

A Cross-cultural Adaptation of the "Telemedicine Satisfaction and Usefulness Questionnaire" Scale to Rioplatense Spanish and an Evaluation of the Global Satisfaction Level of Tele-Rehabilitation in a Kinesiology and Occupational Therapy Service

Paula L. Diez¹, María M. Pozzo¹, Graciana F. García¹, Juan P. Gill¹, Claudio N. Blumhagen¹, Sergio A. Terrasa² and Fernando R. Vazquez²

1. Servicio de Kinesiología. Hospital Italiano de Buenos Aires. Buenos Aires, Argentina

2. Servicio de Medicina Familiar. Hospital Italiano de Buenos Aires. Buenos Aires, Argentina

RESUMEN

Introduction: the Kinesiology service of the Hospital Italiano de Buenos Aires adopted virtuality for patient care during the COVID-19 pandemic. It was decided to make a cross-cultural adaptation of the 17-item Telemedicine Satisfaction and Usefulness Questionnaire (TSUQ) validated for Peninsular Spanish to assess patient satisfaction.

Methods: two native researchers adapted the TSUQ questionnaire to Rioplatense Spanish. The participants were patients seen between May 2021 and March 2022 who had undergone at least four sessions of TR. We evaluated the correlation between the resulting instrument score and that of an item added as a concurrent external criterion. Construct validation was done with exploratory and confirmatory factor analysis.

Results: we obtained 293 questionnaires (mean age 57 years, 64% female). After the AFE results (n=101), we agreed on eliminating five items. The final questionnaire (12 items) was tested in a new sample (n=192) with a CEA. Composite reliability, mean-variance extracted, and convergent validity were adequate, whereas the discriminant accuracy was low. We documented a moderate correlation (Spearman of 0.35, $p < 0.0001$) between the total questionnaire score and the aggregate question score as a concurrent external validation criterion and an excellent correlation between versions.

Conclusion: the abbreviated version of the TSUQ questionnaire in Spanish has suitable psychometric properties, which makes it a valuable instrument for evaluating patient satisfaction in persons undergoing Tele-Rehabilitation.

Key words: telemedicine, physiotherapy, kinesiology, occupational therapy, COVID-19.

Author for correspondence: juan.gill@hospitalitaliano.org.ar, Gill JP.

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INTRODUCTION

Since December 2019, the world has been affected by the COVID-19 pandemic. Its high contagion rate forced the population to perform compulsory preventive isolation to minimize the probability of contagion and avoid the collapse of health systems¹.

International organizations such as the World Health Organization (WHO) recommended shifting service delivery to virtual channels, minimizing attendance to emergency rooms, and self-monitoring the symptoms caused by COVID-19². That led to a breakdown of professional-user interactions in hospital services, forcing the rapid development of strategies to ensure patient care³. The Hospital Italiano already had a remote healthcare platform that this pandemic prompted to spread to the majority of the healthcare team, looking after the integrity of the patient and the professional, and seeking to ensure service excellence, so that it implemented training strategies for professionals and patients in these methods of attention. The Kinesiology Service adapted to this situation by providing a new system of care and the possibility of monitoring patients under treatment, as well as initial evaluation and admission of new patients. We call this strategy "Tele-Rehabilitation" (TR). RT has existed since 1995 to optimize care for patients with difficulties accessing face-to-face care^{4,5}. Several international entities have developed remote care guidelines for the kinesiology field and articles explaining the ethical foundations of this modality of care^{6,7}. We also have observational studies documenting a high level of satisfaction from patients with chronic pathologies assisted by these methods⁸.

Due to the speed with which the care scheme changed, it was necessary to have validated scales to improve care processes based on the impact and satisfaction of the patients treated by TR. One of the questionnaires available to measure patient satisfaction concerning TR in global terms is the Telemedicine Satisfaction and Usefulness Questionnaire (TSUQ)⁹, validated for Spanish in Spain. Given the cultural differences in some items of the questionnaire construct, we thus decided: 1) to make a cross-cultural adaptation of the questionnaire and 2) to carry out a process of criterion and construct validation of the resulting version of the instrument.

The present work seeks, therefore, to expand understanding and lack of information about kinesic care through TR platforms in Argentina during the pandemic and thus improve healthcare processes.

MATERIALS AND METHODS

In the first stage, we carried out a cross-cultural adaptation of the TSUQ questionnaire to the Rioplatense Spanish language, following the recommendations of the expert literature^{10,11}. Two researchers undertook this first step using the Spanish language of the Metropolitan Area of Buenos Aires (AMBA) as a native language. Both compared the two versions with each other and against

the original instrument and evaluated the discrepancies in the formulation of the items and the conceptual, semantic, and content equivalences of the translated instrument¹². Then they did a final proofreading.

In the second stage, we conducted the validation process of the resulting instrument. Based on comprehension difficulties detected in the cognitive interviews, the term "physiotherapist" was exchanged for professional, and to improve understanding of the text, we modified the semantic structures of the questions phrased as negative propositions to positive statements. Table 1 shows the changes made by the group of experts.

Since items 1- 2- 4- 7. and 9 had inadequate factor loads (see Table 1), in the exploratory factor analysis performed with the calibration sample, the group of experts considered the possibility of eliminating these items, for which the authors of the present work held a meeting for an hour and a half with the group of experts (kinesiologists with functions in TR), a methodological advisor and a statistical analyst.

The *construct validation* was carried out with an exploratory factor analysis (calibration sample) with the SPSS program (principal component analysis, varimax rotation), followed by a consensus process of item elimination; and subsequently through a confirmatory factor analysis (CFA) on a validation sample, with the Lisrel® program (DWLS estimator, diagonally weighted least square). CFA analyzed each factor's mean-variance extracted (MVE) and composite reliability (CR). According to the literature, one would expect to document values of 0.5 or more and 0.6/0.7, respectively¹³. To assess the convergent validity, we verified that the standardized factor loads in the final models were all greater than 0.6 or 0.7 and with statistical significance ($p < 0.05$)¹³. To determine the discriminant validity (DV), we assessed whether the variance that each domain or factor shared with its indicators (SMV, Symbols-Meaning Value) exceeded the one shared with the other dimensions included in the model (squared correlation)¹⁴.

The *concurrent external criterion validation* was done by evaluating the correlation of the total score of the TSUQ questionnaire with the score of the following aggregate question: *Would you recommend this modality of care to a person you trust?*; a question also based on a 5-point ordinal scale. According to the literature, we expected a correlation between 0.3 and 0.7 (Pearson or Spearman) between the score of this aggregate question and the overall scale scores¹⁵. On the other hand, we also evaluated the correlation between the original version of the questionnaire (17 items) and the abbreviated version resulting from our local adaptation and validation process. The final version of the item had high reliability, as expressed in the article by Demiris et al.¹⁶. We conducted this stage using a cross-sectional study and the questionnaire resulting from the cross-cultural adaptation process.

TSUQ adapted to Spanish of Spain (left), and its cross-cultural adaptation to Rioplatense Spanish (right).

Table 1. TSUQ

1. The Physiotherapist can gain an accurate understanding of my health problem through the computer.	1. The professional (e.g., kinesiologist, occupational therapist) could understand my health problem through the virtual platform.
2. Telerehabilitation intervention may violate my privacy.	2. Telerehabilitation (distance rehabilitation) sessions may violate my privacy.
3. The operation of the equipment needed for this Telerehabilitation program is difficult for me to manage.	3. The applications and/or devices needed in the Telerehabilitation ("distance rehabilitation") session are difficult to use.
4. I can be as satisfied talking to the physiotherapist through the computer as when talking in person.	4. Talking remotely with the professional through the device is for me like talking in person. I am just as satisfied.
5. Teletehabilitation can improve my overall health.	5. Telerehabilitation sessions (distance rehabilitation) can improve my health
6. Telerehabilitation can save time for Physiotherapists.	6. Telerehabilitation (remote rehabilitation) sessions save time for health professionals.
7. Telerehabilitaci3n can't save me money	7. Doing telerehabilitation sessions does NOT save money for me.
8. Using Telerehabilitation, the Physiotherapist will be able to monitor my condition well.	8. Through Telerehabilitation treatments (remote rehabilitation), the professional can control well my health problem.
9. I don't like the lack of physical contact during a Telerehabilitation visit.	9. I regret the lack of physical contact during the Telerehabilitation (remote rehabilitation) sessions.
10. Telerehabilitation is a convenient form of health care provision for me.	10. Telerehabilitation (remote rehabilitation) is a convenient form of care for me.
11. The Telerehabilitation intervention saves me time.	11. Doing my telerehabilitation ("distance rehabilitation") treatment saves me time. -
12. Telerehabilitation will be a standard form of health care delivery in the future.	12. In the future, Telerehabilitation (remote rehabilitation) will be a normal form of care.
13. Telerehabilitation can be an addition to the regular care I receive (both could be used).	13. It would be good to add Telerehabilitation (remote rehabilitation) to the one that one can do with the professional in person.
14. Tele-Rehabilitation can reduce costs for public health care systems.	14. Telerehabilitation (remote rehabilitation) can save money for health systems (e.g., social security, prepaid care, public sector, etc.).
15. A Physiotherapist cannot examine me through the computer as in person.	15. The health care professional cannot examine me through electronic devices as he/she would in person.
16. Telerehabilitation makes it easier for me to communicate with the Physiotherapist.	16. Tele-Rehabilitation (remote rehabilitation) facilitates my communication with the health professional.
17. I can't always rely on the equipment to work	17. It can't trust this system to work every time.

TSUQ adapted to Spanish of Spain (left), and its cross-cultural adaptation to Rioplatense Spanish (right).

Source of data collection

We invited to participate all patients of any age who attended various sections of the Outpatient Kinesiology Service (traumatology, neurology, pelvic floor rehabilitation, osteopathy, and occupational therapy) of the Hospital Italiano de Buenos Aires and who performed at least four sessions of TR between May 2021 and March 2022.

Variables gathered

Age, sex, health coverage, number of kinesiology sessions, each of the 17 items of the scale (score of each item 1 to 5, minimum score 17, maximum 85). Question for concurrent external criterion validation, discrete numerical variable: score 1 to 5.

To minimize courtesy bias, we did not ask for participants' identification data, and, in addition, the forms were not sent from the e-mail address of the professional in charge of each patient's rehab but from an institutional e-mail address.

Sample size calculation

To calculate the sample size for the exploratory factor analysis, we followed the recommendations of the bibliography¹⁷ regarding a minimum of 100 surveys carried out and at least five people for each item of the questionnaire. Since the instrument has 17 items, we calculated a minimum of 101 observations.

For the confirmatory factor analysis, we relied on the recommendation of Brown et al., who suggested using a minimum of 150 observations for short questionnaires with less than 15 items (the resulting version of our item reduction process had 12 variables)¹⁸.

Regarding the validation through a concurrent external criterion, aiming for a 90% power to detect a Pearson correlation of a minimum of 0.4 (with a two-tailed alpha error of 0.05), it was necessary to evaluate a minimum of 62 patients with both procedures (TSUQ questionnaire and the concurrent external validity question).

Ethical Aspects

The protocol for this study was approved as No. 5901 by the Ethics Committee for Research Protocols of the Hospital Italiano de Buenos Aires. Eligible patients were invited by e-mail to answer the cross-culturally adapted version of the TSUQ questionnaire anonymously through the Google Forms® platform. The header of the questionnaire informed about the invitation to the potential participant to answer the questionnaire only once, who could accept or decline the invitation. The model consent form can be found in ANNEX I.

RESULTS

Due to comprehension difficulties detected in the cognitive interviews, the expression "physiotherapist" was replaced by "professional", and for a better understanding of the text, the semantic structures of the questions that

appeared as negative propositions were modified to positive statements. Table 1 shows the changes made by the group of experts.

A total of 293 completed questionnaires were answered. The first 101 were used to carry out the AFE, and the following 192 were used to carry out the AFC. The mean age of the participants (64% female) was 57 years ($SD \pm 18.58$). Of the total number of surveys completed, 252 corresponded to members of the Plan de Salud del Hospital Italiano de Buenos Aires and the rest to other health coverage.

Concerning construct validity, Figure 1 shows the scale items distributed in the domains "Video Visits" and "Use and Impact". Since items 1, 2, 4, 7, and 9 had inadequate factor loads (see Table 1), in the exploratory factor analysis performed with the calibration sample, the group of experts considered the possibility of eliminating these items. An hour and a half meeting was held between the group of experts (kinesiologists with functions in TR and authors of this study), a methodological advisor, and a statistical analyst to reach a decision. Finally, it was decided to eliminate them since, on top of the mathematical problems already described, the group of experts considered that they were not fundamental from a conceptual point of view.

Once the calibration sample analysis was completed, and before performing the confirmatory factor analysis on the validation sample, it was decided -with the aim of representing as versatile as possible the thematic links between two or more questions with a degree of conceptual and/or linguistic structure overlap- to adjust the confirmatory factor analysis, through the correlation of the measurement errors of the items, provided that they were included in the same domain and a residual association was found between them, beyond the usual one due to belonging to the same factor.

We then conducted a confirmatory factor analysis on the final validation sample. In this analysis we correlated the measurement errors in items 5 and 8, and also in items 11 and 13 (see Fig. 1). See Table 2 for the results of the CFA.

Composite Reliability (CF), Mean Variance Extracted (MVE), Convergent Validity (CV) and Discriminant Validity (DV) were analyzed for both domains. For the domain "Video Visits" the SMV was 0.517 and the CF 0.9. For the domain "Use and Impact", the SMV was 0.3752 and the FC 0.634.

When evaluating the convergent validity, we verified that almost 80% of the "Visits to the Video" domain load factors were 0.6 or higher (100% statistically significant). Regarding the "Use and Impact" domain, 66% had values of 0.6 or higher, and 100% had statistically significant results. We evaluated the discriminant validity by observing that the SMV of the first domain (0.517) was higher than the square of the correlation between the two domains ($0.65 \text{ squared} = 0.42$). However, the SMV of the second domain (0.37) was not higher than the square of the correlation between the domains (0.42). The model fit indicators of the confirmatory factor analysis were acceptable (see Table 2).

Exploratory factor Analysis

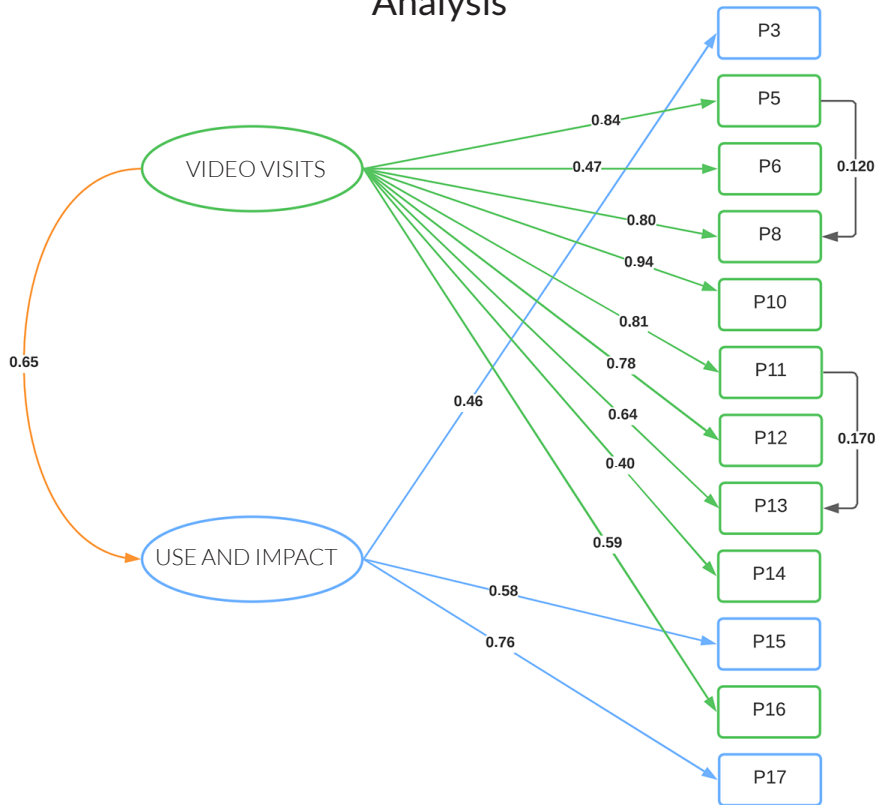


Figure 1. Graph showing standardized coefficients and measurement errors.

Q3: The applications and/or devices needed in the Telerehabilitation (remote rehabilitation) session are difficult to use. Q5: Telerehabilitation sessions can improve my health. Q6: Telerehabilitation (remote rehabilitation) sessions save time for health professionals. Q8: Through Telerehabilitation (remote rehabilitation) treatments, the professional can control my health problem well. Q10: Telerehabilitation (remote rehabilitation) is a convenient form of care for me. Q11: Doing my Telerehabilitation (rehabilitation at a distance) treatment saves me time. Q12: In the future, Telerehabilitation (remote rehabilitation) will be a normal form of care. Q13: It would be good to add Telerehabilitation (remote rehabilitation) to what one can do with the professional in person (both could be used). Q14: Telerehabilitation (remote rehabilitation) can save money for health systems (e.g., social security, prepaid, public sector, etc.). Q15: The healthcare professional cannot check me through electronic devices as he/she would in person. Q16: Telerehabilitation (remote rehabilitation) facilitates my communication with the healthcare professional. Q17: I cannot rely on this system to always work.

Table 2. Results of the confirmatory factor analysis, according to the goodness of fit indices

P-value from Chi square (Expected value: > 0,05)	Chi square/ Degrees of freedom (Expected value: Up to 4)	RMRs (Expected value: Up to 0,09)	CFI (expected value: 0,96 or more)	NNFI (Expected value 0,96 or more)	RMSEA (Expected value: Up to 0,08)
0.00*	118.46/51 = 2,32*	0.09*	0.97*	0.96*	0.08*

RMRs: Standardized Root Mean Square Residual. CFI: Comparative Fit Index. NNFI: Non-Normed Fit Index. RMSEA: Root Mean Square Error of Approximation. (*)Values by approximation to two decimal places.

We documented a correlation coefficient (Spearman's $\rho = 0.35$; $p < 0.0001$) between the total score of the abbreviated questionnaire (sum of the 12 items) and that of the question added as a concurrent criterion (Would you recommend this modality of care to a person you trust?), by what is recommended by the specialized literature¹⁹ to be used as external validation criterion (see Fig. 2a). On the other hand, we certified the conceptual redundancy of the deleted items by verifying an almost perfect correlation (Spearman's $\rho = 0.97$; $p < 0.0001$) between the score of the abridged version (12 items) and that of the original version (17 items) (see Fig. 2b).

DISCUSSION

We have obtained an abbreviated version in Spanish of the TSUQ questionnaire, which has 12 items and good psychometric properties.

It is worth mentioning as a weakness that for the domain "Use and Impact" the SMV was 0.42 by approximation (0.37). That is due to the low load factors of two of the negatively stated items (3 and 15; see Fig. 2), which also affects the QoL of this factor. However, for the initial stages of questionnaire validation, it is possible to consider these load factors sufficient, especially if there is another item in the same factor with an optimal load, such as 1720. We do not rule out future modifications to the text of items 3 and 15 to achieve a higher correlation with question 17. Although the of this domain was not ideal, it is an acceptable value for the literature since it

exceeds 0.613, especially considering that it is a domain represented by only three items. With the changes enunciated, the FC will surely increase as well. The low SMV of this domain is also verified when evaluating the DV since its value is lower than the square of the correlation between the two domains. This low DV implies that the results of our questionnaire should be interpreted predominantly in terms of its overall score and not so much concerning the score of each domain.

The fit indicators of the CFA were acceptable since, in the case of models with many variables (generally 13 or more)⁸, it is to be expected to document "p" values of less than 0.05, this indicator not being a classic determinant for evaluating the fit of the models^{21,22} (see Table 2).

Among the strengths of our research, we highlight that based on the results of the AFE performed in the first sample and the agreement among the group of experts, we were able to obtain an abbreviated version of the TSUQ questionnaire, whose psychometric properties were validated in a second independent sample of patients through a CFA.

CONCLUSIONS

The application of remote modalities in medicine is a field in constant development, which requires data collection on the usefulness and patient adherence to it. The instrument is used in various areas of action within remote medical care to measure satisfaction²³, and, beyond the mentioned limitations, we consider

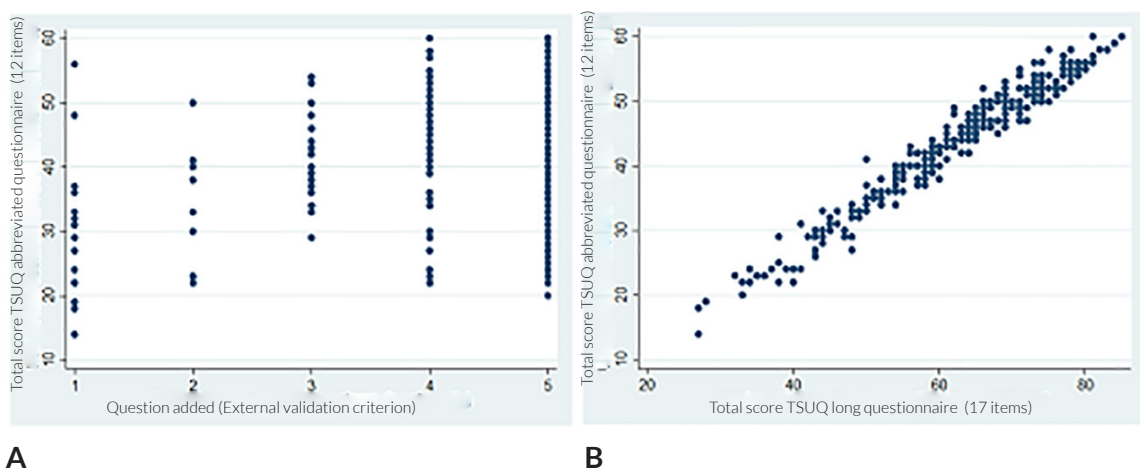


Figure 2. Exploration of the graphical correlation of the resulting abbreviated version and two reference criteria. A: graphic correlation between the scores of the abbreviated version (12 items) of the TSUQ questionnaire and that of the question used as concurrent external validation criterion (Spearman's $\rho = 0.35$; $p < 0.0001$). B: graphic correlation between the score of the abbreviated version (12 items) and the extended version (17 items) of the TSUQ questionnaire (Spearman's $\rho = 0.97$; $p < 0.0001$).

that the abbreviated version of the TSUQ questionnaire in Spanish has adequate psychometric properties, which makes it a valuable instrument for evaluating the satisfaction of patients undergoing telerehabilitation in the Rio de la Plata area. Having these resources allows health teams to improve care processes, prioritizing patient adherence to treatment and its quality to obtain results that translate into constant improvement of the individual's health, thus reducing costs for the health system and the patient.

Conflict de intereses: the authors declare no conflict of interests

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ANNEX I – INFORMED CONSENT

You are being invited to voluntarily participate in a research study at the Hospital Italiano de Buenos Aires. Kindly read the following information carefully.

What is the objective?

We are evaluating patients' satisfaction with kinesiology sessions performed remotely by TeleRehabilitation.

Why did they choose me?

We are using this questionnaire with many hospital patients to get their feedback.

You have the right to access your personal data, request rectification if necessary, and have your data not processed in the future in case of withdrawal, except for the data collected up to that moment. Based on these regulations, please allow us to provide you with information about the study and your rights as a participant.

Answering the questionnaire will take you 5 minutes. There are no right and wrong answers. You must choose the options that best indicate your case. You should not give your name or any identifying information.

The answers you provide will receive confidential treatment, and security rules do not allow associating them with your name or other personal data that identify you. Your responses will appear in a spreadsheet (similar to Excel) and will be viewed only by the head researcher.

Once the work is over, we will remove your e-mail address from the registry to ensure strict confidentiality. Your contribution to this study is voluntary, and you will not receive financial compensation or other personal benefits.

Even if you have agreed to participate, you are entitled to stop responding at any time, but it is very beneficial if you attempt to answer all questions. At the same time, failure to participate will not result in any consequences to the institution.

This protocol has been evaluated and approved by the Ethics Committee for research protocols and authorized by the Medical Direction of the Hospital. If you have any additional questions, feel free to contact the research team: paula.diez@hospitalitaliano.org.ar, tel. 4959-0200 ext. 3140. If you wish to inquire about your rights as a participant in this research study, you may contact the Coordinator at cepi@hospitalitaliano.org.ar, tel. 4959-0200 ext. 8425.

Thank you very much for your attention and interest.

Best regards.

Project Team