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Psychometric Properties of the Spanish Version of the Tampa Scale for Kinesiophobia (TSK)

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Abstract: **The Tampa Scale for Kinesiophobia (TSK) is one of the most frequently employed measures for assessing pain-related fear in pain patients. Although the TSK has been translated into different languages, a Spanish version of the TSK has not been available, up to now. Thus, the aim of this study was to validate the Spanish version of the TSK in 2 different pain samples: A heterogeneous chronic pain sample (n = 125) and a musculoskeletal acute pain sample (n = 86). Factor analysis revealed a 2-factor model of 11 items replicated on both samples, named TSK-11. The instrument obtained shows good reliability (internal consistency and stability) and validity (convergent and predictive), with the advantage of brevity. Evidence is provided on discriminant validity between both TSK factors (called Activity Avoidance and Harm). The Harm factor shows the best predictive validity, as it predicts pain persistence, catastrophizing, depression, and pain intensity scores after 6 months. Changes in the Activity Avoidance factor are positively correlated with changes in catastrophizing and anxiety, and negatively associated with changes in functional status. The results of this study point to the relative contribution of both components of pain-related fear to pain adjustment.**

Perspective: ***This article presents the Spanish version of the TSK. Factor analysis revealed a 2-factor model (called Activity Avoidance and Harm). The version obtained shows good reliability and validity. Results provide clinicians with access to a measure of pain-related fear for Spanish-speaking pain patients, offering the advantage of brevity.***

Key words: *Spanish, Tampa Scale for Kinesiophobia, chronic and acute pain, factor structure, validity.*

Currently, it is well-known that the transition from acute pain to chronic pain is influenced by many factors; moreover, empirical evidence supports the notion that the persistence of pain equally depends on these cognitive, behavioral, affective, and social factors.[28] Of these, fear of movement/(re)injury have been considered one of the most significant predictors of pain perpetuation and pain behavior, and is a central construct in the cognitive-behavioral model of Fear-Avoidance.[42-45] One of the main instruments based on this model is the Tampa Scale of Kinesiophobia (TSK).[19] In fact, the TSK is one of the most widely used instruments to measure fear of movement or fear of (re)injury during movement. It has been translated into Dutch,[42,43] French,[10] Swedish,[4,21] Norwegian,[9] and Portuguese.[33]

The different versions of the TSK have shown appropriate internal consistency ranging from .70[37] to .84.[14] There is also empirical evidence on the construct, convergent, and predictive validity of the TSK in different pain patient samples, as it has been shown to correlate not only with other measures of pain-related fear,[8,11,32,37] but with catastrophizing, depression, anxiety, and pain intensity.[7,11,32,34,43,44] It is also a strong predictor of disability[18,42,43] and poor performance on several physical tests.[8,31,43,44]

However, the content validity of the TSK has been questioned, as factor analyses have yielded inconsistent findings regarding the number of factors and the items that comprise them.[5] Vlaeyen et al[44] submitted the Dutch version to a Principal Component Analysis (PCA) with oblique rotation, which yielded a 4-factor solution. Clark et al[6] carried out an exploratory factor analysis on a 13-item English version (without the reverse-scored items) and obtained a 2-factor solution: one factor called "Activity Avoidance" (that reflects the belief that activity

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may result in [re]injury or increased pain), and the second named "Pathological Somatic Focus" (related to beliefs about underlying and serious medical problems). This 2-dimension model was replicated by Geisser et al (with the exception of 1 item).[13] On the other hand, Lundberg et al[23] obtained a 5-factor solution based on the 17-item Swedish version.

In order to compare the fit of the alternative models obtained with exploratory factorial analysis, other studies have used a confirmatory approach.[7,14,31,32,37] Most results seem to indicate that the 13-item 2-factor solution proposed by Clark et al[6] is the best one. In addition, multisample analyses have shown that the 2-factor model is invariant across different samples of chronic pain patients,[14] and across groups of patients with different ages.[7] An 11-item English version has been recently proposed.[47] This 11-item version provides the best fit with a 2-factor solution, as well as being invariant across pain diagnoses, and across Dutch, Swedish, and Canadian samples.[32] In addition, evidence has been provided in favor of the usefulness of applying a TSK 2-factor solution, as it appears that both TSK subscales represent different constructs. Thus, some previous findings showed that in chronic low back pain patients, physical performance tasks are more strongly associated with "Activity Avoidance" than with "Somatic Focus."[13,31] Despite these findings, French et al[11] have recently recommended using the 17-item version without eliminating the reverse-scored items, as they found an alternative trait-method model—where the statistical term "trait" refers to a latent factor representing the construct of interest[11]—whose fit indices were comparable to those obtained by Clark et al.[6]

Bearing in mind these results, and because a Spanish version of the TSK has not been available up to now, the main aim of this study was to analyze the factorial structure and psychometric properties of the Spanish adaptation in 2 different samples: Heterogeneous chronic pain patients and musculoskeletal acute pain patients.

Methods

Participants and Procedures

Chronic Pain Sample

The chronic pain sample consisted of 125 heterogeneous chronic pain patients (80.8% females) who received medical attention at the Clinical Pain Unit of the "Carlos Haya" University Hospital in Málaga (Spain). Participants were eligible for the study if they had experienced pain on a daily or almost daily basis for at least 6 months, and if they were not being treated for a terminal disease. Although there were no exclusionary diagnoses, the vast majority of patients had musculoskeletal (57%) and neuropathic diagnoses (49%). A total of 16% of the patients suffered both nocioceptive and neuropathic pain. Their mean age was 58.26 years (SD = 14.63) and the mean pain duration was 11.72 years (SD = 9.12). Demographic characteristics did not differ from those found in chronic pain populations.[3] On some of the TSK items, 3 participants were identified as multivariate outliers based on elevated Mahalanobis distances[38] and were therefore excluded from the analyses.

Acute Pain Sample

The acute pain sample initially comprised 86 musculoskeletal pain patients (74.4% female) presenting back, neck or upper extremity pain, who were referred to the Rehabilitation Service of a General Practitioners Clinic in Málaga (Spain). Their mean age was 46.79 years (SD = 14.43) and the average pain duration was 87.02 days (SD = 62.15). In this case, participants were considered eligible for the study if they had suffered pain for less than 6 months. Of these, 50 patients had recovered from pain, whereas 36 were still suffering pain at a second assessment, 6 months after the first. There were no significant differences in sex, marital status, employment status, educational level, pain origin, and the average duration of pain between these groups of patients. However, patients who were still suffering pain at the second assessment showed a significantly higher pain rating at both first and second assessments, compared to those whose pain had gone. At the second assessment, the mean duration of pain among those patients still in pain was 9.23 months. No multivariate outliers were found in this sample.

In both samples a battery of questionnaires was completed by each participant. All subjects filled out the questionnaires at their clinic, while waiting to be seen by their physicians. Acute pain patients were asked if they could be contacted by phone for a second assessment. Patients whose permission was obtained were interviewed by phone 6 months later.

Informed consent was obtained prior to data collection. Participants were aware that the information collected was confidential. The research project, of which this study is a part, was approved by the "Carlos Haya" University Hospital Ethics Committee at Málaga (Spain).

Measures

Demographic and Pain-Related Measures

Subjects completed a questionnaire assessing demographic and injury variables, including age, gender, employment status, marital status, educational level, circumstances of pain onset, time in pain, medication and other medical treatment, medical consultations, and surgery related to pain.

Pain Numerical Rating Scale (NRS)

According to Jensen et al's recommendations,[17] patients were asked to rate their lowest, medium, and strongest pain during the previous week, as well as their current pain, on a scale ranging from 0 (Not at all) to 10 (Extremely painful). The mean of these 4 scores was calculated to obtain the average pain intensity.

Tampa Scale for Kinesiophobia (TSK)

The TSK[19] is a 17-item self-report measure of fear of movement and (re)injury. Four of the items are negatively

worded and reversed scored (4, 8, 12, and 16). Ratings are summed to yield a total score where higher values reflect greater fear of (re)injury. The English version of the TSK (taking into account the modification by Vlaeyen et al[43] in item order) was translated into Spanish by 2 native Spanish speakers. Both were clinical psychologists familiar with the terminology of the area covered by the instrument, and had clinical experience with chronic pain patients. Thus, 2 Spanish versions were obtained, which were compared for inconsistencies. These inconsistencies were taken into account, and a new Spanish version was produced once the corrections were made. This version was retranslated into English by a native English speaker. This English translation was then compared to the original English TSK and checked for inconsistencies. The inconsistencies were then corrected in the final Spanish version.

Fear Avoidance Beliefs Questionnaire (FABQ)

The FABQ[46] has good predictive validity, as it has been found to predict disability and work lost, as well as subjective pain and depressive symptoms in chronic pain samples.[8,12,15,46] It consists of 16 items, each scored on a scale ranging from 0 (Totally agree) to 6 (Totally disagree) with higher scores reflecting higher levels of fear-avoidance beliefs. Although 2 subscales have been identified in the original version, they were not replicated in the Spanish version of this questionnaire,[20] and so the FABQ total score was used in this study. The Spanish version shows high internal consistency (a = .93). This questionnaire was completed only by the acute pain sample.

Pain Catastrophizing Scale (PSC)

The PCS[34] is composed of 13 items on 5-point scale, ranging from 0 (Not at all) to 4 (All the time). The items describe different thoughts and feelings that individuals may experience when they are in pain. The PCS was developed to assess 3 components of catastrophizing: Rumination, magnification, and helplessness. This 3-factor structure has also been obtained by other authors using exploratory and confirmatory factor analyses.[26,41] The PCS has excellent psychometric properties and has been widely used in research.[35] The internal consistency of the Spanish version[39] used in this study is high (a = .94).

Hospital Anxiety and Depression Scale (HADS)

The HADS[48] comprises 2, 7-item scales designed to rate depression (HADS-D) and anxiety (HADS-A). Ratings may range from 1 (Almost always) to 4 (Almost never). It was developed with brevity in mind and excludes items which might reflect somatic complaints, and thus could improve measuring anxiety and depression in pain patients. The Spanish version[29] shows suitable reliability (a for HADS-D = .82 and a for HADS-A = .81).

The Impairment and Functioning Inventory (IFI)

The IFI[30] is composed of 37 items each referring to an activity related to one of the following areas: Household, autonomy behaviors, leisure, and social relationships. The IFI takes into account the distinguishing features of Spanish culture. The instrument gives an index of functioning, an index of impairment, and scores for each of these areas. The subscales and the global scales show suitable reliability (a = .84 for functional status, and a = .85 for functional impairment).

Data Analyses

All the analyses were performed using the SPSS statistical package, v15.0 for Windows (SPSS Inc, Chicago, IL).

Factor Analysis

In order to obtain the factorial structure of the instrument, 2 PCAs with both varimax and oblimin rotation were conducted separately on the scores from both the chronic pain and the acute pain samples.

Reliability

Internal consistency was calculated with Cronbach's a coefficient. Pearson's correlation coefficient was used to calculate stability in the acute pain sample between the TSK scores at the first (T1) and second (T2) assessment. Because some of the patients were still in pain at T2, whereas others had recovered, the correlations were calculated for both groups. In addition, 2 intra-subject Student *t* test analyses were performed for each group of patients to examine potential changes in the TSK scores from T1 to T2.

Validity

Convergent and Construct Validity

Convergent validity was analyzed by examining the pattern of correlations between the TSK and other pain-related measures theoretically related to kinesiophobia (namely, catastrophizing, depression, anxiety, functional status, as well as pain intensity) in both samples separately. In the acute sample, correlations with the FABQ were also calculated. In order to examine the discriminant validity of the TSK factors obtained from the previous PCA analysis, correlations were calculated using the TSK factor scores separately.

Construct validity was also analyzed by examining differences in TSK scores measured at T2 between the group of acute pain participants who were still experiencing pain at this time and those who were not. It was hypothesized that the TSK scores from the first group would be higher than those from the second group.

As further evidence of construct validity, changes in TSK scores from T1 to T2 were calculated, as well as in the other assessed variables. Partial correlations between changes from T1 to T2 were then calculated, while controlling for the presence of pain at T2 (pain/no pain) in the acute pain sample.

Predictive Validity

Because only the acute pain sample was assessed twice, the predictive validity was calculated for the scores from this sample. First, Pearson's correlations were calculated between the variables assessed at T1 and T2. Several hierarchical regression analyses were then performed,

considering as criterion variables the scores for catastrophizing, anxiety, depression, functional status, and pain intensity at T2, whereas both TSK total score and TSK factor scores at T1 were considered as predictive variables. Those variables assessed at T1 that correlated with the criterion variables were controlled during the analyses.

Results

Preliminary Analyses

Before factor analysis was performed, inter-item correlations and item-total correlations were calculated separately for both samples with the 17-item version. In the case of the chronic pain sample, the 4 reverse-scored items (4, 8, 12, and 16) showed low intercorrelations with the other TSK items. Also, the inspection of the internal consistency reliability showed that these reverse items reduce the Cronbach's a coefficient. When these items were deleted the alpha increased to a = .76. Preliminary factor analyses effectuated with the 17-items version showed that the loadings of the reverse items were below .30. Regarding the acute pain sample, similar results were found. Thus, their loadings were lower than .30, and they showed low intercorrelations with the remaining items. Also, the alpha coefficient increased to a = .78 when these items were deleted. In addition, the pattern of correlations of these 4 items was not consistent between chronic and acute pain samples. Due to the fact that other studies have also reported inconsistent results regarding these items,[8,16,31,47] the 4 inverse-scored items were not included in further analyses. Items 2 and 5 were also eliminated for various reasons: They showed low correlation with the other items and their item-total correlation was under .20 for both samples (Table 1). Also, when these items were deleted, the Cronbach's alpha increased to a = .79 (chronic pain sample) and to a = .81 (acute pain sample).

In order to guarantee the validity of further analyses, some of the variables from both samples were transformed as they were not normally distributed (namely, catastrophizing, pain intensity, TSK total score, and TSK factors, for the chronic sample; and catastrophizing, depression, and pain intensity, for the acute pain sample). Men and women from both samples were compared using Student *t* tests to determine whether these 2 groups were comparable. In the acute sample, men and women did not differ in any of the pain-related variables. In the chronic sample, they only differed in pain intensity (M = 5.42 versus M = 6.57, respectively; t [120] = 2.27, $P < .05$).

Table 1. **Corrected Item-Total Correlations Between TSK Items**

	Corrected Item-Total Correlation	
Items	Chronic Pain Sample	Acute Pain Sample
1	.58	.52
2	.06	.15
3	.39	.39
4	.58	.29
5	.18	.16
6	.40	.42
7	.36	.20
8	.06	.12
9	.52	.65
10	.38	.48
11	.50	.46
12	.39	−.01
13	.32	.21
14	.53	.57
15	.55	.62
16	.18	.28
17	.32	.35

Factor Analysis

A PCA analysis with varimax and oblimin rotation was performed separately for both samples on the remaining 11 items.

Results of the PCA Analysis for the Chronic Pain Sample

The results of the Kaiser-Meyer-Olkin Test (.71) as well as the Bartlett Test of Sphericity (c2 = 10.68; $P < .001$) justified continuing with the factor analysis.[25] Both the scree-plot and the inspection of the eigenvalues suggested a 2-factor solution that accounted for 48.37% of the explanatory variance. One factor (27.77% of the explanatory variance) was composed of 7 items (1, 9, 10, 13, 14, 15, and 17), and the second one (20.59% of the explanatory variance) comprised 4 items (3, 6, 7, and 11) (Table 2). The same results were obtained using oblimin rotation.

Results of the PCA Analysis for the Acute Pain Sample

The results of the Kaiser-Meyer-Olkin Test (.77) and the Bartlett Test of Sphericity (c2 = 306.86; $P < .000$) established that the data matrix was suitable for factor analysis.[25] As in the chronic pain sample, the scree-plot and the inspection of the eigenvalues pointed toward a 2-factor solution, which explained 50.01% of the variance. The first factor (27.35% of the explanatory variance) was composed of 7 items (1, 9, 10, 13, 14, 15, and 17), and the second one (22.66% of the explanatory variance) of items 3, 6, and 11. Analyses using oblimin rotation produced identical results. However, unlike in the chronic pain sample, in this sample item 7 showed similar weights in both factors (with loadings under .30 in each of them) (Table 2). Despite this, this item was included in the second one for various reasons: First, in the chronic pain sample, this item clearly scored in this factor; second, other authors included it in a factor that also comprised items 3, 6, and 11.[6,13] Also, when this item was deleted the alpha total score reduced to a = .75.

Thus, a 2-factor solution emerged in both samples. Due to the content of the items, these factors were named "Activity Avoidance (AA)" (items 1, 9, 10, 13, 14, 15, and 17) and "Harm (H)" (items 3, 6, 7, and 11).

Table 2. **Rotated Factor Loadings of the 2-Factor Model of the TSK-11**

	Chronic Pain Sample		Acute Pain Sample	
Spanish Translated Items	Factor 1	Factor 2	Factor 1	Factor 2
1. Tengo miedo a lesionarme si hago ejercicio físico.	.78	.17	.64	.22
2. Si me dejara vencer por él, el dolor aumentaría.	.02	.83	.03	.81
3. Mi cuerpo me está diciendo que tengo algo serio.	.02	.74	.09	.82
7. Tener dolor siempre quiere decir que en el cuerpo hay una lesión.	.23	.44	.24	.26
9. Tengo miedo a lesionarme sin querer.	.73	.17	.71	.32
10. Lo más seguro para evitar que aumente el dolor es tener cuidado y no hacer movimientos innecesarios.	.64	.01	.74	.05
11. No me dolería tanto si no tuviese algo serio en mi cuerpo.	.18	.76	.15	.84
13. El dolor me dice cuándo debo parar la actividad para no lesionarme.	.53	–.01	.43	–.00
14. No es seguro para una persona con mi enfermedad hacer actividades físicas.	.64	.39	.62	.29
15. No puedo hacer todo lo que la gente normal hace porque me podría lesionar con facilidad.	.70	.21	.73	.38
17. Nadie debería hacer actividades físicas cuando tiene dolor.	.49	.06	.60	–.11

Reliability

Internal Consistency

Internal consistency ratings were moderate. In the chronic pain sample, Cronbach's a = .79 was obtained using all 11 TSK items. Regarding the AA and H factors, Cronbach's a was .79 and .70, respectively. In the acute pain sample, Cronbach's a was .81 (with all 11 TSK items) and, as in the chronic sample, .79 and .70 for factors AA and H, respectively.

Stability (Acute Pain Sample)

For the acute pain sample, the correlation between the TSK-11 total score at the first (T1) and second (T2) assessment was r = .55 for the acute group still in pain at T2, and r = .40 for the recovered group. In those patients whose pain had gone by T2, the Student *t* test analysis showed that there were statistically significant reductions in TSK-11 total score (M_{T1} = 27.2, M_{T2} = 22.12; t [49] = 5.75; $P < .001$), in AA factor scores (M_{T1} = 18.74, M_{T2} = 14.86; t [49] = 5.21; $P < .001$), and in H factor scores (M_{T1} = 8.54, M_{T2} = 7.26; t [49] = 3.77; $P < .001$). However, in the case of those patients whose pain persisted at T2, there were no significant differences from T1 to T2 in TSK-11 total scores, neither in AA nor H factor scores.

Validity

Table 3 presents descriptive statistics and Pearson correlations coefficients between TSK-11, AA, H, and the pain-related measures. As can be seen, in both samples, the AA and H factors were significantly associated with the TSK-11 total score, although the correlation between them was significant but modest. Regarding the

Table 3. **Descriptive Statistics and Correlation Matrix of TSK-11, TSK Factors, and Pain-Related Measures**

	Chronic Pain Sample (N = 125)					Acute Pain Sample (N = 86)						
						T1		T2				
	Mean	SD	TSK-11	AA	H	Mean	SD	Mean	SD	TSK-11	AA	H
TSK-11	36.04	5.70	_			27.86	7.25	25.27	7.12	_		
AA	23.90	4.06	.85□	_		18.58	5.26	17.46	5.14	.91□	_	
H	12.14	2.80	.70□	.32□	_	9.28	3.32	8.89	3.19	.75□	.40□	_
Catastrophizing	37.81	10.87	.49□	.37□	.43□	22.00	7.60	19.85	8.15	.27□	.34□	.06
Depression	16.47	5.42	.35□	.16	.40□	11.36	3.64	10.68	4.21	.34□	.31□	.25*
Anxiety	15.47	5.68	.29□	.09	.38□	19.85	4.92	20.86	4.71	.37□	.34□	.27*
Functional status	79.89	30.54	–.24□	–.22□	–.19□	104.26	37.95	109.51	35.08	–.23*	–.19	–.21
Pain intensity	6.36	2.18	.27□	.19□	.21*	5.02	1.56	3.01	2.37	.16	.09	.20
FABQ	_	_	_	_	_	31.36	18.18	33.99	20.41	.23*	.19	.21

Abbreviations: TSK-11, total score of the TSK (11 items); AA, Activity Avoidance factor; H, Harm factor; FABQ, Fear Avoidance Beliefs Questionnaire; T1, first assessment; T2, second assessment.

NOTE. Correlations for the acute pain sample only concern the first assessment (T1).

*P < .05.

□P < .01.

acute pain sample, correlations only concern the first assessment.

Convergent and Construct Validity (Chronic Pain Sample)

With respect to the chronic pain sample, the TSK-11 total score was significantly and positively correlated with catastrophizing, depression, anxiety, and pain intensity, and was significantly and negatively associated with functional status. Regarding TSK-11 factors, AA was significantly and positively correlated with catastrophizing and pain intensity, and had a negative but significant relationship with functional status. H was significantly and positively associated with catastrophizing, anxiety, depression, and pain intensity, and was significantly and negatively associated with functional status (Table 3).

Convergent and Construct Validity (Acute Pain Sample)

Regarding the acute pain sample, the TSK-11 total score was significantly and positively associated with catastrophizing, depression, and anxiety, and had a negative correlation with functional status although, unlike the chronic sample, no correlation was obtained for pain intensity. In addition, the TSK-11 total score was significantly and positively associated with fear of movement as measured by the FABQ. Both AA and H factors were significantly and positively correlated with depression and anxiety, but no correlations were obtained for functional status and pain. The AA factor was also positively related with catastrophizing (Table 3).

With respect to construct validity, the Student *t* test analysis showed significant differences in the TSK-11 total score, as well as in the AA and H scores, at T2 between the acute patients who were still in pain (n = 36) and those who were not (n = 50). The mean of the TSK-11 total scores for the group still in pain was significantly higher than the mean for the group without pain (M = 29.64 versus M = 22.12, respectively; t [84] = –5.64, $P < .001$). The same result was obtained for the AA factor scores (M = 18.47 versus M = 14.86, respectively; t [64] = –3.68, $P < .001$) and for the H factor scores (M = 11.17 versus M = 7.26, t [84] = –6.99, $P < .001$).

Changes from T1 to T2 were calculated for TSK-11, AA and H scores, as well as for pain intensity and all the other pain-related variables (catastrophizing, depression, anxiety, functional status, and FABQ). Correlations between changes in TSK-11, AA and H scores and changes in pain-related variables were calculated for each group in the acute pain sample: patients still in pain and patients without pain (Table 4). The results indicated that, in the group of patients still in pain at T2, changes in both TSK-11 and AA scores were positively and significantly correlated with changes in catastrophizing and anxiety, and negatively and significantly correlated with changes in functional status. Changes in H were also positively and significantly correlated with changes in catastrophizing and anxiety, but no correlations with functional status were found. In addition, changes in TSK-11 scores significantly and positively correlated with changes in both AA and H scores. Again, changes in AA and H scores were significantly and positively associated each other, although the association was moderate. Regarding the group of patients without pain at T2, correlations were only found between changes in TSK-11 and changes in AA and H scores. Changes in AA and H scores were also significantly and positively associated with each other, although this association was low.

Table 4. **Correlation Matrix Between Changes From First to Second Assessments on TSK-11, TSK Factors, and Pain-Related Measures (Acute Patients With and Without Pain at T2)**

	Acute Pain Group (N = 36)			*Nonacute Pain Group (N = 50)*		
	D*TSK-11*	D*AA*	D*H*	D*TSK-11*	D*AA*	D*H*
DTSK-11	_			_		
DAA	.94□	_		.93□	_	
DH	.76□	.48□	_	.61□	.27*	_
DCatastrophizing	.50□	.49□	.33*	.19	.17	.12
DDepression	.06	.13	.01	.14	.21	.09
DAnxiety	.57*	.45□	.60□	.11	.15	.04
DFunctional status	–.24*	–.24*	–.11	–.24	–.23	–.16
DPain intensity	.13	.07	–.18	.07	.10	–.04
DFABQ	.24	.21	–.17	.12	.13	.01

Abbreviations: T2, second assessment; TSK-11, total score of the TSK (11 items); AA, Activity Avoidance factor; H, Harm factor; FABQ, Fear Avoidance Beliefs Questionnaire.
*P < .05.
□P < .01.

Predictive Validity (Acute Pain Sample)

In line with Vlaeyen and Linton's Fear Avoidance Model,[45] it was postulated that the TSK-11 scores at T1 would predict catastrophizing, depression, anxiety, functional status, and pain intensity at T2. Pearson's correlations were calculated between the variables assessed at T1 and T2. The results of these analyses (Table 5) showed that only catastrophizing at T2 positively and significantly correlated with the 3 TSK scores considered in the analysis: TSK-11, AA and H at T1. Regarding the other variables, depression at T2 was positively and significantly associated with TSK-11 and H scores at T1, but not with AA. Anxiety at T2 positively and significantly correlated with TSK-11 and AA scores at T1, but not with H. Finally, only H scores at T1 significantly correlated with both functional status (negatively) and pain intensity (positively) at T2.

Taking these results into account, a series of hierarchical regression analyses were performed using AA scores measured at T1 so as to predict catastrophizing and anxiety at T2, and H scores measured at T1 so as to predict catastrophizing, depression, functional status, and pain intensity at T2 (Table 6). During the analyses, the pain-related variables at T1 that were correlated with the criterion variable as measured at T2 were controlled for (Table 5).

The obtained results indicated that only H at T1 predicted catastrophizing at T2 (when controlling for

Table 5. **Correlation Matrix Between TSK-11, TSK Factors, and Pain-Related Variables as Measured at T1 and Pain Related-Variables as Measures at T2 (Acute Pain Sample)**

	Variables Measured at T2				
Variables Measured at T1	*Catastrophizing*	*Depression*	*Anxiety*	*Functional Status*	*Pain Intensity*
TSK-11	.36□	.28*	.25*	−.18	.14
AA	.28□	.18	.26*	−.08	.05
H	.35□	.31□	.13	−.27*	.23*
Catastrophizing	.46□	.24*	.36□	−.02	.07
Depression	.27*	.30□	.35□	−.12	.07
Anxiety	.29□	.20	.51□	.09	.08
Functional status	−.13	−.13	.04	.55□	.07
Pain intensity	.26*	.16	.01	.19	.21*
FABQ	.12	.08	.05	−.18	.13
Age	.01	.17	−.12	−.22*	.10
Pain duration	.04	.09	.11	−.23*	−.09

Abbreviations: T1, first assessment; T2, second assessment; TSK-11, total score of the TSK (11 items); AA, Activity Avoidance factor; H, Harm factor; FABQ, Fear Avoidance Beliefs Questionnaire.
*P < .05.
□P < .01.
□P < .001.

catastrophizing, depression, anxiety, and pain intensity at T1), and depression at T2 (after controlling depression and catastrophizing at T1). AA at T1 was not statistically significant in the model.

Discussion

The aim of this study was to analyze the factorial structure and psychometric properties of the first Spanish TSK translation in 2 samples of pain patients: Chronic and acute. Exploratory factor analysis revealed a 2-factor solution (11 items) for both samples. The obtained TSK-11 has shown good reliability and validity.

The results obtained in this study are quite similar to those found by Clark et al[6] and confirmed by other authors,[7,11,13,14,31,37] with the exception of items 2 and 5 which were eliminated in our study due to their low item-total correlations. Therefore, a 2-factor model of

Table 6. **Results of the Regression Analyses Using AA and H (T1) as Predictors of Catastrophizing, Depression, Anxiety, and Functional Status (T2) (Acute Pain Sample)**

Criterion Variables	*Predictors*	b	*SE*	*T*	*P*
Catastrophizing T2					
F(6,79) = 7.48, P <.001, R^2 adjusted = .31	Catastrophizing T1	.40	.005	3.97	.00
	Depression T1	.07	.01	.725	.05
	Anxiety T1	.10	.00	.95	.38
	Pain intensity T1	.18	.00	1.93	.05
	AA T1	.05	.00	−.32	.75
	H T1	.25	.00	2.57	.01
Depression T2					
F(5,78) = 4.44, P <.005, R^2 adjusted = .14	Depression T1	.05	.026	□1.83	.07
	Catastrophizing T1	.16	.009	1.75	.08
	H T1	.25	.001	2.22	.03
Anxiety T2					
F(5,80) = 7.77, P <.001, R^2 adjusted = .29	Anxiety T1	.42	.097	3.81	.00
	Catastrophizing T1	.15	1.22	1.87	.07
	Depression T1	.14	3.57	1.55	.13
	AA T1	.02	.095	.29	.77
Functional status T2					
F(5,80) = 9.78; P < .001; R^2 adjusted = .34	Age	−.11	.221	□1.25	.22
	Pain Duration	−.19	.051	□2.10	.04
	Functional status T1	.52	.085	5.66	.00
	H T1	−.14	1.06	□1.35	.18
Pain intensity T2					
F(3,85) = 2.56; P < .061; R^2 adjusted = .05	Pain intensity T1	.17	.05	1.62	.11
	H T1	.22	.027	1.89	.06

Abbreviations: T1, first assessment; T2, second assessment; AA, Activity Avoidance factor; H, Harm factor.

a shortened version of the TSK was the most appropriate for Spanish chronic and acute pain patients, supporting the view that the TSK comprises 2 different aspects of fear of movement and (re)injury.[31] Due to the contents of both factors, the first was named "Activity Avoidance" (items 1, 9, 10, 13, 14, 15, and 17), and the second, "Harm" (items 3, 6, 7, and 11). Items of the Activity Avoidance factor reflected fear of movement and avoidance of activities that may cause pain, whereas items of the Harm factor refer to beliefs that pain is a sign of serious harm or damage to the body.[13] Regarding the items of this factor, we agree with Goubert et al[14] that "Harm" is a more appropriate label than "Pathological somatic focus." In addition, and in line with these authors[14,31] and other studies,[6,11,23,47] the Spanish version does not comprise inversely phrased items, due their weak associations with the other TSK items.

With respect to the convergent validity of the 2-factor model, it appears that the TSK factors represent 2 different constructs. Even though both factors are intercorrelated, the association between them is moderate in both the acute and chronic samples. Moreover, although TSK-11 is related to catastrophizing, depression, anxiety, and functional status in both pain samples, analysis of the correlations between the Activity Avoidance and the Harm factors showed mixed results depending on which sample is considered. Whereas catastrophizing correlated with Activity Avoidance in both samples, it was only associated with Harm in the chronic one. However, the results of the regression analyses in the acute pain sample showed that only Harm significantly contributes to the prediction of both catastrophizing and depression (measured 6 months later). On the other hand, whereas anxiety and depression were associated with Harm in both samples, it only correlated with Activity Avoidance in the acute one. These findings point to the relative contribution of both components of pain-related fear to pain adjustment, highlighting the fact that both dimensions play an important role in the evolution and maintenance of pain.[1,44] In line with Vlaeyen and Linton's Fear and Avoidance model,[45] these results support the notion that the TSK reflects elements of catastrophic thinking and that catastrophizing is closely related to the construct of fear of movement that leads individuals to avoid physical activity.[5,13,44] They also indicate that distress is increased by beliefs that pain signifies serious bodily damage.[13]

Regarding functional status, whereas both TSK factors were related to this variable in the chronic pain sample, neither Activity Avoidance nor Harm was associated with functional status in the acute pain sample. However, this could be explained by the fact that the mean pain duration in the sample of acute patients was 87 days. These results appear to indicate that fear of movement plays a different role in patients with chronic and acute pain, and that the relationship between these variables and other pain-related measures changes over time. These findings are congruent with Boersma and Linton's postulates,[1] who recently demonstrated that the association between fear of movement and functional status is moderated by the stage of chronicity, and support the idea that psychological factors play a relevant role in the process of pain persistence. In fact, these authors found that fear of movement did not emerge as a significant predictor of functional status until after 1 year of pain duration, and that the strength of the association between these 2 variables increased across the stages of chronicity. In addition, regarding the chronic pain sample data, the results are consistent with previous findings demonstrating that pain-related fear is related to decreased activities in daily life.[13,44,45] Therefore, it is possible that the predictive validity of the TSK factors would be higher if the analyses had been applied to the chronic pain sample data. This issue warrants future research.

Again, the correlations between TSK-11 as well as between Activity Avoidance and Harm factors with pain intensity showed different results depending on what sample of patients is considered. Specifically, pain intensity was related with TSK-11 and both TSK factors in the chronic sample; but not in the acute one. These results contrast with those founded by Boersma and Linton,[1] because they did not find an association between pain intensity and pain-related fear at any stage of pain chronicity. In spite of their results, the authors suggested that fear could be viewed as arising from an interaction between pain and functional status, so when pain continues beyond the expected healing time or when pain increases when is expected to decrease, the person might become fearful. More research about this issue is necessary.

Contrary to what was expected, neither of the TSK factors correlated with the FABQ. Only the TSK-11 global score was significantly correlated with fear of movement as measured by that instrument, although the association was quite low ($r = .23$), suggesting that they are measuring different constructs. As far as we know, there is only 1 previous study that has examined the concurrent validity of both questionnaires in an acute pain sample.[32] The correlations between both measures in that study were higher than those we found in our research. In line with this previous work,[36] it should probably be concluded that, although both questionnaires show empirical overlap, the theoretical constructs underlying them are not completely identical. In fact, Swinkels-Meewisse et al[36] suggested that the TSK may measure fear of (re)injury, whereas the FABQ measures fear of pain directly caused by physical activities or work.

Regarding predictive validity, the obtained results indicated that neither Activity Avoidance nor Harm predicted functional status. These results are in contradiction with Vlaeyen and Linton arguments[45] postulating that fear of pain leads to activity avoidance and, therefore, to functional disability. Also, the findings of this study are not in line with previous results showing that pain-related fear predicted functional disability[24] and pain intensity.[2,27] Although correlations showed that the Harm factor was significantly and negatively related to functional status and significantly and positively associated to pain intensity (both measured

6 month later), in the regression analyses this factor was not statistically significant in the models.

Previous literature shows that TSK is both stable[36,47] and modifiable by clinical interventions.[10,44] In the current study, TSK-11, Activity Avoidance and Harm proved to be sensitive to changes in pain outcomes over time, as differences in TSK-11 and both factor scores between the first and second assessment periods were found in those patients whose pain had disappeared by the second assessment. However, in those patients who were still in pain, pain-related fear did not change over time. Therefore, it seems that if pain diminishes, fear beliefs decrease, but when pain persists, pain-related fear remains the same. The magnitude of the correlations between the TSK-11 scores at both time assessments (r = .55) showed that the construct of fear of movement comprises a temporally stable component. Nevertheless, as the results of the present study show, this construct may be affected by changes in other pain-related measures. In this sense, correlations were found between the changes from the first to the second assessment in TSK-11 and Activity Avoidance scores with the changes in catastrophizing, anxiety, and functional status, in the subgroup of acute pain patients that were still in pan by the second assessment. Also, changes in Harm scores are correlated with catastrophizing and anxiety, although no correlations were found with functional status. According to Vlaeyen and Linton's Fear Avoidance Model,[45] reductions in catastrophizing could be related to reductions in fear of movement, which in turn would diminish anxiety and increase daily activity. Furthermore, the fact that changes in Harm did not correlate with changes in functional status, could indicate that activity avoidance is the key fear of movement dimension to which interventions should be aimed at in order to produce changes in other pain-related variables. In fact, some recent findings point in this direction. Thus, in the study carried out by Leeuw et al,[22] the effectiveness of 2 treatment approaches was compared: An exposure in vivo treatment versus an operant-graded activity. The results indicated that, although the exposure in vivo treatment was more effective in reducing the patients' perceived harmfulness of physical activities and pain catastrophizing, both treatments were equally effective in improving functional disability, increasing daily activity levels, and reducing pain intensity. The authors considered that both interventions share some treatment components, such as exposure to various activities, including those that are fear eliciting. Nevertheless, more empirical support is needed to confirm this hypothesis.

This study has a number of limitations that should be noted. The most relevant is that both samples are small, particularly the acute pain sample. Therefore, the findings of the exploratory factor analysis must be taken with caution and need to be replicated in a larger sample, which would also allow a confirmatory factor analysis to be conducted. Moreover, the latter would be used to compare the fit of different factor models and to test for factor structure invariance not only across acute and chronic pain samples, but across diagnoses. Regarding diagnoses, it must be borne in mind that the TSK was initially developed for chronic musculoskeletal pain. However, in this study, the chronic pain sample consisted of patients with musculoskeletal and neuropathic pain. Given that the TSK measures fear of movement and fear of (re)injury during movement, it could be find a different factor structure between both diagnoses. In fact, differences are likely, because in neuropathic pain conditions pain-related fear may be more related to the pain itself rather than to physical activity. This issue warrants future research.

A second limitation is that, although in the current study acute patients were followed longitudinally, the follow-up period was quite short. It would be of interest either to extend the follow-up period or to use a prospective cohort study.

Another limitation is that only self-report measures were considered. As pointed out previously,[4] future research should use physical performance tests to explore the types of activities that are avoided by patients. Furthermore, despite the widespread use of the TSK to assess fear of movement/(re)injury, it is a rather abstract and verbal instrument which is somewhat open to respondent interpretation. In addition, the TSK does not provide information about which specific activities a patient fears or avoids. In contrast, there is growing interest in measurement instruments for assessing fear based on specific pictorial stimuli that can be used as initial screening for fear generated by very specific movements. This is the case of both the Photograph Series of Daily Activities (PHODA)[21] and the Pictorial Fear of Activity Scale-Cervical (PFActS-C).[40]

Finally, the possible influence of pain interventions (eg, medication, physiotherapy, activity-related instructions) was not controlled for. Despite these limitations, our results provide clinicians with access to a valid and reliable measure of pain-related fear for Spanish pain patients, offering the advantage of brevity.

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