Abstract. [Purpose] The purpose of this study was to establish the reliability and validity of the Korean version of the Spine Functional Index (K-SFI), a translated version of the original SFI used with patients with spinal disorders. [Subjects and Methods] Sixty participants with spine disorder, 22 males and 38 females, participated in the study. Reliability was determined by using the intra class correlation coefficient and Cronbach’s alpha for internal consistency. Validity was examined by correlating K-SFI scores with the Roland Morris Disability Questionnaire (RMDQ), Neck Disability index (NDI), and the Functional Rating Index (FRI). [Results] Test-retest reliability was 0.94. The criterion-related validity was established by comparison with the Korean version of the RMDQ, NDI and FRI. [Conclusion] The Korean version of the SFI was shown to be a reliable and valid instrument for assessing spine complaints.

Key words: Spine Functional Index (SFI), Reliability, Validity

INTRODUCTION

Patients with spinal problems encounter difficulties with daily functioning. Such spinal problems are evaluated by patient-reported outcome measures. Issues with the lumbar and cervical spinal regions are the most frequent in the general population. Accordingly, most patient outcome measures evaluating spinal problems are divided into categories assessing the lumbar and the cervical.

Whereas the use of region-specific tools is preferred in evaluating the functional status of patients suffering damage to the upper or lower limbs, few patient-reported outcome measures evaluate the whole spine. Therefore, evaluating a spinal disorder requires the use of several evaluation questionnaires assessing the neck and back. In this case, assessing patients with a whole spinal problem inevitably results in an assessment gap, making it difficult to distinguish these patients from those with a back or neck problem.

The whole spine evaluation questionnaire battery comprises: the Functional Rating Index (FRI), Bournemouth Questionnaire, the Extended Aberdeen Spine Pain Scales, the Pain Disability Questionnaire, and the Core Outcome Measures Index. However, the appropriate factor structure of these questionnaires has not been verified by Rasch analysis or factorial analysis. Of these questionnaires, the FRI is often preferred because its clinimetric properties have been verified for back and neck.

The Spine Functional Index (SFI), developed as a whole spine patient-reported outcome measure, evaluates the whole spine, including the cervical and lumbar areas, with a single kinetic-chain. In addition to the simple completion process and fewer missing responses, the SFI has been shown to be superior to the FRI in terms of its clinimetric properties. Furthermore, it is currently available in many languages including Spanish and Turkish confirming its credibility and validity.

However, the reliability and validity of the SFI translated into Korean have not yet been confirmed. This study aimed to determine the reliability and validity of a Korean version of the SFI.
SUBJECTS AND METHODS

A total of 60 outpatients with spinal disorders receiving physical therapy at C Orthopedic Clinic in Gyeonggii-do were recruited into this study. The participants had reported pain for at least 12 months. Those who declined to complete the questionnaire or did not understand the contents, or who had recent surgeries, pregnancies, infectious diseases, neurological diseases, cancer, or other systemic diseases possibly affecting spinal function, were excluded from the study. After participants were informed about the study, they agreed to participate and signed consent forms.

The study was approved by the Institutional Review Board of Gachon University.

The K-SFI is a questionnaire designed to be completed by patients to evaluate the limitations in activity and participation resulting from back complaints. The questionnaire consists of 25 “yes”, “partly” or “no”. The K-SFI score is calculated by summing the response items, multiplying the total by four, and subtracting the answer from 100, giving the total score as a percentage. The scores range from 0% (maximum limitation) to 100% (no disability).

The forward- and back-translations of the K-SFI presented no major language problems for an expert committee comprising professors and language experts.

To evaluate reliability, the test-retest method was used. The questionnaire was to be completed once, and again in seven days. The 7-day test-retest reliability was analyzed according to the intra class correlation coefficient (2,1) as well as internal consistency with Cronbach’s α. Criterion-related validity was evaluated by correlating between the K-SFI and RMDQ, NDI, FRI.

RESULTS

The general characteristics of the 60 participants are shown in Table 1.

The ICC was used for test-retest reliability, and the K-SFI ICC (2,1) was 0.94 (90% confidence interval [CI] =0.85–0.95) showing a high level of reliability (Table 2).

The K-SFI values showed significant correlations with the all categories of the RMDQ, NDI, and FRI (Table 3). The correlation between the K-SFI and RMDQ was high (r=0.75, p<0.05), and correlations between the K-SFI and the NDI, and FRI were fair (r=0.53 and r=0.57, respectively).

DISCUSSION

This study measured the test-retest reliability of the K-SFI for patients with spinal disorder, and our results showed that the Korean version had high reliability. The Spanish17) and Turkish11) versions of the SFI demonstrated high test-retest reliability when administered at a 7 day interval. Similarly, this study measured the test-retest reliability seven days apart, targeting chronic patients who had been suffering with an injury for more than 12 months. Our results demonstrated high reliability level of r=0.94. The Spanish and Turkish versions of the SFI had high internal consistency, with a Cronbach’s α coefficient of 0.85. The K-SFI had a similar result to that of the Spanish and Turkish versions. Furthermore, the K-SFI did not exceed the accepted threshold (α=0.95), suggesting that there was no evidence of item redundancy18).

To verify the validity of the Spanish version of the SFI, its correlations with the Roland Morris Questionnaire and the Neck Disability Index were measured. The results showed that the Spanish version of the SFI was strongly correlated with the RMDQ, but had a relatively weak correlation with the NDI. The correlation between the Turkish version of the SFI and

| Table 1. Demographic characteristics of study participants (N=60) |
|--------------------|------------------|
| Gender (male/female) | 22 /38 |
| Age (years) | 46.1 ± 22.3 |
| Pain duration (months) | 17.2 ± 10.9 |
| Sub-region |
| Cervical region | 18 |
| Thoracic | 2 |
| Lumbar region | 32 |
| Multi-area | 8 |

| Table 2. Test-Retest Reliability and internal consistency for K-SFI |
|--------------------|------------------|
| Internal consistency (α) | ICC (95% CI) |
| K-SFI | 0.88 | 0.94 |

All correlations are significant at the 0.05 level.
K-SFI: Korean version Spine Functional Index

| Table 3. Pearson’s correlation coefficients for the K-SFI for correlation with RMDQ, NDI, and FRI |
|--------------------|------------------|
| RMDQ | NDI | FRI |
| K-SFI | 0.75 | 0.53 | 0.57 |

All correlations are significant at the 0.05 level.
RMDQ: Roland Morris Disability Questionnaire; NDI: Neck Disability Index; FRI: Functional Rating Index
the Oswestry Disability Index (ODI) was shown to be weaker than that of the Spanish version of the SFI. We argue that this was because the RMDQ is a dichotomous scale, while the ODI employs a 6 point Likert scale for item ratings. Furthermore, the correlation between the Turkish version of the SFI and the FRI, which is a 5 Likert scale, demonstrated a fair degree of validity, as opposed to the high degree of validity reported in the original study. It is argued that this is because Turkish people do not often use the ‘half-mark’ of the SFI due to cultural reasons. This study measured the correlations between the K-SFI and the RMDQ, NDI, FRI, respectively, in order to measure the validity of the K-SFI. The results of the study showed that while the SFI had a strong correlation with RMDQ, it had a fair degree of validity with the NDI and with the FRI, as with the Spanish and Turkish versions.

The Turkish version of the SFI was shown to have a low SFI error value, which signifies high sensitivity to changes over time. In case of the ceiling or floor effect, however, the sensitivity to changes in patients with minor or severe symptoms decreases. This study checked for the ceiling or floor effect and verified that, as with the original version, no ceiling or floor effect was found in the SFI.

This study translated the SFI into Korean and confirmed its high reliability and validity. However, because only Korean speakers were participated, it is difficult to generalize our finding. And responsiveness to detect changes over time was not assessed in this study.

In future studies, we should measure the reliability by including a broader range of subjects with whole spine disorders and analyze the correlation between neck and back pain outcome measure; furthermore, translation and cross-cultural adaptation of the SFI into other languages are required.

ACKNOWLEDGEMENT

This work was supported by the Gimcheon University Research Grant.

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