



Brazilian Journal of Physical Therapy

<https://www.journals.elsevier.com/brazilian-journal-of-physical-therapy>



ORIGINAL RESEARCH

Analysis of the measurement properties of the Brazilian-Portuguese version of the Tampa Scale for Kinesiophobia-11 in patients with fibromyalgia



Evany Maira Espirito Santo Salvador, Katherinne Ferro Moura Franco, Gisela Cristiane Miyamoto, Yuri Rafael dos Santos Franco, Cristina Maria Nunes Cabral*

Master's and Doctoral Program in Physical Therapy, Universidade Cidade de São Paulo, São Paulo, SP, Brazil

Received 6 September 2019; received in revised form 18 March 2020; accepted 17 May 2020

Available online 26 May 2020

KEYWORDS

Tampa Scale for Kinesiophobia-11; Measurement properties; Fibromyalgia

Abstract

Objective: To analyze the measurement properties of the Brazilian-Portuguese version of the Tampa Scale for Kinesiophobia-11 in patients with fibromyalgia.

Methods: Assessment was made at three time points: baseline ($n=130$) and 15 days ($n=54$) and eight weeks after baseline ($n=51$). Data collected at baseline were used to assess internal consistency, criterion and construct validity, and ceiling and floor effects. Data collected at baseline and 15 days after baseline were used to assess reliability and measurement error, and data collected before and after an eight-week exercise-based physical therapy intervention were used to assess interpretability of change scores.

Results: The Tampa Scale for Kinesiophobia-11 showed adequate internal consistency (Cronbach's $\alpha=0.77$; α if item deleted: $0.74-0.77$), substantial reliability (intraclass correlation coefficient $\kappa_{2,1}=0.85$; 95% confidence interval: $0.75, 0.90$), good measurement error (standard error of measurement: 2.65 points), and a minimal detectable change (90% confidence) of 6.16 points. For validity, the Tampa Scale for Kinesiophobia-11 showed a positive and good correlation with the original Tampa Scale for Kinesiophobia ($r=0.84, p<0.01$), positive and moderate correlation with the Pain Catastrophizing Scale ($r=0.55, p<0.01$), positive and weak correlation with the Numerical Pain Rating Scale ($r=0.25, p<0.01$), positive and moderate correlation with the Beck Depression Inventory ($r=0.39, p<0.01$), and no correlation with the Patient-Specific Functional Scale ($r=0.11, p=0.23$). Kinesiophobia, pain, function, catastrophizing, and depression statistically improved after the eight-week intervention ($p<0.01$).

Conclusion: The Tampa Scale for Kinesiophobia-11 is consistent, reliable, and appropriate to assess fear of movement in patients with fibromyalgia in the clinical context. Responsiveness of the Tampa Scale for Kinesiophobia-11 should be tested in future studies.

© 2020 Associação Brasileira de Pesquisa e Pós-Graduação em Fisioterapia. Published by Elsevier Editora Ltda. All rights reserved.

* Corresponding author at: Programa de Mestrado e Doutorado em Fisioterapia, Rua Cesário Galeno 475, CEP: 03071-000, São Paulo, SP, Brazil.

E-mail: cristina.cabral@unicid.edu.br (C.M. Cabral).

Introduction

Individuals with chronic musculoskeletal pain have different types and extent of emotional, cognitive, and behavioral response to pain.¹ Among these responses, fear related to perceived threatening situations may be most significant. Patients with high levels of fear view pain as a sign of injury and any activity that causes or has the potential to cause pain² is interpreted as dangerous.³ The fear, avoidance, anxiety, and pain model is the most used to explain the cycle that contributes to pain chronification.³

Kinesiophobia is defined as an excessive, irrational, and debilitating fear of movement and physical activity, resulting from the feeling of vulnerability to painful or new injuries.⁴ Kinesiophobia was identified in 60% of patients with chronic musculoskeletal pain,⁵ with a negative impact on function in patients with chronic low back pain,⁶ knee osteoarthritis,⁷ and chronic shoulder pain.⁸ Kinesiophobia is commonly found in patients with fibromyalgia due to the association between pain/fatigue and movement, which consequently reduces the level of physical activity, increases disability, and perpetuates pain.^{3,9,10}

The Tampa Scale for Kinesiophobia (TSK) is the most widely used self-report questionnaire for evaluating kinesiophobia in patients with chronic pain.⁴ The TSK has already been translated into Brazilian-Portuguese and validated for patients with chronic low back pain.¹¹ In 2005, a shorter version was created that excludes six items with inadequate measurement properties. Four items (4, 9, 12, and 14) were removed because their answers did not fit a normal distribution pattern and two (8 and 16) because they seemed to measure different constructs than the other items. Thus, the 11-item version known as the Tampa Scale for Kinesiophobia-11 (TSK-11) was created.¹²

The TSK-11 has measurement properties similar to the original version, with the advantage of being shorter and simpler.¹² In addition, the TSK-11 is validated for patients with chronic low back pain,¹² chronic musculoskeletal pain in older adults,¹³ and in adults.¹⁴ The assessment of kinesiophobia in patients with fibromyalgia may be important to properly design rehabilitation strategies and goals in this population. However, the measurement properties of the TSK-11 in patients with fibromyalgia have not yet been determined. Therefore, the objective of this study was to establish the reliability, interpretability, and criterion and construct validity of the Brazilian-Portuguese version of the TSK-11 in patients with fibromyalgia.

Methods

This study was approved by the Research Ethics Committee of Universidade Cidade de São Paulo (UNICID), São Paulo, SP, Brazil under number 51328215.1.0000.0064, and authorized by the original author¹² of the TSK-11 via direct electronic communication.

Participants

One hundred and thirty participants were recruited through advertisements on local websites and newspapers. After the baseline assessment, participants were divided into

two samples: 79 were invited to participate in a second assessment 15 days later, and 51 were included in an ongoing randomized controlled trial¹⁵ and received a physical therapy intervention for eight weeks. We included individuals who could read and write in Brazilian-Portuguese and met the 2010 American College of Rheumatology diagnostic criteria for fibromyalgia¹⁶: Widespread Pain Index (WPI) greater than or equal to 7 and Symptom Severity Score (SSS) greater than or equal to 5, or WPI between 3 and 6 and SSS greater than or equal to 9, absence of any other disease that explained the symptoms, and presence of pain for at least three months.

The exclusion criteria were the following: uncontrolled systemic diseases (diabetes mellitus, systemic arterial hypertension, and thyroid dysfunction); neurological, cardiorespiratory, and musculoskeletal conditions that could interfere with treatment, such as paralysis, significant changes in sensory function, or changes in the level of cognitive function and understanding; advanced joint diseases (e.g., severe arthrosis, hip or knee arthroplasty, severe rheumatoid arthritis, neck pain with referred pain to upper limbs); injury or severe pain in the lower limb joints that limited aerobic exercise (e.g., meniscal injury, plantar fasciitis); partial or total muscle tear; amputations; recent surgery; and pregnancy. All patients included in the study signed an informed consent form prior to participation.

Procedures

At baseline assessment, personal, anthropometric, and clinical data were collected for sample characterization. All participants completed the TSK, the TSK-11, the Numerical Pain Rating Scale (NPRS), the Patient-Specific Functional Scale (PSFS), the Pain Catastrophizing Scale (PCS), and the Beck Depression Inventory (BDI). Data collected at baseline assessment were used to assess internal consistency, construct and criterion validity, and ceiling and floor effects. After 15 days, the patients completed the TSK-11 again for the assessment of reliability and measurement error – with the assumption that no change in status would have occurred in 15 days and that the window of time was sufficient to minimize recall. Finally, eight weeks after the baseline assessment, those patients who underwent physical therapy treatment completed the same questionnaires administered at baseline assessment, to assess interpretability of change scores.

Questionnaires

The TSK consists of 17 questions that assess fear of movement. The score for each item ranges from 1 to 4, where 1 represents “strongly disagree”, 2 “somewhat disagree”, 3 “somewhat agree”, and 4 “strongly agree”. For the final score, it is necessary to reverse the scores of questions 4, 8, 12, and 16. The total score varies between 17 and 68 points, and a higher score represents greater kinesiophobia.^{11,17}

The TSK-11 is composed of 11 items of the TSK, scored in the same manner as described for the 17-item scale. The final score of the scale is calculated by adding the scores of the items and ranges from 11 to 44 points with a higher score representing greater kinesiophobia.¹² The TSK

has already undergone the process of translation and cross-cultural adaptation to Brazilian-Portuguese, therefore it was not necessary to repeat the translation and cross-cultural adaptation phase for the TSK-11 as it is simply a subset of the questions in the original version.

The NPRS was used for the individual to indicate their average pain over the past seven days. It consisted of an 11-point scale, ranging from 0 to 10, where 0 was "no pain" and 10 was "the worst possible pain".¹⁸

For the PSFS, the individual identifies three primary activities he or she felt unable to do or had difficulty with because of fibromyalgia. Next, the individual rates their ability to perform the identified activities on an 11-point scale, where 0 represents "unable to perform the activity" and 10 represents "able to perform the activity at preinjury level". The average score for the three activities is then calculated with a higher score indicating better function.¹⁸

The PCS is a 13-item scale with three domains: helplessness, magnification, and rumination. It is designed to assess the degree of catastrophization, thoughts, and feelings that patients develop when they are in pain. Each item is scored from 0 to 4 points, where 0 represents "not at all", 1 "to a slight degree", 2 "to a moderate degree", 3 "to a great degree", and 4 "all the time". The total score is the sum of all items, ranging from 0 to 52 points. The higher the score, the higher the level of catastrophizing about pain.¹⁹

The BDI consists of 21 items that assess depressive symptoms in the last week, including the day of assessment. The answer for each item contains statements about the symptoms that are rated on an ordinal scale from 0 to 3, and the sum of the items results in the total score, which ranges from 0 to 63 points. Severity levels are classified according to the final score as "no depression" or "minimal depression" (from 0 to 13), "mild depression" (from 14 to 19), "moderate depression" (from 20 to 28), or "severe depression" (from 29 to 63).²⁰

All questionnaires used have already been translated and validated to Brazilian-Portuguese. The PSFS and the NPRS were tested on patients with acute low back pain and had substantial to excellent reliability, with intraclass correlation coefficient (ICC) and 95% confidence interval (95% CI) of 0.85 (0.77, 0.90) and 0.94 (0.90, 0.96), respectively.¹⁸ The PSFS was considered more responsive than other functional capacity assessment scales in terms of its correlation with the change measured by the Global Perceived Effect Scale ($r = 0.34$, $p < 0.01$).¹⁸ The PCS was tested on patients with chronic musculoskeletal pain and showed adequate internal consistency and excellent reliability, with a Cronbach's alpha of 0.91 (0.93 for helplessness, 0.88 for magnification, and 0.86 for rumination) and ICC of 0.92 (95% CI: 0.91, 0.94).¹⁹ The BDI showed adequate internal consistency and substantial reliability in community-dwelling patients, with a Cronbach's alpha of 0.93 and ICC of 0.89 (95% CI: 0.82, 0.93).²⁰

Intervention

All patients received the intervention recommended by the guidelines, composed by an educational booklet with information on fibromyalgia, self-care strategies, and exercises.^{21–23} The treatment consisted of aerobic exercises

or modified Pilates exercises performed twice a week in 60-min sessions over a period of eight weeks. Patients who performed aerobic exercise could choose between using a treadmill or stationary bike, maintaining exercise intensity between 57% and 76% of their maximum heart rate.^{24–26} Perceived exertion for both exercise approaches was monitored using the Borg Perceived Exertion Scale²⁷ with the goal to maintain perceived exertion between 10 and 12²⁸ out of 20. More details about the treatment can be found elsewhere.¹⁵

Analysis of measurement properties

The analyses had the required number of participants and classifications for each measurement property.^{29,30} Internal consistency was analyzed using Cronbach's alpha and alpha if item deleted. Alpha values greater than or equal to 0.70 and less than 0.95 were considered adequate.³¹ Reliability was calculated using ICC type 2,1 and 95% CIs. ICC values lower than 0.40 represent poor reliability, between 0.40 and 0.75 represent moderate reliability, between 0.75 and 0.90 represent substantial reliability, and greater than 0.90 represent excellent reliability.²⁹ Measurement error was calculated using two methods: standard error of measurement (SEM) and minimal detectable change (MDC). The SEM is expressed in the units of measurement of the scale. To obtain the SEM, the standard deviation of the mean of the differences was divided by the square root of 2 (standard deviation of mean differences/ $\sqrt{2}$).³² The percentage of SEM related to the total scale score was interpreted as very good when $\leq 5\%$, good when $> 5\%$ and $\leq 10\%$, doubtful when $> 10\%$ and $\leq 20\%$, and poor when $> 20\%$.³¹ The MDC was calculated using the formula $MDC = 1.645 \times \sqrt{2} \times SEM$, which reflects a 90% CI. Values higher than the MDC characterize a change in a patient's score that is above measurement error.³¹

Construct validity was assessed using Pearson's correlation test, in which $r < 0.30$ indicated a weak correlation, $r \geq 0.30$ and < 0.60 indicated a moderate correlation, and $r \geq 0.60$ indicated a good correlation.³³ The correlation was performed between the total scores for the TSK-11 and the total scores for the PCS, NPRS, BDI, and PSFS. Criterion validity can be assessed when there is a gold standard available for the measure. For a patient-reported outcome measure, the long version of an instrument can be considered an acceptable gold standard for the short version of the same instrument.³⁰ Thus, criterion validity was assessed using the correlation between the TSK and the TSK-11. The hypotheses for validity were that the Brazilian-Portuguese version of the TSK-11 would have a positive and good correlation with the PCS, positive and moderate correlation with the NPRS and the BDI, negative and moderate correlation with the PSFS, and a positive correlation greater than 0.70 with the TSK.^{29,33}

Interpretability of the change scores for kinesiophobia, pain, function, catastrophizing, and depression was analyzed with data collected from the 51 patients who received treatment. Paired *T*-test was used to compare the differences between baseline and eight weeks after baseline assessments. The ceiling and floor effects evaluated the percentage of patients who obtained the maximum and minimum scores on the scale. This effect was considered present

Table 1 Characteristics of the study participants.

Variables	Baseline assessment (n = 130)	15-day assessment (n = 54)
<i>Female gender</i>	128 (98.5)	53 (98.1)
<i>Age (years)</i>	45.5 ± 11.1	43.5 ± 11.4
<i>Weight (kg)</i>	75.4 ± 14.1	72.7 ± 14.5
<i>Height (m)</i>	1.6 ± 0.1	1.6 ± 0.1
<i>Body mass index (kg/m²)</i>	28.5 ± 5.3	27.3 ± 5.4
<i>Marital status^a</i>		
Single	30 (23.3)	14 (26.4)
Married	76 (58.9)	32 (60.4)
Divorced	20 (15.5)	7 (13.2)
Widowed	3 (2.3)	0
<i>Academic level^b</i>		
Less than 5 years of study	5 (3.9)	3 (5.8)
Completed 10 years of study	17 (13.3)	4 (7.7)
Completed 15 years of study	55 (43.0)	22 (42.3)
More than 15 years of study	51 (39.8)	23 (44.2)
<i>Income (dollar per month)</i>	737.4 ± 620.2	562.2 ± 498.9
<i>Physical activity practice</i>	45 (34.6)	22 (40.7)
<i>Duration of pain (months)</i>	113.9 ± 95.9	107.3 ± 94.8
<i>Physical therapy treatment</i>	15 (11.5)	8 (14.8)
<i>Other type of treatment</i>	41 (31.5)	24 (44.4)
<i>Use of medication for pain</i>	100 (76.9)	37 (68.5)
<i>Use of other medication</i>	87 (66.9)	36 (66.7)
<i>Kinesiophobia</i>		
Tampa Scale for Kinesiophobia (TSK: 17–68 points)	47.5 ± 7.7	NA
Tampa Scale for Kinesiophobia-11 (TSK-11: 11–44 points)	30.6 ± 6.8	30.3 ± 6.9
<i>Pain (NPRS: 0–10 points)</i>	7.6 ± 1.4	NA
<i>Function (PSFS: 0–10 points)</i>	3.9 ± 1.5	NA
<i>Catastrophizing (PCS: 0–52 points)</i>	34.4 ± 12.5	NA
<i>Depression (BDI: 0–63 points)</i>	21.8 ± 6.0	NA

Continuous variables are expressed as mean ± standard deviation and categorical variables as frequency (proportion).

^a Values for 129 participants at baseline assessment and 53 at the 15-day assessment.

^b Values valid for 128 participants at baseline assessment and 52 at the 15-day assessment.

NA, not assessed.

Higher scores in the Tampa Scale for Kinesiophobia (TSK), Tampa Scale for Kinesiophobia-11 (TSK-11), Numerical Pain Rating Scale (NPRS), Pain Catastrophizing Scale (PCS), and Beck Depression Inventory (BDI) indicate a worse condition, and higher scores in the Patient-Specific Functional Scale (PSFS) indicate better function.

when more than 15% of the sample obtained the maximum (ceiling) or minimum (floor) score on the questionnaire.^{31,34}

Results

One hundred and thirty participants were assessed at baseline for the analysis of internal consistency, construct and criterion validity, and ceiling and floor effects. From this initial group, 54 of the 79 participants invited to participate in the follow-up assessment completed the TSK-11 15 days later. These data were used for the analysis of reliability and measurement error of the TSK-11. Twenty-five participants did not return for assessment at 15 days and their data were used only for the baseline assessment. The demographic and clinical characteristics of the patients included at baseline are described in Table 1, with 11.5% of them receiving physical therapy care and 31.5% receiving other treatments, such as medication (16.9%), and alter-

native therapies such as acupuncture (6.9%). In the broad category of pain medications, use of muscle relaxants was the most often reported (30.9%), and among other medication, use of antidepressants was the most often reported (69.4%).

The results of the reliability and criterion and construct validity analyses, and their classification are provided in Table 2. No ceiling and floor effects were detected with no participant reaching the minimum or maximum score. In the validity analysis, the criterion validity between TSK and TSK-11 was confirmed based on a correlation higher than 0.70. For construct validity, only one of the previously defined hypotheses was confirmed (a positive and moderate correlation between TSK-11 and BDI). The results of the interpretability of change scores are presented in Table 3. There was a statistically significant improvement for all outcome measures after the exercise-based intervention ($p < 0.05$).

Table 2 Reliability and criterion and construct validity of the TSK-11.

Properties	Values	Classification
Reliability		
<i>Internal consistency (n = 130)</i>		
Cronbach's alpha (alpha if item deleted)	0.77 (0.74–0.77)	Adequate
<i>Reliability (n = 54)</i>		
Intraclass correlation coefficient _{2,1} (ICC _{2,1} , 95% CI)	0.85 (0.75, 0.90)	Substantial
<i>Measurement error (n = 54)</i>		
Standard error of measurement (points, %)	2.65 (7.81)	Good
Minimal detectable change (points) ^a	6.16	NC
<i>Criterion validity (n = 130)</i>		
Tampa Scale for Kinesiophobia (<i>r</i> , <i>p</i>)	0.84 (<0.01)	Good
<i>Construct validity (n = 130)</i>		
Numerical Pain Rating Scale (<i>r</i> , <i>p</i>)	0.25 (<0.01)	Weak
Patient-Specific Functional Scale (<i>r</i> , <i>p</i>)	0.11 (0.23)	–
Pain Catastrophizing Scale (<i>r</i> , <i>p</i>)	0.55 (<0.01)	Moderate
Beck Depression Inventory (<i>r</i> , <i>p</i>)	0.39 (<0.01)	Moderate

CI, confidence interval; NC, not classified; –, no significant correlation.

^a The minimal detectable change was calculated with 90% CI.

Bold values for criterion and construct validity represent the hypotheses confirmed.

Table 3 Change in scores from pre to post 8-week intervention (n = 51).

Outcomes	Baseline Mean ± SD	Eight-week assessment Mean ± SD	Mean difference (95% CI)	<i>p</i> -value
<i>Kinesiophobia</i>				
TSK (17–68 points)	47.5 ± 7.7	41.8 ± 7.6	5.7 (3.2, 8.2)	<0.01
TSK-11 (11–44 points)	30.6 ± 6.8	24.6 ± 7.0	6.0 (4.1, 8.0)	<0.01
<i>Pain (NPRS: 0–10 points)</i>				
	7.6 ± 1.4	4.4 ± 3.0	3.1 (2.2, 4.0)	<0.01
<i>Function (PSFS: 0–10 points)</i>				
	3.9 ± 1.5	5.5 ± 1.6	–1.6 (–2.1, –1.1)	<0.01
<i>Catastrophizing (PCS: 0–52 points)</i>				
	34.4 ± 12.5	27.9 ± 11.2	6.5 (3.0, 10.0)	<0.01
<i>Depression (BDI: 0–63 points)</i>				
	21.8 ± 6.0	13.5 ± 7.4	8.3 (6.3, 10.4)	<0.01

SD, standard deviation; CI, confidence interval.

Higher scores in the Tampa Scale for Kinesiophobia (TSK), Tampa Scale for Kinesiophobia-11 (TSK-11), Numerical Pain Rating Scale (NPRS), Pain Catastrophizing Scale (PCS), and Beck Depression Inventory (BDI) indicate a worse condition, and higher scores in the Patient-Specific Functional Scale (PSFS) indicate better function.

Discussion

The aim of this study was to analyze the reliability, interpretability, and criterion and construct validity of the TSK-11 in patients with fibromyalgia. The results showed that the Brazilian-Portuguese version of the TSK-11 has adequate internal consistency, substantial reliability, and good measurement error. For validity, the hypotheses confirmed were positive and good correlation with the TSK and positive and moderate correlation with the BDI.

In the baseline assessment, the participants presented with high pain intensity, moderate depression, and a high degree of kinesiophobia and pain catastrophizing. These characteristics are consistent with previous reports of patients with fibromyalgia, i.e., that patients with higher levels of kinesiophobia also report higher levels of pain and depression.¹ Other studies in different languages that analyzed the measurement properties of the TSK-11 in patients with chronic pain also found similar results, such as adequate internal consistency, substantial reliability, and good measurement error.^{9,12–14} Therefore,

the Brazilian-Portuguese version of the TSK-11 seems reliable and applicable in the clinical and research settings because it has similar results for these measurement properties as other versions which are already tested and widely used.

The influence of psychological factors is already well described in patients with chronic musculoskeletal pain.^{35,36} The choice of instruments used in this study to analyze construct validity was based on the fear-avoidance model² and in agreement with other studies.^{13,14,17} The TSK-11 was associated with catastrophizing, depression, and pain, as in other studies.^{13,14} The only instrument that showed no correlation with the TSK-11 was the PSFS, which assesses disability in specific activities indicated by the patient. The PSFS is more specific than other disability scales,¹⁸ which may explain this finding. Studies^{13,14} usually measure functional capacity using general disability assessment instruments. However, only 40% of the hypotheses were confirmed for validity. Given that patients with fibromyalgia appear to have different results from other patients with chronic pain in physical and psychological constructs,³⁷ our

hypotheses may have been overestimated. Other point that should be highlighted is that none of the instruments used to assess construct validity evaluates kinesiophobia directly, the chosen instruments evaluate related constructs.

One of the strengths of this study is that the instruments used as comparators to assess the criterion validity and construct validity have already been validated for Brazilian-Portuguese and showed adequate measurement properties. As recommended by the guidelines, to determine whether the results are reliable, it is essential to provide information about the measurement properties of the instruments used to analyze the correlations between the constructs.³⁸ Another important point is that all clinical outcomes (kinesiophobia, pain, function, catastrophizing, and depression) showed improvement after intervention. An improvement of pain and function was expected, as the intervention was designed according to the guidelines.^{39,40} However, our data showed that kinesiophobia also improved, even after an intervention not designed specifically to change fear. A limitation of the present study is that responsiveness was not assessed. Further studies are needed that include treatments targeting kinesiophobia in patients with fibromyalgia to evaluate the responsiveness of the Brazilian-Portuguese version of the TSK-11.

Conclusion

The TSK-11 may be considered adequate and reliable for use in future research and in the assessment of patients with fibromyalgia in clinical practice. However, further studies are necessary to assess its responsiveness.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

This work was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001. The funder had no role in the study design, in the collection, analysis, and interpretation of data, in the writing of the report, and in the decision to submit the article for publication.

References

1. Turk DC, Robinson JP, Burwinkle T. Prevalence of fear of pain and activity in patients with fibromyalgia syndrome. *J Pain*. 2004;5(9):483–490.
2. Asmundson GJ, Vlaeyen JWS, Crombez G. *Understanding and Treating Fear of Pain*. USA: Oxford University Press; 2004.
3. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*. 2000;85(3):317–332.
4. Korri S, Miller R, Todd D. Kinesiophobia: a new view of chronic pain behaviour. *Pain Manag*. 1990;3:35–43.
5. Branstrom H, Fahlstrom M. Kinesiophobia in patients with chronic musculoskeletal pain: differences between men and women. *J Rehabil Med*. 2008;40(5):375–380.
6. Picavet HS, Vlaeyen JW, Schouten JS. Pain catastrophizing and kinesiophobia: predictors of chronic low back pain. *Am J Epidemiol*. 2002;156(11):1028–1034.
7. Gunn AH, Schwartz TA, Arbeeve LS, et al. Fear of movement and associated factors among adults with symptomatic knee osteoarthritis. *Arthritis Care Res (Hoboken)*. 2017;69(12):1826–1833.
8. Feleus A, van Dalen T, Bierma-Zeinstra SM, et al. Kinesiophobia in patients with non-traumatic arm, neck and shoulder complaints: a prospective cohort study in general practice. *BMC Musculoskelet Disord*. 2007;8:117.
9. Hapidou EG, O'Brien MA, Pierrynowski MR, de las Heras E, Patel M, 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(3):235–241.
10. Lünig Bergsten C, Lundberg M, Lindberg P, Elfving B. Change in kinesiophobia and its relation to activity limitation after multidisciplinary rehabilitation in patients with chronic back pain. *Disabil Rehabil*. 2012;34(10):852–858.
11. Siqueira FB, Teixeira-Salmela LF, de Castro Magalhães L. Análise das propriedades psicométricas da versão brasileira da escala tampa de cinesiofobia Analysis of the psychometric properties of the Brazilian version of the tampa scale for kinesiophobia. *Acta Ortop Bras*. 2007;15(1):19–24.
12. Woby SR, Roach NK, Urmston M, Watson PJ. Psychometric properties of the TSK-11: a shortened version of the Tampa Scale for Kinesiophobia. *Pain*. 2005;117(1–2):137–144.
13. Larsson C, Hansson EE, Sundquist K, Jakobsson U. Psychometric properties of the Tampa Scale of Kinesiophobia (TSK-11) among older people with chronic pain. *Physiother Theory Pract*. 2014;30(6):421–428.
14. Gómez-Pérez L, López-Martínez AE, Ruiz-Párraga GT. Psychometric properties of the Spanish version of the Tampa Scale for Kinesiophobia (TSK). *J Pain*. 2011;12(4):425–435.
15. Franco KFM, Franco YRS, Salvador EMES, Nascimento BCB, Miyamoto GC, Cabral CMN. Effectiveness and cost-effectiveness of the modified Pilates method versus aerobic exercise in the treatment of patients with fibromyalgia: protocol for a randomized controlled trial. *BMC Rheumatol*. 2019;3:2.
16. Wolfe F, Clauw DJ, Fitzcharles MA, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care Res (Hoboken)*. 2010;62(5):600–610.
17. de Souza FS, da Silva Marinho C, Siqueira FB, Maher CG, Costa LOP. Psychometric testing confirms that the Brazilian-Portuguese adaptations, the original versions of the Fear-Avoidance Beliefs Questionnaire, and the Tampa Scale of Kinesiophobia have similar measurement properties. *Spine (Phila Pa 1976)*. 2008;33(9):1028–1033.
18. Costa LOP, Maher CG, Latimer J, et al. Clinimetric testing of three self-report outcome measures for low back pain patients in Brazil: which one is the best? *Spine (Phila Pa 1976)*. 2008;33(22):2459–2463.
19. Sehn F, Chachamovich E, Vidor LP, et al. Cross-cultural adaptation and validation of the Brazilian Portuguese version of the Pain Catastrophizing Scale. *Pain Med*. 2012;13(11):1425–1435.
20. Gomes-Oliveira MH, Gorenstein C, Lotufo Neto F, Andrade LH, Wang YP. Validation of the Brazilian Portuguese version of the Beck Depression Inventory-II in a community sample. *Rev Bras Psiquiatr*. 2012;34(4):389–394.
21. Fitzcharles MA, Ste-Marie PA, Goldenberg DL, et al. 2012 Canadian guidelines for the diagnosis and management of fibromyalgia syndrome: executive summary. *Pain Res Manag*. 2013;18(3):119–126.

22. Whaley MH, Brubaker PH, Otto RM, Armstrong LE. *ACSM's Guidelines for Exercise Testing and Prescription*. Philadelphia, Pa: Lippincott Williams & Wilkins; 2006.
23. Marques A, Yuan S, Matsutani L, Santos A. *Programa de atualização em fisioterapia esportiva e traumato-ortopédica*. Porto Alegre, Secad; 2014.
24. Bidonde J, Busch AJ, Bath B, Milosavljevic S. Exercise for adults with fibromyalgia: an umbrella systematic review with synthesis of best evidence. *Curr Rheumatol Rev*. 2014;10(1): 45–79.
25. Garber CE, Blissmer B, Deschenes MR, et al. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med Sci Sports Exerc*. 2011;43(7):1334–1359.
26. Hauser W, Klose P, Langhorst J, et al. Efficacy of different types of aerobic exercise in fibromyalgia syndrome: a systematic review and meta-analysis of randomised controlled trials. *Arthritis Res Ther*. 2010;12(3):R79.
27. Borg GA. Psychophysical bases of perceived exertion. *Med Sci Sports Exerc*. 1982;14(5):377–381.
28. Jones KD, Burckhardt CS, Deodhar AA, Perrin NA, Hanson GC, Bennett RM. A six-month randomized controlled trial of exercise and pyridostigmine in the treatment of fibromyalgia. *Arthritis Rheum*. 2008;58(2):612–622.
29. de Vet HC, Terwee CB, Mokkink LB, Knol DL. *Measurement in Medicine: A Practical Guide*. Cambridge: Cambridge University Press; 2011.
30. Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. *Qual Life Res*. 2018;27(5):1147–1157.
31. Terwee CB, Bot SD, de Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. *J Clin Epidemiol*. 2007;60(1):34–42.
32. de Vet HC, Terwee CB, Knol DL, Bouter LM. When to use agreement versus reliability measures. *J Clin Epidemiol*. 2006;59(10):1033–1039.
33. Enderlein G, Fleiss J. *The Design and Analysis of Clinical Experiments*. New York, Chichester, Brisbane, Toronto, Singapore: Wiley; 1986.
34. Mokkink LB, Prinsen CA, Bouter LM, Vet HC, Terwee CB. The CONsensus-based Standards for the selection of health Measurement INstruments (COSMIN) and how to select an outcome measurement instrument. *Braz J Phys Ther*. 2016;20(2):105–113.
35. Turk DC, Wilson HD. Fear of pain as a prognostic factor in chronic pain: conceptual models, assessment, and treatment implications. *Curr Pain Headache R*. 2010;14(2):88–95.
36. Pincus T, Smeets RJ, Simmonds MJ, Sullivan MJ. The fear avoidance model disentangled: improving the clinical utility of the fear avoidance model. *Clin J Pain*. 2010;26(9):739–746.
37. Porter-Moffitt S, Gatchel RJ, Robinson RC, et al. Biopsychosocial profiles of different pain diagnostic groups. *J Pain*. 2006;7(5):308–318.
38. Mokkink L, de Vet H, Prinsen C, et al. COSMIN Risk of Bias checklist for systematic reviews of Patient-Reported Outcome Measures. *Qual Life Res*. 2017:1–9.
39. Häuser W, Ablin J, Perrot S, Fitzcharles MA. Management of fibromyalgia: key messages from recent evidence-based guidelines. *Polish Arch Int Med*. 2017;2017:127.
40. Carville SF, Arendt-Nielsen S, Bliddal H, et al. EULAR evidence-based recommendations for the management of fibromyalgia syndrome. *Ann Rheum Dis*. 2008;67(4):536–541.