TRANSLATION, VALIDATION AND CULTURAL ADAPTATION OF THE "SPORTS ACTIVITIES SCALE"

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SUMMARY

Objectives: to translate and adapt the "Sports Activities Scale" as well as to check its measurement, reproduction and validity properties. Method: the translation, cultural adaptation and validation were made by reviewing the work by Guillemin et al. For statistical analysis, we used descriptive analysis, t-test, inter-class correlation coefficient and Spearman correlation coefficient, with significance level equal to 5% ($\alpha = 0.05$). Results: the translated questionnaire showed to be understandable and culturally equivalent for 95% of Brazilian patients after some modifications were made; an excellent reproducibility ($\alpha = 0.01$, $\rho < 0.001$) when correlating intra- and inter-interviewers; a significant correlation with the SF-36 questionnaire on the following items: functional capacity, pain, general aspects and social aspects, a weak association with SF-36 questionnaire on vitality, emotional aspects and mental health; a significant correlation with Lysholm ($\alpha = 0.01$, $\rho > 0.001$); and a moderate negative correlation with the visual analog scale for pain ($\alpha = 0.05$, $\rho = 0.0013$). Conclusion: The Brazilian version of the "Sports Activities Scale" questionnaire is an easily-manageable, reproducible and valid parameter for a specific evaluation of knee's symptoms and restraints during sports activities, in Brazilian patients.

Keywords: *Athletes; Translations; Cultural adaptation; Scales; Validation.*

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INTRODUCTION

Sports practice, which was limited to a small portion of the population in the past, is now encouraged and has become a real habit and need to large groups of people in today's world. The continuous exposure to new trauma and efforts can result in aggressions to the body, increasing the incidence of diseases[1].

A study conducted by the International Olympic Committee showed that the most frequent injuries are those occurring on the knee, followed by ankle, foot and spine[2].

The various criteria for assessing this joint function and the clinical picture of injuries, render measuring and quantifying employed treatments and their corresponding evolution difficult.

O'Donoghue[3] was the first author to develop a questionnaire to assess the outcomes of knee ligament reconstructions.

Lysholm and Gillquist[4], developed a scale for assessing knee symptoms, addressing symptoms such as limping, support, restraining, instability, pain, swelling, the act of climbing stairs and squatting.

Irrgang developed the questionnaire *Knee Outcome Survey* (KOS) to assess the functional level associated to knee pathologies. This questionnaire consists of two separate scales, the *Activities of Daily Living Scale* (*ADLS)* which is designed to assess symptoms and functional restraints during daily life activities, and the *Sports Activities Scale (SAS)* which is designed to assess symptoms and functional restraints during sports activities.

It is important to correlate the diseases that limit sports activities to data from generic instruments of quality of live in order to understand the impact of different diseases, either physical or mental[3,5,6].

The SF-36 (The Medical Outcomes Study 36-item Short-Form Health Survey) was developed in 1992 by Ware and Shelbourne[7], intending to provide a generic questionnaire for health assessment that could meet the minimum psychometric standards required to compare groups involving general health concepts. That questionnaire was translated and validated into Portuguese in 1997 by Ciconelli et al.[3, 8].

Among the instruments specifically translated and validated into Portuguese, the following are included: the Lysholm questionnaire, which was translated and validated by Peccin, in 2001[3], the "Boston Carpal Tunnel Questionnaire", which is intended to assess the symptoms severity and functional status in carpal tunnel syndrome, which was translated and validated by Campos, Manzano, Andrade, Castelo and Nóbrega[9], the "Ingersoll & Marrero's Diabetes Quality of Life for Youths", transculturally adapted and validated by Novato[10].

Guillemin, Bomabardier and Beaton[11], after a literature review, assessed articles published in the period comprehending 1966 and 1992 addressing translation and cultural adaptation methodologies, and suggested standards for transcultural adaptation of quality of life instruments.

The present study aims to translate into Portuguese, provide a cultural adaptation, validate and check reproducibility of the Sports Activities Scale questionnaire, due to the absence of a standard Portuguese-language questionnaire for assessing symptoms and functional restraints of knees injured during sports practice.

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MATERIALS AND METHODS

The "*Sports Activities Scale"*, described by Irrgang, was selected for translation because it is widely known and used. It is composed by 11 items. Items 1 to 7 address symptoms, namely: pain, crepitation, stiffness, edema, partial and full missing, and weakness. Each item is graded according to the degree of restraint , ranging from absence of symptom (grade 5) to inability to practice sports due to symptoms (grade 0). Items 7 - 11 are concerned to functional restraints during sports practice. Functional activities on SAS include the ability to run, jump and land on the involved knee, and; stop and quickly resume, and change direction and turn on the involved led. The answers for each item are graded according to the restraint degree, ranging from absence of restraint (grade 5) to inability to perform sports activity (grade 0). SAS also includes 9 items that are not originally included at SAS scoring calculation. The answers to those items are reported in separate to provide a global description of the individual. One item is designed to elucidate the global knee function rate during sports practice in a scale ranging from 0 to 100. Two items are designed to describe knee's individual function during sports practice and the level of sports activity as normal, almost normal, abnormal and extremely abnormal. The last six items are designed to determine individual level and frequency of sports practice before injury, before injury treatment and currently.

A questionnaire translation, cultural adaptation and validation protocol was used based on a review of Guillemin, Bomabardier and Beaton's literature[3,11] :

- Translation: made by two Brazilian translators who were aware of the objectives of the translation.

- Evaluation of the first translation version: once translated, the instrument must be translated back again to the original language, and the result must be compared to the original instrument.

- Review: Comparison of the translation versions by a multidisciplinary team in order to address any discrepancies.

- Pre-test: Final version is applied associated to an interview questioning doubts.

- Sample calculation: 95% confidence, 80% power on tests and 40% standard deviation, obtaining a sample size (n) of 49 patients.

- Validation: Three interviews conducted, being the first two within an interval of approximately 30 minutes and the third interview one week later.

The respondents met the following inclusion criteria: Brazilian citizens, ≥ 18 years old, clinical diagnosis determined by an orthopaedic doctor and by imaging tests, practicing pre-determined physical activities, and able to sign a consent term.

The following were exclusion criteria: acute trauma, cognitive changes, pathologies on other joints, and use of drugs in the period between interviews.

- Statistical analysis: collected data were sent to the statistician. who used: the descriptive analysis for population characterization; t-test for numeric variables comparison to assess homogeneity between genders and between conditions; intra-class correlation coefficient to assess intra- and inter-interviewer reproducibility, and the Spearman's correlation coefficient for assessing the studied questionnaire validity, considering the correlation between variables in the questionnaire and its correlation to other questionnaires. For all the tests, a significance level of 5% (α = 0,05) was adopted, with tests showing p-values < 5 being regarded as statistically significant.

RESULTS

Translation into Portuguese

The "Escala da Atividade Esportiva" (EAE) is the Portuguese version of the "Sport Activities Scale" questionnaire. In the cultural equivalence assessment phase, 23 patients with knee conditions were enrolled.

The results of translation evaluations along with the expert panel indicated equivalence and reconciliation of translated items, semantic equivalence between both translation versions and absence of translation failures. The inclusion of explanations was suggested for symptoms and ability levels (between parenthesis) to provide a better understanding of the word or phrase. Those suggestions were subsequently discussed on a second committee meeting, and were included to the final version of the instrument.

Only the difference of the questions addressing overall function rating and activity level during sports practice was regarded as difficult to understand by over 10% of the population in the study (n=12).

The review committee sought the author of the present questionnaire for further details. With the explanations given by the author, we modified the way in which these questions were asked.

The new version was applied once again on 11 patients else aiming to check if it was understandable and culturally equivalent. After those modifications, the question was regarded as equivalent by over 95% of the patients.

Reproducibility

The results of the "Escala da Atividade Esportiva" questionnaire obtained from interviewer 1 and the first interviewer-2 application were used as parameters for intra-interviewer reproducibility analysis, while the first interviewer-2 application (second interview) with the second interview made by interviewer 2 (third interview) were used as parameters for inter-interviewer reproducibility analysis. The correlation between the results of the questionnaire showed excellent reproducibility, both intra- and inter-interviewer.

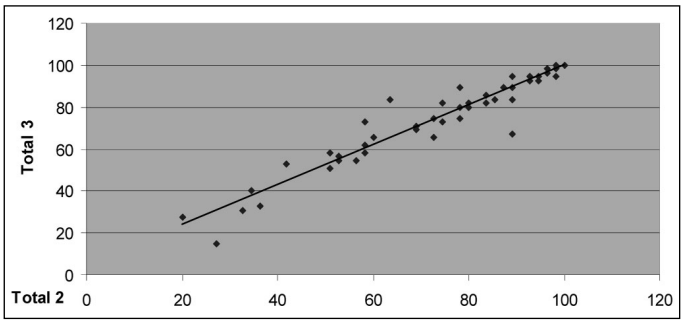
When we compare the consistence of the first application of the "Escala da Atividade Esportiva" questionnaire by one interviewer to the subsequent applications in two different moments with the same patient, we could see that the median was quite similar between those conditions, as well as scores variability, resulting in an excellent reproducibility (Table 1).

	Inter-interviewer	Intra-interviewer
Sports Activity Scale	α =0.9747 *p*<0.001	α =0.9778 *p*<0.001

***Table 1** – Values showing inter-and intra-interviewer consistence. (α = Cronbach's alpha)*

In intra-interviewer correlation, one can notice that a high positive correlation existed between total scores (on the 0-100 scale) with a statistic significance (α=0.01, ρ<0.001), with a correlation coefficient of 0.949, and that the evaluation of each additional item showed a strong positive correlation with statistic significance (α=0.01, ρ<0.001) for all items, with a correlation coefficient of 0.837 for current knee function rating during physical activity; of 0.824 for overall function rating; of 0.769 for current level of activity rating; of 0.876 for

the best sport activity level before knee injury; of 0.838 for the best level of sports activity after knee injury; of 0.877 for the best current sports activity level; of 0.953 for the frequency of sports activities before knee injury; of 0.904 for frequency of sports practice after knee injury, and; of 0.741 for current frequency of sports practice. (Figure 1)

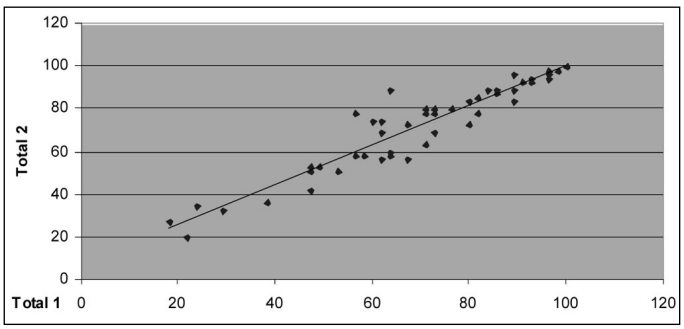


Total 2 = values of the total scores of the second interview.

Total 3 = values of the total scores of the third interview.

Figure 1 - *Intra-interviewer correlation of the total score of EAE questionnaires.*

In inter-interviewer correlation, we can notice a high positive correlation between total scores (at the 0-100 scale) with a statistic significance (α=0.01, ρ<0.001), with a correlation coefficient of 0.949, and that the evaluation of each additional item showed a strong positive correlation, with a statistic significance (α=0.01, ρ<0.001) for all items, showing the following correlation coefficients: 0.960 for current knee function rating during physical activity; 0.761 for overall function rating; 0.825 for current level of activity rating; 0.934 for the best sport activity level before knee injury; 0.778 for the best level of sports activity after knee injury; 0.908 for the best current sports activity level; 0.967 for the frequency of sports activities before knee injury; 0.808 for frequency of sports practice after knee injury, and; 0.951 for current frequency of sports practice. (Figure 2)



Total 1 = values of the total scores of the first interview (interviewer 1).

Total 2 = values of the total scores of the second interview (interviewer 2).

Figure 2 - *Inter-interviewer correlation of the total score of EAE questionnaires.*

When correlating total score with additional items scores on the EAE Questionnaire, one can notice that the total score of the EAE questionnaire shows a strong positive correlation with the current knee function rating during physical activity with a statistic significance (α=0.01, ρ<0.001), which means that the higher the total score, the higher the current rating for knee function at physical activity. EAE questionnaire total score also shows, with a statistic significance (α=0.01, ρ<0.001), a strong negative correlation with the overall function rating, current level of activity rating and the best current sports activity level, meaning that, the higher the total score the lower the overall function rating, current level of activity rating and the best current sports activity level. (Table 2).

The items best sports activity level before knee injury, best sports activity level after knee injury, and frequency of sports activities after knee injury, and the current frequency of sports activities do not show a statistically significant correlation with the total score of the EAE questionnaire. (Table 2)

Items	Total score	
	Correlation coefficient	ρ
Rate	0.873 (**)	0.000
Overall Function	-0.729 (**)	0.000
Level	-0.784 (**)	0.000
Best activity - before	-0.208	0.144
Best activity - after	-0.144	0.315
Best activity - current	-0.741 (**)	0.000
Frequency - before	0.070	0.628
Frequency - after	-0.226	0.110
Frequency - current	-0.213	0.113

** Statistically significant correlation (α=0.01)

Table 2 - *Correlation of the total score of the first interview of the EAE questionnaire with additional items.*

Validity

In the correlation between EAE and SF-36 questionnaires scores, we can see that the correlations between EAE and SF-36 questionnaires achieved statistical significance when Functional Capacity (correlation coefficient = 0.811; α=0.01; ρ<0.001), Physical Aspect (correlation coefficient = 0.425; α=0.01; ρ=0.002), Pain (correlation coefficient = 0.404; α=0.01; ρ=0.003), Overall Status (correlation coefficient = 0.389; α=0.01; ρ=0.005) and Social Aspects (correlation coefficient = 0.303; α=0.05; ρ<=.030) are assessed. Concerning Vitality, Emotional Aspects and Mental Health, correlations were poor, with a statistically insignificant p value (correlation coefficient = 0.186 and ρ=0.192; correlation coefficient = 0.028 and ρ=0.846; correlation coefficient = 0.066 and ρ=0.645, respectively) (Figures 3-7).

In the correlation of the EAE and Lysholm questionnaires scores, we can see that the EAE questionnaire scores show a moderately positive correlation with the numeric Lysholm scale, showing a correlation coefficient of 0.669 with a statistic significance (α=0.01, ρ<0.001) (Figure 8), and that it shows a high positive correlation with the nominal Lysholm score, showing a correlation coefficient of 0.709 with a statistic significance (α=0.01, ρ<0.001), where scoring re-codification of the Lysholm questionnaire is found: Excellent = 4, Good = 3, Fair = 2, and Poor = 1.

In the correlation of the EAE questionnaire score with the Pain Visual Analog Scale, we can see that the EAE questionnaire scoring shows a moderately negative correlation with the pain

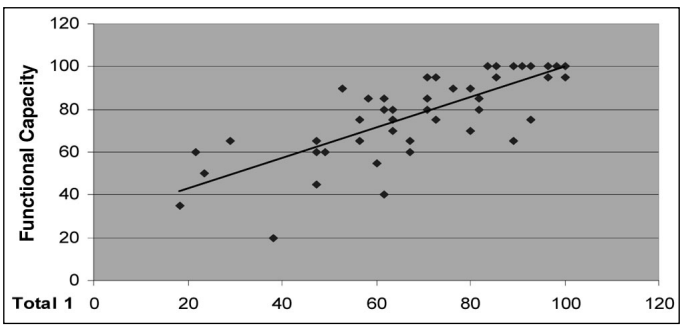


Figure 3 - *Correlation between total score of the EAE questionnaire and Functional Capacity parameter of the SF-36*

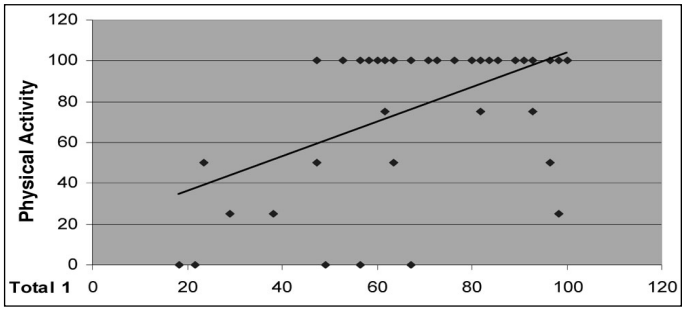


Figure 4 – *Correlation between total score of the EAE questionnaire and Physical Aspect parameter of the SF-36*

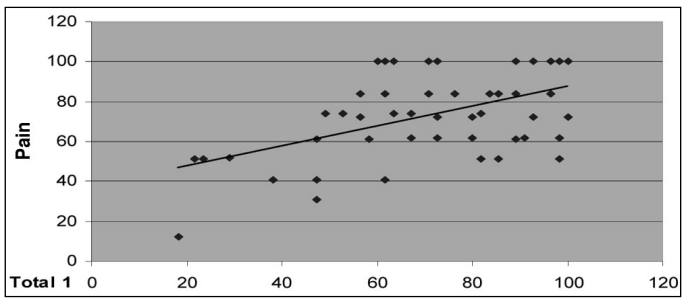


Figure 5 – *Correlation between total score of the EAE questionnaire and Pain parameter of the SF-36*

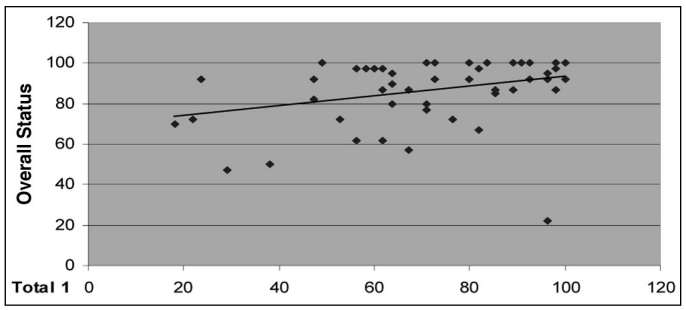


Figure 6 – *Correlation between total score of the EAE questionnaire and Overall Status parameter of the SF-36*

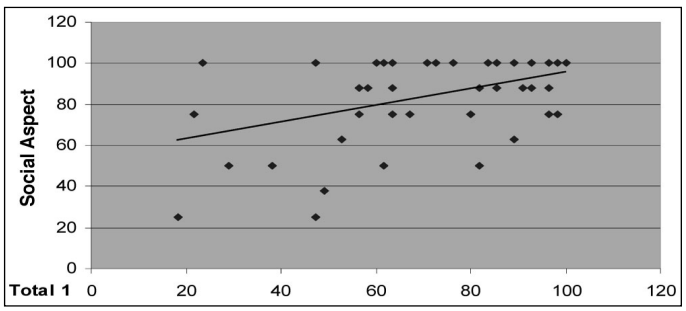
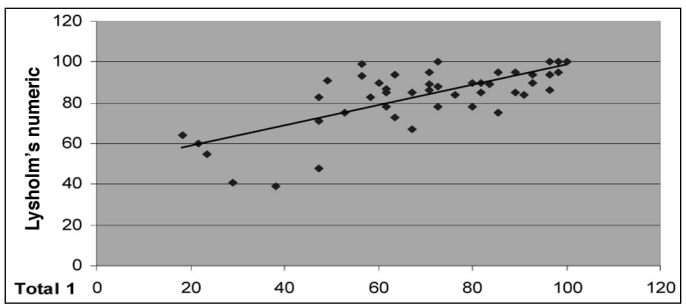


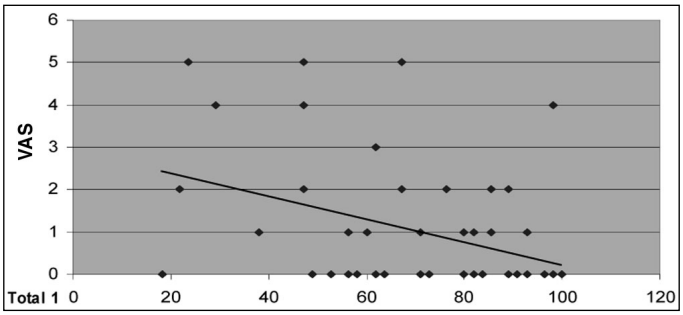
Figure 7 – *Correlation between total score of the EAE questionnaire and Social Aspect parameter of the SF-36*



Total 1 = total score values of the first interview (interviewer 1).
Lysholm's numeric = numeric score values of Lysholm's questionnaire.

Figure 8 – *Correlation of the EAE scores with Lysholm's numeric values*

visual analog scale, showing a correlation coefficient of -0.345 with a statistic significance equal to 5% ($\alpha=0.05$, $\rho<0.013$), meaning that the higher the AEA questionnaire score, the lower the value of the pain visual analog scale (Figure 9).



Total 1 = total score values of the first interview (interviewer 1).
VAS = Values of the Pain visual analog scale.

Figure 9 – *Correlation of the EAE scores with Pain Visual Analog Scale values*

DISCUSSION

Although an expressive number of scales and questionnaires have been developed and used, not all instruments are available in all countries and languages[12].

Guillemin, Bomabardier and Beaton[11], published a literature review addressing the validation of measurements aiming to provide process standardization, and concluded that, for having high quality translations, these should be made by two independent translators, thus reducing the likelihood to errors and to interpretation of items ambiguous to the original version.

Fleck et al[13], published the development of a Portuguese version of the World Health Organization's quality of life assessment instrument, where a translation into Portuguese was developed by a translator familiar to this kind of instrument. That version was submitted to a multidisciplinary bilingual panel, and a back-translation was subsequently provided into English by an independent translator.

Duarte, Miyazaki, Ciconelli and Sesso[12], made the translation and cultural adaptation of the quality of live assessment instrument to chronic kidney patients (KDQOL-SF™), according to the specifications by the KDQOL working Group. The instrument was translated into Portuguese by a sworn-in translator and reviewed by a health-expert translator. That version was subsequently submitted to back-translation by two independent translators.

The present study was based on a research conducted by Guillemin, Bomabardier and Beaton[11] in order to provide a high quality translation, where the "Escala de Atividade Esportiva" - the Portuguese version of the *"Sports Activities Scale"* - presented a conceptual equivalence of the translation performed by two independent and qualified Brazilian translators and of the back-translations performed by two native English-speaker translators, and the multidisciplinary team that noted that equivalence, added synonyms between parenthesis to better understanding of symptoms and functional activities.

Guillemin, Bomabardier and Beaton[11], reported that in order to check translation errors and diversions, the instrument should first be used in a sample of the population to be studied.

Fleck et al[13], when developing a Portuguese version of the World Health Organization's quality of life assessment instrument, used focal group discussions of the Portuguese version

in order to review questions formulation and the questionnaire comprehension, to discuss to what extension each of the facets affected quality of life and to investigate the existence of other facets that could be important specifically to Brazil. However, they did not apply the modified questionnaire in a population.

In this phase of the Sports Activity Scale questionnaire translation, the population suggested that two questions should be modified for better understand this questionnaire.

Questionnaires can be administered by interviewers or be self-applicable, where questionnaires applied by interviewers impose the need to standardize the form of application, which can incur in higher costs to train interviewers, while self-applicable instruments exclude some patient groups and increases the potential to unanswered questions[3]. Despite of the initial questionnaire instructions allowing its self-application by patients, we decided that interviewers should apply the questionnaire as a way to standardize the administration process.

The questionnaires under validation process must be compared and correlated to previously validated questionnaires within the study population in order to confirm if the questionnaire presents homogenous answers.

Borsa, Lephart and Irrgang[14], in the published study Sport-Specificity of Knee Scoring Systems to Assess Disability in Anterior Cruciate Ligament – Deficient Athletes showed, by comparing three specific questionnaires addressing injured knees, that the results of KOS, Lysholm and Cincinnatti-modified questionnaires show results with statistically significant and linear correlation, that LOS apparently provides valid measurements of an individual's disability and indicates that the aspects of the questionnaire work well with daily life activities, but became functionally and symptomatologically limited for sports, and that the Lysholm system is more specific to the activities of daily life, while the Cincinnati-modified was more specific to sports.

Ciconelli, Ferraz, Santos, Meinão and Quaresma[8], in a Portuguese translation and validation of the SF-36 questionnaire, correlated the SF-36 with the HAQ, Nottingham Health Profile (NHP) and to the Arthritis Impact Measurement Scale 2 (AIMS2), which presented valid parameters for assessing quality of life of Brazilian rheumatoid arthritis patients.

The present study correlated the Sports Activity Scale with the SF-36, the Lysholm questionnaire, and the Pain Visual Analog Scale. The correlation between EAE and SF-36 questionnaires was statistically significant in terms of Physical Aspects, Social Aspects, Pain, Overall Status and Functional Capacity. However, in terms of Vitality. Emotional Aspects and Mental Health, correlations were poor, probably because there is no specific question in the EAE addressing non-physical/ functional status. The correlation between EAE and Lysholm questionnaires was statistically significant both for ordinal and nominal scores, probably because they both present similar characteristics, that is, physical/ functional features. The correlation between EAE and the Pain Visual Analog Scale was oppositely statistically significant, probably because pain can impair sports practice.

New instruments or those under validation process must be assessed and reassessed by different researchers, in different societies and situations[3] .In our study, we assessed the applicability of the questionnaire in a population sample with good cultural level, which, to a certain degree, limits its use in this population. Due to the current importance of this topic, in the future, the Sports Activity Scale should be applied to different socioeconomic layers.

Ciconelli, Ferraz, Santos, Meinão and Quaresma[8], administered the SF-36 Brazil questionnaire by interviewing 50 patients with rheumatoid arthritis during the SF-36 translation and validation development process.

Novato[10], in the discussion about Transcultural Adaptation and Validation of Ingersoll and Marrero's Diabetes Quality of Life for Youths, applied the adapted instrument to 124 teenagers with type-1 diabetes *mellitus*.

After consulting a statistics-expert professional to obtain the optimal sample calculation for validating this questionnaire, we interviewed 50 patients with knee injuries and physically active subjects.

Assessment instruments must be reproducible over time[3] considering an unchanged overall clinical status. All patients in our sample were interviewed twice for the first interview and once more 15 days later. These patients presented with a medical diagnosis of chronic knee joint disease, which could justify the excellent intra-interviewer consistence level due to the absence of major clinical picture changes within a period of 15 days.

Ciconelli, Ferraz, Santos, Meinão and Quaresma[8], when evaluating SF-36 questionnaire reproducibility, interviewed the patients twice in the first interview and once more within a 15-day period.

Peccin[3], when translating and validating the Portuguese version of the "Lysholm Knee Scoring Scale", applied the questionnaire to 50 patients with knee intra-joint diseases, in three interviews, by two independent investigators, with two interviews being applied in the first evaluation and another interview applied 15 days later.

The suggested adaptation to the "Sports Activities Scale" to Portuguese was shown to be a reproducible, valid, user-friendly parameter and a useful instrument to specifically assess knee symptoms in Brazilian patients. This translation requires an ongoing follow-up, as a future study, to be used as pre- and post-intervention measurement in Brazilian patients with knee joint conditions, as well as in individuals at different socio-cultural levels, assessing its responsibility.

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