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Psychometric testing of a short form, 11-item Tampa Scale of Kinesiophobia–Arabic version

TSK-AV-11

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Abstract

To examine the psychometric properties of a short form TSK-AV in Arabic-speaking patients with chronic low back pain (CLBP).

One hundred one CLBP patients recruited from Jordan University Hospital provided demographic information and completed the TSK-AV full version and measures of pain severity and disability. Explorative factor analysis was used to determine whether a generally accepted 2-factor model consisting of fewer TSK items applies to the TSK-AV and exhibits acceptable psychometric properties.

A 2-factor model provided an adequate-to-good fit to our data, explaining 46.54% of the variance. Factor 1 (labeled as "activity avoidance") comprised items 1, 2, 7, 9, 14, 15, and 17. Factor 2 was labeled as "somatic focus" and comprised items 3, 6, 11, and 13. The 11-item TSK-AV comprised of the 2 factors (TSK-AV-11) as well as its subscales all remained independent significant ($P < .001$) predictors of pain disability in Jordanian patients with CLBP after accounting for factors such as age, gender, pain duration, and pain severity.

The short, 11-item TSK-AV (TSK-AV-11) appears to be an ideal clinical and research tool for measuring fear of movement/re (injury) in Arabic-speaking patients.

Abbreviations: CFA = confirmatory factor analysis, CLBP = chronic low back pain, RMDQ = Roland Morris disability questionnaire, TSK-AV = Tampa Scale of Kinesiophobia-Arabic version, VAS = visual analog scale.

Keywords: arabic, chronic low back pain, psychometric properties, Tampa Scale of Kinesiophobia- version-11 (TSK-AV-11)

1. Introduction

Tampa Scale of Kinesiophobia (TSK) is one of the well-known tools for assessing fear of movement and (re)injury,[1] originally developed in English.[2] The TSK is a 17-item self-report questionnaire with a total score ranging from 17 to 68 with higher scores indicating higher level of fear of movement/(re) injury. High levels of kinesiophobia or fear of movement/(re) injury can predict future disability and pain in acute and healthy samples.[3–15] Importantly, interventions aimed at reduction of kinesiophobia have demonstrated improved functional status and activity tolerance among highly disabled patient samples.[4] Many reports could demonstrate replication of TSK in different types of chronic pain with ongoing testing of its contribution to improve outcomes.

Studying psychometric characteristics of TSK is of high importance for researchers to find out fitting model for studied samples. Both exploratory factor analysis and confirmatory factor analysis (CFA) were investigated, looking for possible factor structure or relation between components and specific factors, respectively.[16] Different models were proposed based on above mentioned methodology. the Dutch version[17] identified 4 factors:

- harm
- fear of (re)injury
- importance of exercise
- avoidance of activity

Geisser et al,[18] described a 2-factor structure for the TSK-13 in a sample of chronic back pain patients and French et al[19] also conducted a CFA of the TSK and confirmed the 13-item, 2-factors solution.

Moreover, looking for shorter, valid and replicable form was tempting. The TSK-11 was first described and recommended by Woby et al,[20] where 6 items found to have poor psychometric properties were omitted .This work was followed by a novel CFA by Roelofs et al,[21] who confirmed that an 11-item, 2-factor solution is a fitting model for different patients samples.

The first translation and validation in Arabic-speaking population was accomplished in Jordanian patients with chronic

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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low back pain (CLBP) and reported in April 2017.[15] The original TSK-Arabic version consisted of all 17 items (TSK-AV-17) and was found to be an independent significant predictor of pain disability in these patients after accounting for factors such as age, gender, pain duration, and pain severity. In this current study we aimed to investigate whether the generally accepted 2-factor model of "activity avoidance" and "somatic focus" comprising fewer TSK items also applies to the TSK-AV, thereby potentially leading to a psychometrically sound short form TSK-AV for clinical and research use.

2. Patients & methods

2.1. Participants

One hundred one CLBP patients were recruited from the Department of Rehabilitation and Neurosurgery department at Jordan University Hospital in Amman, Jordan, all of whom gave their informed consent for participation in the study. The same set of patients used in our previous study[15] was used in this study to derive a new measure of kinesophobia in the Arabic population that has not been explored or published before. The study was approved by our local IRB committee and conducted in accordance with the Helsinki Declaration of 1975, as revised in 1983. Chronic pain was defined as pain of at least 3-month duration. Participants provided demographic information and completed measures of pain severity, disability and the TSK-AV.

2.2. Outcome measurements

Pain severity was measured by using a visual analog scale [VAS],[22] The Egyptian version of the Roland Morris disability questionnaire (RMDQ) was used as a measure of functional status/disability related to back pain.[23] The Arabic translation of the Tampa Scale of Kinesiophobia (TSK-AV) was used to assess the fear of (re)injury associated with physical movement.[15]

2.3. Statistical analysis

Means and standard deviations were calculated for participant socio-demographic characteristics, VAS, RMDQ, and TSK-A scores. Analyses of variance compared men and women on study variables.

Using the SPSS package for exploratory factor analysis, 13 TSK-AV items were subjected to a principle axis factoring with varimax rotation to determine whether the most recent 2-factor model proposed by Roelofs and colleagues[21] provided a good fit for the data. This analysis was performed with omission of reversed key items, an approach taken by nearly all proposed models to investigate the internal structure of TSK.[21,24,25] The scree plot (with all components after the elbow to be dropped) was used to determine appropriateness of the number of factors.[26] Items with loading below 0.32 on all factors were excluded based on the criteria of Comrey and Lee.[27] Items having high factor loading on more than 1 factor were assigned to a factor based on content. Internal consistency of subscales derived from the full version of TSK-AV was calculated using the Cronbach alpha coefficient, with values above 0.70 considered acceptable.[28]

A series of hierarchical regression analyses were then performed to assess the unique predictive validity of the various subscales of the TSK-AV obtained through exploratory factor analysis. For each regression, RMDQ score served as the dependent variable and initial blocks controlled for demographic variables and pain severity. Initial checks confirmed assumptions of normality, linearity, and hetero-scedasticity. Variance-inflation factors confirmed no problems of multi-collinearity.

3. Results

3.1. Sample characteristics

One hundred one patients with CLBP participated in the study. Fifty-three were female; 81 were married and 49 were employed. Their age ranged from 20 to 83 years with a mean age of 47.8 years (SD = 16.3). Mean pain duration was 5.1years (SD = 5.2) with a range of 0.25 to 25 years. In comparison to male participants, female participants were older (52.2 vs 43 years, $P < .01$), had higher VAS scores (pain severity), (60.7 vs 43.4, $P < .001$), RMDQ scores (disability) (15.5 vs 9.4, $P < .001$) and TSK-AV scores (47.7 vs 39.9, $P < .001$).

3.2. Factor analysis

Scree test method indicated the relative suitability of 2 factors for the TSK-AV. A solution of 2 factors, similar to that proposed by Roelofs and colleagues[21] provided adequate fit for the data. Factors were labeled following the common procedure of giving the greatest consideration to items with high loadings on each factor. The following labels were assigned: activity avoidance (TSK-AV-AA) comprising items 1, 2, 7, 9, 14, 15, and 17 and somatic focus (TSK-AV-SF) comprising items 3, 6, 11, and 13. This 2-factor solution cumulatively accounted for 46.54% of the total variance (33.73% and 12.81% for each factor, respectively).

Table 1 shows the factor loadings of each of the TSK-AV items included in the 2-factor solution. Items 5 and 10 had no significant loadings on any factor. Item 6 was assigned to factor 2 (somatic focus) based on its content. The final TSK-AV consisted of 11 items (TSK-AV-11).

3.3. Internal consistency

The internal consistency (Cronbach coefficient) for the TSK-AV-11 was 0.80, indicating good internal consistency. Cronbach coefficients for the TSK-AV-AA and TSK-AV-SF factors were 0.74 and 0.68, respectively.

3.4. Predictive validity

Table 2 summarizes 3 separate hierarchical regression analyses conducted to examine the independent predictive value of the 2-factor TSK-AV-11and each discrete factor separately in accounting for variance in disability (RMDQ). For each analysis, socio-demographic variables (age, gender, pain duration) were entered into the first block. Pain severity (VAS) was entered into the second block. In Regression 1, the TSK-AV-11 was entered into the third block. Regressions 2 and 3 examined the unique contribution of TSK-AV-AA and TSK-AV-SF factors, respectively.

Of demographic characteristics, age and gender accounted for 27% of the variance in disability scores, $F\Delta = 13.34$, $P < .001$, indicating that women and older patients reported greater disability. In the second block, pain severity accounted for an additional 17% of the variance, $F\Delta = 20.87$, $P < .001$. When added to the third block, participants score on the 11-item TSK-

Table 1

Factor loadings of the 2-factor Tampa Scale of Kinesiophobia-Arabic Version model as obtained by principal axis factoring.

Factor I: Activity Avoidance (TSK-AV-AA)		
Item 1	I am afraid that I might injure myself if I exercise.	.646
Item 2	If I try to overcome it, my pain would increase.	.487
Item 7	Pain always means that I have injured my body.	.484
Item 9	I am afraid that I might injure myself accidentally.	.621
Item 14	It is really not safe for a person with a condition like mine to be physically active.	.738
Item 15	I can't do all the things that normal people do because it is too easy for me to get injured.	.702
Item 17	No one should have to exercise when he/she is in pain.	.540
Factor II: Somatic Focus (TSK-AV-SF)		
Item 3	My body is telling me I have something dangerously wrong.	.820
Item 6	My accident has put my body at risk for the rest of my life.	.515
Item 11	I wouldn't have this much pain if there weren't something potentially dangerous going on in my body.	.820
Item 13	Pain lets me know when to stop exercising so that I don't injure myself.	.482

AV accounted for an additional 14% of the variance in disability (Regression 1: FΔ = 29.01, $P < .001$), beyond that accounted for pain severity, duration, and socio-demographic variables. The factor TSK-AV-AA alone accounted for an additional 10% of the variance in disability scores when entered into the third block (Regression 2: FΔ = 24.97, $P < .001$). The factor TSK-AV-SF alone accounted for an additional 8% of the variance when entered in to the third block (Regression3: FΔ = 23.17, $P < .001$).

Finally, a regression model including age, gender, pain duration, pain severity (VAS), and TSK-AV-11 demonstrates that only TSK-AV-11 (beta = 0.489; $P < .001$), age (beta = 0.224; $P = .0012$), and VAS (beta = 0.2651; $P = 0.001$) are significant predictors of disability (RMDQ).

4. Discussion

Our group has previously reported the first translation and validation of the original TSK-AV in Arabic-speaking CLBP patients.[15] The 17-item TSK-Arabic version or TSK-AV-17 predicted pain disability in this population and was, deemed a suitable measure of kinesiophobia in Arab patients with CLBP. The objective of the current study is to investigate whether the generally accepted 2-factor model of "activity avoidance" and "somatic focus" comprising fewer TSK items also applies to the TSK-AV.

Explorative factor analysis of our data supported the widely accepted 2-factor model, explaining approximately 46.54% of the variance. As in Roelofs et al,[21] our model contained 11 items; however, these items are not identical to the Roelofs study. Similar to Roelofs study, our "somatic focus" factor included items 3, 6, and 11; these items consistently reflect the somatic focus factor in previously reported models,[5,18,24,29,30] However, item 5 (labeled "somatic focus" by Roelofs et al) did not load on any factor in our investigation. Likewise, item 7 (also labeled "somatic focus" by Roelofs et al) loaded on the TSK-AV-AA factor in the current study. Conversely, item 13 emerged as part of the TSK-AV-SF factor within our study but were identified as part of the "activity avoidance" factor by Roelofs et al. Careful content inspection of items 7 and 13 suggests that they may be assigned to either the TSK-AV-AA or TSK-AV-SF factor. In particular, item 7 loaded onto "activity avoidance" in studies by Swinkels-Meewisse et al, Geisser et al[18] and in the 2-factor model of the TSK Persian version.[13]

In comparing our model with other studies, it is notable that our model showed good internal consistency for the 11-item TSK-AV (α=0.80) and acceptable internal consistency for the TSK-AV-AA and TSK-AV-SF factors (α=0.74 and 0.68, respectively). These values are in line with those previously reported for 2-factor models.[13,19] Moreover, the 11-item TSK-AV, the TSK-AV-AA, and the TSK-AV-SF each accounted for independent variance in disability after controlling for demographic and pain variables.

When examined separately, the factor TSK-AV-AA explained somewhat greater variance in disability than TSK-AV-SF. This

Table 2

Stepwise hierarchical regression analyses.

Independent Variables	R^2	R^2_{change}	F	β	t
Step 1	.27	.27	13.34[a]	0.00	0.00
Age				.31	3.35[a]
Gender				−.36	−4.00[a]
Pain duration				.02	.19
Step 2	.44	.17	20.87[a]	0.00	
Pain Intensity (VAS)				.45	5.58[a]
Step 3.1	.58	.14	29.01[a]	0.00	
TSK-AV-11				.49	5.78[a]
Step 3.2	.54	.10	24.97[a]		
TSK-AV-AA				.42	4.75[a]
Step 3.3	.52	.08	23.17[a]		
TSK-AV-SF				.33	4.22[a]

[a] $P < .001$; 3.1, 3.2, 3.3 are regressions 1 through 3; TSK-AV-11 = 11-item Tampa Scale of Kinesiophobia-Arabic Version, TSK-AV-AA = Tampa Scale of Kinesiophobia-Arabic Version- Activity Avoidance, TSK-AV-SF = Tampa Scale of Kinesiophobia-Arabic Version-Somatic Focus, VAS = Visual Analog Scale.

finding is consistent with emphasis on avoidance behavior in development/maintenance of disability as articulated by the fear-avoidance model[30] as well as exposure-based interventions stemming from this model.[31] However, the predictive value of TSK-AV-SF attests to the importance of attention and interpretation of bodily sensations as part of the fear-avoidance cycle.[31] Finally, the variance explained by the combined factors was less than the sum of the variance of each factor, suggesting conceptual overlap between activity avoidance and somatic focus that has been noted in previous psychometric studies.[19]

When compared to the 17-item TSK-AV (TSK-AV-17) examined in our previous report,[15] the short form TSK-11 shows similar or superior psychometric properties. The 2-factor model explains 46.54% of the variance versus 45.2% explained by a 3-factor model comprising all 17 items. In multivariate regression analysis both the TSK-AV-11 and TSK-AV-17 accounted for an additional 14% of the variance in disability beyond that accounted for pain severity, duration, and socio-demographic variables. While the Cronbach coefficient for the TSK-AV-11was identical to the TSK-AV-17 (both 0.80), the Cronbach coefficients for the TSK-AV-AA and TSK-AV-SF factors in the current 2-factor model were 0.74 and 0.68, respectively versus 0.75, 0.64, and 0.6 for the TSK-AV-AA, TSK-AV-EP, and TSK-AV-SF factors, respectively in the 3-factor model encompassing all 17 TSK items, indicating superior internal consistency for the 2-factor model. Given the advantage of brevity and the similar or superior psychometric properties compared with the TSK-AV-17, the TSK-AV-11 is a preferred tool for measuring kinesiophobia in patients with CLBP with potential application in other pain conditions, such as acute LBP and work-related upper extremity disorders. This brevity allows the TSK-AV-11 to increase the response rate, item completion rate,[32] reduces response burden,[33] and puts the TSK-AV-11 at better preference from time required for administration compared to TSK-AV-17. However, prospective studies are needed to determine the performance of this new measure in the clinical and research settings.

5. Conclusion

The current study of TSK-AV in Jordanian patients with CLBP replicated the 2-factor structure of activity avoidance and somatic focus identified in previous literature. The 11-item TSK-AV (comprising the 2-factor model), the TSK-AV-AA, and the TSK-AV-SF each accounted for significant variance in disability above and beyond demographic and pain factors. Overall, the findings support the utility of the short TSK-AV-11 instrument in assessing kinesiophobia among Arabic individuals with CLBP.

Author contributions

AAL-S and MEJ conceived the study and its design; KF and ZMH collected the data; AAL-S, MEJ, KF, ZMH and AA managed, analyzed, and interpreted the data. AAL-S and MEJ wrote the original manuscript. All authors have read, edited and approved the final manuscript.

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