ORIGINAL PAPER

Cognitive Assessment of Musculoskeletal Pain: Validity and Reliability of the Greek Version of the Tampa Scale of Kinesiophobia in Patients Suffering from Chronic Low Back Pain

George GEORGOUDIS[a, b], Konstantinos RAPTIS[c], Christos KOUTSERIMPAS[c]

[a]aMusculoskeletal Physiotherapy Research Laboratory, University of West Attica, Athens, Greece

[b]PhysioPain Group®, Pain Therapy & Rehabilitation Centres, Athens, Greece

[c]Department of Orthopaedics and Traumatology, "251" Hellenic Air Force General Hospital of Athens, Greece

ABSTRACT

Objectives: *The Tampa Scale of Kinesiophobia (TSK) evaluates pain associated fear, which is considered an important factor in the cognitive assessment of musculoskeletal pain according to the biopsychosocial model. The aim of this study was to validate the Greek version of the TSK (TSK-GR) in a population suffering from chronic low back pain.*

Methods: *Following Institutional Review Board's approval (ref.: 6/16-2-2018), 70 consecutive patients with low back pain, lasting more than three months, completed the TSK-GR together with the Greek versions of the Hospital Anxiety & Depression Scale (HADs-GR), Fear Avoidance Beliefs Questionnaire (FABQ-GR), Pain Locus of Control (PLC-GR) and visual analogue scale for pain (VAS). A subgroup of 20 patients completed the TSK-GR (48 hours) twice (test-retest reliability). Construct validity was evaluated through the a priori hypothesis of correlation with the FABQ-GR, HADs-GR and VAS, while discriminant construct validity through the lack of correlation with the PLC-GR. The Cronbach's alpha (a), the Pearson's correlation coefficient (r) and the Intraclass Correlation Coefficient (ICC) statistics were used for analyses.*

Results: *Internal consistency and test-retest reliability were satisfactory (Cronbach's a=0.74 and ICC=0.78). The construct validity of the TSK-GR was shown through its association with both FABQ subscales (FABQ-work: r=0.48, p<0.001, and FABQ-physical: r=0.51, p<0.001), with both HADs subscales (HADs-depression: r=0.45, p<0.001, and HADs-anxiety: r=0.34, p<0.005) and with the VAS (r=0.62, p<0.001). Discriminant construct validity was shown through the lack of association between TSK-GR and the PLC-GR.*

Address for correspondence:
C. Koutserimpas, MD, PhD
Department of Orthopaedics and Traumatology,"251" Hellenic Air Force General Hospital of Athens, Greece
Address: Kanellopoulou Av 3, Athens 11525
Tel: 0030 6948712130; email: chrisku91@hotmail.com
ORCID: 0000-0002-1398-9626

Conclusions: This study provided evidence for the validity and reliability of the Greek version of TSK in patients with chronic low back pain.

Keywords: kinesiophobia, fear of pain, spinal pain, fear of injury, fear-avoidance.

INTRODUCTION

Kinesiophobia is the unreasonable activity or (re)injury fear as a result of perceived risk of pain (1). Patients with kinesiophobia are reluctant to initiate and/or engage in physical activities, leading to pain persistence and later on disability (1).

Patients' previous experiences of pain are of utmost importance for the development of this fear, while kinesiophobia may last for a prolonged period of time, after the injury has completely been restored (1-3). The cycle of the Fear Avoidance model, by Vlaeyen and Linton, describes the cyclical nature of prolonged avoidance of activities that is associated with increased functional impairment and disability, caused by kinesiophobia (4).

Hence, treating psychosocial factors such as kinesiophobia may be of great importance in effectively recuperating from various painful musculoskeletal diseases such as low back pain, postoperative pain from joint reconstruction surgery, anterior cruciate ligament injuries, extremities injuries and osteoarthritis (5, 6).

Low back pain is associated with physical limitation in every-day life and sports. Cognitive, emotional, environmental and social factors may drastically affect patients' inclination to question the pain they experience and, thus, may lead to disability (7). Hence, a biopsychosocial approach may lead to thorough understanding of lasting pain and its effect on patients' functional capacity.

In order to offer chronic low-back patients, multidisciplinary interventions, encouraging faster successful recovery, it is essential to detect kinesiophobia among this population.

The Tampa Scale for Kinesiophobia (TSK) is one of the most widely performed scores, evaluating kinesiophobia in patients suffering various pain types (1-3). The translation of TSK in many languages has already been performed, while the reliability and validity of the scale has been well demonstrated in different populations (3, 6).

Nevertheless, the TSK has not yet been translated in Greek.

The aim of the present study was to adopt the TSK into the Greek language (TSK-GR) and to assess its validity and reliability regarding patients suffering low-back pain. ❏

METHODS

Translation of the TSK

The adaptation of TSK into Greek followed the international guidelines, including the translation, synthesis, back-translation and expert committee review phases (8). The questionnaire was translated into Greek by a working group comprised of two psychologists, two physiotherapists, an occupational therapist and an orthopeadic surgeon, and it was back translated into English by another health psychologist and a professional translator. A couple of problematic terms were culturally adapted and, after consensus by the translation team, the provisional final version was developed. The provisional version of the questionnaire was field-tested with the completion from a subgroup of the study population (n=10), to evaluate the distribution of responses for a high proportion of missing items or single responses. Subjects were also interviewed to elaborate on the meaning of each item of the TSK- GR and their response. The results of this initial field-testing showed that the adapted version was still retaining its equivalence in an applied situation (Appendix).

Study design

A total of 70 consecutive patients (aged 18-75 years old) suffering from chronic low back pain (for more than three months) during an 18-month period, who were undergoing physiotherapy in two private Physiotherapy clinics (PhysioPain Group®) in Athens, Greece, and the University Pain Clinic (Aretaieion hospital), Greece, was prospectively enrolled in this study. Patients older than 75 or younger than 18 years and those with malignancy, infections or acute trauma were excluded from the study. Further-

more, patients having undergone spinal surgery and those suffering from low back pain due to pregnancy, as well as patients with sciatica an/or neurological symptomatology were also excluded.

Demographics, including age, gender and occupation, were all recorded. The Visual Analogue Scale (VAS) to evaluate the average intensity of pain, during the previous week, was used.

All patients completed the TSK-GR, a 17-item checklist with a four-point Likert scale. The score ranges between 17 and 68, with scores of 37 or less indicative of low fear of movement and those higher than 37 suggestive of high fear of movement (9).

Furthermore, patients completed the Greek version of the Hospital Anxiety and Depression Scale (HADs) (HAD-GR) (10) (a 14-item questionnaire assessing levels of anxiety and depression) and the Greek version of the Fear-Avoidance Beliefs Questionnaire (FABQ-GR) (11) (a 16-item questionnaire measuring fear-avoidance). Finally, all patients completed the Greek version of the Pain Locus of Control questionnaire (PLC-GR), a 20-item questionnaire examining the perception of patients that their pain may be successfully controlled by themselves or externally (12).

Participants completed the questionnaires in a random order in order to avoid bias (e.g., favouring of the first questionnaire). A standardized text was used for explanation of the questionnaires' requirements. At that point, any queries from the study population were responded.

It is of note that a subgroup of randomly selected patients (N=20) completed the TSK-GR for a second time after 48 hours (t2).

Internal consistency of the TSK-GR was assessed with the Cronbach's alpha statistic (a). Longitudinal reliability (test-retest) was evaluated with the Intraclass Correlation Coefficient (ICC) for the TSK-GR scores taken with 48 hours difference (t1 and t2). Criterion-related validity was evaluated by the degree of association between the TSK-GR, the FABQ-GR and the VAS. The psychometric properties of the TSK-GR were further studied through its relationship with the HAD anxiety and depression subscales. The hypothesis of lack of correlation between the TSK-GR and PLC-GR subscales, two cognitive assessment tools created to examine completely different cognitive parameters of pain, was considered to be initial evidence of TSK-GR discriminant construct validity. Pearson's correlation coefficient (r) was used to examine all correlations. Only data taken at t1 were analysed. Data were analyzed using the SPSS v.24.0 (SPSS Inc. Chicago, IL, USA) statistical package for personal computers. The level of significance was set to 0.05.

All parts of the study were developed within the principles and standards of the Declaration of Helsinki and in accordance with the Guidelines on the Practice of Ethics Committees in Medical Research Involving Human Subjects. Written informed consent was received from all participants, while the study has been approved by the University's bioethics committee (Ref.: 6/16-2-2018). ❑

RESULTS

The main features of the studied population sample are depicted in Table 1. Most of the patients were females (N= 58; 82.9%), while the mean age of the sample was 42.2 years [standard deviation (SD) =12].

Table 2 summarizes the mean values from each score. More specifically, the mean VAS score during the last week was 4 (SD= 2.2), the mean TSK- GR (at t1) 40.6 (SD= 8.1), the mean FABQ- physical subscale 15.6 (SD= 5.6), the mean FABQ- GR work subscale 15.7 (SD= 9.1), while the HAD- GR anxiety subscale was 7.7 (SD= 3.9) and the HAD-GR depression subscale 7.9 (SD= 2.7). Furthermore, the mean PLC- GR pain control subscale was 12.4 (SD= 4.5) and

TABLE 1. Main demographic characteristics of the studied population

Participants (N=70)		
Men	12 (17.1%)	
Women	58 (82.9%)	
Age	42.2±12.0 yrs (range: 18-72)	
General Health	Excellent	4.2%
	Very Good	27.1%
	Good	33.3%
	Not Bad	31.3%
	Poor	4.2%
Job status	Office	28.0%
	Manual (light)	45.6%
	Manual (heavy)	19.7%
	Not working	6.7%

TABLE 2. Descriptive statistics for the variables included in the study

	Mean ± S.D.	Range
TSK-GR (at *t1*)	40.6 ± 8.1	26 – 57
TSK-GR (at *t2*)	39.6 ± 5.8	27 – 51
FABQ-GR_physical	15.6 ± 5.6	3 – 24
FABQ-GR_work	15.7 ± 9.1	0 – 36
HAD-GR_anxiety	7.7 ± 3.9	1 – 17
HAD-GR_depression	7.9 ± 2.7	4 – 14
VAS	4.0 ± 2.2	1 – 9.5
PLC-GR_ pain control	12.4 ± 4.5	2 – 23
PLC-GR_ pain responsibility	7.2 ± 2.4	2 – 12

the mean PLC- GR pain responsibility subscale 7.2 (SD= 2.4).

Internal consistency and test-retest reliability
Internal consistency of TSK-GR was shown to be acceptable (Cronbach's a= 0.74, N=70, items=17). Interestingly, the Cronbach's statistic was further increased (a=0.83, N=70, items=13) when the reverse scored items were removed (items 4, 8, 12, 16). Test-retest reliability was adequate for TSK-GR scores taken with 48 hours difference in a subgroup of the sample (ICC=0.78, 95% CI=0.44–0.91, N=20).

Construct validity
The association between TSK-GR and FABQ-GR, two measures of fear-avoidance, was significant but not very high (FABQ-GR work: r=0.48, p<0.001 and FABQ-GR physical: r=0.51, p<0.001). A relatively high correlation was found between TSK-GR and the VAS of the intensity of pain during last week (r=0.62, p<0.001). A moderate but significant relationship of the TSK-GR with the HAD-GR anxiety (r=0.34, p<0.005) and depression (r=0.45, p<0.001) subscales, was also established. All the above findings were a priori hypotheses according to the properties attributed to the original TSK measure (Table 3).

TABLE 3. Correlation statistics between the TSK-GR and measures of the study

(N=70)	TSK-GR
FABQ-GR_work	r=0.48, p<0.001
FABQ-GR_physical	r=0.51, p<0.001
VAS	r=0.62, p<0.001
HAD-GR_anxiety	r=0.34, p<0.005
HAD-GR_depression	r=0.45, p<0.001
PLC-GR_pain control	r=0.06, NS
PLC-GR_pain responsibility	r= -0.35, p<0.005

A lack of correlation was noted between TSK-GR and the PLC-GR subscales (p>0.05). Specifically, the PLC pain responsibility subscale initially reached an enhanced association with TSK-GR (r= -0.35, p<0.005), which became non-significant after controlling for depression (r= -0.27, p=0.03) and applying the necessary Bonferroni correction (p<0.007) [p value for significance was 0.0071 after Bonferroni correction (0.05/7=0.0071)]. ❑

DISCUSSION

The present study reports a cross-cultural translation and adaption of the TSK in a Greek population suffering from chronic low back pain. The outcomes of this cohort provide preliminary evidence for the validity and reliability of the adapted into Greek Tampa Scale of Kinesiophobia.

Internal consistency was satisfactory (a=0.74) and within the range reported in the literature (from a=0.68 to a=0.81) (1-3, 5). Interestingly, when the reverse-scored items were removed, the Cronbach's a increased (a=0.83), similarly to another study (13) and in opposition to what would be expected (Cronbach's alpha is dependent on and favoured by the increased number of items). The decrease in Cronbach's a probably reflects the difficulty in patients interpreting the structure and content of these items caused by their formulation (13).

The test-retest reliability of the TSK-GR in chronic LBP has not been previously reported except for acute LBP patients (1, 13). A 'substantial' agreement was noted between the TSK-GR scores taken with 48 hours difference (ICC=0.78) in chronic LBP patients. This value is identical with the one reported in acute LBP patients, further confirming the longitudinal reliability of the measure in chronic pain patients (13).

Convergent construct validity (criterion-related) of the TSK-GR was shown through the significant association with the FABQ-GR (FABQ physical: r= 0.51, p<0.001 and FABQ work: r= 0.48, p<0.001). The magnitude of this expected association in the present study lies within the reported values in the literature (13, 14).

It is of note that the only moderate association of the two cognitive measures may reflect the fact that the theoretical constructs of the two questionnaires are not completely the same (al-

though they show an empirical 'moderate' overlap). Tampa Scale for Kinesiophobia evaluates the fear of (re)injury, while FABQ examines the fear of pain directly triggered by physical activities and/ or work (13, 14).

Although expected, it was interesting the finding of an enhanced association between the TSK-GR and the VAS (r= 0.62, p<0.001), compared to the literature (from r= 0.18 to r= 0.27) (1, 3, 7, 13, 14). Although not possible, this increased magnitude cannot be ruled out to be a statistical artefact due to the relatively low spread of VAS and mainly TSK-GR scores (VAS: 4.0 ± 2.2 and TSK-GR: 40.6 ± 8.1). On the other hand, this result seems to confirm the suggestion that TSK is capable of predicting the intensity of chronic musculoskeletal pain, especially when it did explain 38.5% of the variance in this study (14).

It seems that TSK-GR has similar psychometric properties with the original and other adapted versions in relation to anxiety and depression. The associations found in this study (anxiety: r= 0.34, p<0.005, depression: r= 0.45, p<0.001) are matching what it has been reported in the literature (13, 14). This seems to be a relatively common setting, in which such phobic patients are also anxious and depressed, especially since these theoretically "independent" concepts, better seem to define the general psychological distress status of each patient (2, 3).

Discriminant construct validity for TSK was attempted for the first time to be shown through the lack of association with the PLC-GR. A fear-avoidance measure was not expected to be associated with either the pain control or pain responsibility subscales of the PLC-GR, despite the fact that both measures assess cognitive aspects of pain. This assumption was straightforward shown between the TSK-GR and pain control subscale (r= 0.06, p=NS). For the pain responsibility subscale, it was necessary to remove the effect of a third variable (depressive symptoms as measured by the HAD-depression scale) and apply the necessary statistical correction (p was significant for values < 0.007) before concluding to the expected assumption. This finding further enhances the validity (discriminant construct) of the TSK measure.

An ambiguous issue in the literature is the use of parametric or non-parametric statistics (Pearson's or Spearman's correlation coefficient) in order to examine the scores of the above questionnaires for potential associations (15). In the present study, although the Pearson's statistic was employed and described in all correlations, a second analysis using the Spearman's statistic was computed without however providing any different values.

Another issue of concern may be the selected 48 hours interval in order to evaluate the test-retest reliability of the TSK-GR. This time interval was selected in order to minimize the likelihood of clinical change and recall effects. Furthermore, no treatment was administered during this time interval and patients' medication was unaltered. Nevertheless, a 48-hour recall of some of the patients' previous answers cannot be completely ruled, even if this seems to be highly unlike.

This study had a cross-sectional design and any significant correlations should not be confused with causal effects, since if causal effects were to be drawn a different study design and statistical analysis would be needed. ❏

CONCLUSIONS

The TSK was linguistically translated and culturally adapted into the Greek language. The Greek version of TSK appears to be a valid and reliable cognitive assessment tool which retains the psychometric properties of the original version regarding patients suffering from chronic low back pain. The results of the present study provide initial evidence that the TSK-GR may be used in clinical practice and research in Greece assessing kinesiophobia in patients with musculoskeletal pain. ❏

Appendix

TSK-Greek version

Ονοματεπώνυμο: ……………………………   Ημερομηνία: ……/……/…….

Παρακάτω είναι μια λίστα φράσεων που άλλοι ασθενείς έχουν χρησιμοποιήσει για να εκφράσουν πως νιώθουν για τη πάθηση τους. Παρακαλώ σημειώστε σε ποιο βαθμό συμφωνείται με κάθε δήλωση.

		Διαφωνώ απολύτως 1	Διαφωνώ σε κάποιο βαθμό 2	Συμφωνώ σε κάποιο βαθμό 3	Συμφωνώ απολύτως 4
1.	Φοβάμαι ότι μπορεί να τραυματιστώ εάν κάνω ασκήσεις	1	2	3	4
2.	Εάν προσπαθήσω να τον ξεπεράσω, ο πόνος μου θα χειροτερέψει	1	2	3	4
3.	Το σώμα μου, μου λέει ότι έχω κάτι πάρα πολύ σοβαρό	1	2	3	4
4.	Ο πόνος μου πιθανώς θα ανακουφιζόταν εάν έκανα ασκήσεις	1	2	3	4
5.	Οι άλλοι δεν παίρνουν αρκετά σοβαρά το ιατρικό μου πρόβλημα	1	2	3	4
6.	Η κατάσταση μου βάζει σε κίνδυνο το σώμα μου για την υπόλοιπη ζωή μου	1	2	3	4
7.	Ο πόνος σημαίνει *πάντα* ότι έχω τραυματίσει το σώμα μου	1	2	3	4
8.	Επειδή μπορεί κάτι να χειροτερεύει το πόνο μου, δεν σημαίνει ότι είναι και επικίνδυνο	1	2	3	4
9.	Φοβάμαι ότι μπορεί να τραυματισθώ κατά λάθος	1	2	3	4
10.	Απλά με το να είμαι προσεκτικός να μην κάνω κινήσεις που δεν χρειάζονται, είναι ο ασφαλέστερος τρόπος να προλάβω το πόνο μου από το να χειροτερέψει	1	2	3	4
11.	Δεν θα πόναγα τόσο πολύ εάν δεν συνέβαινε κάτι σοβαρό στο σώμα μου	1	2	3	4
12.	Μολονότι η κατάσταση μου είναι επώδυνη, θα ήταν καλύτερα εάν συνέχιζα να ασκούμαι	1	2	3	4
13.	Ο πόνος μου λέει πότε να σταματήσω να ασκούμαι έτσι ώστε να μην τραυματισθώ	1	2	3	4
14.	Πραγματικά δεν είναι ασφαλές για άτομα με τη δική μου πάθηση να συνεχίζουν να ασκούνται	1	2	3	4
15.	Δεν μπορώ να κάνω όλα όσα κάνουν οι φυσιολογικοί άνθρωποι, γιατί είναι πολύ εύκολο για μένα να τραυματισθώ	1	2	3	4
16.	Παρόλο που κάτι μου προκαλεί πολύ πόνο, δεν νομίζω ότι είναι κάτι σοβαρό	1	2	3	4
17.	Κανένας δεν πρέπει να ασκείται ή να γυμνάζεται όταν έχει πόνο	1	2	3	4

References

1. **Luque-Suarez A, Martinez-Calderon J, Falla D.** Role of kinesiophobia on pain, disability and quality of life in people suffering from chronic musculoskeletal pain: a systematic review.
Br J Sports Med 2019;53:554-559.

2. **Ye DL, Plante I, Roy M, et al.** The Tampa Scale of Kinesiophobia: Structural Validation among Adolescents with Idiopathic Scoliosis Undergoing Spinal Fusion Surgery.
Phys Occup Ther Pediatr 2020;40:546-556.

3. **Kese B, Salcı Y, Yılmaz ÖT.** Validity and reliability of the Tampa Kinesiophobia-Fatigue Scale in patients with multiple sclerosis.
Ir J Med Sci 2022.
doi: 10.1007/s11845-021-02902-x.

4. **Vlaeyen JWS, Linton SJ.** Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art.
Pain 2000;85:317-332.

5. **Kamonseki DH, Haik MN, Ribeiro LP, et al.** Measurement properties of the Brazilian versions of Fear-Avoidance Beliefs Questionnaire and Tampa Scale of Kinesiophobia in individuals with shoulder pain.
PLoS One 2021;16:e0260452.

6. **Cai L, Liu Y, Woby SR, et al.** Cross-Cultural Adaptation, Reliability, and Validity of the Chinese Version of the Tampa Scale for Kinesiophobia-11 Among Patients Who Have Undergone Total Knee Arthroplasty.
J Arthroplasty 2019;34:1116-1121.

7. **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.

8. **Beaton DE, Bombardier C, Guillemin F, Ferraz MB.** Guidelines for the process of cross-cultural adaptation of self-report measures.
Spine (Phila Pa 1976) 2000;25:3186-191.

9. **Weermeijer JD, Meulders A.** Clinimetrics: Tampa Scale for Kinesiophobia. *J Physiother* 2018;64:126.

10. **Julian LJ.** Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A).
Arthritis Care Res (Hoboken) 2011;63 Suppl 11(0 11):S467-S472

11. **Georgoudis G, Papathanasiou G, Spiropoulos P, Katsoulakis K.** Cognitive assessment of musculoskeletal pain with a newly validated Greek version of the Fear-Avoidance Beliefs Questionnaire (FABQ).
Eur J Pain. 2007;11:341-351.

12. **Araújo LG, Lima DM, Sampaio RF, Pereira LS.** Pain Locus of control scale: adaption and reliability for elderly.
Rev Bras Fisioter 2010;14:438-445.

13. **Swinkels-Meewisse EJ, Swinkels RA, Verbeek AL, et al.** Psychometric properties of the Tampa Scale for kinesiophobia and the fear-avoidance beliefs questionnaire in acute low back pain.
Man Ther 2003;8:29-36.

14. **Bunzli S, Smith A, Schütze R, et al.** Making Sense of Low Back Pain and Pain-Related Fear.
J Orthop Sports Phys Ther 2017;47:628-636.

15. **Nijs J, Truyen S.** Statistics and pain-related fear measures in acute low back pain.
Manual Therapy 2004;9:45-46.