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Clinical Study

# The relationship between the Tampa Scale of Kinesiophobia and low back pain rehabilitation outcomes

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**Abstract**

**BACKGROUNDCONTEXT:** The Tampa Scale for Kinesiophobia (TSK) is commonly used in clinical practice to quantify levels of pain-related fear of activity or re-injury in patients presenting with back pain. Patients with high levels of kinesiophobia are often considered at greater risk of developing long-term activity limitation and chronicity. There is, however, little evidence to support this assumption.

**PURPOSE:** The purpose of this study was to assess the role of the TSK in determining eventual outcome in a cohort of low back pain patients completing a multidisciplinary rehabilitation program.

**STUDY DESIGN/SETTING:** A prospective cohort study was used.

**PATIENT SAMPLE:** The sample consisted of 313 low back pain patients treated at one of six rehabilitation clinics in New Zealand over a 4-year period.

**OUTCOME MEASURES:** The outcome measures for this study are the TSK, Numeric Pain Scale (NPS), Modified Low Back Outcome Score (m-LBOS), and vocational status (working or not working).

**METHODS:** TSK questionnaire scores and three additional quality of life (QoL) measures (NPS, m-LBOS, and vocational status) were recorded at the initial assessment and after a 6- to 12-week period of rehabilitation. Statistical analysis was performed to determine the relationships between TSK scores and the QoL values recorded at initial assessment and postrehabilitation checkpoints.

**RESULTS:** The correlations between initial TSK, NPS, and m-LBOS values recorded at assessment were statistically significant, but the relationships were weak. More importantly, there was no correlation between baseline TSK scores and changes in the numeric pain rating, perceived function, or vocational status after a period of rehabilitation. Correlations between changes in TSK scores and changes in NPS and m-LBOS values after rehabilitation were statistically significant, but the relationships were weak.

**CONCLUSIONS:** The TSK provides no benefit as a screening tool to predict pain, functional and work outcomes following rehabilitation. Measured changes in TSK scores following rehabilitation do not correlate strongly with similar, concordant changes in pain scores, functional levels, or return-to-work outcomes. 

*Keywords:* Chronic low back pain; Fear avoidance; Kinesiophobia; Outcomes; Prognosis

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## Introduction

The presence of kinesiophobia or "fear of movement" has been suggested to be a key factor in the development of long-term inactivity and chronicity for individuals presenting with low back pain (LBP) [1]. The Tampa Scale of Kinesiophobia (TSK) questionnaire was originally developed for use in the clinical setting to objectively discriminate kinesiophobia from less extensive fear of activity among patients with long-standing musculoskeletal pain [2]. The influence of kinesiophobia on eventual outcomes for individuals with LBP is still uncertain; however, in spite of this ambiguity, patients with high TSK scores (representing greater levels of kinesiophobia) are considered at increased risk of developing long-term disability and restricted participation in work and activities of daily living [3–5]. Many have suggested that the early identification of patients with higher risk for kinesiophobia may alter treatment strategies, resulting in improved outcomes [6–8].

The original TSK questionnaire contained 17 items that assessed subjective ratings of fear-related concepts. Each item has a four-point Likert scale with scoring options tiered from "strongly agree" to "strongly disagree" and a total score ranging from 17 to 68; higher scores represented stronger levels of fear avoidance behavior. The original TSK demonstrated excellent inter-tester reliability and construct validity [9] and is now routinely used in many clinical practices to detect potentially adverse kinesiophobic behavior.

A few studies have analyzed the relationship between TSK scores and other outcome measures. Boersma and Linton [10] studied the value of the TSK to predict pain and disability in a cohort of 81 patients with musculoskeletal pain. They found a statistically significant correlation between the TSK and the development of future disability and pain. Lüning-Bergsten et al. [11] analyzed the relationship between baseline TSK scores and subsequent changes in disability levels following a period of multidisciplinary rehabilitation. The authors determined that patients with greater than an eight-point improvement (decrease) in TSK scores over the period of rehabilitation were more likely to have improvements in their overall disability index rating.

The development of profiling models to help determine the outcome of treatment for LBP is an evolving area in spine research. The ability to identify individuals at a higher risk of developing long-term chronicity is a key to stratifying health resources and optimizing treatment outcomes. The purpose of this study was to determine the role of the TSK in determining treatment outcome in a group of LBP patients completing an active rehabilitation program.

The specific objectives of this study were to determine the relationships between the following:

(1) Assessment TSK scores and three baseline quality of life (QoL) measures: Numeric Pain Scale (NPS), Modified Low Back Outcome Score (m-LBOS), and vocational status (working or not working)
(2) Assessment TSK scores and changes in these three QoL measures from initial assessment to program completion
(3) Changes in TSK scores and changes in these three QoL measures from initial assessment to program completion.

EVIDENCE & METHODS

**Context**

The Tampa Scale for Kinesiophobia (TSK) is commonly used in physical therapy and rehabilitation to determine the level of patient anxiety around movement or re-injury while recovering from episode(s) of low back pain. Patients with high levels of kinesiophobia are often felt to be at greater risk of developing long-term activity limitations and chronic back pain due to these underlying concerns/perceptions. The authors assessed the predictive capacity of the TSK in determining outcome after rehabilitation for an episode of low back pain in a prospective cohort of patients.

**Contribution**

The authors conducted their study among a cohort of 313 individuals. They concluded that the TSK performed poorly as a screening tool capable of informing outcomes following the rehabilitation process.

**Implications**

Findings regarding the utility of the TSK should not be seen as contravening assumptions regarding patient perceptions and anxiety and the role they play in contributing to chronic low back pain. Rather, this study points to the fact that the TSK is not a useful screening tool capable of informing patient outcomes following a course of rehabilitation. Differences in the socio-ethnic, demographic, and clinical composition of this cohort as compared with other populations with chronic low back pain in the United States and elsewhere may impair broad translation of this study's findings. For example, it may be that the TSK, developed in a different clinical context, may not be an ideal screening tool for a New Zealand patient population in and of itself.

*—The Editors*

## Methods

This was a prospective, cohort study of 313 patients with LBP who completed a 6-to 12-week active rehabilitation program within one of six spine rehabilitation clinics in New Zealand. The inclusion criteria were all LBP patients between the ages of 18 and 60, who were referred for a contracted rehabilitation program between October 2008 and March 2012. Patients with acute (less than 3 month's symptom duration)

or chronic LBP (greater than 3 month's duration) were included in the sample group. Patients with major trauma, infection, suspected systemic illness, and those with an incomplete initial TSK questionnaire were excluded from the study.

Each of the clinics involved in the study provided a standardized methodology for the assessment and treatment of back pain [12]. Every clinician received additional training to ensure the diagnostic criteria, rehabilitation content, and resources were uniform across all clinics. The treatment approach that was used classifies mechanical LBP into four clinically relevant subgroups (patterns), based on the location of the dominant pain site (back pain or leg pain of spinal origin), pain consistency (constant or intermittent), and symptom response to spinal postures and activities. All subgroups were further stratified by identifying patients with coexisting heightened pain behaviors. Once categorized, patients were treated with a combination of pattern-specific pain control exercises, education, functional reactivation activities, and cognitive behavioral therapy. All patients received standardized education (including handouts and education classes) to assist in modifying fear avoidance behaviors, including promotion of activity, hurt versus harm rationalizing, and scheduled activities of daily living.

For all participants, TSK, NPS, m-LBOS questionnaires, and vocational status were recorded at both the initial assessment and on the final day of the rehabilitation program. The NPS records perceived pain level based on an 11-point (range: 0 [no pain] to 10 [high pain]) scale [13]. Perceived functional ability was recorded for each patient using a slightly modified version of the LBOS [14,15].

For vocational status, patients were classified as either "working" (usual pre-injury hours or reduced or modified hours or duties), "not working" (no work hours or duties), or "not in workforce" (homemakers, students, or retirees).

To assist with the interpretation of data, baseline TSK scores were classified into either low (less than or equal to 41 points) or high (greater than 41) risk categories based on previously recommended cutoff points (11). Changes in outcome scores following rehabilitation were also dichotomized into clinically relevant improvement categories, based on recommendations from previous literature for classifying pain and disability outcome measures [16,17]. For NPS, a 20% decrease in score (1.9 points) was used. For functional improvement, a 30% increase in m-LBOS was regarded as clinically meaningful.

*Statistical analysis*

Pearson correlation coefficient was used to determine the correlation between continuous variables. Independent *t* tests were used to determine associations between continuous and categorized variables, and chi-square tests were used to measure associations between categorized variables. The level of statistical significance was set at $p<.05$. SPSS Version 22 (IBM Corporation, Armonk, New York, NY USA) was used as the software for all statistical analysis.

## Results

A total of 313 patients met the inclusion criteria for the study and made up the final sample group. The mean age of the cohort was 40.0 years (SD=10.9) and 67.4% of the group were male. The mean symptom duration was just over 12 months (377.7 days: SD=414.9). Of the total group, 283 of 313 were classified as being in the workforce ("not working" [187 of 283], "working" [96 of 283]) and 10 of 313 were categorized as either homemakers, students, or retirees. Work status was not recorded for 20 of 313 of the sample group. Table 1 shows the questionnaire completion rates and mean scores for TSK and the three QoL measures recorded at both assessment and discharge checkpoints.

All of the 313 patients who were included in the study completed their discharge rehabilitation program. At the completion of treatment, there was a mean improvement in NPS of 1.84 (19% reduction) and an increase in m-LBOS functional score of 10.4 (28.3% improvement). Of the 209 of 313 patients who completed the TSK questionnaire at program completion, the average improvement was 5.5 points (Table 1).

Table 2 details the proportion of patients who achieved a clinically relevant improvement in their individual QoL measures following a period of rehabilitation. Nearly two-thirds (65.5%) of the group had a clinically relevant improvement in pain, and approximately a third (34.7%) had a clinically relevant improvement in their perceived function. Work status was successfully recorded at discharge for 170 of the 187 (90%) patients who were categorized as "not working" at their initial assessment. Approximately half of this group (88 of 170 [51.8%]) achieved a successful return-to-work outcome (pre-injury or modified work hours and duties) following rehabilitation.

Table 1
Change in continuous TSK and QoL scores from assessment to discharge

| | Assessment scores | | Completion scores | | |
|---|---|---|---|---|---|
| Variable | Mean (SD) | n | Mean (SD) | Change in score mean (SD) | Completion rate n (%) |
| TSK | 41.1 (7.9) | 313 | 35.6 (9.2) | 5.5 (8.8) | 209 of 313 (67%) |
| Function (m-LBOS) | 36.7 (9.9) | 311 | 47.1 (12.8) | 10.4 (10.9) | 280 of 313 (89%) |
| Pain level (NPS) | 5.24 (2.1) | 294 | 3.4 (2.4) | 1.84 (2.4) | 276 of 313 (89%) |
| Work status (% working) | 96 of 283 (33.9%) | 283 | 175 of 274 (63.8%) | 29.9% | 274 of 313 (87.5%) |

Table 2
Association between assessment TSK risk category and clinically relevant change in QoL values following rehabilitation

| QoL measure | Clinically relevant improvement in score? | TSK risk category at assessment | | n | p value |
|---|---|---|---|---|---|
| | | Lower risk (≤41) | Higher risk (+41) | | |
| Function (m-LBOS) | Yes (>30% score change) | 40 (31.3%) | 57 (37.7%) | 97 | .26 |
| | No (≤30% score change) | 88 (68.8%) | 94 (62.3%) | 182 | |
| Pain (NPS) | Yes (>20% score change) | 81 (67.5%) | 99 (63.9%) | 180 | .53 |
| | No (≤20% score change) | 39 (32.5%) | 56 (36.1%) | 95 | |
| Return to work | Yes (working) | 39 (54.9%) | 49 (49.5%) | 88 | .10 |
| | No (not working) | 32 (45.1%) | 50 (50.5%) | 82 | |

*Objective 1: Relationship between baseline TSK score and QoL values*

*Categorized values*

At baseline assessment, patients reporting a higher category of perceived function (score>46 points) or lower pain levels (score<3 of 10) had significantly lower mean TSK scores (Table 3). There was no statistically significant difference in mean TSK scores based on categorized work status at assessment (Table 3).

Table 3
Relationship between baseline TSK score and categorized QoL values at assessment

| Assessment values | n | TSK score | Analysis | p-Value |
|---|---|---|---|---|
| Function (m-LBOS) | | | | |
| ≤36 | 164 | 42.0 | ≤36:37–45 | .898 |
| 37–45 | 89 | 41.6 | | |
| 46+ | 58 | 37.8 | 37–45:46+ | .011 |
| Pain level (NPS) | | | | |
| ≤3 | 61 | 37.8 | ≤3:4–6 | .003 |
| 4–6 | 151 | 41.7 | | |
| 7+ | 82 | 43.2 | 4–6:7+ | .331 |
| Work status | | | | |
| Working | 96 | 40.2 | | .069 |
| Not working | 187 | 41.9 | | |

*Continuous values*

Correlations between baseline TSK scores and initial NPS scores (r=0.248, p<.01) and functional m-LBOS scores (r=–0.237, p<.01) were statistically significant, but the relationships were weak.

*Objective 2: Relationship between baseline TSK scores and changes in QoL measures following rehabilitation*

*Categorized values*

Table 2 reveals that there was no statistically significant association between the baseline TSK risk category and postrehabilitation, clinically relevant improvement categories for function (p=.26), pain (p=.53), or return-to-work outcome (p=.10).

*Continuous values*

Correlations between baseline TSK scores and changes in pain scores (r=–0.018, p=.762) and function scores (r=–0.081, p=.176) were not statistically significant.

*Objective 3: Relationship between changes in TSK scores and changes in QoL measures following rehabilitation*

*Categorized values*

There was a statistically significant association between changes in continuous TSK scores following rehabilitation

Table 4
Relationship between change in TSK scores and clinically relevant changes in QoL values

| QoL measure | Clinically relevant improvement after rehabilitation? | Change in TSK score Mean (SD) n (%) | Diff | 95% CI | p-Value |
|---|---|---|---|---|---|
| Function (m-LBOS) | Yes (>30%) | –9.0 (9.2) 70 of 201 (34.8%) | | | |
| | No (≤30%) | –4.6 (8.2) 131 of 201 (65.2%) | –4.4 | –6.9 to –1.9 | .001 |
| Pain level (NPS) | Yes (>20%) | –7.6 (8.6) 129 of 196 (65.8) | | | |
| | No (≤20%) | –4.0 (9.2) 67 of 196 (34.2) | –3.6 | –6.2 to –0.9 | .008 |
| Successful return to work | Yes (working) | –5.8 (10.3) 68 of 125 (54.4%) | | | |
| | No (not working) | –5.6 (9.1) 57 of 125 (45.6%) | –0.2 | –3.7 to –3.3 | .91 |

and clinically relevant, categorized, changes in function (p=.001) and pain (p=.008). The association between changes in TSK score and postrehabilitation work status was not statistically significant (Table 4).

*Continuous values*

Correlations between changes in TSK scores and changes in continuous pain (r=0.202, p<.01) and function scores (r=–0.275, p<.01) were statistically significant, but the relationship was weak.

## Discussion

The primary goal of this study was to further our understanding of the relationship between the TSK and eventual outcomes from spinal rehabilitation. The weak correlation between baseline TSK scores and initial pain (NPS), function (m-LBOS) scores, and work status observed in this study suggest that constructs such as kinesiophobia can develop independently from symptom intensity, perceived disability, and work status. Patients who must maintain tenuous employment, or those with a previous history of prolonged injury or disability, may have high levels of fear avoidance related to a current back problem but suffer relatively little pain or functional limitation. Conversely, patients with high levels of pain or functional impairment may have positive aspirations for recovery and have relatively low levels of anxiety or fear associated with movement or re-injury.

Reneman et al. [18] studied the relationship between baseline TSK and functional capacity as measured by a standardized functional capacity evaluation. The authors found that the relationship between TSK scores and functional capacity evaluation performance was weak or non-existent in patients with back pain. In our study, we chose to use the m-LBOS as the assessment tool as it measures activity limitation as opposed to "disability" as defined by the International Classification of Functioning, Disability and Health. This QoL measure showed no correlation between TSK scores and measures of functional change. Lüning-Bergsten et al. [11] analyzed the relationship between the TSK score and both physical ability (Oswestry Disability Questionnaire) and disability (as measured by the Pain Disability Index) and also found no statistically significant correlation between TSK scores and measures of functional ability or disability.

The results of our study indicate that baseline TSK levels do not correlate strongly with the eventual outcome of rehabilitation. Accordingly, there is little evidence to support the use of routine TSK screening as a predictive tool for LBP patients. The specific cutoff point on the TSK that identifies patients at a high risk of chronicity because of fear avoidance behavior is yet to be determined. The results from this study found that patients classified at higher risk in this study (TSK >41) were no more likely to have a poor response to rehabilitation than those that scored 41 points or less.

One possible explanation for the poor correlation between both baseline and postrehabilitation TSK levels and measures of function and pain is that the TSK may not be an accurate measure of kinesiophobia. Lundburg et al. [19] reviewed 11 separate questionnaires for kinesiophobia and rejected all existing versions because of their limited prognostic value (unacceptable goodness of fit statistic). They concluded that further research was required to develop the conceptual and operational definitions of kinesiophobia and to determine the use of the TSK as an assessment tool. Linton et al. [20] found that the TSK did not detect patients with fewer fear-avoidance beliefs. They discovered that patients continued to have high TSK scores (even after successfully participating in treatment) and concluded that the result may reflect a problem with the questionnaire. Our inconsistent findings, based on both continuous and categorical measures, support the notion that the TSK may not be an accurate measure of fear avoidance.

One of the key findings in our study was that, although some associations existed, changes in TSK scores over the course of rehabilitation did not correlate strongly with changes in perceived functional ability or pain levels. This was unexpected as the TSK is a measure of pain-related fear of movement, and it was assumed that patients with improvements in function levels or pain scores would have similar, concordant, improvements in TSK scores. Changes in symptom severity or activity levels may therefore not be the main drivers influencing kinesiophobic behavior, and reductions in TSK scores may relate more to messages that positively influence anxiety and fear without directly improving symptoms or the resumption of normal activity or work.

There are a few limitations in the design of this study that may affect the interpretation of the results. Although data collection rates for TSK and QoL measures at assessment were high (90.4%–100%), only 209 of the 313 (66%) patients in the sample completed their discharge TSK questionnaire. By comparison, the completion rate for recording work status was 87.5%, and the completion rate for both the NPS and m-LBOS was 89%. Another potential limitation might have occurred in the program design. All participants received individualized rehabilitation, and certain therapists (or clinics) might have added additional education or resources to help address high levels of kinesiophobic behavior. Patients could also have accessed additional external health services that may have influenced the eventual outcome and interpretation of results. However, the clinics and clinicians chosen for this study offered a standardized approach with similar strategies and education resources and, on analyzing the results further, there was no significant difference in either baseline or postrehabilitation TSK scores among the participating facilities. In addition, patients included in this study were referred for a time-limited, multidisciplinary rehabilitation program with all costs covered by their health insurer. In our opinion, it is highly unlikely that patients would privately pay for additional cotreatment throughout their period of fully funded rehabilitation; nevertheless, this potential confounder cannot be completely excluded.

The identification of risk factors associated with treatment outcomes for LBP is an important development in the management of spine pain. Our results show that the TSK offers no benefit as a profiling tool to predict treatment response for LBP patients. In addition, although improvements in kinesiophobic behavior is clearly a positive outcome, the poor correlation between changes in TSK levels and improvements in other important QoL measures highlights the limitations in quantifying the benefit, and value, of LBP rehabilitation exclusively on measured improvements in the TSK.

## Supplementary material

Supplementary material related to this article can be found at http://dx.doi.org/10.1016/j.spinee.2015.08.018.

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