



ORIGINAL PAPER

[Translated article] Transcultural validation and adaptation of the Pedi-IKDC scale for the functional assessment of children that undergo knee surgery



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KEYWORDS

Scale;
 Children;
 Knee;
 Tibial eminence

Abstract

Introduction: In the last decades sports practice in children has increased, thus increasing the number of musculoskeletal injuries. There are no validated scales in Spanish for the functional evaluation of knee aspects in children. The validation and cross-cultural adaptation of the Pedi-IKDC scale to Spanish, used for this purpose, was carried out.

Methodology: The scale was applied to 50 patients that suffered traumatic knee injuries between 2016 and 2021 and underwent surgical interventions. The validation process of the scale was carried out after a pilot test, cross-cultural adaptation of words into Spanish, translation-retranslation, statistical, determination of internal consistency of the instrument, intraclass correlation, test-retest and evaluation of data dispersion.

Results: The internal consistency of the evaluated instrument is good according to the Gregory scale with a Cronbach's alpha of 0.82. The intraclass correlation was considered substantial (0.624) and the test-retest correlation, showed a coefficient of 0.91. The Bland-Altman graph showed a low dispersion among the data.

Conclusion: The Pedi-IKDC scale can be a useful tool to assess functionality in children who have undergone knee surgery, it is considered valid, with adequate reliability and with the advantage of easy application.

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PALABRAS CLAVE

Escala;
Niños;
Rodilla;
Eminencia tibial

Validación y adaptación transcultural de la escala Pedi-IKDC para la evaluación funcional de niños llevados a cirugía de rodilla

Resumen

Introducción: En las últimas décadas la práctica deportiva en los niños ha incrementado, presentándose así mayores lesiones osteomusculares. No existen escalas validadas al español para la evaluación funcional de la rodilla en niños. Se realizó la validación y adaptación transcultural de la escala Pedi-IKDC al español, usada para este fin.

Metodología: Se aplicó la escala a 50 pacientes operados por lesiones traumáticas de la rodilla entre el 2016 y el 2021, se realizó el proceso de validación, previa prueba piloto, adaptación transcultural de palabras al español, traducción-retraducción, y análisis estadístico, determinación de consistencia interna del instrumento, correlación intraclase, test-retest y evaluación de dispersión de los datos.

Resultados: La consistencia interna del instrumento evaluado es buena según la escala de Gregory, con un alfa de Cronbach de 0,82; la correlación intraclase se consideró sustancial (0,624) y al momento de realizar la correlación test-retest se encontró un coeficiente de 0,91. En el gráfico de Bland-Altman se evidenció una baja dispersión entre los datos.

Conclusión: La escala Pedi-IKDC puede ser una herramienta útil para evaluar la funcionalidad en niños que han sido llevados a cirugía de rodilla; se considera válida, con una adecuada confiabilidad y con la ventaja adicional de ser de fácil aplicación.

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Introduction

Recent decades have witnessed an increase in sports practice in children, increasing the number of knee injuries due to activities that include contact, pivoting, acceleration, and jumping.¹ Knee injuries can cause pain, oedema, stiffness, and instability, leading to structural and functional damage that can have long-term sequelae. This explains the growth in the number of knee surgeries in children and, with the new generations of young athletes, the need to measure the functional outcomes of such procedures has emerged; however, the same tools used in adults have been used, despite the clear differences with the paediatric population in many respects. Taking this into account, scales have been designed that make functional assessment in children possible, such as the *Pedi-International Knee Documentation Committee Knee* form (Pedi-IKDC), which has been validated in English and German. Nevertheless, there are no scales that have been validated in Spanish to determine knee functionality after a surgical procedure.^{2,3}

Existing adult scales such as the IKDC or *Knee Injury Osteoarthritis Outcome Score* (KOOS) for the assessment of disorders affecting the knee, which are validated and standardised for adults, and that evaluate and quantify pain, symptoms, function in daily life and sports activities, have been found to be unsuitable for children in recent studies. These scales contain technical terms that are not easily understood and the questionnaires are too long for a child's attention span, resulting in inaccurate data as documented in the systematic review by Jacobsen et al.⁴

The aim of our study is to perform a validation and cross-cultural adaptation of the Pedi-IKDC scale into Spanish, used for functional assessment of the knee in children.

Materials and methods

Information pertaining to surgical procedures performed over a 4-year period, between 2016 and 2020, was obtained with the permission of the ethics committee of the National University of Colombia. Individuals who had undergone knee procedures were selected and a database was created, in which basic demographic data and the type of surgical procedure were entered. The patients were contacted by e-mail and provided with a self-report form that, once completed, was sent to the database to consolidate the information.

Scale validation

The international parameters for the development and validation of health scales were adhered to and governed all the steps in the validation of the Pedi-IKDC scale.⁵ Prior to translation, a scale review committee was formed, comprising two paediatric orthopaedists, a knee surgeon, and an orthopaedic epidemiologist and biostatistician, all of whom had knowledge of English, in order to anticipate any difficulties that could arise during the processes of both translation and validation. Subsequently, two bilingual interpreters with medical and conceptual knowledge of medical scales were used to translate the scale, taking into account the conceptual content of each item, thereby fulfilling the direct translation of the scale.

After translation by the first and second interpreters, a consensus was reached between them to assess the differences in their translations in order to reach an agreement. The translated document was handed over to a third translator, who made a back translation of the scale that was then evaluated by the scale review committee. The committee's

Table 1 Knee injuries requiring any type of surgical procedure.

Type of injury	N/% = 50
Tibial spine fracture	18 (36%)
Patellar fracture	4 (8%)
Patellofemoral malalignment	5 (10%)
Recurring dislocation of the patella	6 (12%)
Tibial plate fracture	5 (10%)
Varus Genu	1 (2%)
Patellar tendon injury	6 (12%)
Tibial tuberosity fracture	2 (4%)
Foreign body in the knee	3 (6%)

evaluation determined that one of the words in the original scale, ‘skiing’, was not fitting for the context of an equatorial country where this sport is not practised; it was therefore changed to ‘riding a bicycle’, which is a common activity in our country.

Preliminary-pilot testing

The final version (Annex) was given to a group of 10 patients by means of an autonomous report with or without the help of the parent; the degree of comprehension, of terms, and presence of ambiguities, was determined, as were the frequency of responses and the restrictions in the range of responses. The time taken to complete the test was also measured as part of the pilot test.

Validity testing

Once the pilot test had been conducted, the questionnaire was deemed appropriate and, without making any changes to it, the scale was then administered to another 40 patients, and the 50 questionnaires underwent statistical analysis. Item-item and item-scale correlation were measured by assessing internal consistency and homogeneity using Cronbach’s alpha, a designation made by Cronbach in 1951. Using the SPSS22 statistical system, the value of the index was determined, which had to be greater than 0.7 to be considered valid, in addition to measuring the intraclass correlation coefficient, which is regarded as substantial if it exceeds 0.6. Finally, the test–retest validation of the scale was then performed, by means of the Bland–Altman graph, which verifies the presence of data dispersion; this method makes it possible to evaluate the concordance between two tests.

Results

The scale was administered to 50 patients as per the standards and instructions of the Pedi-IKDC system.⁶ No difficulties were encountered in answering the questionnaire and the average time required to complete it was 3.32 min. The leading surgical procedure encountered was open reduction and fixation of tibial spine fractures. The average age of the patients tested was 8–15 years, with an average age of 11.8 (Table 1). Sixty-two percent of the

Table 2 Cronbach’s alpha, intraclass correlation coefficient (ICC), and test–retest statistical values.

	Statistics	P value
Cronbach’s alpha	.824	.000
Intraclass correlation coefficient	.649	.000
Test–retest	.914	.000

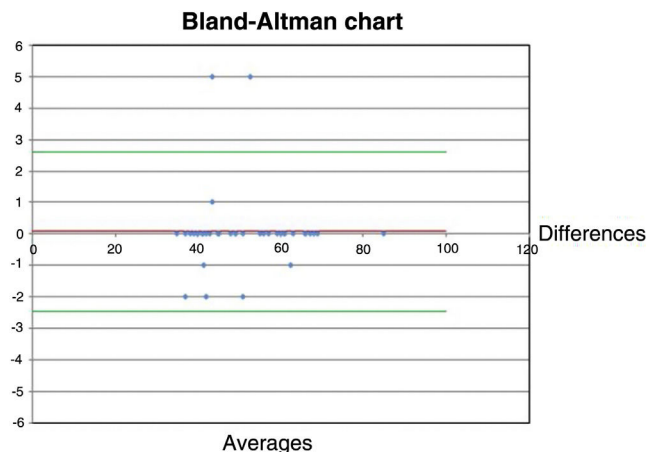


Figure 1 Bland–Altman plot illustrating the dispersion of the test–retest data. The green lines correspond to the confidence interval; it is clear that most of the measurements are within the confidence interval.

respondents answered the scale on their own and 38% of the children answered the scale in the company of a parent.

The internal consistency of the instrument was good based on Gregory’s scale, with a Cronbach’s alpha of 0.82. The intraclass correlation was considered substantial (0.624). An excellent test–retest correlation coefficient of 0.91 was found (Table 2) and the Bland–Altman plot revealed little data dispersion (Fig. 1).

Discussion

Precise data on the incidence of knee injuries in children and the types of procedures in our setting are unknown, but we do know that the knee is one of the structures most commonly affected in paediatric traumatic events, sustaining injuries ranging from simple sprains to fractures. These injuries should not be underestimated, as they can be the starting point for early onset osteoarthritis in the adult. In Austria, Kraus et al. studied 1119 patients over a 2-year period and identified a 0.5% incidence of injuries; most were extra-articular in origin and sustained during school age, and occurred more frequent in males,⁷ with two peaks of presentation, at 6 years of age and in early adolescence.

There are few validated methods in English to assess functionality in children, and none that have been validated in Spanish. The Pedi-IKDC scale, validated by Kocher’s group in 98 patients, after different types of surgical procedures including meniscal, ligament, and patellar procedures, found the scale to be valid and to have sufficient internal validity for use.^{6,8}

Macchiarola et al.⁹ undertook a cross-cultural adaptation and validation of the Pedi-IKDC scale in children in Italian, among 49 patients with ages between 8 and 16 years who underwent any surgical procedure on the knee, and found a Cronbach's alpha of 0.9, slightly higher than in our study, but nevertheless deemed valid for use.

Kocher et al. reported the normative data of the Pedi-IKDC scale for the outcomes achieved in patients with varying ethnic characteristics, without finding any differences between demographic variables, and validated its use in any child between 10 and 18 years of age.¹

Van der Velden et al.³ validated the Pedi-IKDC scale in German and compared its performance with the KOOS-child scale. The Pedi-IKDC scale demonstrated suitable test-retest and better psychometric characteristics than the KOOS-child scale; nevertheless, both scales are valid. Dietvorst et al.¹⁰ conducted a systematic review of patient self-response systems, in which they identified the Pedi-IKDC scale as valid and reproducible. Our study included only patients from the central region, which might constitute a limitation of the study; hence, in the future, consideration should be given to a study having similar characteristics that expands the data to different areas of the country.

The current study validated the Pedi-IKDC scale in Spanish with adequate results, with a substantial Cronbach's alpha (.624) and no problems when the scale was administered. We can therefore infer that this scale can be used and administered reliably in children and adolescents to obtain a perception of the functionality of a given paediatric patient with knee surgery. Previous scales used in adults and not validated in children are regarded as unsuitable, in view of the technical jargon that make it difficult to understand the questions and [prolong] the time it takes to fill them in, and of the inability to accurately determine the exact date of injury and the time elapsed since then, as reported by Nasreddine et al. in their study, in which they performed a detailed item-by-item evaluation of the IKDC scale.⁸

Conclusion

The scale presented is valid and suitably reliable for use in children, with a Cronbach's alpha of .82, which is regarded as very good, and an ICC of .649, which is considered substantial, with an excellent test-retest correlation of .91. Consequently, it is considered to be a useful and user-friendly tool to assess functionality in children who have had knee surgery.

Level of evidence

Level of evidence IV.

Funding

There is no funding body.

Conflicts of interest

The authors have no conflicts of interest to declare.

Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Right to privacy and informed consent

The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.recot.2022.08.001](https://doi.org/10.1016/j.recot.2022.08.001).

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