Foot and Ankle Surgery 28 (2022) 756–762

Contents lists available at ScienceDirect

Foot and Ankle Surgery

journal homepage: www.elsevier.com/locate/fas

Validity and reliability of the French translation of the Identification of Functional Ankle Instability (IdFAI)

Charlotte Beaudart[a,*], Christophe Demoulin[a,b,c], Klejdi Mehmeti[b], Stephen Bornheim[a,b], Julien Van Beveren[d], Jean-François Kaux[a,b,e]

[a] Department of Physical Medicine and Rehabilitation, Liege University Hospital Center, University of Liège, Liège, Belgium
[b] Department of Rehabilitation and Sports Sciences, University of Liège, Liège, Belgium
[c] UCLouvain, Faculty of Motor Sciences at Université Catholique de Louvain-La-Neuve, Louvain, Belgium
[d] HEL (Haute Ecole de la ville de Liège), Liège, Belgium
[e] Department of Physical Medicine and Sports Traumatology, SportS(2), FIFA Medical Centre of Excellence, University and University Hospital of Liège, Liège, Belgium

ARTICLE INFO

Article history:
Received 8 July 2021
Received in revised form 18 August 2021
Accepted 5 October 2021

Keywords:
Functional Ankle Instability
Translation
French
Transcultural adaptation
Identification of Functional Ankle Instability

ABSTRACT

Purpose: To translate and validate the Identification of Functional Ankle Instability (IdFAI) into French.
Methods: The IdFAI was translated according to international recommendations. Discriminative power, floor and ceiling effects, construct validity (including confirmatory factorial analysis (CFA)), internal consistency and test-retest reliability were measured. Standard Error of Measurement (SEM) and Smallest Detectable Change (SDC) were also calculated.
Results: 160 participants were included. The IdFAI-F showed a very good test-retest reliability (ICC = 0.95). The SEM was 1.37 and the MDC was 3.79. The internal consistency was moderate (Cronbach's alpha coefficient = 0.68). The correlation between the IdFAI and the Cumberland Ankle Instability Tool (CAIT) was high ($r = -0.75$, $p < 0.001$). No floor, nor ceiling effects were observed. The CFA analyses did not confirm the factor structure proposed by the authors of the original English version.
Conclusions: The IdFAI-F is a valid and reliable tool to accurately identify and measure chronic ankle instability in research and clinical settings for French-speaking individuals.

1. Introduction

Ankle sprains are among the most common injuries in the physically active population [1,2]. Ankle sprains can lead to various consequences: mobility issues, recurrent sprains, pain and residual swelling for 6–8 months after injury, etc. Moreover, more than 40% of patients report chronic ankle instability (CAI), which is described as the subjective sensation of the ankle to "give way" after an initial ankle sprain [1,3,4]. Although ankle conditions can be diagnosed by clinical examination and imaging techniques, there is no "gold standard" for the diagnosis of CAI. Therefore, questionnaires (i.e. Ankle Instability Instrument (AII) [5], Cumberland Ankle Instability Tool (CAIT) [6], Chronic Ankle Instability Scale (CAIS) [7], etc.) have been developed to assist in the diagnosis of CAI. A preliminary study [8] revealed that no single questionnaire was able to predict whether individuals met the minimally accepted criteria (at least 1 ankle sprain and an episode of giving way) for CAI and that the combination of the AII and the CAIT seems the best choice for assessing the two minimum criteria needed to detect CAI. Based on both of these questionnaires, in order to further facilitate clinical diagnose, the Identification of Functional Ankle Instability (IdFAI) questionnaire has been developed by Simon and Donahue [9]. With only 10 items, the IdFAI is intended to give both researchers and clinicians a simple and effective tool to determine individual's ankle stability status. A total score of 10 or lower indicates that the participant is unlikely to have FAI, whereas a total score of 11 or higher indicates that a participant is likely to have FAI [10].

The IdFAI has shown acceptable psychometric properties, both in clinical and research settings and across different age groups in adults, with good reliability and validity [9,10]. This questionnaire has initially been developed in English, which limited its usage only to those who can read and write in English. Considering the growing trend of multinational and multicultural research, guidelines has been developed to translate and cross-culturally adapt questionnaires in a another language [11]. Several research

* Corresponding author at: CHU Liège, Service de médecine de l'appareil locomoteur, Bât. CNRF Centre Neurologique et de Réadaptation Fonctionnelle, Rue Champ des Alouettes 30, 4557 Tinlot, Belgium.
E-mail address: c.beaudart@uliege.be (C. Beaudart).

https://doi.org/10.1016/j.fas.2021.10.001
1268-7731/

teams have already translated the IdFAI questionnaire into Turkish, Korean, Japanese, Chinese, Persian, Malay, Portuguese, Greek, and Spanish to extend its use to other populations [12–19]. While French is one of the most widespread languages worldwide, the fifth most spoken language and commonly used in the sport context, no French version of the IdFAI Tool was available. Therefore, the objective of this study was to translate the IdFAI into French according to international guidelines and to evaluate the main measurement properties of this new version (IdFAI-F).

2. Methods

The present study was conducted in two separate stages: the translation process and the validation process (Fig. 1**).** The full protocol of the study is available upon request to the corresponding author.

2.1. Translation and cross-cultural adaptation

The aim of the translation was to provide a precise and culturally adapted French version of the Functional Ankle Instability (IFAI) questionnaire. Permission was obtained from the developers of the IdFAI to translate the questionnaire. The translation was based on a standardized method, following Beaton's international cross-cultural adaptation recommendations for questionnaires measuring health status: «Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures» [11].

Firstly, two bilingual experts with French as their mother tongue independently translated the IdFAI questionnaire from English to French. A meeting was held between the translators accompanied by the research team to reach a consensus on the French version. Secondly, two back translations were independently created by two native English speakers who were fluent in French and were blinded to the original IdFAI questionnaire. Thirdly, an expert panel including the four translators and the research team members consensually agreed on a pre-final version of the French IdFAI, taking into considerations both back-translations. Finally, the questionnaire was preliminary tested on a sample of 20 participants (15 participants with ankle trauma and 5 healthy participants) to assess its understanding and clarity.

2.2. Validation process

The study of the psychometric properties was performed considering the principles of the Consensus-based Standards for the Selection of Health Status Measurement Instruments (COSMIN) recommendations [20]. The study was approved by the Ethics Committee of the University of Liège.

2.2.1. Participants

A convenience sample with French-speaking voluntary participants aged 18 years or older and practicing a physical activity or sport was recruited via social networks in the xxx. Two different groups of participants were included: (1) healthy participants

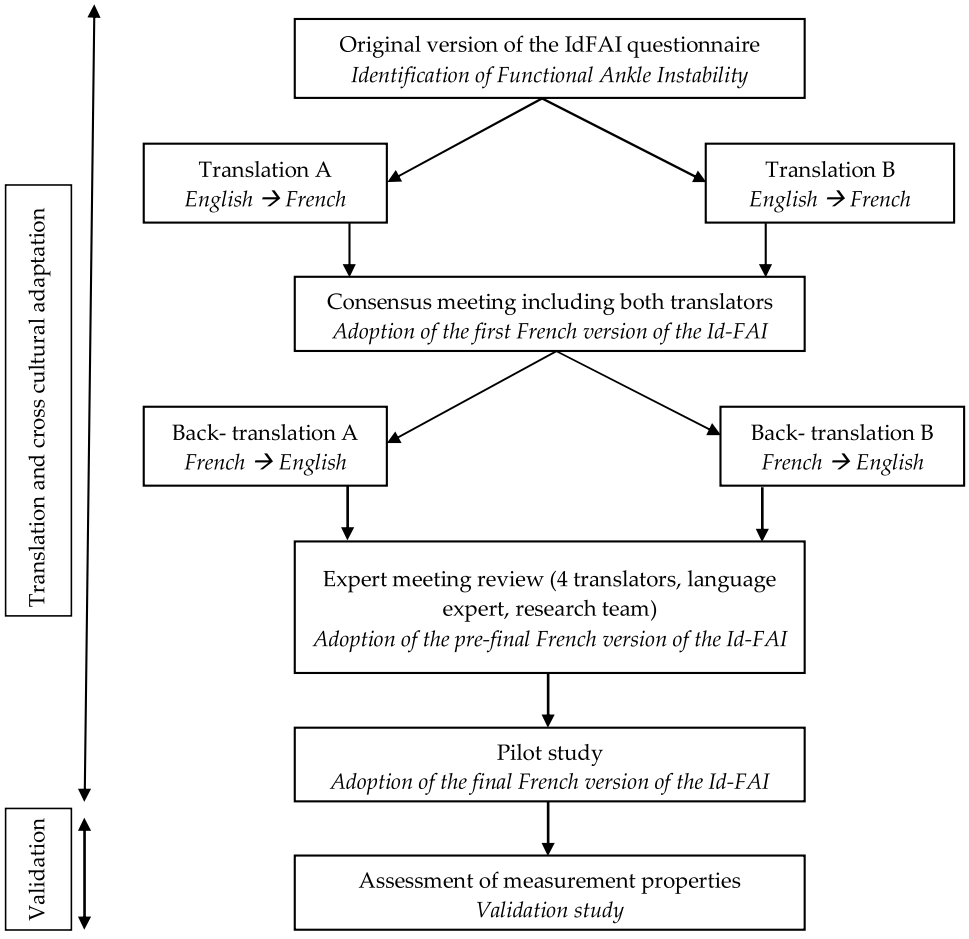

Fig. 1. Flow Chart of the IdFAI French translation and validation.

without any CAI history and, (2) participants with an ankle trauma history or presenting recurrent sensation of CAI. For the second group, participants who presented an ankle sprain within the previous 3 months were however excluded to avoid as much as possible the residual symptoms that could persist following a recent ankle sprain. Participants suffering from neurological diseases (i.e. stroke, Parkinson, spinal cord injury, etc.) or any other disease that could cause ankle joint deformation were also excluded.

Before data collection, all the participants read and signed an informed consent form.

2.2.2. Questionnaires

The Id-FAI [9] is a brief questionnaire that consist of 10 items. This questionnaire covers three factors: (1) "Initial ankle sprains", including items 1, 2, 3 and 4 and scored between 0 and 13 points; (2) "History of ankle instability" including items 5, 6, 7 and 10 and scored between 0 and 16 points; (3) "Instability during daily living activities" including item 8 and 9 and scored between 0 and 8 points. The total scoring ranges from 0 to 37 points, with a score of 10 points or less indicating that the participant is unlikely to present a FAI, and a score of 11 points or more reflecting a likelihood of FAI.

The French version of the Cumberland Ankle Instability Tool (CAIT-F) [6,21] was also administered to all participants to measure convergent validity. This questionnaire also provides a diagnosis and severity of a FAI. The CAIT-F is composed of 9 questions, with a score ranging from 0 (i.e. reflecting an unstable ankle) to 30 (i.e. reflecting a perfectly stable ankle).

2.2.3. Course of the validation study

All participants completed the French versions of both the Id-FAI and the CAIT questionnaires. One week later, all participants were invited to complete the Id-FAI questionnaire for the second time to test the reliability of the questionnaire. The duration of the interval was chosen so that the "ankle instability" injury did not evolve positively or negatively. Participants were asked to report any particular health changes between both administrations to control this aspect. Patients with ankle instability completed the questionnaire in regard to their pathological ankle. In the case where both ankles were affected, they were asked to complete the questionnaire for the most affected ankle. Regarding the healthy participants, they were requested to answer the questionnaire considering their dominant ankle.

2.2.4. Measurement properties and statistics

First, all quantitative variables were subjected to the Shapiro–Wilk normality test, histogram analysis, QQ plot diagram and the difference between the mean and the median to check for Gaussian distribution. The mean and standard deviation were used to present the normally distributed variables while the median and quantiles (percentile 25 and percentile 75) were used for asymmetric variables. The qualitative variables were presented as an absolute or relative frequency. For group comparison, the Students t-test was applied if the variables were normally distributed or the Mann–Whitney test was used when variables were skewed. The Chi^2 test was used for qualitative variables. The correlation between two quantitative variables was conducted using the Pearson (normal distribution) or Spearman (asymetric distribution) coefficients. All statistical analyses were computed using SPSS version 25 (IBM, USA).

The following measurement properties were measured:

1) Discriminative power

The ability of the questionnaire to distinguish between healthy participants and participants with an history of ankle instability was measured using the Student's t test.

2) Internal consistency

The estimation of homogeneity across items, or the internal consistency, was measured using two methods. First, a Cronbach's alpha coefficient was calculated, which varies between 0 and 1, and reflects a good internal consistency when values are comprised between 0.7 and 0.95 [22]. Then, the correlation between the total score and each individual items was measured. Spearman or Pearson correlation were used based on the the normality of distribution of the variables. A correlation <0.3 was considered weak, equal to 0.3 or between 0.3 and 0.6 moderate and >0.6 strong [23].

3) Test-retest reliability

Test-retest reliability of the questionnaire over time was also tested [24]. The IdFAI was administered a second time to all participants, one week after the first completion of the questionnaire. The test-retest reliability was evaluated using the intraclass correlation coefficient (ICC – two-way mixed, absolute agreement). Test–retest reliability improves as the ICC approaches 1, and an ICC of greater than 0.7 is indicative of an acceptable reliability [25]. The standard error of measurement (SEM) and smallest detectable change (SDC) of the IdFAI were also calculated. The SEM, which provides a range around the observed value in which the theoretical true value can be found, was measured by dividing the standard deviation of the difference between the test and the retest by the root of 2. The MDC, which indicates the amount of change that needs to be measured to be sure that the change measured is real and not due to a potential measurement error, was measured using the following formula: $1.96^{*}SEM^{*}\sqrt{2}$ [24]. A Bland & Altman plot (B&A plot) analysis was also performed to evaluate a bias between the mean differences of the test and the retest, and to estimate the limits of agreement, within which 95% of the differences of the retest, compared to the test, fall.

4) Construct validity

The construct validity was measured using two approaches. First, the convergent validity was measured with the correlation between the IdFAI and the CAIT questionnaires, assuming that a strong correlation between them will be found [23]. Second, the structural validity of the IdFAI was measured. A confirmatory factor analysis (CFA) was carried out using the model published by the authors of the original English scale [9]. The CFA was conducted using the diagonally weighted least squares estimator (WSLMV) for original data using the R package "Lavaan" (version 0.6–6). Model fit was evaluated with the Chi-square test ($p \geq 0.05$ indicates good fit), and the robust versions of the comparative fit index ($CFI \geq 0.95$ indicates good fit); the Tucker-Lewis index ($TLI \geq 0.95$ indicates good fit), the root mean square error of approximation ($RMSEA \leq 0.08$ indicates good fit) and the standardized root mean square residual ($SRMR \leq 0.08$ indicates good fit) [26,27].

5) Floor/ceiling effects

Floor or ceiling effects are considered to be present when more than 15% of the population obtained a maximum score (ceiling effect) or a minimum score (floor effect) [22].

Only the analysis on discriminative power included the healthy participants. All other measurement properties were measured exclusively on participants presenting a history of ankle trauma.

2.2.5. Sample size

A sample size power calculation was calculated for reliability since this is one of the most frequently used measurement properties. For an alpha of 0.01, a statistical power of 0.9, a minimum acceptable reliability of ICC = 0.7, an expected ICC of 0.85, a total of 100 participants was required [28]. A sample size of 100 participants also seems adequate and sufficient for the other measurement properties, according to Beaton's recommendations [11]. Finally, for the factorial analysis, a minimum of 10 patients per item is often recommended, which also confirmed a required sample size of 100 participants [29,30].

3. Results

3.1. French translation and cross-cultural adaptation

The 10 items of the IdFAI questionnaire were translated without any difficulties. The pilot version, performed on 20 participants, revealed no issues with understanding the French-translated

IDENTIFICATION D'UNE INSTABILITÉ FONCTIONNELLE DE LA CHEVILLE

Instructions : ce questionnaire sera utilisé afin d'évaluer le degré de stabilité de votre cheville. Un questionnaire différent devrait être utilisé pour chaque cheville. Veuillez compléter l'entièreté du questionnaire et si vous avez la moindre question, veuillez vous adresser à la personne qui vous a soumis ce questionnaire. Merci pour votre participation.

Veuillez lire la remarque suivante :
"Se laisser aller" est utilisé pour décrire une sensation temporaire d'instabilité (incapacité de contrôler sa cheville) ou de torsion de cheville.

Je complète ce questionnaire pour ma cheville **DROITE/GAUCHE** (entourez la réponse qui convient).

1.) Combien de fois environ vous êtes-vous tordu la cheville ? _____

2.) Quand vous êtes-vous tordu la cheville pour la dernière fois ?

❑Jamais (0) ❑ > 2 ans (1) ❑ 1-2 ans (2) ❑ 6-12 mois (3) ❑ 1-6 mois (4) ❑< 1 mois (5)

3.) Si vous avez consulté un entraineur, un médecin ou un professionnel de la santé, comment a-t-il catégorisé votre plus sévère entorse de cheville ?

❑Je n'ai vu personne (0) ❑Légère (Grade I) (1) ❑Modérée (Grade II) (2) ❑Sévère (Grade III) (3)

4.) Si vous avez déjà utilisé des béquilles ou un autre dispositif à la suite d'une entorse de cheville, pendant combien de temps les avez-vous utilisées ?

❑Je n'ai jamais utilisé de dispositif (0) ❑1-3 jours (1) ❑4-7 jours (2) ❑1-2 semaines (3) ❑2-3 semaines (4) ❑>3 semaines (5)

5.) Quand avez-vous pour la dernière fois ressenti que votre cheville ***"se laissait aller"*** ?

❑Jamais (0) ❑> 2 ans (1) ❑1-2 ans (2) ❑6-12 mois (3) ❑ 1-6 mois (4) ❑< 1 mois (5)

6.) A quelle fréquence avez-vous la sensation que votre cheville ***"se laisse aller"*** ?

❑Jamais (0) ❑1 fois par an (1) ❑1 fois par mois (2) ❑1 fois par semaine (3) ❑1 fois par jour (4)

7.) Habituellement, quand votre cheville commence à se tordre, pouvez-vous l'arrêter ?

❑Je ne me suis jamais tordu la cheville (0) ❑Immédiatement (1) ❑Parfois (2) ❑Incapable de l'arrêter (3)

8.) A la suite d'un incident typique de torsion de votre cheville, combien de temps faut-il pour un retour à la "normale" ?

❑Je ne me suis jamais tordu la cheville (0) ❑Immédiatement (1) ❑< 1 jour (2) ❑1-2 jours (3) ❑> 2 jours (4)

9.) Lors "des activités de la vie quotidienne", à quelle fréquence votre cheville vous semble-t-elle ***INSTABLE*** ?

❑Jamais (0) ❑1 fois par an (1) ❑1 fois par mois (2) ❑1 fois par semaine (3) ❑1 fois par jour (4)

10.) Lors "des activités sportives/ou récréatives", à quelle fréquence votre cheville vous semble-t-elle ***INSTABLE*** ?

❑Jamais (0) ❑1 fois par an (1) ❑1 fois par mois (2) ❑1 fois par semaine (3) ❑1 fois par jour (4)

Fig. 2. Final French version of the IdFAI.

Table 1
Participant's characteristics.

	All (n = 160)	Healthy participants (n = 44)	Participants with history of ankle trauma (n = 116)	p-value
Sex				
Women	61 (38.1)	21 (47.7)	40 (34.5)	0.12
Age (years)	24.4 ± 4.48	23.9 ± 2.51	24.6 ± 5.04	0.28
Sport practice (hours/week)	5.69 ± 3.24	5.5 ± 3.88	5.77 ± 2.98	0.64
Ankle				
Right	110 (68.7)	31 (70.5)	79 (68.1)	0.77
IdFAI-F score (0–37)	10.9 ± 7.81	2.11 ± 4.15	14.3 ± 6.05	<0.001
CAIT score (0–30)	24.3 ± 4.68	28.4 ± 2.29	22.8 ± 4.41	<0.001

Continuous variables are expressed in mean ± SD, qualitative variables are expressed in absolute and relative frequencies, n (%).

version of the Id-FAI. No change was thereby required. The French IdFAI (IdFAI-F) is available in Fig. 2.

3.2. Validation study

3.2.1. Participant's characteristics

A total of 160 participants were included in the study (Table 1). Of these, 44 were healthy participants and 116 had an history of ankle trauma. The population was mainly composed of men (n = 99, 61.9%). The mean age of the population was 24.4 ± 4.48 years and participants reported practicing a mean of 5.69 ± 3.24 h of sport per week (range 1–25). A total of 68.7% of the participants completed the questionnaire for the right ankle. No significant difference between healthy participants and participants with ankle trauma history was observed in regard to these characteristics.

3.2.2. Discriminative power

A significant difference was found between groups for the IdFAI and CAIT score. Patients reporting ankle trauma history had higher IdFAI-F scores and lower CAIT scores, both p-values <0.05. The IdFAI-F questionnaire demonstrated its ability to discriminate between pathological and healthy participants (Table 1).

3.2.3. Internal consistency

The Cronbach's alpha for the entire questionnaire was α = 0.68, indicating a moderate internal consistency. When deleting one item at a time, internal consistency remained unchanged. All items nevertheless showed significant positive correlations with the total score, with a correlation ranging from r = 0.25 (item 8) to r = 0.78 (item 5) (Table 2).

3.2.4. Test-retest reliability

The Id-FAI-F has an excellent test-retest reliability with an ICC value of 0.95 (95%CI 0.93; 0.96) for the total score. All ICC values for individual items were excellent as well (Table 2). The standard error of measurement was calculated to be 1.37 points and the smallest detectable change was 3.79 points.

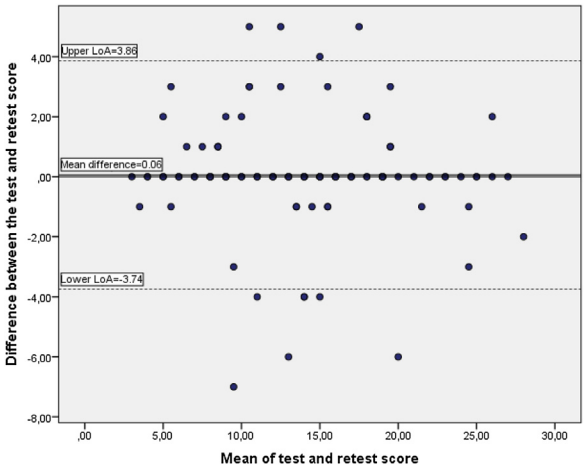

Fig. 3. Bland & Altman plot of the id-FAI questionnaire.

The Bland & Altman plot is available in Fig. 3. The mean difference between test and retest is equal to -0.06 (limits of Agreement -3.74; 3.86).

3.2.5. Construct validity

A strong and significant correlation between the IdFAI-F and the CAIT questionnaire was found (r = −0.75, p < 0.01), revealing a good construct validity.

The confirmatory factor analysis (CFA) of the 3-dimensional model did not result in adequate fit indices (Chi^2 = 107.703, df = 32, p < 0.001; CFI = 0.94; TLI = 0.92; RMSEA = 0.143 (95%CI 0.114–0.174); SRMR = 0.122).

Table 2
Results of test-retest reliability and internal consistency.

	Test-retest reliability		Internal consistency		
	ICC	95% CI	Cronbach alpha if item deleted	Correlation with total score	p-value for correlation
Item 1	1.00	1.00	0.72	0.31	0.001
Item 2	0.84	0.77; 0.88	0.65	0.46	<0.001
Item 3	0.87	0.81; 0.91	0.67	0.49	<0.001
Item 4	0.89	0.84; 0.92	0.67	0.59	<0.001
Item 5	0.85	0.78 ;0.89	0.61	0.78	<0.001
Item 6	0.85	0.78; 0.89	0.64	0.74	<0.001
Item 7	0.85	0.79; 0.90	0.68	0.35	<0.001
Item 8	0.81	0.74; 0.87	0.70	0.25	0.007
Item 9	0.82	0.75; 0.88	0.64	0.66	<0.001
Item 10	0.82	0.75; 0.88	0.63	0.74	<0.001
Total score	0.95	0.93; 0.96	0.68	NA	NA

3.2.6. Floor and ceiling effects

No participants obtained a maximum or minimum score to the questionnaire indicating no floor/ceiling effects of the questionnaire.

4. Discussion

The current study allowed to develop a French translation and cultural adaptation of the IdFAI questionnaire and to investigate its measurement properties. The IdFAI is a self-reported, simple and easy-to-apply patient-reported outcome tool measuring CAI. This questionnaire is specifically designed to detect whether a patient meets a minimum criterion necessary for inclusion in a CAI population. Results of the current study indicated that the French version of the IdFAI (IdFAI-F) discriminates well between healthy participants and participants with an history of ankle trauma. Moreover, a very good test-retest reliability has been observed (ICC of 0.95 (95%CI 0.93; 0.96)), with a SEM of 1.37 points and an MDC of 3.79 points. The IdFAI-F also has moderate internal consistency, a good convergent validity and does not have floor or ceiling effects. However, CFA analyses did not confirm the factor structure (i.e. 3 factors) proposed by the authors of the original English version.

Clinimetric properties of the IdFAI-F seem consistent with those obtained from the original version of the questionnaire and those from the different translations and cultural adaptations [12–19]. **Table A1 in Appendices** displays a general summary of all measurement properties of the IdFAI across different validation studies.

The participants who reported an history of ankle trauma reported significantly lower scores to the IdFAI-F questionnaire than healthy participants. We did not calculate a cut-off to discriminate between both populations, simply because the healthy population showed a large amount of ceiling effects which prevent us to perform a ROC curve analysis. Nevertheless, such analyses were performed for the Korean [13], Spanish [17] and Turkish [19] versions of the IdFAI and a global consensus for a cut-off of 10 or 10.5 points for the diagnosis of ankle instability seems to emerge from those papers.

The IdFAI-F demonstrated excellent test-retest reliability (ICC 0.95), as in all of the 9 other translation/validation studies of the IdFAI questionnaire [12–19]. Because the ICC was even higher than expected, our study demonstrates sufficient statistical power, in reference to our sample size calculation. A low standard error of measurement (i.e. 1.37) was also found for the IdFAI-F, which is comprised in the range of SEM found in other validation studies (lowest SEM of 0.63 for the original English version [9] and higher SEM of 2.35 for the Persian [15] translated version, mean SEM across 7 studies of 1.43 points). The smallest detectable change for the IdFAI-F is 3.79 points which means that a patient would have to change by at least this amount before we can be sure that he/she has improved or deteriorated. Including ours, only 5 studies [13,14,17,18] looked at the SDC value, and the mean SDC value found across studies is of 4.38 points.

Most of the other studies used the CAIT questionnaire to measure convergent validity and results are similar to ours, showing an excellent convergent validity with the CAIT questionnaire (mean of r = 0.71 across 7 validation studies). This result is not surprising, given the fact that the IdFAI questionnaire is derived from the CAIT questionnaire.

The main difference found between our results and the 9 other translation/validation of the IdFAI studies is the internal consistency. While in all other studies, internal consistency found to be very high with Cronbach's α values >0.79, we found a moderate internal consistency with a Cronbach $\alpha = 0.68$. We do not have hypothesis to explain these results since all individual items seems to correlate significantly and positively with the total score of the IdFAI-F. Contrarily to other validation analyses, we were also unable to confirm the factor structure suggested by the authors of the original English version [9]. Indeed, authors of the English version of the IdFAI conducted an exploratory factor analysis and identified three factors (items 5, 6, 7 & 10 belonging to factor 1; items 1, 2, 3 & 4 belonging to factor 2 and items 8 & 9 belonging to factor 3). However, replicating this 3-dimensional model in the CFA did not result in adequate fit indices. Other studies did not confirm this model either. Indeed, while it was confirmed for the Malay [16], Persian [15], Portuguese [18] and Spanish [17] versions, the Chinese [12] and Turkish [19] versions found better fit indices using a 1 or 2-dimensional model investigated throughout an EFA and then, a CFA.

Finally, to the best of our knowledge, no prospective study has been done to measure the responsiveness of the IdFAI questionnaire as well as the minimal clinically detectable change.

5. Strengths and limitations

The main strength of our study lies in the rigorous methodology employed to provide an equivalence between the original English IdFAI and its French translation. Moreover, even if the IdFAI has already been translated into multiple other languages, not all of them provided a discriminative power analysis, as well as SEM and SDC values.

As for all studies, our study has a number of limitations that must be kept in mind. First, because of the cross-sectional design of our study, we were unable to measure the responsiveness, the minimal clinical important difference as well as the predictive validity of the IdFAI questionnaire. Second, because participants were recruited from social networks, our convenience sample questions the generalization of the results. Third, we measured the convergent validity using the CAIT questionnaire only. Other questionnaires could have been used to provide additional confirmation of the convergent validity. Nevertheless, the convergent validity of the IdFAI has already been confirmed in multiple other cohorts and we can therefore be confident that additional analyses would have led to similar results.

6. Conclusion

A validated French version of the Identification of Functional Ankle Instability (IdFAI) questionnaire is now available and demonstrates a good validity and reliability. The French version of this tool can be use with confidence to effectively and accurately assess chronic ankle instability both in research and clinical settings for French-speaking individuals.

Disclosure of interest

The authors report no conflict of interest

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethics

The study was approved by the Ethical Committee of the University of Liège.

Data availability

All data are available under request to the corresponding author.

Acknowledgement

We would like to thank all the participants of this study.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.fas.2021.10.001.

References

[1] Hootman JM, Dick R, Agel J. Epidemiology of collegiate injuries for 15 sports: summary and recommendations for injury prevention initiatives. [cited 2021 Jun 15]. Available from:. J. Athl. Train. Association, Inc; 2007. p. 311–9. www.journalofathletictraining.org.

[2] Beynnon BD, Renström PA, Alosa DM, Baumhauer JF, Vacek PM. Ankle ligament injury risk factors: a prospective study of college athletes. J Orthop Res 2001;19:213–20. . Elsevier BV, [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/11347693/.

[3] Bridgman SA, Clement D, Downing A, Walley G, Phair I, Maffulli N. Population based epidemiology of ankle sprains attending accident and emergency units in the West Midlands of England, and a survey of UK practice for severe ankle sprains. Emerg Med J 2003;20:508–10. . BMJ Publishing Group. [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/14623833/.

[4] van Rijn RM, van Os AG, Bernsen RMD, Luijsterburg PA, Koes BW, Bierma-Zeinstra SMA. What is the clinical course of acute ankle sprains? A systematic literature review. Am J Med 2008;121:. . Elsevier Inc. [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/18374692/.

[5] Docherty CL, Gansneder BM, Arnold BL, Hurwitz SR. Development and reliability of the ankle instability instrument. J Athl Train 2006;41:154–8. . Association, Inc. [cited 2021 Jun 15]. Available from: www.journalofathletictraining.org.

[6] Hiller CE, Refshauge KM, Bundy AC, Herbert RD, Kilbreath SL. The cumberland ankle instability tool: a report of validity and reliability testing. Arch Phys Med Rehabil 2006;87:1235–41. . [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/16935061/.

[7] Eechaute C, Vaes P, Duquet W. The chronic ankle instability scale: clinimetric properties of a multidimensional, patient-assessed instrument. Phys Ther Sport 2008;9:57–66. . [cited 2021 Aug 17]. Available from: https://pubmed.ncbi.nlm.nih.gov/19083705/.

[8] Donahue M, Simon J, Docherty CL. Critical review of self-reported functional ankle instability measures. Foot Ankle Int 2011;32:1140–6. . Available from: https://pubmed.ncbi.nlm.nih.gov/22381198/.

[9] Simon J, Donahue M, Docherty C. Development of the identification of functional ankle instability (IdFAI). Foot Ankle Int 2012;33:755–63. . [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/22995264/.

[10] Gurav RS, Ganu SS, Panhale VP. Reliability of the identifi cation of functional ankle instability (IdFAI) scale across different age groups in adults. N Am J Med Sci 2014;6:516–8. . [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/25489564/.

[11] Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976) 2000;25:3186–91. . [cited 2015 Jan 10]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11124735.

[12] Li Y, Guan L, Ko J, Zhang S, Brown CN, Simpson KJ. Cross-cultural adaptation and validation of an ankle instability questionnaire for use in Chinese-speaking population. J Sport Heal Sci 2019;8:555–60, doi:http://dx.doi.org/10.1016/j.jshs.2017.04.003 Elsevier B.V. Available from:.

[13] Ko J, Rosen AB, Brown CN. Cross-cultural adaptation, reliability, and validation of the Korean version of the identification functional ankle instability (IdFAI). Disabil Rehabil 2018;40:3185–90, doi:http://dx.doi.org/10.1080/09638288.2017.1375032 Informa UK Ltd. Available from:.

[14] Tsekoura M, Billis E, Samada EK, Savvidou I, Fousekis K, Xergia S, et al. Cross cultural adaptation, reliability and validity of the Greek version of Identification of Functional Ankle Instability (IdFAI) questionnaire. Foot Ankle Surg 2020, doi:http://dx.doi.org/10.1016/j.fas.2020.12.005 European Foot and Ankle Society. Available from:.

[15] Kordi Ashkezari MH, Sahebozamani M, Daneshjoo A, Abbasi Bafghi H. Validity and reliability of the Persian version of "Identification of functional ankle instability" questionnaire in people with lateral ankle sprain. Phys Treat Specif Phys Ther J 2019;9:177–82.

[16] Omar MK, Abdul-Karim S. Validity and reliability of the malay version of the identification of functional ankle instability (Idfai-m) questionnaire among malaysian university athletes. Malaysian Orthop J 2021;15:32–42.

[17] Cervera-Garvi P, Ortega-Avila AB, Marchena-Rodriguez A, Gijon-Nogueron G. Transcultural adaptation and validation of the Spanish version of the Identification of Functional Ankle Instability questionnaire (IdFAI-Sp). Disabil Rehabil 2020. . Taylor and Francis Ltd. [cited 2021 Jun 15]; Available from: https://pubmed.ncbi.nlm.nih.gov/33296608/.

[18] Santos Ribeiro E. Validation of psychometric characteristics validity and reliability of Portuguese version of Identification of Functional Ankle Instability (IdFAI).

[19] Tayfur A, Sendil A, Karakaya J, Ergun N. Cross-cultural adaptation, validity, and reliability of Turkish version of Identification of Functional Ankle Instability (IdFAI) scale. Acta Orthop Traumatol Turc 2020;54:300–4. . AVES Publishing Co. [cited 2021 Jun 15]. Available from: https://pmc/articles/PMC7586761/.

[20] Mokkink LB, Prinsen CAC, Bouter LM, de Vet HCW, Terwee CB. The COnsensus-based standards for the selection of health measurement INstruments (COSMIN) and how to select an outcome measurement instrument. Braz J Phys Ther 2016;105–13. . Revista Brasileira de Fisioterapia. [cited 2021 Jun 15]. Available from: https://pmc/articles/PMC4900032/.

[21] Geerinck A, Beaudart C, Salvan Q, Van Beveren J, D'Hooghe P, Bruyère O, et al. French translation and validation of the Cumberland Ankle Instability Tool, an instrument for measuring functional ankle instability. Foot Ankle Surg 2020;26:391–7. . Elsevier Ltd. [cited 2021 Jun 15]. Available from: https://pubmed.ncbi.nlm.nih.gov/31118138/.

[22] de Vet HCW, Terwee CB, Mokkink LB, Knol DL. Measurement in medicine. [cited 2019 Jul 10]. Available from:. Cambridge: Cambridge University Press; 2011. http://ebooks.cambridge.org/ref/id/CBO9780511996214.

[23] Deyo RA, Diehr P, Patrick DL. Reproducibility and responsiveness of health status measures. Statistics and strategies for evaluation. Control Clin Trials 1991;12:142S–58S. . [cited 2015 May 21]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/1663851.

[24] Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, et al. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res 2010;19:539–49. . Springer [cited 2018 Jun 6]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20169472.

[25] Terwee CB, Bot SDM, de Boer MR, van der Windt DAWM, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007;60:34–42. . [cited 2014 Jul 10]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17161752.

[26] Brown T. Confirmatory factor analysis for applied research. 2nd ed. The Guildford Press; 2015.

[27] Kline R. Principles and practice of structural equation modeling. 4th ed. The Guildford Press; 2016 editor.

[28] Arifin WN. A web-based sample size calculator for reliability studies. Educ Med J 2018;10:67–76.

[29] Mundfrom DJ, Shaw DG, Ke TL. Minimum sample size recommendations for conducting factor analyses. Int J Test 2005;5:159–68. . Informa UK Limited. [cited 2021 Jun 15]. Available from: https://www.tandfonline.com/doi/abs/10.1207/s15327574ijt0502_4.

[30] Kyriazos TA. Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. Psychology 2018;09:2207–30. . Scientific Research Publishing, Inc. [cited 2021 Jun 23]. Available from: http://www.scirp.org/journal/psych.