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ORIGINAL RESEARCH

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Cross-cultural adaptation of the Korean Synkinesis Assessment Questionnaire: A validation study

Sang-Soo Nam KMD, PhD[1] | Yoon Jae Lee KMD, PhD[2] | Bonhyuk Goo KMD, PhD[3] | Jung-Hyun Kim KMD, PhD[3] | Seung-Min Lee KMD, PhD[4] | Me-Riong Kim KMD, PhD[5] | In-Hyuk Ha KMD, PhD[2] | Jee Young Lee KMD, PhD[6]

[1]Department of Acupuncture & Moxibustion, College of Korean Medicine, Kyung Hee University, Seoul, Republic of Korea

[2]Jaseng Spine & Joint Research Institute, Jaseng Medical Foundation, Seoul, Republic of Korea

[3]Department of Acupuncture & Moxibustion, Kyung Hee University Hospital at Gangdong, Seoul, Republic of Korea

[4]QualTEAM Academy, Seoul, Republic of Korea

[5]Jaseng Hospital of Korean Medicine, Seoul, Republic of Korea

[6]Integrative Cancer Center, Cha Ilsan Medical Center, Goyang-si, Republic of Korea

Correspondence
Jee Young Lee, Integrative Cancer Center, Cha Ilsan Medical Center, 1205, Jungang-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do 10414, Republic of Korea.
Email: happiade@hanmail.net

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Abstract

Objective: The Synkinesis Assessment Questionnaire (SAQ) is a reliable tool to assess synkinesis symptoms; however, it is yet to be validated in Korea. Thus, this study aimed to translate and validate the Korean SAQ.

Methods: This validation study was set in a clinic in Seoul, Korea, that provides general integrative medicine services. A total of 100 participants with facial palsy were enrolled. Participants completed the SAQ, House–Brackmann grade (HB grade), Sunnybrook Facial Grading System (SB), and Facial Disability Index (FDI). The forward–backward translation method was followed. Of the 100 participants, 31 underwent a second assessment for test–retest reliability. Internal consistency and test–retest reliability were evaluated using Cronbach's alpha coefficient. The construct validity of the Korean version of the SAQ was tested using Spearman's rank correlation coefficient.

Results: The internal consistency score for the SAQ was 0.789, and the test–retest reliability score was 0.787. According to Spearman's rank correlation coefficient, the SAQ correlations to the synkinesis subdomain of SB score, total SB score, HB grade, and physical function domain in the FDI score were 0.366 ($p < .001$), −0.386 ($p < .001$), 0.315 ($p = .001$), and −0.269 ($p = .007$), respectively. All values were statistically significant.

Conclusions: The Korean SAQ is a valid and reliable tool used to evaluate synkinesis in patients with facial palsy.

Level of Evidence: Level 3.

KEYWORDS
facial palsy, Synkinesis Assessment Questionnaire, validation

1 | INTRODUCTION

Facial functions are essential for the communication of an individual's social and emotional states, which require sophisticated features. Patients with facial palsy are often dissatisfied with their physical, mental, and social functioning and have a poor quality of life.[1] Patients with facial nerve palsy may have complications, such as synkinesis, during or after the appearance of palsy symptoms. Synkinesis is a

condition characterized by unwanted movements of a group of facial muscles that occur together with involuntary facial movements.[2] The most classic symptoms include crocodile tears, neck tension, and shedding of tears when eating.[3] In general, facial palsy is characterized by acute onset, short duration, and a high likelihood (70%–80%) of complete recovery. However, synkinetic complications, reported to occur in 21.3% of cases,[4] may persist for extended periods, leading to a significant reduction in patients' quality of life and causing social impairment.[3,5,6]

Synkinesis may cause a cluster of symptoms depending on the accompanying movements and residual autonomic dysfunction. Well-validated questionnaires are required to comprehensively assess these diverse symptoms.[7] To date, facial palsy has been assessed based on a single index, the House–Brackmann grade (HB grade), which is administered by healthcare providers. However, the HB grade is not suitable for assessing the severity of synkinesis, as it has a subjective component. Thus, it should be complemented by an objective assessment tool or a patient-reported outcome pertinent to discomfort.[8,9] Measurement tools related to patient-reported outcomes in facial palsy include the Synkinesis Assessment Questionnaire (SAQ), Facial Disability Index (FDI), and Derriford Appearance Scale.[10–12] These tools offer the advantage of assessing not only palsy but also patients' functional discomfort and quality of life.

The SAQ was developed in the United States (2007) to assess the nine main synkinesis symptoms using a five-point scale.[10] Despite being an excellent instrument for comprehensive assessment, with a Cronbach's alpha value of .859, test–retest reliability of 0.876, and high construct validity, it is yet to be validated in East Asia, including Korea. Thus, its efficiency and accuracy in evaluating Korean patients with facial palsy have been questioned. In light of the criteria proposed by Beaton et al. that recommend cultural adaptation, the SAQ requires both cultural adaptation and translation for usage in countries where English is not the first language. The disparities in culture, language, and country of use must be considered.[13]

Therefore, this study aims to translate, adapt, and validate the SAQ for use in Korea to enable accurate assessments for treating patients with facial palsy and examine its clinical trial feasibility. Hence, the SAQ was systematically translated, and its internal consistency, test–retest reliability, and validity were verified in patients with facial palsy and its sequelae.

2 | MATERIALS AND METHODS

2.1 | Study design

The objective of this study was to validate and adapt the SAQ for use in Korea. The flowchart outlining the translation and validation process is presented in Figure 1. The study protocol followed the international guidelines for the cross-cultural adaptation of health-related quality-of-life measures.[14] We contacted the original author of the SAQ and obtained permission to translate and validate the questionnaire.

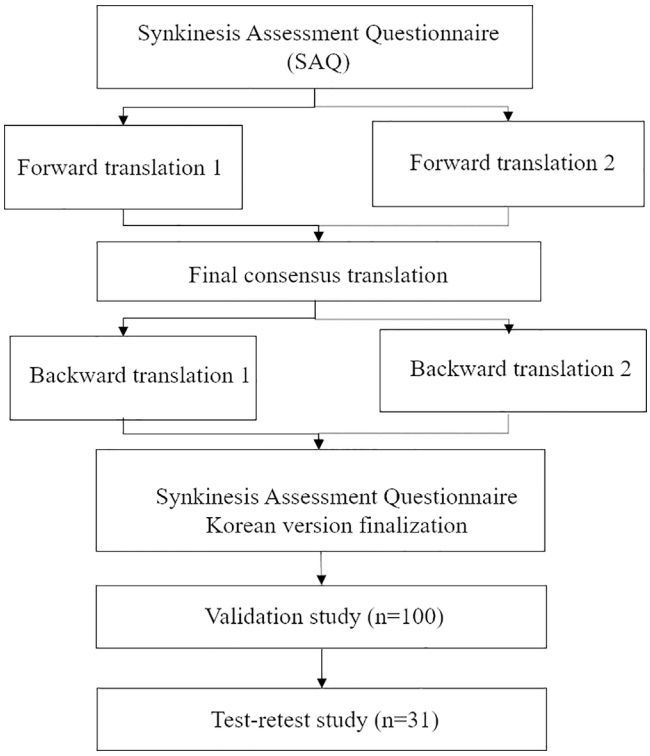

FIGURE 1 Schematic representation of process.

An expert committee was established to translate the questionnaire; this included two bilingual forward translators—a clinical expert to offer a clinical perspective and a native translator with no clinical expertise to offer a lay opinion—and two bilingual backward translators, whose mother tongue is English—a language professional and a methodologist. Health professionals provided suggestions based on their clinical experience. The language professional revised grammar and conceptual errors to avoid misunderstandings due to cultural differences. The methodologist guided the whole process. After the translation process, a prospective cohort survey was conducted to validate the Korean SAQ and finalize the cultural adaptation.

2.2 | Translation

The Korean native translators—clinical expert (T1) and lay individual (T2)—translated the SAQ. Two bilingual forward translators translated the SAQ in a written report. The idea that any disagreements that arose during the translation process were resolved through discussions. The final consensus (T12) was reached based on T1 and T2 translations. Two native English translators, who could speak Korean and had never seen the original SAQ, backward translated it to English (BT1 and BT2). Each process was accompanied by a written report, highlighting how a word or phrase was chosen. The expert committee comprehensively reviewed the forward translation, backward translation, and written reports of each translation process. An offline meeting was held, and the whole expert committee aggregated the

responses to the questions, answers, and explanations to finalize the pre-final version of the Korean SAQ (Supporting information).

2.3 | Validation process and participants

To validate the SAQ, a prospective clinical survey was conducted in the facial palsy center of a university hospital in Gangdong from May 2021 to July 2021. The study was reviewed and approved by the institutional review board of Kyung Hee University Hospital at Gangdong (KHNMC-OH-2021-04-007). Inclusion and exclusion criteria are presented as below.

2.3.1 | Inclusion criteria

1. Age greater than 19 years.
2. Diagnosis of facial palsy and ongoing neuromuscular dysfunction in the facial area.
3. Report of at least one discomfort or inconvenience based on SAQ items.
4. Individuals who comprehend the study and consent to participate.
5. (For retest only) Individuals whose facial palsy is not expected to significantly change within the next month, particularly if they have experienced persistent facial palsy for over a year.

2.3.2 | Exclusion criteria

1. Individuals with underlying conditions that may lead to disorientation of time, place, or person.
2. Individuals who were unable to read, understand, or write in Korean for questionnaire completion.
3. Individuals experiencing difficulties providing informed consent for participation.
4. Any other reason that the researcher deems inappropriate for study inclusion.

When patients meeting the inclusion/exclusion criteria visited the facial palsyclinic, the physician recommended their participation in the study. The 100 eligible participants who voluntarily signed the informed consent form were enrolled in the study. They underwent patient-reported outcome measurements, including the Korean SAQ, and were assessed by an expert physician who had 4 years of training and 5 years of clinical experience with facial palsy. The participants were asked to complete the SAQ, FDI, and the 36-item short form health survey (SF-36). The researchers collected clinical data, and the physician graded the facial palsy status according to the HB grade system and the Sunnybrook (SB) Facial Grading System.

For the test–retest reliability, we recruited 31 participants who had experienced facial palsy and related synkinesis symptoms for over a month from the original group. After a three-week interval, we conducted reassessments, including patient-reported outcomes such as the Korean SAQ. The choice of a 3-week measurement interval aligns with the previous SAQ validation study[10] and was made in consultation with a facial palsy clinical expert. It is based on two principles: avoiding undue influence from initial responses and ensuring it is not too distant to genuinely reflect changes in synkinesis status among patients.

During and after completing the SAQ, participants were asked if they had difficulties understanding the questions. An independent report was planned to aggregate comments from participants, but no comments were provided.

2.4 | Comparative outcome measures

The original SAQ was developed in 2007. It is a self-reported assessment tool that evaluates the symptoms of facial synkinesis by grading nine representative symptoms on a five-point Likert scale. The SAQ is a well-validated questionnaire, with a Cronbach's alpha value of .859 and test–retest reliability of 0.876. A higher total score indicates poor synkinesis symptoms.[10]

The HB grade is presented by dividing the degree of facial palsy into six levels using a comprehensive assessment of the muscle groups found on the forehead, around the eye, and around the mouth in the gross and resting states. A higher level indicates greater severity. The HB grade is the most widely known assessment tool for facial palsy.[15]

The SB Facial Grading System evaluates three subdomains of facial palsy: resting symmetry, symmetry of voluntary movement, and synkinesis. Although a higher total score indicates a relatively normal facial function, a higher synkinesis subdomain score indicates severe synkinesis symptoms. When the total score was calculated, the synkinesis subdomain score was subtracted.[16,17]

The FDI is a patient-reported questionnaire that was developed to evaluate the subjective ability to use facial muscles. The FDI comprises two domains: the physical function and the social/wellbeing function. A higher score indicates that the patient's functioning was not affected due to abnormal facial movements and related symptoms.[11] The researcher used the physical subdomain of the FDI for the SAQ validation study.

The SF-36 is a globally validated questionnaire that evaluates health-related quality of life. It includes 36 items under eight domains: physical, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The Korean version of the SF-36 was used, which was validated in 2003.[18] The researcher used the physical component summary score for the validation study.

2.5 | Sample size

There were various recommendations for adequate sample size in validation studies based on the subject-item ratio or absolute minimum. We endeavored to determine the sample size in accordance with established literature, which recommends a minimum of 100 participants when the subject-to-item ratio reaches five or more.[19,20] Since

the SAQ questionnaire has nine items, we used an adequate sample size of 100 and did not calculate the drop-out rate. A systematic review of sample sizes in validation studies for patient-reported outcomes reported that 90% of the articles had a sample size ≥100, with a median subject-item ratio of 11.[21] The sample size for our study was calculated with reference to these findings.

2.6 | Statistical analysis

2.6.1 | General

The data were presented as mean and standard deviation or *N* (%), unless stated otherwise. The significance level was fixed at 0.05. An independent statistician performed the statistical analysis. Demographic characteristics were analyzed using an independent *t*-test or chi-square test. In light of the one-time nature of the survey, the approach to addressing missing data was not within the scope of this study. Instead, researchers dedicated their efforts to proactively minimizing the likelihood of missing responses by ensuring participants' completion of the survey.

2.6.2 | Reliability

For inter-item reliability, Cronbach's alpha coefficients were calculated to estimate internal consistency. Internal consistency evaluation assesses homogeneity, indicating the degree to which items within an instrument are interrelated and measure the same underlying concept. A Cronbach's alpha of >.70 is generally considered acceptable, and that of >.80 is considered good.[22] Test–retest reliability was also evaluated using the intraclass correlation coefficient (ICC) using the Bland and Altman method by repeating questionnaires.[23]

2.6.3 | Validity

Construct validity was analyzed using Spearman's rank correlation coefficient method. The SAQ was compared with the synkinesis domain from the SB score using correlation coefficients for construct validity. Convergent validity, one of the subtypes of construct validity, was also assessed. The total SB score, HB grade, and physical function domain in the FDI score were additionally assessed to confirm the convergent validity of the SAQ using Spearman's rank correlation coefficient method. Our hypothesis was that high scores on the SAQ questionnaire would be positively correlated with the synkinesis subdomain in the SB score, a low score in the physical function domain of the FDI, a low total SB score, and high HB grades. Additionally, we hypothesized the absence of a significant correlation or only a slight correlation between the physical subscale of the SF-36 and SAQ. We considered the correlation to be absent if the score was <0.1, weak if the score was between 0.1 and 0.3, moderate if the score was between 0.3 and 0.5, and strong if the score was ≥0.5.[24]

3 | RESULTS

3.1 | Participants

Between May and June 2021, a total of 100 eligible patients (45 men and 55 women) with facial palsy voluntarily signed the consent form and were prospectively enrolled in the study. The study's flowchart is presented as Figure S1. All patients completed the assessment and the survey, including the SAQ. Their mean age was 52.2 ± 14.3 years. Most of the participants had no underlying disease (43.0%) or a mild underlying disease (39.0%) according to the Charlson Comorbidity Index. Of the participants, 36% had been diagnosed with facial palsy for less than 3 months to 1 year, while 64% had been diagnosed for

TABLE 1 General characteristics of the participants.

	Original group ($n = 100$)	Retest group ($n = 31$)
Age (years, mean ± SD)	52.2 ± 14.3	52.6 ± 14.1
Gender (male/female)	45/55	11/20
BMI	22.1 ± 2.6	22.1 ± 1.9
CCI (N [%])		
0	43 (43.0)	15 (48.4)
1–2	39 (39.0)	10 (32.3)
3–4	17 (17.0)	5 (16.1)
≥5	1 (1.0)	1 (3.2)
Diabetes mellitus (N [%])	9 (9.0)	0 (0.0)
Etiology (N [%])		
Idiopathic facial paralysis (Bell's palsy)	92 (92.0)	29 (93.5)
Ramsay-Hunt syndrome	4 (4.0)	1 (3.2)
Benign neoplasm of cranial nerve	2 (2.0)	1 (3.2)
Injury of facial nerve	1 (1.0)	0 (0.0)
Guillain Barre syndrome	1 (1.0)	0 (0.0)
Facial palsy side (N [%])		
Left	48 (48.0)	17 (54.8)
Right	50 (50.0)	14 (45.2)
Bilateral	2 (2.0)	0 (0.0)
Time from diagnosis (N [%])		
<21 days	0 (0.0)	0 (0.0)
21 days–3 months	0 (0.0)	0 (0.0)
3 months–1 year	36 (36.0)	6 (19.4)
≥1 year	64 (64.0)	25 (80.6)
HB grade (N [%])		
1	10 (10.0)	0 (0.0)
2	53 (53.0)	19 (61.3)
3	36 (36.0)	12 (38.7)
4	1 (1.0)	0 (0.0)

Abbreviations: BMI, body mass index; CCI, Charlson comorbidity index; HB grade, House–Brackmann grade; SD, standard deviation.

more than 1 year. Additionally, 90% of the patients exhibited HB grade 2 or higher. Moreover, 92% of the participants received a diagnosis of idiopathic facial palsy. The study included facial palsy patients with Ramsay–Hunt syndrome, benign neoplasm of cranial nerves, and facial nerve injuries. For the 31 participants whose synkinesis symptoms were predicted to persist for more than a month by the clinician, the assessment and SAQ were completed twice at an interval of 3 weeks (retest group). Participants' demographic details are described in Table 1. The baseline SAQ scores are described in Table 2.

3.2 | Reliability and internal consistency

The internal consistency of the Korean SAQ items was assessed using Cronbach's alpha coefficients. The coefficient alpha value for the total number of items was .789 (95% confidence interval [CI]: 0.721–0.846). When each item in the SAQ was deleted, the Cronbach's alpha ranged from .753 to .791, and none of the items had a significant overall impact.

Test–retest reliability was also calculated. The test–retest reliability for the SAQ score was 0.787 (95% CI: 0.607–0.891). The test–retest ICCs for each item of the Korean SAQ are described in Table 3.

TABLE 2 Synkinesis Assessment Questionnaire score at baseline and internal consistency.

	Cronbach's α Total = 0.789	If item deleted	Test results (Mean ± SD)	*N*
SAQ 1		0.765	2.38 ± 1.40	100
SAQ 2		0.753	1.87 ± 1.15	100
SAQ 3		0.755	2.59 ± 1.46	100
SAQ 4		0.773	1.50 ± 0.90	100
SAQ 5		0.756	2.18 ± 1.32	100
SAQ 6		0.758	2.16 ± 1.40	100
SAQ 7		0.769	1.40 ± 0.79	100
SAQ 8		0.791	2.14 ± 1.36	100
SAQ 9		0.791	1.79 ± 1.24	100

Abbreviations: SAQ, Synkinesis Assessment Questionnaire; SD, standard deviation.

3.3 | Construct validity

Spearman's rank correlation coefficients provided the construct validity of the SAQ in relation to the preexisting tool for synkinesis assessment in patients with facial palsy. The SAQ score was positively related to the synkinesis subdomain in the SB score. Spearman's rho value was 0.366 ($n = 100$, $p < .001$). Other correlations were additionally assessed to support the construct validity of the SAQ score. The SAQ and total SB scores were negatively correlated, which matched our hypothesis. Spearman's rho value was −0.386 ($n = 100$, $p < .001$). The correlations between the SAQ score and HB grade and between the SAQ score and the physical function domain in the FDI score were statistically significant. Spearman's rho value was 0.315 ($n = 100$, $p = .001$) and −0.269 ($n = 100$, $p = .007$), respectively. This analysis was consistent with our hypothesis, indicating that a high SAQ score was correlated with a low score in the physical function domain of the FDI, a low total score in the SB, and a high HB grade. The SAQ was not related to the physical component summary score in the SF-36, with a Spearman's rho value of 0.039 ($p = .703$).

4 | DISCUSSION

This study aimed to translate and validate the SAQ, assessing the internal consistency, test–retest reliability, and validity of the Korean SAQ in patients with facial palsy and its sequelae. The Cronbach's alpha values for internal consistency and test–retest reliability were .789 and .787, respectively. The Korean SAQ was also confirmed to have a good construct validity, as it significantly reflected the functional discomfort and synkinesis of patients with facial palsy when

TABLE 3 Individual test–retest reliability for the sub scores and items of the Synkinesis Assessment Questionnaire.

	Test results (Mean ± SD)	Retest results (Mean ± SD)	ICC	95% CI
SAQ 1	2.39 ± 1.36	2.81 ± 1.35	0.755	0.516–0.879
SAQ 2	2.06 ± 1.15	2.16 ± 1.21	0.850	0.714–0.925
SAQ 3	3.10 ± 1.51	3.23 ± 1.43	0.701	0.466–0.844
SAQ 4	1.61 ± 1.05	1.81 ± 1.14	0.707	0.479–0.846
SAQ 5	2.35 ± 1.40	2.19 ± 1.22	0.521	0.210–0.737
SAQ 6	2.61 ± 1.58	2.42 ± 1.41	0.800	0.627–0.898
SAQ 7	1.55 ± 0.85	1.52 ± 0.81	0.502	0.179–0.725
SAQ 8	2.42 ± 1.31	2.94 ± 1.55	0.537	0.236–0.745
SAQ 9	1.87 ± 1.28	1.81 ± 1.28	0.541	0.232–0.750

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient; SAQ, Synkinesis Assessment Questionnaire; SD, standard deviation.

compared to the synkinesis subdomain, total SB score, HB grade (indices for facial palsy), and the physical function domain of the FDI (a patient-reported outcome).

Facial palsy is known to affect 77 per 100,000 population; it is categorized into peripheral facial palsy and central facial palsy.[25] Synkinesis, a complication of facial palsy, is a condition in which different groups of facial muscles are involuntarily and irregularly involved in generating abnormal movements or symptoms. Synkinesis is reported to affect approximately 21.3% of patients with facial palsy and is hypothesized to occur during the recovery period.[26,27] Synkinesis tends to become chronic, and long-term facial disfigurement undermines individuals' social confidence and self-esteem, thereby impairing their quality of life in the long run.[6,28]

The diagnosis of facial palsy is primarily dependent on visual inspection, systematic history-taking, and patients' symptoms; it is assisted by radiologic findings, electromyography, and blood test results.[25,29] The most popular instruments used to assess the condition are the HB grade and the Yanagihara grading system, which are clinician-guided assessment tools used by healthcare providers as they physically examine patients.[15,30] In addition to the difficulty in eliminating the assessor's subjective opinions, these instruments have difficulties in categorizing facial palsy symptoms according to severity in detail (HB grade) and a lack of consideration for the complications of facial palsy (Yanagihara grading system).[31,32] Other instruments, such as the Facial Nerve Grading System 2.0 (FNGS 2.0) and the SB score, evaluate synkinesis in addition to facial palsy for a more multilateral assessment of the condition.[16,33] The synkinesis assessment portion of the FNGS 2.0 is used to globally evaluate the overall facial area with a four-level scoring system (none-slight/minimal-obvious/mild to moderate-disfiguring/severe), while the SB score allows for a more specific assessment of the synkinesis intensity by facial area.

Although these instruments accurately detail the severity of palsy and allow the prediction of general diseases, they have limitations in determining the severity of sequelae. Particularly, since the perceived discomfort and needs are crucial for patients with chronic complications, the self-reported measures for patient-reported experiences are useful. However, the instruments described above are clinician-guided assessment tools that do not reflect patients' perceived discomfort.[34,35] As synkinesis is characterized by involuntary and irregular episodes of spasms and contractures, patient-reported outcome measurement is more appropriate than clinician-guided assessment of symptoms during patient visits.

Patient-reported outcome measurement tools for facial palsy include the SAQ, FDI, and Derriford appearance scale, which can be used to inspect patients' discomfort from multiple perspectives.[10–12] Among these, the SAQ is particularly promising due to its simplicity as an exclusive questionnaire for synkinesis. It is a well-validated questionnaire with a Cronbach's alpha value of .859, test–retest reliability of 0.876, and a high construct validity for a comprehensive assessment of synkinesis.[10] It has also been translated into many different languages, including Dutch and French.[36–38] The Dutch SAQ has an internal validity of 0.80 and a test–retest reliability of 0.53. It was also correlated with the HB grade, SB score, and the physical and social/wellbeing function of the FDI. Its correlation with the SB synkinesis subdomain score was 0.50 using Spearman's correlation coefficient.[36] The French SAQ had an internal validity of 0.87 and a very high test–retest reliability of 0.96, but it was not significantly correlated with the FNGS 2.0 synkinesis sub score using Pearson's product–moment correlation ($r = 0.23$; 95%; CI: −0.57–0.18). It was also not significantly correlated with the synkinesis sub score of the SB system using Spearman's rank correlation ($r = -0.19$; 95% CI: −0.55–0.22).[37] The Brazilian Portuguese SAQ has an internal validity of 0.809 and was negatively correlated with the synkinesis subdomain of the Facial Clinimetric Evaluation Scale (−0.449, $p < .001$). Further, it was not correlated with the HB grade.[38]

Based on these results, the Korean SAQ is considered to be a questionnaire with acceptable internal consistency despite having similar or lower Cronbach's alpha values compared to other questionnaires. It is statistically significant but moderately correlated with the synkinesis subdomain of another questionnaire. It is not surprising that the correlation with the SB Facial Grading System is not strong because the SAQ is a patient-reported assessment tool, while the SB Facial Grading System is a physician-guided assessment tool.

This study has a few limitations. First, 92% participants who volunteered had idiopathic peripheral facial palsy. This homogenous study population may be a strength; however, it inhibits the examination of the etiologies of various diseases. Although we were aware of the existence of content validity, which was recommended to be established before evaluating the validation of the questionnaire, we decided not to set the content validation process and calculate content validity index because we translated an existing assessment tool instead of developing a new tool. The recommended sample size for validation differs across studies. Some studies require a conservative minimum sample size of 300, but it was practically difficult to meet this requirement. Several items in the SAQ exhibited low ICCs during the retest phase. Despite our focus on patients with chronic facial palsy who were not expected to demonstrate significant improvement within a 3-week period, it is important to acknowledge the potential for slight improvements as a result of ongoing treatment at the facial palsy clinic. This consideration introduces a limitation to our study. Moreover, this study does not deal with the clinical importance of the SAQ.

In the future, a clinical application study of the SAQ involving a larger and more diverse group of patients with various types of facial palsy will be necessary to enhance the generalizability of the culturally adapted Korean SAQ. Furthermore, future research efforts may need to explore the concept of minimal clinically important changes for this instrument to facilitate its more active utilization in clinical practice and research.

This study is significant because this is the first study on the East-Asian cultural adaptation of the SAQ. The Korean SAQ can contribute to a systematic assessment of facial palsy in Korea and provide foundational data for future multinational and multicenter studies. Further global research based on these results would help develop a more reliable questionnaire.

5 | CONCLUSION

This study confirmed the validity and reliability of the Korean SAQ used to evaluate synkinesis in patients with facial palsy. Knowledge of the SAQ may help address its clinical significance in future studies involving patients with facial palsy.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interests.

ORCID

Jee Young Lee https://orcid.org/0000-0002-1080-1915

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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