.90	<0.001**

*: p<0.05, **: p<0.001, Est: Estimated regression weights, S.E: Standard Error, C.R: Standardized estimated regression weights,, HADS: Hospital Anxiety and Depression Scale, RMDI: Roland Morris Disability Questionnaire, VAS: Visual Analog Scale, TSK-11: Tampa Scale for Kinesiophobia-11.

fit index (IFI), Tucker-Lewis coefficient (TLI) versus comparative fit index (CFI), goodness-of-fit index (GFI), adjusted GFI, and root mean square error of approximation (RMSEA) were used to evaluate model fitness. Scores of >0.9 were considered as good and >0.95 were considered as excellent for the NFI, RFI, IFI, TLI, and CFI of the compliance indices; for RMSEA, values of <0.08 were considered as good and those <0.03 were considered as a perfect fit (12).

RESULTS

The average age of the women was 58.3±8.53 years. The average menopausal age was 47.55±5.95. The average TSK-11 was above average as 25.97±8.57. Anxiety and depression risks were also above the cut-off score according to HADS. The average anxiety risk score was 14.74±11.27 and the average of depression risk score was 12.39±10.51. The sociodemographic and clinical data were shown in Table 1.

Regression analysis to determinate the variables for SEM

Firstly, the variables that were thought to be affected by kinesiophobia according to the data obtained from the literature, were examined by regression analysis. Here, it was aimed to obtain a regression model that best explained the variation in the kinesiophobia variable and then to explain the interactions of the variables in this model with the contribution of latent variables using SEM analysis. As a result of the regression analysis, the variables included in the significant model (p = 0.001, R^2=0.863) were selected to be used in the SEM analysis phase. The variables were finally determined as: pain intensity, pain duration, BMI, disability, anxiety and depression.

1st model creation results

Functional disability, pain intensity, pain duration, and BMI were considered as observed variables, while kinesiophobia, anxiety, and depression were considered as latent variables (Figure 1A). The first model was created as a result of the analysis. It was not identified in the program due to an insufficient number of observations (preferably at least 10 per variable) according to the number of variables. Since the first model was not identified, so it was modified and a second model was created by modifying the first model.

2nd model creation results

The second model was identified when the depression variable was removed, the TSK 11 total score was used instead of 11 items, and the model was re-tested. Anxiety remained a latent variable (Figure 1B). The coefficients on the one-directional links between variables were the standardized regression coefficients. Bidirectional arrows between error terms represented covariance and were added to improve model 2 using modification indices. The chi-square statistic for the model was obtained as chi-square=37.58 (df= 43; p=0.700). These values showed that the tested model was significant. According to the analysis results of this model, kinesiophobia had a strong effect on anxiety (b=0.36, p<0.001). Pain had a strong positive effect on functional disability (b=0.43, p<0.001). Anxiety had a weakly positive effect on pain (b=0.16,

Table 3: Model Fitting Analysis for Primary, Modified and Last Measurement Models Obtained at 60º/s and 180º/s Speeds of Dominant and Non-Dominant Shoulder.

Fit index	Modified model	Critical value	Last model
Normed-fit index (NFI)	0.92	> 0.9	0.95
Relative fit index (RFI)	0.89	> 0.9	0.92
Incremental fit index (IFI)	1.01	> 0.9	1.01
Tucker-Lewis coefficient (TLI)	1.01	> 0.9	1.02
Comparative fit index (CFI)	1.00	> 0.9	1.00
Root mean square error of approximation (RMSEA)	0.00	> 0.8	0.00

Scores of >0.9 are considered good and >0.95 are considered excellent for the NFI. RFI. IFI. TLI. and CFI of the compliance indices. For RMSEA values of <0.08 were considered good and those <0.03 were considered a perfect fit.

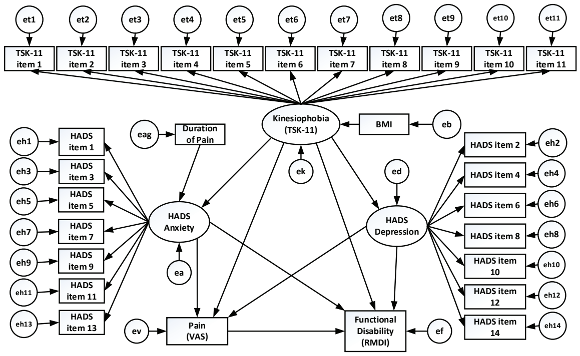

Figure 1A: Primary structural model (Model 1)

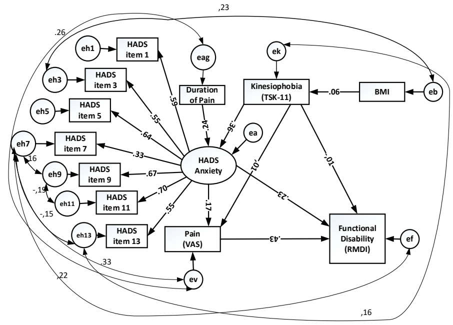

Figure 1B: Modified structural model (Model 2)

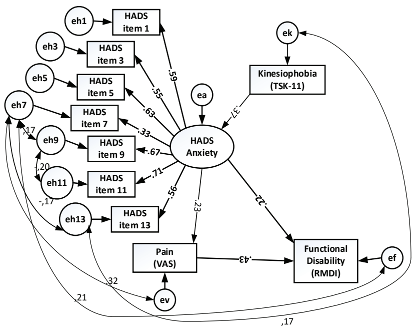

Figure 1C: Last structural model (Model 3)

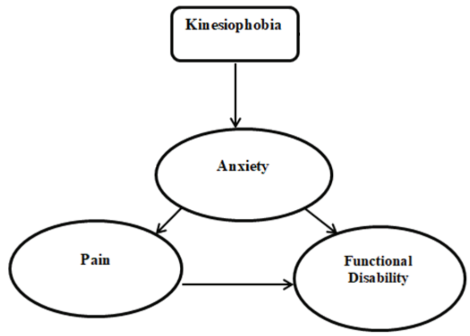

Figure 1D: Final structural model framework

et1= error term for TSK-11 item 1; et2= error term for TSK-11 item 2; et3= error term for TSK-11 item 3; et4= error term for TSK-11 item 4; et5= error term for TSK-11 item 5; et6= error term for TSK-11 item 6; et7= error term for TSK-11 item 7; et8= error term for TSK-11 item 8; et9= error term for TSK-11 item 9; et10= error term for TSK-11 item 10; et11= error term for TSK-11 item 11; eh1= error term for HADS item 1; eh3= error term for HADS item 3; eh5= error term for HADS item 5; eh7= error term for HADS item 7; eh9= error term for HADS item 9; eh11= error term for HADS item 11; eh13= error term for HADS item 13; eh2= error term for HADS item 2; eh4= error term for HADS item 4; eh6= error term for HADS item 6; eh8= error term for HADS item 8; eh10= error term for HADS item 10; eh12= error term for HADS item 12; eh14= error term for HADS item 14; ek= error term for latent variable TSK-11 total score; eb= error term for BMI; ed= error term for latent variable HADS Depression score; ef= error term for Functional Disability; ev= error term for VAS score; ea= error term for latent variable HADS Anxiety score; eag= error term for Duration of Pain.

p=0.031) and a positive effect on functional disability (b=0.22, p=0.004). While the correlation between kinesiophobia and anxiety (b=0.36, p<0.001) and the correlation between anxiety and functional disability (b=0.23, p=0.004) were significant. The correlation between kinesiophobia and functional disability (b=-0.01, p=0.902) was not significant. Likewise, while the direct correlation between kinesiophobia and anxiety and the correlation between anxiety and pain intensity were significant, the direct link between kinesiophobia and pain (b=0.01, p=0.883) was not significant. These results confirmed the Hypothesis 5. The correlation between BMI and kinesiophobia was not significant (b=0.06, p=0.375) (Figure 1B) (Table 2). Thus, since Hypothesis 6 was rejected, the BMI variable was removed from the model. Goodness-of-fit statistics were: NFI: 0.92, RFI: 0.89, IFI: 1.01, TLI:1.01, CFI:1.00, RMSEA:0.00 (Table 3).

3rd model creation results

Model 2 showed moderate fitness in accordance with RFI; good fitness in accordance with NFI, IFI, TLI, and CFI; and perfect fitness in accordance with RMSEA. To obtain a better fitness, BMI and pain duration variables, which seemed insignificant in model 2, were removed from the model. Thus model 3 was obtained (Figure 1C). The chi-square statistic for the model was found as 1,37 (df =28, p=0.810). These values showed that the analyzed model was significant, and the P values were higher than those in model 2. According to the results of the analysis, there was a strong effect of kinesiophobia on anxiety (b=0.37, p<0.001) (Table 2). Pain intensity had a strongly positive effect on functional disability (b=0.43, p<0.001). Anxiety had a weakly positive effect on pain (b=0.23, p=0.005). Anxiety also had a positive effect on functional disability (b=0.22, p=0.003). All regression coefficients related to the model were significant. Goodness-of-fitness of the model was given in Table 3 and Figure 1C. The model had good fitness according to RFI and perfect fitness in accordance with NFI, IFI, TLI, CFI, and RMSEA. Thus, a perfect fit index was obtained in accordance with all criteria except RFI. This final structural model created as the framework (Figure 1D).

DISCUSSION

In the present study, a new SEM model was created which could explain kinesiophobia with pain intensity, anxiety, and functional disability in postmenopausal women with CLBP. According to our results, pain and functional disability affected the kinesiophobia directly. Anxiety was a strong mediator of this relationship. Another finding was BMI and pain duration were not related to the all parameters of the model. Also depression risk factor decreased the fit coefficient of the model. For this reason, these variables were found unrelated with kinesiophobia, so they removed from the model.

Most women experienced much more CLBP during postmenopausal term than before. The reason was emotional symptoms and pain intensity increased in this period. This coincided with the fact that the women in our sample were at risk of developing anxiety and depression. So they started to avoid the movement. Also, Trocoli et al reported that there was a strong correlation between anxiety and kinesiophobia scores in patients with CLBP (13). In our first hypothesis (H1), the relationship between kinesiophobia and anxiety was confirmed in the model. This finding was consistent with previous studies showing an association between kinesiophobia and anxiety (3). Erden et al. and Bilgin et al reported positive correlation between anxiety and kinesiophobia in people with CLBP in their studies. (8, 14). Contrarily Branström et al found no relationship between kinesiophobia and anxiety in patients with chronic musculoskeletal pain (15). However, their results were not specific to the postmenopausal women. In our study, we presented a new evidence about relationship between anxiety and kinesiophobia for postmenopausal period–specifically in our SEM model. Results should be supported by the further studies.

Evidence about effects of anxiety and depression is common in the general population with CLBP but rare in the postmenopausal period. In our second hypothesis (H2), while the effect of anxiety on pain intensity was significant, depression was not fit with the model. So depression was removed from the model. This finding was compatible with the literature (16, 17, 18-20). Kanwaljit et al reported that the pain was affected by emotional status on non-specific CLBP in postmenopausal women (21). In our model, positive correlation between pain intensity and anxiety revealed in postmenopausal women. The negative effects of pain intensity and depressive symptoms on functional status were previously indicated in the literature (22). However, it was understood that anxiety and depression did not affect patients to the same extent. Some studies reported that depression affected pain intensity (17, 22). There were some studies which rejected this relationship (23). There was not a current consensus about this field. Kuch et al found no difference in depression risk levels between patients with low back pain (24). Results should be supported by the further studies.

In related literature it was known that patients with CLBP had worse physical function and experience more problems in daily life compared to individuals without CLBP (22). In our third hypothesis (H3), positive correlation was found between anxiety and functional disability. Asama et al emphasized that the catastrophobia and anxiety were relative risk factors for disability in patients with CLBP (25, 26). Dündar et al found high pain and disability levels as well as poor functional and emotional statuses in patients with CLBP versus those without CLBP. They also emphasized that emotional status evaluation was crucial in patients with CLBP (27). But their sample was not postmenopausal women. As a contribution, the effect of anxiety on functional disability was demonstrated in our model. So the model fit index proved that this effect could not be independent of pain in our model.

Studies about CLBP over the past decade have shown that pain could lead to avoidance, kinesiophobia, decreased physical function capacity, and increased disability (27). In related literature, pain during the activity decreased physical functions (28). Our fourth hypothesis (H4) was confirmed the association between pain intensity with functional disability. The model also explained that anxiety was an important factor in this relationship. Kuch et al found that anxiety was associated with functional disability in patients with musculoskeletal pain (24). Güçlü et al found a weakly positive correlation between pain intensity and disability and kinesiophobia in patients with CLBP (29). Conversely, Baillie et al emphasized that pain intensity is a strong predictor for disability in CLBP (30). In our study, we also found a positive correlation between kinesiophobia and functional disability in postmenopausal women.

In some studies, anxiety was defined as a mediator between physical functions and social parameters. Korkmaz et al. emphasized that emotional factors were important on the functional disability and kinesiophobia (31). Cederbom et al. showed that there was a relationship between chronic pain and disability. They emphasized that both pain-related disability and emotional state were the mediators of disease in CLBP (32). Helminen et al. found that the change in pain and functional status were as a result of anxiety (33). Anxiety was a strong mediator on relationship between kinesiophobia, pain intensity and functional disability in our fifth hypothesis (H5). Our model revealed the relationship between anxiety, kinesiophobia, disability and pain intensity clearly.

In conclusion, the results of our study indicated that kinesiophobia affected pain intensity, functional disability and anxiety. The key point of the results was the anxiety was as strong mediator of this relationship. Kinesiophobia which affected the social participation of postmenopausal women were examined in depth by this model with health-related variables. By this modelling, the underlying reasons could be explained by phenomenon-based hypothetical approach rather than roughly examining the relationships. Since it was the first study which was used the structural equation model in postmenopausal women with CLBP. So our study had an important contribution in terms of encouraging it's widely used in physiotherapy, women's health and other fields of health.

There are some limitations. Sociodemographic features and quality of life was also important to explain the kinesiophobia in postmenopausal term. Because poor economic conditions could be caused poor quality of life too. So lower quality of life could affect pain and kinesiophobia in this period. Further studies are needed to evaluate these parameters. Second limitation was the lack of data about presence of another musculoskeletal problems such as osteoporosis. Because osteoporosis is very common in postmenopausal term and triggers the CLBP. More comprehensive and detailed outcome measures of women health could warrant more fruitful results in discerning the role of osteoporosis on level kinesiophobia during postmenopausal term. Potential confounders, such as use of alcohol, tobacco, hormonal drugs, and specific disabilities should also be considered in future research. Last limitation was the lack of data about participants' anxiety experiences which they had before postmenopausal term. It could have been confounders in the evaluation of anxiety in any period of life.

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REFERENCES

1. E Silva AVS, Lacativa PGS, Russo LAT, Gregorio LH, Pinheiro RAC et al. Association of back pain with hypovitaminosis D in postmenopausal women with low bone mass. BMC Musculoskelet Disord. 2013;14:184. https://doi.org/10.1186/1471-2474-14-184.
2. Uluğ N, Yakut Y, Alemdaroğlu İ, Yılmaz Ö. Comparison of pain, kinesiophobia and quality of life in patients with low back and neck pain. J Phys Ther Sci. 2016;28:665-670. https://doi.org/10.1589/jpts.28.665.
3. Hapidou EG, O'Brien MA, Pierrynowski MR, Las Heras E, Patla T. Fear and avoidance of movement in people with chronic pain: psychometric properties of the 11-Item Tampa Scale for Kinesiophobia (TSK-11). Physiother Can. 2012;64:235-241. https://doi.org/10.3138/ptc.2011-10.
4. Flores-Ramos M, Silvestri Tomassoni R, Guerrero-López JB, Salinas M. Evaluation of trait and state anxiety levels in a group of peri-and postmenopausal women. Women Health. 2018;58:305-319. https://doi.org/10.1080/03630242.2017.1296059.
5. Wáng YXJ, Wáng JQ, Káplár Z. Increased low back pain prevalence in females than in males after menopause age: evidences based on synthetic literature review. Quant Imaging Med Surg. 2016;6:199-206. https://doi.org/10.21037/qims.2016.04.06.
6. Hoyle RH, Editor. Handbook of structural equation modeling. New york: A Division of Guilford Publications. c2012.
7. Wolf EJ, Harrington KM, Clark, SL, Miller MW. Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety. Educ Psychol Meas. 2013;76:913–934. https://doi.org/10.1177/0013164413495237.
8. Erden A, Altuğ F, Malkoç A, Akgül Kocabal A. Investigation Of The Relationship Between Kinesiophobia, Pain, Anxiety-Depression Status And Quality Of Life In Patients With Knee Osteoarthritis Before Surgery. OTSHD. 2016;7:1-17. https://doi.org/10.17372/OTSHD.2016.7.16650.
9. Yilmaz ÖT, Yakut Y, Uygur F, Uluğ N. Turkish version of the Tampa Scale for Kinesiophobia and its test-retest reliability. Turk J Physiother Rehabil. 2011;22:44-49.
10. Aydemir Ö, Guvenir T, Kuey L, Kultur S. Validity and reliability of Turkish version of hospital anxiety and depression scale. Turk Physciatry Derg. 1997;8:280-287.
11. Küçükdeveci AA, Tennant A, Elhan AH, Niyazoğlı H. Validation of the Turkish version of the Roland-Morris Disability Questionnaire for use in low back pain. Spine. 2001;26:2738-43. https://doi.org/10.1097/00007632-200112150-00024.
12. Hooper D, Coughlan J, Mullen M. Structural equation modelling: Guidelines for determining model fit. EJBRM. 2008;6:53-60.
13. Trocoli TO, Botelho RV. Prevalence of anxiety, depression and kinesiophobia in patients with low back pain and their association with the symptoms of low back spinal pain. Rev Bras Reumatol Engl Ed. 2016;56,330–336. doi:10.1016/j.rbre.2016.02.010.
14. Bilgin S, Cetin H, Karakaya J, Kose N. Multivariate Analysis of Risk Factors Predisposing to Kinesiophobia in Persons With Chronic Low Back and Neck Pain. J Manipulative Physiol Ther. 2019;42(8):565-571. https://doi.org/10.1016/j.jmpt.2019.02.009.
15. Branström H, Fahlström M. Kinesiophobia in patients with chronic musculoskeletal pain: differences between men and women. J Rehabil Med. 2008;40:375-380. https://doi.org/10.2340/16501977-0186.
16. Durmaz T. Investigation of the factors effect on low back pain in postmenopausal women. 15th World Congress on Menopause. 28 September-01 October, 2016. Prague. Climacteric; 2016;19(sup1):p48.
17. Bair MJ, Wu J, Damush TM, Sutherland JM, Kroenke K. Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients. Psychosom Med. 2008;70:890. https://doi.org/10.1097/PSY.0b013e318185c510.
18. Meints SM, Mawla I, Napadow V, Kong J, Gerber J, Chan ST, et al. The relationship between catastrophizing and altered pain sensitivity in patients with chronic low-back pain. Pain. 2019;160(4), 833–843. doi:10.1097/j.pain.0000000000001461.
19. Subhadra KT. Low back pain: Correlation with anxiety, depression, and well-being and the effect of homeopathic medicines on the physical signs of patients. Int J Med Sci. 2017;6(9), 1427-1432.
20. Comachio J, Magalhães MO, Campos Carvalho E Silva, APDM, Marques AP. A cross-sectional study of associations between kinesiophobia, pain, disability, and quality of life in patients with chronic low back pain. Adv Rheumatol. 2018;58. doi:10.1186/s42358-018-0011-2.
21. Kanwaljit Chopra, Vipin Arora. An intricate relationship between pain and depression: clinical correlates, coactivation factors and therapeutic targets. Expert Opin Ther Targets. 2014;18:2, 159-176, DOI: 10.1517/14728222.2014.855720.
22. Yazıcı K, Tot Ş, Biçer A, Yazıcı A, Buturak V. Anxiety, Depression and Quality of Life in Patients with Lowback Pain and Neck Pair. J Clin Psychol. 2003;6:95-101.
23. Casten RJ, Parmelee PA, Kleban MH, Lawton MP, Katz IR. The relationships among anxiety, depression, and pain in a geriatric institutionalized sample. Pain. 1995;61:271-276. https://doi.org/10.1016/0304-3959(94)00185-h.
24. Kuch K, Cox B, Evans RJ, Watson PC, Bubela C. To what extent do anxiety and depression interact with chronic pain? Can J Psychiatry. 1993;38:36-38. https://doi.org/10.1177/070674379303800110.
25. Ranger TA, Cicuttini FM, Jensen TS, Manniche C, Heritier S, Urquhart DM. Catastrophization, fear of movement, anxiety, and depression are associated with persistent, severe low back pain, and disability. The Spine Journal. 2020;6:857-865. https://doi.org/10.1016/j.spinee.2020.02.002.
26. Marshall PWM, Schabrun S, Knox MF. Physical activity and the mediating effect of fear, depression, anxiety, and catastrophizing on pain related disability in people with chronic low back pain. PLOS ONE. 2017; 12(7). doi:10.1371/journal.pone.0180788.
27. Dündar Ü, Özlem S, Demirdal ÜS, Toktas H, Kavuncu V. Relation of pain, disability and depression with quality of life in patients with chronic low back pain. Genel Tip Derg. 2009;19:99-104.
28. Erden A, Şenocak E. An analysis on factors affecting back awareness of postmenopausal women with chronic low back pain. JETR. 2020;7(1), 21-27.
29. Güçlü DG, Güçlü O, Ozaner A, Şenormancı O, Konkan R. The relationship between disability, quality of life and fear-avoidance beliefs in patients with chronic low back pain. Turk Neurosurg. 2012;22:724-731. https://doi.org/10.5137/1019-5149.JTN.6156-12.1.
30. Baillie L, Bacon CJ, Hewitt CM, Moran RW. Predictors of functional improvement in people with chronic low back pain following a graded Pilates-based exercise programme. J Bodyw Mov Ther. 2019;23,211–218. doi:10.1016/j.jbmt.2018.06.007.
31. Korkmaz N, Akinci A, Yörükan S, Sürücü HS, Saraçbaşi O, Ozçakar L. Validation and Reliability of the Turkish Version of the Fear Avoidance Beliefs Questionnaire in Patients With Low Back Pain. Eur J Phys Rehabil M. 2009;45:527-35.

32. Cederbom S, Söderlund A, Denison A, Wagert PH. Chronic pain among older women living alone. A study focusing on disability and morale. Eur J Physiother. 2014;16:139-150. https://doi.org/10.3109/21679169.2014.893448.
33. Helminen EE, Sinikallio SH, Valjakka AL, Väisänen-Rouvali RH, Arokoski JPA. Determinants of pain and functioning in knee osteoarthritis: a one-year prospective study. Clin Rehabil. 2016;30:890-900. https://doi.org/10.1177/0269215515619660.