

Reliability of the Korean Version of Tampa Scale for Kinesiophobia for Temporomandibular Disorders

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Purpose: The aim of this study was to translate the original English version of Tampa scale for kinesiophobia for temporomandibular disorders (TSK-TMDs) for cultural equivalency into Korean language and to evaluate the reliability of the Korean version of the TSK-TMD among symptom free subjects.

Methods: The original version of TSK-TMD was translated and cross-culturally adapted following international guidelines. A total 90 subjects (50 women, 40 men) were participated to fill out the questionnaire. The internal consistency and test-retest reliability with a one- or two-week time interval were evaluated.

Results: The internal consistency of TSK-TMD of the original and the modified 12-item TSK-TMD were 0.866, and 0.858, respectively using the Cronbach's alpha coefficient. And the internal consistency of activity avoidance (AA) and somatic focus (SF) subscale were 0.838 and 0.807 assessed with Cronbach's alpha indicating excellent reliability. Test-retest reliability of the original TSK-TMD measured by the intra-class correlation coefficient (ICC) was 0.764, and coefficients value of the 12-question TSK-TMD was 0.752. Test-retest reliability of AA subscale was 0.722 and SF subscale was 0.677 measured by ICC.

Conclusions: The Korean version of the TSK-TMD questionnaire was found to be a reliable instrument and successfully translated to Korean language. There are no significant differences between overall and modified version of TSK-TMD. It can be used as a valuable instrument for the analyses of the psychosocial aspects of the TMD patients in Korea.

Key Words: Fear of movement; Kinesiophobia; Reliability; Tampa scale; Temporomandibular disorders

INTRODUCTION

Temporomandibular disorders (TMDs) encompass a range of commonly occurring orofacial conditions that compromise the comfort and healthy functioning of the hard and soft tissues of the masticatory system.¹⁾ The prime manifestations of these disorders are described as acute or chronic pain in the area of the temporomandibular joint (TMJ) and/or masticatory muscles, limitations or deviations in range of mandibular motion, and TMJ clicking and/or crepitus

sounds during mandibular function.

TMD has been considered as a chronic pain condition and reported to be associated with psychologic, behavioral, and social factors in addition to physical pathology. There are many cross-sectional studies demonstrate that chronic pain patients show greater levels of psychological distress, environmental stress, catastrophizing, and somatic symptoms compared with pain-free controls.²⁻⁴⁾ The negative role of pain-related fear on functioning recently gained considerable attention in the field of musculoskeletal pain research.⁵⁾

In the fear-avoidance model of pain and disability,⁶⁾ and pain catastrophizing is suggested to predispose individuals toward the development of fear of movement (FM) which, in turn, may lead to increased disability and a heightening of the overall pain experience. FM seems particularly relevant for patients with musculoskeletal disorders, and is often assessed with the Tampa Scale for Kinesiophobia (TSK).⁷⁾ There is good evidence FM measured with TSK is a strong predictor of disability in patients with acute and chronic low back pain,⁸⁻¹⁰⁾ fibromyalgia,⁹⁾ and osteoarthritis.⁵⁾

TMD patients share many commonalities with the chronic musculoskeletal patients, and have association with psychosocial factors. However, there are only few researches about fear-avoidance model in TMD. Turner et al.¹¹⁾ reported that catastrophizing may play an important role in TMD pain problems both as reported by patients and as assessed during a clinical examination. Recently, TSK-TMDs has been developed for evaluating FM in TMD patients by Visscher et al.¹²⁾ And several studies are showed high validity and reliability of TSK-TMD.^{12,13)} But, there is currently no validated Korean version of TSK-TMD for the Korean population. Because of variations in social structures, culture, and language, an instrument must be cross-cultural adapted and validated to retain the psychometric properties of the original version.¹⁴⁾ The aims of this study were to translate the original English version of TSK-TMD for cultural equivalency into Korean language and to evaluate the reliability of the Korean version of TSK-TMD.

MATERIALS AND METHODS

1. Subjects

One hundred subjects without any symptoms and signs of TMD volunteered and participated in the study. One subject refused to participate in the study, 7 subjects did not answer the second questionnaire, and 2 subjects did not complete the questionnaire. Therefore total 90 subjects were evaluated in this study. Participates were consisted of 50 women and 40 men, and mean age was 27.46 ± 4.75 years (ranged from 21 to 41 years). There is no statistical significance between age and gender between the study participants and the respondents.

The study was approved by the Institutional Review

Board of Seoul National University Dental Hospital (IRB no. CRI14012). Each subject gave informed consent.

2. TSK-TMD Questionnaire

The original TSK questionnaire is developed for assessing fear of movement, particularly for patients with musculoskeletal disease. Because TMD patients have distinguishable feature from other musculoskeletal disease, Visscher et al.¹²⁾ modified for TSK and developed TSK-TMD for assessing FM of TMD patient. The original TSK-TMD is an English-language instrument¹²⁾ contains 18 items to assess FM in patients with TMD. The answer of each question is a 4-point Likert scale: strongly disagree, somewhat disagree, somewhat agree, and strongly agree (equivalent to scores of 1-4). As in the original TSK-TMD questionnaire, 4 items are reversely scored (i.e., items 4, 8, 12, and 16). High and low total scores of TSK-TMD indicate high and low degrees of kinesiophobia, respectively. Through confirmatory factor analysis, Visscher et al.¹²⁾ proposed that the original 18-item instrument be reduced to the indicated 12 items for routine assessment in TMD, and questionnaire divided into two domains which is estimate activity avoidance (AA) and somatic focus, respectively. The first factor, AA, reflected the belief that activity may result in (re)injury or increased pain (items 1, 2, 10, 13, 15, 17, and 18) and the second factor, somatic focus (SF), reflected a belief in underlying and serious medical problems (items 3, 5, 6, 7, and 11). And FM was sum of AA and SF subscale.¹²⁾ Visscher et al.¹²⁾ suggested that 12-item version of the TSK-TMD has generally good reliability and validity and more suitable for assess TMD patients, as a result of construct validity assessment. Therefore, in this study we analyzed both TSK-TMD with original 18 items, and modified 12 items.

3. Translation and Cross-Cultural Adaptation

According to the standard guidelines proposed by Guillemin et al.,¹⁵⁾ the process of translation and cross-cultural adaptation of the TSK-TMD included following major steps.

1) Forward translation

A faculty in the Department of Oral Medicine and Oral Diagnosis, Seoul National University who was fluent in both Korean and English first translated the TSK-TMD from

English to Korean. This translation was evaluated and revised by several faculty members.

2) Back-translation

Then, the back-translation from Korean to English was performed by a native English speaker who was also fluent in Korean.

3) Expert panel reviewer

An expert panel then compared and assessed the two versions of TSK-TMD. This was to ensure that the translated version reflected the same content as the original version. An initial Korean version of TSK-TMD was then produced.

All the findings were re-evaluated and discussed by the expert panel and then, the final Korean version was completed. The Korean version of TSK-TMD questionnaire is attached in the Appendix 1 (available online only) of this manuscript.

4. Data Collection and Interval of the Test

On the first visit of the subjects, an examiner who was an oral medicine specialist instructed them brief information for the Korean version of TSK-TMD questionnaire and the patients completed the series of the questionnaire and the checklist on TMD symptoms. One or two weeks later, on the second visit of the subjects, the questionnaire was drawn up once again using the simple blind technique. The one or two weeks interval was selected as a period short enough to eliminate the likelihood of significant changes in the subject's TMD symptoms taking place, but long enough to ensure that subjects could not recall their responses to the first questionnaire.¹⁶⁾

5. Statistical Analysis

To compare gender differences in each sum of original TSK-TMD and FM, AA, and SF subscales, independent t-tests were performed. Internal consistency was measured using Cronbach's alpha. This method has the advantage of the alpha coefficient being calculated through only one test. Figures in the range of 0.7-0.9 are preferable even though values as low as 0.6 may be acceptable. Test-retest reliability was assessed using an intra-class correlation coefficient (ICC). To investigate whether the each subscale of TSK-TMD is associated with the symptoms of TMD, we analyzed correlation between symptom checklist and each subscale with Spearman's rho coefficient. These statistical analyses were performed using the SPSS ver. 12.0 software (SPSS Inc., Chicago, IL, USA).

RESULTS

1. Subject Characteristics

A total 90 subjects were participated in this study. All the participants fully completed the Korean version of TSK-TMD questionnaires and declared that the items of TSK-TMD were easy to understand. The demographic features of the subjects are shown in Table 1. There was no significant difference in age between men and women. There were no significant differences between genders in total score of TSK-TMD and each subscale of FM, AA, and SF. The mean score of each question is shown in Table 2.

2. Test-Retest Reliability

The optimal interval between the two test-retest reliability measurements was approximately one to two weeks. The Korean version of TSK-TMD was administered to all

Table 1. Demographic features of the subjects and mean values of total score and each subscale of TSK-TMD according to gender

Variable	Women (n=50)	Men (n=40)	Total (n=90)	p-value
Age, y (range)	26.78±4.32 (21-40)	28.30±5.18 (21-41)	27.46±4.75 (21-41)	0.132
TSK-TMD	34.06±5.78	34.61±7.01	34.31±6.33	0.683
FM	22.06±4.58	22.25±6.55	22.14±5.51	0.945
AA	14.02±3.40	14.08±4.17	14.04±3.74	0.782
SF	8.04±1.73	8.18±2.65	8.10±2.18	0.877

TSK-TMD, tampa scale for kinesiophobia for temporomandibular disorders; FM, fear of movement; AA, activity of avoidance; SF, somatic focus.

Values are presented as mean±standard deviation. p-values were obtained from independent t-test.

Table 2. Mean scores of each item of the Korean version of TSK-TMD questionnaire

Item	Mean \pm SD
1. I am afraid that I might injure myself if I move my jaw.	1.59 \pm 0.81
2. If I ignored my jaw symptoms, they would get worse.	2.34 \pm 1.04
3. My jaw is telling me that something is seriously wrong with it.	1.56 \pm 0.73
4. My jaw symptoms would probably be better if I moved my jaw more.	2.61 \pm 0.60
5. Other people do not take my jaw symptoms seriously enough.	2.20 \pm 1.04
6. My jaw symptoms have put my health at risk for the rest of my life.	1.42 \pm 0.68
7. My jaw symptoms mean that I have injured my jaw.	1.34 \pm 0.65
8. Just because something aggravates my jaw symptoms does not mean that it is harmful.	1.81 \pm 0.87
9. I am afraid that I might accidentally injure my jaw.	1.99 \pm 0.96
10. The safest way to prevent my symptoms from getting worse is to be careful and not to move my jaw any more than necessary.	2.85 \pm 0.98
11. I would not have this many jaw symptoms if there was not something potentially harmful going on.	1.58 \pm 0.76
12. Although I have jaw symptoms I would be better off if I kept using my mouth normally.	1.79 \pm 0.95
13. My jaw symptoms let me know when to stop moving my jaw so that I do not injure myself.	2.20 \pm 0.94
14. It is really not safe for someone with a jaw condition like mine to use the mouth a lot.	2.19 \pm 0.92
15. I cannot do everything other people can do, because it is too easy for me to injure my jaw.	1.62 \pm 0.83
16. Even if doing something aggravates my jaw symptoms, I do not think that it is harmful.	1.77 \pm 0.90
17. No one should have to move the jaw when he/she has a jaw problem.	1.82 \pm 0.78
18. I am afraid to open my mouth wide because then I may not be able to close it again.	1.62 \pm 0.87

TSK-TMD, Tampa scale for kinesiophobia for temporomandibular disorders; SD, standard deviation.

Table 3. Test-retest reliability of the Korean version of TSK-TMD

Version	Internal consistency (Cronbach's alpha)	Test-retest (ICC)	Range (95% CI)
Original version	0.866	0.764	0.662-0.838
Modified 12 version	0.858	0.752	0.645-0.829

TSK-TMD, Tampa scale for kinesiophobia for temporomandibular disorders; ICC, intra-class correlation coefficient; CI, confidence intervals.

participants, re-administered after one or two weeks to determine the test-retest reliability. Test-retest reliability of the original TSK-TMD measured by the ICC was 0.764, and coefficients value of the 12-question TSK-TMD was 0.752 (Table 3). Test-retest reliability of each subscale; AA and SF was evaluated, and ICC was 0.722 and 0.677, respectively (Table 4).

3. Internal Consistency

Internal consistency was considered in each subscale and total score of TSK-TMD. The Cronbach's alpha value of the original and the modified 12-item TSK-TMD were 0.866, and 0.858, respectively. Internal consistency of each subscale was measured. AA and SF were 0.838 and 0.807 assessed with Cronbach's alpha indicating excellent reliability (Table 4).

Table 4. Test-retest reliability of TSK-TMD subscale

Subscale	Internal consistency (Cronbach's alpha)	Test-retest reliability (ICC)	Range (95% CI)
FM	0.858	0.752	0.645-0.829
AA	0.838	0.722	0.606-0.808
SF	0.807	0.677	0.547-0.775

TSK-TMD, Tampa scale for kinesiophobia for temporomandibular disorders; ICC, intra-class correlation coefficient; CI, confidence intervals; FM, fear of movement; AA, activity avoidance; SF, somatic focus.

4. Correlation among Subscales and Check List

The TSK-TMD has 4 questions of TMD symptom check list. We conducted correlation analysis between symptom check list and TSK-TMD. There are weak but significant relations were found between symptom check list and TSK-TMD score and each subscale. "Jaw pain" symptom were correlated with AA, SF, and FM scale. There are correlation between "Noises in my jaw when I move my mouth" question and SF scale. "Other jaw problem" were correlated with AA and FM scale. But "Lower jaw is stuck or locked such that it cannot be opened or closed" was not related with TSK-TMD (Table 5).

DISCUSSION

Pain-related fear has been increasingly recognized as an

Table 5. Correlations between symptom checklist and each subscale of TSK-TMD

Symptom checklist	FM	AA	SF
Jaw pain	0.335*	0.316*	0.306*
Noises in my jaw when I move my mouth	0.177	0.125	0.245**
Lower jaw is stuck or locked such that it cannot be opened or closed	0.142	0.114	0.160
Other jaw problem	0.217**	0.218**	0.139

TSK-TMD, tampa scale for kinesiophobia for temporomandibular disorder; FM, fear of movement; AA, activity of avoidance; SF, somatic focus.

*Significant at 0.01 level.

**Significant at 0.05 level.

important mediator from acute to chronic pain, and also as contributor to the maintenance of chronic pain. The importance of pain-related fear has been stressed in the fear-avoidance model of chronic pain.^{9,17)} In fear-avoidance model, a prolonged pain experience is interpreted in a catastrophic way, leading to pain-related fear and behavioral avoidance. Avoidance, in its turn, fosters negative psychological consequences, such as low mood and negative physiological consequences.^{18,19)} In 1990, Kori and colleagues⁷⁾ developed the TSK to measure fear of movement/(re)injury in chronic pain patients. This scale was later translated into a Dutch version, and validated in patients with chronic back pain,^{6,9,20)} acute back pain,^{10,21)} osteoarthritis,⁵⁾ and fibromyalgia.^{9,20)} In 2010, The TSK-TMDs was developed by Visscher et al.¹²⁾ to assess of FM in TMD patients. Through confirmatory factor analysis, Visscher et al.¹²⁾ recommend that the original 18-item instrument be reduced to the indicated 12 items based on Woby et al.²²⁾ for routine assessment in TMD, with AA and SF as subscales.

TSK-TMD was translated into various language including Chinese,¹³⁾ Japanese,²³⁾ and Brazilian Portuguese²⁴⁾ and widely used in FM in TMD patients. In the present study, the English version of TSK-TMD was successfully translated into Korean and validated with good reliability. With regard to the reliability, both the internal consistency and test-retest reliability were confirmed to be good. The Cronbach's alpha for original version of TSK-TMD and 12-question TSK-TMD were 0.866, and 0.858, respectively. The test-retest reliability of the Korean version of TSK-TMD questionnaire was relatively satisfactory.

The test-retest reliability for the original and modified TSK-TMD were regarded as good with an ICC value of 0.764, and 0.752 that was above 0.7 and thus exhibited good reproducibility. The test-retest reliability of each subscale

using ICC was greater than 0.7 which may be considered very acceptable.^{25,26)} There are no significant differences between reliability of original and modified 12-question in Korean version of TSK-TMD. As established by Visscher et al.,¹²⁾ we recommend 12-question TSK-TMD version to assess FM in Korean TMD patients. Based on our results, we could suggest the test-retest reliability of the Korean version of TSK-TMD questionnaire indicated good reproducibility. It demonstrated that subjects' responses to the Korean version of TSK-TMD were stable over time. All the participants completed Korean version of TSK-TMD without any difficulties, suggesting it could be meaningfully used in clinical situation. It is important to evaluate FM and pain catastrophizing in Korean TMD patients with Korean version of TSK-TMD. And this can understand better characteristics of Korean TMD patients and will lead to better treatment outcome.

To assess whether there is an association between the degree of FM and symptoms of TMD, all subjects also completed the checklist regarding their specific complaints. There are weak but significant relations were found between symptom checklist and TSK-TMD score and each subscale. Based on these results, the questionnaire itself can be used not only to evaluate fear of movement, but also to understand overall symptoms of TMD. In the study of Visscher et al.,¹²⁾ TMD functional problems (i.e., joint sounds or stuck/locked feeling) were more strongly associated with fear of movement. Unlike these results, in our study showed jaw pain was most correlated with fear of movement. This is thought to be due to the differences in the subjects surveyed. This is thought to be due to the differences in the subjects surveyed. We investigated the general population, but Visscher et al.¹²⁾ investigated only TMD patients. Further research is needed on these differences.

There are several limitations in the present study. Firstly, we only examined TSK-TMD for general populations. Thus it is difficult to determine whether the data could reflect characteristics of TMD. But pain-related fear and catastrophizing were considered as stable characteristics of individuals, and showed in general populations. Buer and Linton²⁷⁾ showed that fear-avoidance beliefs and pain catastrophizing already existed in the general population of nonpatients. And Houben et al.²⁸⁾ investigated fear of movement/injury in the general population. They showed factor structure of TSK for general populations were similar compared with low back complaints people. Therefore, in translating instrument for psychological characteristics, it is more important to focus on linguistic and cultural translation than whom to target.

Secondly, some items showed lower reliability than expected. There is a need to re-evaluate the questions that show low test-retest reliability and replace the phrases to ones that cause less confusion and are more appropriate to reflect the cultural belief of the Korean people concerning pain behavior. For more reliable and effective international collaboration studies, further development to reduce cultural and sociodemographic differences is imperative. The current study gives preliminary data with regard to the Korean TSK-TMD. And future study would be conducted in Korean TMD patients to assess characteristics of disease and FM and pain catastrophizing using Korean version of TSK-TMD questionnaire.

In conclusion, the Korean version of the TSK-TMD questionnaire was found to be a reliable instrument and successfully translated to Korean language. There are no significant differences between overall and modified version of TSK-TMD. Therefore we recommended use 12-TSK-TMD for assessing FM in Korean TMD patients. This study has provided a valid and reliable cross-culturally adapted instrument for TMD researchers in Korea that will allow comparison with data from other international studies.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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