

Validation of a Korean version of the quality-of-life profile for spine deformities (QLPSD) in patients with adolescent idiopathic scoliosis

S.H. PARK¹, T.S. GOH², Y.G. PARK², D.S. KIM², J.S. LEE²

¹Department of Orthopaedic Surgery, Gupo Sungshim Hospital, Busan, Republic of Korea

²Department of Orthopaedic Surgery, Biomedical Research Institute, Pusan National University Hospital, Pusan National University School of Medicine, Busan, Republic of Korea

S. H. Park and T. S. Goh contributed equally to this work as first authors

Abstract. – OBJECTIVE: We aimed to evaluate the reliability and validity of the adapted Korean version of the Quality-of-Life Profile for Spine Deformities (QLPSD) questionnaire.

PATIENTS AND METHODS: English version of QLPSD was translated into Korean according to previously published guidelines. The Korean version of the QLPSD questionnaire and the Korean version of the SRS-22 was sent to 120 consecutive idiopathic scoliosis patients wearing braces recruited from the outpatient clinic. Reliability assessment and construct validity were evaluated.

RESULTS: The intraobserver reliability of all items in the questionnaire had a kappa statistic of agreement greater than 0.6. The QLPSD showed good test/re-test reliability (ICC = 0.815). The internal consistency of Cronbach's α was found to be very good ($\alpha = 0.918$). The Korean version of QLPSD showed a significant correlation with the SRS-22 total score ($p < 0.001$, $r = -0.811$) and single SRS-22 domains scores.

CONCLUSIONS: The adapted Korean version of the QLPSD was successfully translated and showed good measurement properties. As such, it is considered suitable for outcome assessments in Korean-speaking patients with idiopathic scoliosis.

Key Words:

Reliability, Validity, Idiopathic scoliosis, QLPSD, Korean version.

Abbreviations

QLPSD: Quality of Life Profile for Spine Deformities, SRS-22: Scoliosis Research Society-22, ICC: intraclass correlation coefficient (ICC).

Introduction

A growing interest in demonstrating the effect of treatments on the health-related quality of life of patients with idiopathic scoliosis has led to the development of tools and questionnaires¹⁻⁶. The assessment of patients' subjective views of their health is essential to evaluate the course of the disease and assess treatment effects in patients with musculoskeletal diseases⁷. Several instruments have been developed to measure functional disability and pain, ranging from physical assessments by trained assessors to self-administered questionnaire^{8,9}. Among these instruments, the Quality-of-Life Profile for Spine Deformities (QLPSD) is a 21-item self-reporting questionnaire developed specifically for assessing adolescents with spinal deformities and has demonstrated good validity, reliability, and sensitivity to change in different countries. This questionnaire consists of 21 items in 5 categories: psychosocial function (7 items), sleep disorders (4 items), back pain (3 items), body image (4 items), and back flexibility (3 items). The possible answers consist of a typical five-level Likert item ranging from 1 (i.e., "Strongly disagree") to 5 (i.e., "Strongly agree"). The score is calculated as the sum or average of the answers to each question, and a higher score means better quality of life, and a lower score means poor quality of life^{2,10-14}. Also, this questionnaire is suitable for adolescents at least ten years of age, which was revealed through a transcultural adaptation study¹². However, no Korean version of the QLPSD had been previously validated. These kinds of the questionnaire must be translated into

the respective local languages and must also be culturally adapted. The objectives of this study were to translate into the Korean language a culturally adapted version of the QLPSD and to validate this Korean version of the QLPSD in Korean patients.

Patients and Methods

Translation of QLPSD

A prospective study was conducted at two spine centers, Pusan National University Hospital and Gupo Sungshim Hospital. The translation and adaptation processes followed published guidelines for the cross-cultural adaptation of self-report measures¹⁵. The translation procedure in this study had three stages: forward translation, back translation, and an expert committee discussion. In addition, a pilot study was performed to test whether the prefinal version could be understood correctly by Korean patients with scoliosis. The final version was achieved by expert committee discussion and tested for its validity and reliability with the Korean version of the SRS-22⁵.

Two native Korean translators completed the forward translation. The first translator, the author of this article, is an orthopedic surgeon, and the other is a professional translator with no medical background who was not initially informed of the purpose of the translation. The two translators' and the original versions were compared and discussed by the two translators and an orthopedic surgeon until the translation was synthesized.

The back translation was completed independently by two bilingual translators whose native language was English. Both of these translators lacked a medical background and were not informed or aware of the prior translation procedures.

All versions of the translation and the original were discussed by the four translators and an expert committee comprised of 3 bilingual experts, two orthopedic surgeons, and a Korean translation expert. Thus, a total of 7 experts in each field participated in the translation process. This committee discussed the translation procedure and results until a consensus was reached on discrepancies. Accordingly, based on the synthetic forward translation, the prefinal version of QLPSD was created.

Pretest

This prefinal version of the QLPSD questionnaire was given to 40 Korean-speaking patients with idiopathic scoliosis in other spine centers.

Subsequently, these patients were asked about their understanding of questionnaire items and their responses. These 40 patients included 30 females and ten males with a mean age of 14.1 (range: 10-17). The interviewer was asked to document any problems that occurred during the administration of the questionnaire. In addition, at the end of the interview, each patient was asked to provide comments about the questionnaire and identify any words that were difficult to understand. All forty patients correctly understood the questionnaire. The final form of the Korean version of the QLPSD was determined by the expert committee, with the participation of all translators, and a consensus was achieved (*Supplementary Appendix*).

Sample

One hundred twenty consecutive idiopathic scoliosis patients who wore braces for at least three months were recruited from outpatient orthopedic clinics. Participants aged at least ten years old could understand and be able to answer the questionnaire. Patients who had any crucial physical disorders were not included in the study. In addition, patients with congenital anomalies, metabolic bone diseases, or malignancies were excluded.

The Korean version of the QLPSD questionnaire and SRS-22 were mailed to 120 consecutive idiopathic scoliosis patients (102 girls, 18 boys). The first mailing contained a consent form, a description of the study, the Korean versions of QLPSD, and SRS-22 and an addressed and stamped return envelope. One hundred twelve patients (97 female, 15 male) responded to the first set of questionnaires. One hundred four (91 female, 13 male) of the first-time respondents returned their second survey. The average age of the 104 patients was 13.5 years (range: 10.4-17.1) at the survey time. The first and second e-mails were sent to the participant at intervals of 2 weeks, and the average interval of responses received from the participant was 16.3 days (range: 14-19). In addition, patients were asked whether they would agree to participate in the research study. All participants gave their written, informed consent, approved by the Institutional Review Board (IRB) of Pusan National University Hospital (IRB No. H-1909-001-082).

Measurement

Test-retest reliability was measured by comparing responses to the first and second administrations of QLPSD. Test-retest intraobserver reliability was assessed using kappa statistics of the agreement for each item and the intraclass

Table I. Scores of the QLPSD and the SRS-22 domain.

Domain (no. of questions)	Mean \pm SD
QLPSD	
Psychosocial function (7)	2.4 \pm 0.31
Sleep disturbance (4)	2.2 \pm 0.52
Back pain (3)	1.9 \pm 0.46
Body image (4)	3.7 \pm 0.41
Back flexibility (3)	2.5 \pm 0.53
QLPSD – Total (21)	2.6 \pm 0.42
SRS-22	
Function/activity (4)	4.4 \pm 0.69
Pain (5)	4.2 \pm 0.72
Self-image/appearance (5)	3.8 \pm 0.65
Mental health (5)	4.1 \pm 0.73
Satisfaction with management (2)	4.0 \pm 0.75
SRS-22 – Total (21)	4.2 \pm 0.71

QLPSD scale 5 = worst; 1 = best.
SRS-22 scale 5 = best; 1 = worst.

correlation coefficient (ICC2,1). Cronbach's α was used to evaluate internal consistency. We performed correlation analysis by using Pearson's correlation coefficient between QLPSD and SRS-22 to obtain construct validity. All statistical analyses were performed with the SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

A total of 120 native Korean-speaking patients with idiopathic scoliosis treated by brace were enrolled in this study. One hundred four patients completed the second assessment. The curve types of the final enrolled participants were thoracic (65), double major (27), thoracolumbar (6), and lumbar curve (6). The mean scores of QLPSD and SRS-22 for the study population are shown in Table I. We found no ceiling and floor effects for the Korean QLPSD. The best score was 1.2 in one patient, and the worst score was 4.2 in one patient.

All items of the Korean QLPSD had a kappa statistic of agreement greater than 0.6 and ranged from 0.64 to 0.85. The ICC of the test/retest reliability was 0.815 for the 21 items of the Korean QLPSD, 0.713 for the psychosocial function domain, 0.751 for the back pain domain, and 0.793 for the body image domain (Table II). In addition, internal consistency was found to be very good with Cronbach's α (Table III).

Exploratory factor analysis (EFA) was performed to evaluate construct validity and deter-

Table II. Test-retest reproducibility as determined by intraclass correlation coefficient (n = 104).

Questionnaire	ICC (95% CI)
QLPSD - Total	0.815 (0.778-0.854)
QLPSD – Psychosocial function	0.713 (0.687-0.795)
QLPSD – Sleep disturbance	0.737 (0.701-0.788)
QLPSD – Back pain	0.751 (0.728-0.795)
QLPSD – Body image	0.793 (0.755-0.861)
QLPSD – Back flexibility	0.746 (0.711-0.791)

mine each variable's homogeneity to corresponding domains. The value of the Kaiser-Meyer-Olkin (KMO) test was 0.837, which means that the selection of variables for factor analysis is sufficiently meritorious. Bartlett's test of sphericity was statistically significant ($p < 0.05$). The number of factors when the eigenvalue was greater than 1 in EFA was 5, consistent with the original QLPSD with five domains and these explained 59.825% of the cumulative variance (Table IV). The factor loading of all items was between 0.497 and 0.826 for the relevant factors. Construct validity based on the comparison with the SRS-22 questionnaire is shown in Table V. When we investigated the relationship between Korean QLPSD and SRS-22 scores, we obtained an r value of -0.811. Convergent validity for the Korean QLPSD was observed by the moderate to high correlations. Strong correlations were observed between the back pain score of QLPSD and pain score of SRS-22 ($r = -0.751$), and the body image score of QLPSD and self-image/appearance score ($r = -0.764$). The moderate correlations were observed between the psychosocial function of QLPSD and function/activity of SRS-22 ($r = -0.610$), back pain of QLPSD and function/activity of SRS-22 ($r = -0.617$), and psychosocial function of QLPSD and mental health of SRS-22 ($r = -0.648$). The correlation coefficients between domain scores of Korean QLPSD and other domain scores of SRS-22 were relatively weak, indicating adequate divergent validity.

Table III. Internal consistency by Cronbach's alpha (n=104).

Domain (no. of questions)	Mean \pm SD
QLPSD – Total	$\alpha = 0.918$
QLPSD – Psychosocial function	$\alpha = 0.797$
QLPSD – Sleep disturbance	$\alpha = 0.812$
QLPSD – Back pain	$\alpha = 0.851$
QLPSD – Body image	$\alpha = 0.872$
QLPSD – Back flexibility	$\alpha = 0.841$

Table IV. Exploratory factor analysis.

Factor	Eigenvalue	Variance (%)	Cumulative variance (%)
1	12.844	35.677	35.677
2	3.269	9.082	44.758
3	3.044	8.455	53.213
4	1.312	3.644	56.857
5	1.069	2.968	59.825

Table V. Pearson correlation coefficient of the QLPSD with the SRS-22.

	QLPSD	Psychosocial function	Sleep disturbance	Back pain	Body image	Back flexibility
SRS-22	-0.811	-0.657	-0.651	-0.711	-0.603	-0.577
Function/activity	-0.692	-0.610	-0.539	-0.617	-0.415	-0.541
Pain	-0.688	-0.428	-0.441	-0.751	-0.351	-0.452
Self-image/appearance	-0.695	-0.546	-0.521	-0.536	-0.764	-0.547
Mental health	-0.667	-0.648	-0.513	-0.500	-0.455	-0.341
Satisfaction with management	-0.385	-0.356	-0.321	-0.284	-0.319	-0.268

All correlations are significant at the 0.001 level.

Discussion

The objectives of this study were to produce a Korean version of QLPSD by translation and adaptation. The final Korean version of QLPSD was found to be clearly understood and easily administered to the patients. The results of this study indicate that the Korean version of the QLPSD is a reliable and valid instrument for measuring outcomes in Korean patients with idiopathic scoliosis, and its reliability levels were similar to those of the original version, and previous studies^{2,10-14}.

The factor analysis of 21 items was well divided into five domains and showed substantial loading with intended domains as in the original study. Regarding internal consistency, the Cronbach's α values obtained from this study were 0.918 for the QLPSD, 0.713 for the psychosocial function domain, 0.751 for the back pain domain, and 0.793 for the body image domain. They were also similar to those reported by other studies^{2,12,14}. This result shows that this translated version is reliable and has a low standard error of measurement.

The reproducibility of each of the 21 items was satisfactory, with kappa statistics of agreement superior to 0.6 in our study. If the first and second questionnaires were completed by patients while visiting the clinic, it enables an average reproducibility of the item to be lower for other items. The results were explained by some patients probably have to wait for a long time more than others

to the consultation before being received by the interview. We mailed the Korean version of the QLPSD and SRS-22 to idiopathic scoliosis patients to avoid this bias. The agreement of all the items was good in this study. An ICC of 0.815 is a good measure of the reliability of the Korean version of the QLPSD.

Reliability of functional status questionnaires may be measured using an interval of 2 weeks between assessments; clinical status is unlikely to change appreciably in idiopathic scoliosis patients. Thus, we used this in the present study.

In the analysis for construct validity, the QLPSD was expected to reveal correlations with health-related quality of life scales. Therefore, we analyzed construct validity by comparing the total scores of the Korean version of QLPSD to the total score of SRS-22; a high correlation was found ($p < 0.001$). We also compared the total scores of QLPSD and five subscales to each domain of SRS-22. According to subscales meanings, the correlations between back pain domain of QLPSD and pain domain of the SRS-22 ($r = -0.751$), and between body image domain of QLPSD and self-image/appearance domain of SRS-22 ($r = -0.764$) were expected to be stronger than other functional domains of the SRS-22. When there was a common subscale in each questionnaire, such as back pain or body image, the correlation was relatively higher than that of psychosocial function, sleep disturbance, and back

flexibility that were not. Our results are consistent with the results published by Climent et al², which correlation of pain and image was higher than that of other subscales.

Limitations

Before interpreting the results of the current study, several limitations must be considered. First, subjects of this were relatively small. However, in factor analysis, Hair et al. demonstrated that the sample size should be greater than 100¹⁶. Tak et al¹⁷ reported that the number of cases should be 20 times, or more than the number of factors extracted. Our sample number is consistent with that research, supporting that our sample size, although small, is sufficient. Second, the time between test and retest was relatively short, positively affecting our reliability results. Third, subgroup analysis could not be performed using clinical variables such as age, Cobb angle, and treatment option. All the participants were adolescents of a similar age who received treatment only by bracing rather than surgery. In addition, as the study was conducted based on e-mail, the radiological study could not be analyzed.

Conclusions

This Korean version of the QLPSD is the condition-specific outcome instrument for patients with idiopathic scoliosis to be validated in a Korean population. The development and validation of multiple-language versions of existing validated questionnaires play a crucial role in standardizing outcome measurements and increasing the statistical powers of clinical studies. This study demonstrated that the QLPSD was successfully translated into Korean without losing the psychometric properties of the original version. Accordingly, the Korean version of the QLPSD appears to be a reliable and valid outcome measure of functional status in patients with idiopathic scoliosis. Thus, we recommend that this Korean version of the QLPSD can be utilised for future clinical studies in Korea.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (TSG; NRF-2021R1F1A1064056), the health data validation project of Busan and the Korean Cancer Research institute.

Authors' Contributions

JSL designed and supervised the study. YGP and SHP acquired, analysed and interpreted the data. TSG and DSK supported the analysis and interpretation of the data. SHP drafted the initial manuscript with detailed input from TSG and JSL. All Authors have read and approved the final version of this manuscript.

References

- 1) Bezalel T, Carmeli E, Levi D, Kalichman L. The effect of Schroth therapy on thoracic kyphotic curve and quality of life in scheuermann's patients: a randomised controlled trial. *Asian Spine J* 2019; 13: 490-499.
- 2) Climent JM, Reig A, Sa'nchez J, Roda C. Construction and validation of a specific quality of life instrument for adolescents with spine deformities. *Spine* 1995; 20: 2006-2011.
- 3) Maher TR, Gorup JM, Shin TM, Homel P, Merola AA, Grogan DP, Pugh L, Lowe TG, Murray M. Results of the scoliosis research society instrument for evaluation of surgical outcome in adolescent idiopathic scoliosis: a multicenter study of 244 patients. *Spine* 1999; 24: 1435-1440.
- 4) Kwon KB, Choi Y, Sung KH, Chung CY, Lee KM, Kwon SS, Cho GH, Park MS. Correlation between accelerometer and questionnaire-based assessment of physical activity in patients with cerebral palsy. *Clin Orthop Surg* 2020; 12: 107-112.
- 5) Lee JS, Lee DH, Suh KT, Kim JI, Lim JM, Goh TS. Validation of the Korean version of the Scoliosis Research Society-22 questionnaire. *Eur Spine J* 2011; 20: 1751-1756.
- 6) Lim JM, Goh TS, Shin JK, et al. Validation of the Korean version of the brace questionnaire. *Br J Neurosurg* 2018; 32: 678-681.
- 7) Lim JM, Goh TS, Shin JK, Kim DS, Lee CS, Lee JS. Effects of psychiatric factors on patient-reported outcomes after surgical correction of lumbar degenerative kyphosis. *Asian Spine J* 2018; 12: 126-131.
- 8) Lee BH, Moon SH, Suk KS, Kim HS, Yang JH, Lee HM. Lumbar spinal stenosis: pathophysiology and treatment principle: a narrative review. *Asian Spine J* 2020; 14: 682-693.
- 9) Liang MH, Jette AM. Measuring functional ability in chronic arthritis: a critical review. *Arthritis Rheum* 1981; 24: 80-86.
- 10) Howard A, Donaldson S, Hedden D, Stephens D, Alman B, Wright J. Improvement in quality of

- life following surgery for adolescent idiopathic scoliosis. *Spine* 2007; 32: 2715-2718.
- 11) Korovessis P, Zacharatos S, Koureas G, Me-gas P. Comparative multifactorial analysis of the effects of idiopathic adolescent scoliosis and Scheuermann kyphosis on the self-perceived health status of adolescents treated with brace. *Eur Spine J* 2007; 16: 537-546.
 - 12) Motlagh FR, Kanali M and Babaee T. Persian adaptation of Quality of Life Profile for Spinal Deformities questionnaire. *J Back Musculoskelet Rehabil* 2018; 31: 177-182.
 - 13) Pham VM, Houlliez A, Carpentier A, Herbaux B, Schill A, Thevenon A. Determination of the influence of the Chêneau brace on quality of life for adolescent with idiopathic scoliosis. *Ann Readapt Med Phys* 2008; 51: 3-8.
 - 14) Schulte TL, Thielsch MT, Gosheger G, Boertz P, Terheyden JH, Wetterkamp M. German validation of the quality of life profile for spinal disorders (QLPSD). *Eur Spine J* 2018; 27: 83-92.
 - 15) Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 2000; 25: 3186-3191.
 - 16) Hair JF, Anderson RE, Tatham RL, Black WC. *Multivariate data analysis*. Prentice Hall, 1995.
 - 17) Tak JK. *Psychological testing: An understanding of development and evaluation method*. Hakjisa, 2007.