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ORIGINAL ARTICLE

Kinesiophobia and functionality perception in postmenopausal women with chronic low back pain

Cinesiofobia e percepção de funcionalidade em mulheres na pós-menopausa portadoras de lombalgia crônica

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ABSTRACT

BACKGROUND AND OBJECTIVES: Low back pain is the main cause of global disability and is prevalent in women, tending to increase after menopause. The present study aimed to analyze the correlation between body mass index, muscle strength, kinesiophobia, estradiol, functional disability, and low back pain perception in postmenopausal women with chronic low back pain.
METHODS: Twenty-two postmenopausal women with chronic low back pain were evaluated. Abdominal and lower back strength were assessed using isometric tests. Basal serum estradiol levels were analyzed using the chemiluminescence method. Kinesiophobia, low back pain perception, and low back functional disability were determined using the Tampa Scale for Kinesiophobia, the visual analog scale, and the Roland Morris Questionnaire, respectively.
RESULTS: The Spearman correlation test showed correlations between the levels of kinesiophobia and the value of body mass (rho= -0.513; p=0.015) and the levels of kinesiophobia and the values of body mass index (rho= -0.576; p=0.005). There was correlation between the levels of kinesiophobia and perception of lumbar functional disability (rho= 0.434; p=0.043). No significant correlations were found between the variables of muscle strength, estradiol, and low back pain perception.
CONCLUSION: Postmenopausal women with low back pain who have higher body mass and body mass index values tend to present lower levels of kinesiophobia. There is a direct relationship between the fear of moving or maintaining a specific position and the perception of the functionality and safety of the lumbar spine.
Keywords: Body mass index, Low back pain, Muscle strength, Postmenopause, Spine.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor lombar é a principal causa de incapacidade global e possui prevalência em mulheres, tendendo a aumentar após a menopausa. O presente estudo objetivou analisar as associações entre índice de massa corporal, força muscular, cinesiofobia, estradiol, incapacidade funcional e percepção de dor lombar em mulheres na pós-menopausa com dor lombar crônica.
MÉTODOS: Foram avaliadas 22 mulheres na pós-menopausa diagnosticadas com dor lombar crônica. A força abdominal e dos extensores da coluna foi avaliada por meio de testes isométricos. Os níveis séricos basais de estradiol foram analisados pelo método de quimiluminescência. A cinesiofobia, a percepção de dor e a incapacidade funcional lombar foram determinadas pela *Tampa Scale for Kinesiophobia*, escala analógica visual e *Roland Morris Questionnaire*, respectivamente.
RESULTADOS: O teste de correlação de Spearman mostrou associações entre os níveis de cinesiofobia e os valores de massa corporal total (rho=-0,513; p=0,015) e os níveis de cinesiofobia e os valores de índice de massa corporal (rho=-0,576; p=0,005). Foi encontrada correlação entre os níveis de cinesiofobia e de percepção de incapacidade funcional lombar (rho=0,434; p=0,043). Não houve correlações significativas entre as variáveis força muscular, estradiol e percepção de dor.
CONCLUSÃO: Mulheres na pós-menopausa com dor lombar crônica que apresentam maiores valores de massa corporal total e índice de massa corporal tendem a apresentar menores níveis de cinesiofobia. Existe relação direta entre o medo de se movimentar ou permanecer em uma posição específica e a percepção de funcionalidade e segurança da coluna lombar.
Descritores: Coluna vertebral, Dor lombar, Força muscular, Índice de massa corporal, Pós-menopausa.

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INTRODUCTION

Non-specific low back pain (LBP) is a symptom with no defining cause and is considered as the main motive for global disability[1], affecting people of all ages[2], however, its prevalent on women[3], mainly those in the postmenopause period[4]. In this phase of life, women present reduced levels of hormones, such as estradiol[5], which can be a risk factor for degeneration of the intervertebral discs of the lumbar spine[6]. This hormonal reduction is related to the climacteric period, which precedes and lasts for some time after menopause[7]. Besides the reduction of the estradiol levels, other indicators of health related to pain and functionality have a tendency to suffer modifications during the climacteric, like the increase in total body mass (TBM) and body mass index (BMI), as well as the reduction of muscle strength levels[8]. In order to control these variables, specially the treatment of pain, physical exercises are considered as the primary non-pharmacological intervention due to the capacity to generate an increase in the muscle strength levels and, consequently, reduce pain perception levels[9]. Training program models that improve the strength levels of flexor and spinal extensor muscles, such as resistance and stabilization training, can generate positive results in individuals with chronic non-specific LBP[10].

If not treated, the prolonged exposure to this pain can contribute to the development of kinesiophobia, characterized as the fear of feeling pain when making movements or maintaining certain specific positions[11]. Kinesiophobia can develop independently from the levels of pain perception, which can limit, besides other tasks, the practice of physical activities[12]. The sensation of fear caused by kinesiophobia is considered as more disabling than the severity of pain itself[13], because of the impediment of performing tasks, specially those related to mobility. The limitation of movement can aggravate even more the functional disability of the individual[14]. Despite the association between kinesiophobia and LBP and their dysfunctions, there is still a gap in the scientific literature on kinesiophobia and LBP associated with variables related to postmenopause.

A better understanding of the existent association between these variables is important for the control and reduction of LBP in all women, postmenopausal or yet to be. The present study's objective is to analyze the relations between the BMI variables, muscle strength, kinesiophobia, estradiol, low back functional disability, and perception of pain in postmenopausal women with chronic LBP.

METHODS

Correlational, cross-sectional, descriptive original research. The population is composed of women from an orthopedic clinic in Rio de Janeiro, Brazil, going through postmenopause and suffering from LBP. Were included all participants that: presented unspecific chronic LBP[2]; presented LBP perception of at least 4 points in the visual analog scale (VAS) score[15]; were in the postmenopause period[16]; did not practice physical exercises systematically for the last three months. The study excluded the participants that: were under the effect of antidepressants or anxiolytics; presented any kind of condition or pain with the possibility of worsening during the tests or had any kind of physiotherapy treatment in the last three months. The sample size calculation was done in the GPower 3.1(Germany), software, taking into consideration a two-way correlation model with an effect size of 0.5, alpha error probability of 0.05 and power of 0.8. The calculated size of the sample with these information was 26 participants. The sample was obtained from the orthopedic clinic database, the contact was made through e-mail or telephone, and 26 women were selected. During the collection of anthropometric data, four patients did not attend, and 22 were included.

On the first data collection visit, the participants went through an anamnesis, signed the Free and Informed Consent Term (FICT), answered the VAS and done a blood exam for the measuring of estradiol levels. On the second visit, the anthropometric evaluation was done, the kinesiophobia and low back functional disability questionnaires were answered, and the neuromuscular assessments were done.

The LBP perception was evaluated by the VAS, a non millimetered scale ranging from zero to 10cm, in which zero represents the absence of pain and 10 the worst possible pain[15]. The participants were asked to indicate their current level of pain tracing a perpendicular straight line in this scale. After the marking, the examiner positioned a ruler in the same direction and orientation of the scale, assessing the marking in centimeters[17].

The blood sample was collected at 8am, after 12h of fasting. A qualified professional independent from the study protocol performed the blood collection. Next, the levels of estradiol were evaluated by the chemiluminescence method – IM-MULITE – DPC MED LAB, vacuum closed system. As a pattern of reference, the result needed to be >20pg/mL to characterize the postmenopause[16].

The Tampa Scale for Kinesiophobia (TSK)[18] was used to evaluate the excessive fear of movement and physical activity. This scale is a questionnaire composed of 17 questions that approach pain and intensity of symptoms, and the scores are disposed in a Likert scale with a 4 points range.

The answers for the 4, 8, 12 and 16 items had to be inverted to count the scores. The final score can vary between 17 and 68 points. The higher the score, higher are the levels of kinesio-

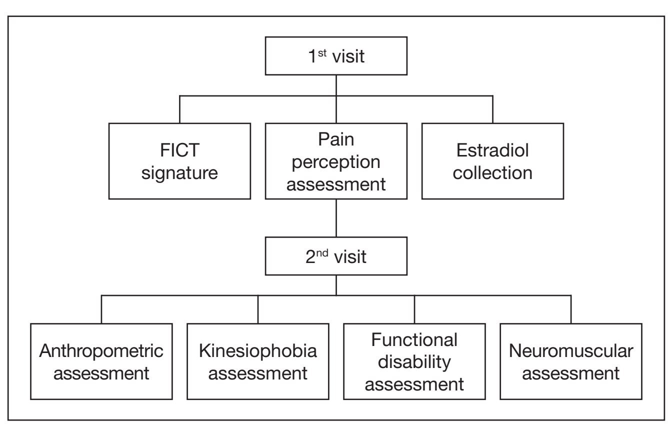

Figure 1. Participant data collection flow

phobia[18]. The score above 41 points indicates a greater degree of commitment related to the belief in movement[19].
A version of the Roland Morris Questionnaire (RMQ)[20], validated and adapted to Brazil, was used to assess the low back functional disability perception. This questionnaire is composed of a subjective scale with 24 phrases referring to the status of the lumbar spine. That patients can answer ''yes" or ''no", according to their own perception at that moment. Each ''yes" answer is equal to 1 point and each ''no" answer is equal to zero points. The final score can vary from zero to 24 points. The mean score is 11.4 and the scores above 14 indicate significant disability[21].
For the measurement of the total body mass (TBM) and height, a mechanical scale with a Filizola® (Brazil) PL - 150 number 8346/97 stadiometer, ABNT NBR ISSO 9001 certified, with 100g precision and maximum capacity for 150k was used. With these data, the BMI was calculated as the ratio between the TBM (kg) and the square height (m^2). All measurements were performed in accordance with the International Standards for Anthropometric Assessment (ISAK)[21] protocol.
The abdominal strength and spine extensor isometric tests were used to assess strength and resistance of the abdominal and lumbar spine extensor muscles. Both tests presented protocols that measured the time, in seconds, in which an individual could maintain himself or herself in a determined position, doing a contraction of the target desired muscle, according to the study[22].
The abdominal isometric test evaluates the abdominal muscle strength (AbdStr). In this test, the individual laid down in dorsal decubitus with hips bent 45° and knees bent 90°. The individual then moved to the final position of each verification level and was instructed to hold the position for as long as possible. The score is given according to the final position he or she was able to perform the test, in addition to measuring the time in seconds.
The score varies from 1 to 5, in which 5 represents higher levels of abdominal strength and resistance: (5) hands crossed behind the nape of the neck, scapulas off the ground; (4) hands crossed over the chest, scapulas off the ground; (3) arms along the body, extended elbows, scapulas off the ground; (2) hands behind the head, only the head off the ground; (1) arms along the body, only the head off the ground[22]. The isometric spine extensor test assessed the strength of the iliocostalis muscles of the lumbar spine and the multifidus (LumbStr). In this test, the individuals laid down in ventral decubitus position and tried to extend the spine as much as possible, lifting their head and trunk from the ground.
The score was given according to the position achieved by the individual and the time he or she was able to maintain isometry. The score ranged from 1 to 5, where 5 represented higher levels of strength of the extensor muscles of the spine: (5) hands behind the head, the individual raised the head, chest and ribs from the ground; (4) arms along the body, the individual raised the head, chest and ribs from the ground; (3) arms along the body, the individual raised the sternum from the ground; (2) arms beside the body, the individual raised the head from the ground; (1) only a slight contraction of the muscle, with no apparent movement[22].

The present study was approved by the Research Ethics Committee of the *Universidade do Estado do Rio de Janeiro* (UERJ), opinion number 1.360.167.

Statistical analysis
The data was analyzed in the IBM SPSS Statistics 23 software and was presented in mean and standard deviation. The Shapiro-Wilk test was used to check the normality of the sample data. The Spearman correlation test was applied to analyze the associations between the TBM, BMI, muscle strength, kinesiophobia, estradiol, lumbar functional disability, and LBP perception variables. The following parameters were used for the interpretation of the magnitude of the correlation level (rho): 0.00-0.30: negligent; 0.30-0.50: low; 0.50-0.70: moderate; 0.70-0.90: high; 0.90-1.00: very high[23]. The study adopted the value of $p<0.05$ for statistical significance.

RESULTS

Table 1 presents the characteristics of the 22 patients that participated in the study and the descriptive results of the VAS, RMQ, TSK variables and the isometric tests, in scores.

Table 1. Descriptive results of the sample characteristics for the study variables

Variables	Mean	SD	p-value (SW)
Age (years)	59.32	8.91	0.922
TBM (kg)	70.27	12.27	0.917
Heigh (m)	1.58	0.10	0.273
BMI (kg/m^2)	28.35	4.70	0.037
Estradiol (pg/mL)	14.29	2.74	0.001
VAS (score)	7.40	1.70	0.132
RMQ (score)	15.59	4.09	0.812
TSK (score)	41.32	8.17	0.655
AbdStr (score)	3.41	1.22	0.001
LumbStr (score)	3.14	0.64	0.000

SD = standard deviation; TBM = total body mass; BMI = body mass index; VAS = visual analog scale; RMQ = Roland Morris Questionnaire; TSK = Tampa Scale for Kinesiophobia; AbdStr = abdominal strength; LumbStr = strength of spine extensors; SW = Shapiro-Wilk

Table 2 presents the result of the Spearman correlation test, expressing the values related to the correlation coefficient (rho) for the studied variables. Two negative moderate correlations related to the levels of kinesiophobia were found, one referring to the TBM (rho= -0.513; p= 0.015) and another one referring to the BMI (rho= -0.576; p= 0.005). This shows that the higher the TBM and BMI values, the lower the kinesiophobia levels tend to be.
Kinesophobia also had a moderate correlation with the perception of lumbar functional disability, however, in a positive manner (rho= 0.434; p=0.043). This means that the higher the levels of kinesophobia, the greater the perception of lumbar functional disability. No significant correlations were found between the variables of muscle strength, estradiol and perception of lumbar pain.

Table 2. Results of the studied variables by the Spearman correlation test

		Age	TBM	BMI	VAS	RMQ	TSK	AbdStr	LumbStr
TBM	rho	-0.156							
	P value	0.489							
BMI	rho	-0.023	0.789						
	P value	0.920	0.000						
VAS	rho	-0.116	0.153	0.183					
	P value	0.607	0.497	0.414					
RMQ	rho	0.141	-0.282	-0.129	0.268				
	P value	0.532	0.204	0.566	0.228				
TSK	rho	0.109	-0.513*	-0.576*	-0.021	0.434*			
	P value	0.630	0.015	0.005	0.926	0.043			
AbdStr	rho	-0.369	-0.383	-0.357	0.141	0.153	-0.039		
	P value	0.091	0.078	0.103	0.531	0.497	0.863		
LumbStr	rho	-0.357	0.101	-0.185	0.049	0.063	0.145	0.148	
	P value	0.103	0.654	0.410	0.829	0.782	0.520	0.511	
Estradiol	rho	0.342	0.048	0.121	0.027	-0.027	-0.076	-0.342	-0.209
	P value	0.119	0.831	0.591	0.904	0.907	0.738	0.119	0.352

TBM = total body mass; BMI = body mass index; VAS = visual analog scale; RMQ = Roland Morris Questionnaire; TSK = Tampa Scale for Kinesiophobia; AbdStr = abdominal strength; LumbStr = strength of spine extensors. * p<0.05.

DISCUSSION

The results showed positive correlation between kinesiophobia and the perception of lumbar functional disability. This indicated that, the higher the levels of kinesiophobia, the higher is the perception of lumbar functional disability. A negative correlation between TBM, BMI and kinesiophobia was also found. This demonstrates that, the higher the TBM and BMI values, the lower tend to be the levels of kinesiophobia.

The BMI values found classified the sample as overweight, within the pre-obese range (25.0-29.9kg/m^2)[24]. For the study[25] overweightness and obesity are strongly associated with increased LBP incidence. Overweightness can increase the risk of LBP, which is often related to a sedentary lifestyle. However, this association between obesity and LBP can have different relationships, as obesity can be a cause or a consequence of LBP[26]. Systematic practice of physical exercise can be efficient in maintaining the values of BMI within the considered adequate parameters[27]. Treatments and exercise programs with an emphasis in recovering functional movement, muscle strength, flexibility and mechanisms of anticipatory stabilization must be the base for LBP prevention and intervention processes[10].

The study[28] correlated the variables of kinesophobia, pain intensity, quality of life and functional disability in 132 patients diagnosed with chronic LBP. There is a correlation between kinesophobia and functional disability in patients with chronic LBP: the greater the fear of movement, the higher are the individual's levels of functional disability, results which are in accordance with this study's findings. A positive correlation between kinesiophobia and pain intensity was found, different from the results found in the current study, in which there was no correlation between the two variables.

In patients diagnosed with chronic LBP, the belief of pain during movement is associated with more pain, more disability and less probability of returning to professional activities. Besides these factors that are directly related to the perception of LBP felt by the patient, it's also possible to observe the brain activity of specific areas related to emotions, such as those related to the beliefs of fear[29]. People in pain tend to have thoughts based on the necessity to protect themselves and avoid feeling more pain as an escape mechanism[30].

Authors[31] evaluated 192 patients diagnosed with chronic LBP, divided in obese and not obese. Kinesiophobia was assessed by TSK, functional disability was assessed by the Oswestry Scale. Quality of life was also evaluated. The results showed higher levels of kinesiophobia in the obese population compared to the non-obese, contrary to the findings of the present study, which showed lower levels of kinesiophobia in individuals with higher TBM and BMI. It's possible that these results are due to the subjective feature of kinesiophobia, since the beliefs related to movement and fear of pain during movement can change according to the individual's previous experiences of pain and the area of pain[32].

The alteration of hormonal levels is common in the process of aging and can have a direct influence on LBP. This condition was observed in the study[22] with 11 postmenopausal women with chronic LBP. These women presented higher levels of LBP perception and less levels of estradiol, but no significant correlations between these two variables were found. These reduced hormonal levels can be associated with the loss of bone mass, which can trigger the deterioration of the lumbar spine intervertebral discs and, consequently, cause pain in this area.

Women who were older presented lower levels of lumbar strength[22]. As for LBP, this reduction in the levels of strength, known as dynapenia, can be caused by changes coming from the aging pro-

cess. This provokes the reduction in the number and size of muscular fibers and progressively reduces muscular function due to the loss of motor neurons which is not properly compensated by the reinnervation of muscle fibers by the remaining motor neurons[33].
The limitations of this research include the fact that the study design is cross-sectional, where causal relationships cannot be established. The relatively small sample size and the absence of any type of control related to the participants' work activities or rest duration during the study were also considered limitations. Due to these factors and that BMI can't distinguish between muscle mass and body fat mass, it's suggested that the study's results are interpreted with prudence.
Studies using a probabilistic sample and seeking to understand the relationship of the postmenopause variables such as quality and quantity of sleep, hormone levels, body fat and muscle mass are necessary, since changes resulting from this physiological and chronological change can affect the quality of life of women, especially at more advanced ages.

CONCLUSION

Women in the postmenopause period with chronic LBP that had higher values of TBM and BMI presented lower levels of kinesiophobia, which means less fear of pain during movement or when maintaining a specific position. There is a positive relation between the levels of kinesiophobia and the perception of functional lumbar disability, indicating that the fear of pain during movement or when maintaining a specific position is directly related to the perception of functionality and safety of the lumbar spine.

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