Psychometric properties of the North American version of the Flodén ATODAI (Attitudes Toward Organ Donor Advocacy Instrument): a validation study

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Abstract

**Background:** Intensive and critical-care nurses are the key to successful donor management in the critical-care setting. No studies measuring attitudes toward organ donor advocacy existed before 2011, when the 51-item Swedish “Attitudes Toward Organ Donor Advocacy Scale” was developed. The aim of this study was to translate, adapt and establish the psychometric properties of the North American version of the Flodén ATODAI (Attitudes Toward Organ Donor Advocacy Instrument) in terms of validity and reliability.

**Methods:** A multi-step approach was used: Initial translation; Back-translation; Review and synthesis of these translations; *Expert panel* (N=7) rated the prefinal version of the instrument for content validity index (CVI); *International panel* made adjustments guided by the *expert panel*. Reliability testing with test and retest of the adjusted 46-item version was conducted using intraclass correlation coefficient (ICC), weighted kappa (κ*weight*), sign test, and Cronbach’s alpha coefficient (α), (N=50); and finally Delphi technique procedure with a preselected *Delphi panel* (N=15).

**Results:** The CVI was determined to be greater than the 0.05 significance level. Item level (I-CVI) ranged 0.82-1.0, with a mean of 0.97. Scale level (S-CVI) on the entire instrument was 0.97. Test-retest procedure was performed to estimate stability. In total, 34 of the items had good-to-high ICC. Accepting an ICC of ≥0.70 resulted in a total of 24 items. Homogeneity reliability was estimated by α and was calculated for these items where α=0.90. In total, 20 of the items had a substantial or almost perfect κ*weight* and 23 showed a moderate κ*weight*. None of the items showed systematical differences. The Delphi technique procedure was used on the 22 items with ICC <0.70 resulted in adjustments establishing that consensus was achieved.

**Conclusions:** Undertaking this multi-step, cross-cultural adaptation procedure has effectively ensured that the 46-item Flodén ATODAI [North America version] produces valid and reliable measurements.

**Background**

Organ donor advocacy (ODA) attitudes among intensive care unit (ICU) nurses are crucial when championing and respecting the donor’s and donor’s family’s end-of-life decision to donate. ICU-
nurses’ awareness, knowledge, skill and competence, i.e. role has an impact upon the organ donation and by that the organ transplantation process. The care by specialist nurses is the key to successful donor management in the critical-care (CC) setting since their actions and behavior are significantly associated with authorization to, or decline of, organ donation (OD) (1-12). In addition, ICU nurses’ attitudes have an impact on the availability of organs for individuals who need life-saving organ transplant treatment (5,8-9).

No studies measuring attitudes toward organ donor advocacy (ATODA) in a clinical context existed before 2011. One reason for this is the absence of validated measuring instruments. In 2011, with the intent to gain an understanding of nurses’ behavior, and their level of ability to advocate for their patients who are either potential or actual organ donors, Flodén et al. (13) developed the 51-item Swedish instrument “Attitudes Toward Organ Donor Advocacy Scale” (ATODAS) to measure ATODA among ICU and CC nurses. This instrument measures ATODA by describing nurses’ actions while caring for potential organ donors and throughout the donation procedure and evaluates changes in organizational structure, guidelines, and educational interventions. The ATODAS is validated in the Swedish context by its application on more than 1,200 ICU nurses, i.e. >50% of all ICU nurses in Sweden. This ATODAS instrument is limited to the Swedish context since it only exists in the Swedish language. Today the ATODAS is to our knowledge the only established instrument within the context of measuring organ donor advocacy, and there is a need for a universal translation among different cultures and countries. Currently, the Flodén ATODAI [North American version] is in use in several countries and continents, and the process of developing a Spanish version has started.

Since specific behavior by ICU personnel is significantly associated with the frequency of referral and OD consent, it is of crucial importance to understand the reasons behind ODA. The concept of ODA in the situation of OD is defined by Flodén et al. (5) as respecting the potential or actual organ donor’s rights, representing, or speaking up for his/her wishes, as well as the family’s points of view, in the OD decision-making process. According to the International Council of Nurses’ Code of Ethics, a nurse’s primary professional responsibility is to people requiring nursing care. Thus, nurses’ behavior and their level of ability to advocate for their patients’ desires applies to potential and actual organ
donors (14). In regard to nurses’ professional ethics in situations when the possibility of OD arises, nurses should represent and defend their patients’ wishes regarding ODA (15). The relative rarity of OD in any hospital or country makes it important to reach out to an international clinical context to establish developmental changes, i.e. professional and/or organizational. After reviewing the roles and practices of ICU and CC nurses in North America, it became clear that the Swedish ATODAS needed to be adjusted to be used in North America (16). Therefore, the aim of this study was to translate, adapt, and establish the psychometric properties of the Swedish ATODAS to one which would be equally valid and reliable in North America. As part of the instrument development in this study, the name of the instrument changed from ATODAS, the 51-item Swedish scale, to Flodén ATODAI (Attitudes Toward Organ Donor Advocacy Instrument), the North American English version.

Methods

Design

The study used a methodological design comprising of a cross-cultural adaptation procedure to effectively translate the 51-item Swedish ATODAS instrument for use in other cultural and language settings. Specifically, the study considered Brislin’s multi-step approach as best practice (18). An additional Delphi technique procedure was performed on the Flodén ATODAI [North American version] as a complementary adaptation approach to secure higher scientific certainty of the instrument with regard to validity and reliability by testing the items for content relevance, clarity, and domain coverage.

Description of the ATODAS [Swedish version]

Flodén et al. (13) developed the Swedish 51-item ATODAS as a means of psychometric evaluation of measuring ICU nurses’ ATODA, including validation and reliability testing. In addition to the demographic data, the instrument contains three dimensions covering statements about attitudes toward: actions to safeguard the wishes of the potential organ donor; actions for supporting the family of the potential organ donor; and actions that promote OD at an organizational or structural level.

Translation and cross-cultural adaptation of the Flodén ATODAI [North American version]
The procedure to transfer the Swedish ATODAS instrument into an international arena was guided by Brislin's (18) multi-step back-translation approach, complemented by a Delphi technique procedure (Figure 1).

**The first step** was for a professional and native American English-speaking interpreter and bilingual Swedish translator to translate the Swedish ATODAS instrument into American-English. **The second step** comprised of back-translation into American-English, as performed by another expert—a native Swedish-speaking bilingual translator. The translation was performed blindly, i.e. without access to the original version of the Swedish ATODAS.

**Step three** constituted cross-language testing by the international committee, consisting of three OD specialists; one representing Sweden (PI), and two representing the United States of America (OneLegacy).

“Review and synthesis of the translations” was performed to provide consensus regarding the most accurate and easily understood items. Working from the original instrument, as well as the translated versions, a synthesis of these translations was conducted to produce a consolidated instrument. This validity-checking procedure ensured the translated version reflected the same item content as the original. A written report thoroughly documented the synthesis procedure by addressing each of the issues and how they were resolved. The consensus included the translated version of the instrument and the introduction and instruction to the instrument, resulting in the prefinal version of the Flodén ATODAI [North American version]. The described procedure included achieving equivalence between the original version and the translated version.

**Study Populations: Steps Four to Six**

**Step four:**

Seven designated ICU or CC nurses in the greater Los Angeles with experiential knowledge of caring for at least one organ donor formed an expert panel. The panel evaluated the content validity of the items, with reference to Lynn's criteria (17). All seven nurses on the panel were female, aged between 29-55 years with a mean age of 44.2 years, and their work experience in the ICU and/or
Emergency Department ranged between 5-31 years. The panel represented nurses from trauma, education, and teaching hospitals: Three worked in the ICU; three in the Emergency Department; and one in the Education Department. Three of the experts were managers/charge nurses, one was a clinical nurse specialist, one a nurse educator, and two were bedside nurses.

**Step five:**

In total, 50 ICU nurses from two hospitals in the greater Los Angeles area participated in the test and retest; one university-affiliated hospital (with different types of ICUs); and one county or community hospital (one ICU) (Table 1). The inclusion criteria were: Being an ICU or CC nurse; experiential knowledge of caring for at least one organ donor; and currently working in a clinical setting with OD. The exclusion criteria were: Being a nurse who was not currently working and/or being a nurse without experience of caring for organ donors.

**Step six:**

A preselected panel of 15 nurses in the United States of America, with extensive experiential knowledge of caring for organ donors, comprised the Delphi panel for the purpose of completing the additional Delphi technique procedure (Table 2).

| Table 1. Socio-demographics of ICU nurses performing the test-retest of the 46-item Flodén ATODAI [North American version] |
| --- |
| ICU or CC nurses | N=50 |
| Age | 25-63 years (mean 38 years) |
| Gender: | n=13 |
| Men | n=37 |
| Women | |
| Work experiences | 0.1-34 years (mean 10.2 years) |
| Experience of caring for brain-dead patients: | n=13 |
| ≤ 5 times | n=6 |
| 6-10 times | n=31 |
| ≥ 10 times | |
Table 2. Socio-demographics of panel (N=15) performing the Delphi technique procedure of the 46-item Flodén ATODAI [North American version]

| Location:                      |      |
|--------------------------------|------|
| Greater Los Angeles            | n=11 |
| Western and South United States| n=4  |

| Age                            | 23-60 years (mean 46.7 years) |
|--------------------------------|--------------------------------|

| Gender:                        |      |
|--------------------------------|------|
| Female                         | n=12 |
| Male                           | n=3  |

| Ethnicity:                     |      |
|--------------------------------|------|
| Asian                          | n=7  |
| Caucasian                      | n=6  |
| Afro-American                  | n=2  |

| Current workplace:             |      |
|--------------------------------|------|
| Intensive Care (general)       | n=8  |
| Emergency Department           | n=4  |
| Trauma ICU                     | n=1  |
| Cardiac ICU                    | n=1  |
| Neuro ICU                      | n=1  |

| Main position:                 |      |
|--------------------------------|------|
| Bedside nurse                  | n=14 |
| Charge nurse                   | n=1  |

| Work experience in ICU         | 3-32 years (mean 16 years) |
|--------------------------------|-----------------------------|

| Hospital:                      |      |
|--------------------------------|------|
| Community hospital             | n=12 |
| University hospital            | n=2  |
| Trauma hospital                | n=1  |
| Private hospital               | n=1  |
Data Collections and Analysis: Steps Four to Six

Step four: First data collection

The first data collection required testing the prefinal version of the Flodén ATODAI [North American version]. The expert panel was given a rating form with the theoretical definition and a delineation of the three dimensions, objectives, and items. They were asked to review the prefinal 51-item version of the Flodén ATODAI [North American version] for content relevance, clarity, and domain coverage and to rate each item on a 4-point scale (from 1=not relevant to 4=very relevant) (17,19).

Step four: First data analysis

Content Validity

The expert panel was formed to estimate the content validity (with reference to Lynn’s criteria (17) of the items. Content was considered valid when an item was rated as either 3 (relevant and needs little revision) or 4 (very relevant) by at least six evaluators (>86%) and, thus, was included in the new scale (17).

The international committee analyzed the content validity rating by the expert panel and weighted the scores, which resulted with the prefinal 51-item instrument being reduced to 46 items. Of the remaining 46 items, five items were re-worded, as guided by the recommendations of the expert panel. A content validity index (CVI) was calculated to indicate the extent of expert agreement, both for the item CVI (I-CVI) and for the scale CVI (S-CVI). An I-CVI was determined by the number of experts who rated an item content as valid (giving it a rating of 3 or 4) divided by the total number of experts, resulting in a proportion of agreement for each item. The S-CVI was determined by the averages of the I-CVIs (17,19).

Step five: Second data collection

The study performed a test-retest procedure to estimate stability (reliability testing) of the adjusted version of the prefinal 46-item version of the Flodén ATODAI [North American version], as developed from the data analysis performed in step four. Fifty ICU nurses agreed to participate by answering the instrument on two occasions, with two weeks in between.

Step five: Second data analysis
Test-Retest Reliability
The intraclass correlation coefficient (ICC) was used to measure the strength of agreement between the test and retest, using ordered categorial data (20). The level of agreement was confirmed via the weighted form of kappa coefficients ($\kappa_{Weight}$) (21).

Moreover, the sign test tested for whether systematical differences occur in either direction, described by exact agreement. The test was two-sided and conducted at the 0.05 significance level. The ICC, the $\kappa_{Weight}$, and the sign test analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA).

Homogeneity and Stability Reliability
Homogeneity reliability was estimated using Cronbach’s alpha coefficient ($\alpha$) via SPSS 18.0. According to the conventional rule by Nunnally, this coefficient should at least exceed 0.70 (22).

Step six: Third data collection
An additional Delphi technique procedure of the Flodén ATODAI [North American version] was performed to test the items for content relevance, clarity, and domain coverage. The Delphi technique is evidently dependent on the experiential knowledge of its expert panel (i.e. the Delphi panel). In this step, the Delphi panel only reviewed and judged the 22 items which were identified in step five as having an ICC $\leq 0.70$. The preselected Delphi panel (N=15) was used to further improve the feasibility of the instrument (23). The Delphi panel members were asked to individually review and judge these 22 items in the Flodén ATODAI [North American version] in two occasions, referred to as “round I” and “round II”. The nurses rated each item using a 4-point rating scale (1=not relevant; 2=unable to estimate relevance without item revision or item in need of such revision that it would no longer be relevant; 3=relevant but needs minor alteration; 4=very relevant and succinct) (17). In round II, the Delphi panel members reviewed the adjusted version of the Flodén ATODAI [North American version] after round I.

Step six: Third data analysis
After round I, this study’s primary investigator (PI) summarized and analyzed all participants’
recommendations. The Delphi panel rated all 22 items as either “relevant but needs minor alteration [3]”, or “very relevant and succinct [4]”. Four of the items were recommended to be kept as they were. The PI, in consultation with the co-investigators, adjusted and re-worded the remaining 18 items, guided by the Delphi panel members’ recommendations. After round II, the PI, in consultation with the co-investigators, summarized, analyzed, and adjusted the Flodén ATODAI [North American version], again guided by the recommendations of the panel.

Results

Content Validity

The first data collection comprised of the expert panel rating the prefinal version of the Flodén ATODAI [North American version]. The international committee then analyzed this data for CVI by calculating both the I-CVI and the S-CVI. The I-CVI ranged from 0.82 to 1.0, with a mean of 0.97, while the S-CVI averaged 0.97. This meant the CVI was $\geq 0.78$ and, therefore, content validity was established beyond the 0.05 significance level, which is the required criterion according to Lynn (17) and Polit and Beck (19). This resulted in a reduction of the number of instrument items from 51 to 46. Of the remaining 46 items, five were re-worded using the recommendations of the expert panel.

Test-Retest Reliability

The strength of agreement between the test and retest was calculated both by ICC and by $\kappa_{weight}$. Also, the sign test was used to identify whether any systematical differences had occurred. The 46-item Flodén ATODAI [North American version] showed an ICC between 0.268 – 0.911 (Table 3). In total, 34 of the items had a good or excellent ICC: Good $n=18$ (0.60-0.74); Excellent $n=16$ ($\geq 0.75$).

Accepting an ICC $\geq 0.70$ (24) yielded a total of 24 items. The level of agreement was confirmed by $\kappa_{weight}$, varying between 0.25 – 0.87 (Table 4). In total, 20 of the items had a substantial or almost perfect $\kappa_{weight}$: Substantial $n=17$ (0.61-0.80); Almost Perfect $n=3$ (0.81-0.99). Moderate $\kappa_{weight}$ (0.41-0.60) was shown for 23 items. Only three items (2, 4, and 37) showed a $\kappa_{weight}$ with fair agreement (0.21-0.40). However, these three items had a high exact agreement that ranged between 75.5%-84.0%. Exact agreement between test and retest for all items varied between 52.1% - 97.9%. None of the items showed statistically significant systematic changes. The retest values were
systematically higher for most of the items. The ICC values were, as is to be expected, very similar to those of $\kappa_{\text{Weight}}$ (25).

Table 3. The strength of agreement between the test and retest of the 46-item Flodén ATODAI [North American version], as measured by ICC using ordered categorial data (20)

| Correlation Level       | n  |
|-------------------------|----|
| Excellent correlation   | 16 |
| (0.75-1.00)             |    |
| Good correlation        | 18 |
| (0.60-0.74)             |    |
| Fair correlation        |  9 |
| (0.40-0.59)             |    |
| Poor correlation        |  3 |
| (<0.40)                 |    |

Table 4. The level of agreement between the test and retest of the 46-item Flodén ATODAI [North American version] by $\kappa_{\text{Weight}}$ (21)

| Agreement Level          | n  |
|--------------------------|----|
| Almost perfect agreement |  3 |
| (0.81-0.99)              |    |
| Substantial agreement    | 17 |
| (0.61-0.80)              |    |
| Moderate agreement       | 23 |
| (0.41-0.60)              |    |
| Fair agreement           |  3 |
| (0.21-0.40)              |    |
| Slight agreement         | -  |
| (0.01-0.20)              |    |
| Less than chance agreement| -  |
| (<0)                     |    |

**Homogeneity and Stability Reliability**

Homogeneity reliability was estimated using $\alpha$ for the 24 items identified with an ICC $\geq0.70$ was $\alpha=0.90$. None of the items had a greater $\alpha$ coefficient “if item was deleted”, meaning that none of the items would substantially affect reliability if they were removed. Furthermore, all items had a “corrected item-total correlation” of 0.30 or above. Calculating the Cronbach’s alpha of the retest gave an $\alpha$ coefficient of 0.913. Analysis of the results of the test and retest established a reasonable degree of both stability and homogeneity for the 24 items in the Flodén ATODAI [North American
version] with an ICC ≥0.70 for test-retest reliability. Out of the remaining 22 items, 10 had an ICC ≥0.60 (i.e. good correlation), 9 had a fair ICC (0.40-0.59), while 3 had a poor ICC (<0.40). All items had been rated as “relevant and succinct” or “relevant but needed minor alteration” by the expert panel. The majority of the 22 items with ICC <0.70 needed minor alterations as part of the Swedish to North American cross-cultural adaptation. These alterations were performed using a Delphi technique procedure.

**The Delphi Procedure**

The Delphi procedure focused on the 22 items identified in step five as showing an ICC <0.70. During round I, the Delphi panel rated all 22 items as relevant, recommending 16 for minor alterations. Then, during round II, the Delphi panel members reviewed the adjusted items from round I and recommended further changes. The adjustments after both round I and round II involved emphasizing the core of the items via re-wording. The PI performed the final adjustments of the items, guided by feedback from the Delphi panel, until consensus was achieved.

**Discussion**

The key to successful donor management in the CC setting is significantly associated with the ICU and CC nurses’ attitudes toward OD, and by that will have an impact on the availability of organs for individuals who need life-saving organ transplant treatment (1-12). Before 2011 no studies measuring ATODA existed in the worldwide clinical context. Which is why the Swedish 51-item ATODAS was developed and validated by Flodén et al. (13) and became the first instrument to measure ATODA among ICU and CC nurses. For a worldwide use the primary limitation of the ATODAS is linguistic since it is written in Swedish, but socio-cultural and legal limitations also exist (18,26). To address these limitations and allow the scale to be used in an international clinical context, a systematic translation procedure for cross-cultural adaptation was initiated and performed (18) (Figure 1).

The linguistic limitation was addressed by the international committee of experts as a validity check. This cross-language testing was essential to ensure a high-quality translated instrument and to safeguard that the translated version reflected the same item content as the original version (18,27). The content validity followed Lynn’s recommendations on how to quantify an otherwise subjective
process (17). Ratings and written feedback by the expert panel was instrumental in making well-informed adjustments of the prefinal version of the Flodén ATODAI [North American version]. I-CVI with a mean of 0.97 and an S-CVI for the whole instrument of 0.97 showed that we achieved strong content validity that was culturally relevant.

Test-retest reliability testing revealed 24 of the 46 items with an ICC \(>0.70\), however 34 of the items had a good or excellent ICC. The \(\kappa_{Weight}\) confirmed the level of agreement. Only three items showed a \(\kappa_{Weight}\) with fair agreement, but all these three items had a high exact agreement between the test and retest. Moreover, the ICC values were very similar to those of \(\kappa_{Weight}\) (20,25). Therefore, the results concluded that reliability was established.

The homogeneity and stability reliability testing focused on the 24 items identified with an ICC \(>0.70\), and the Cronbach’s alpha established a reasonable degree of both stability and homogeneity with \(\alpha = 0.90\) for the initial test, and 0.913 for the retest (22). For the tested 24 items, the Cronbach’s alpha coefficients showed excellent homogeneity and stability reliability.

The Delphi technique procedure was performed as a complementary adaptation approach to secure higher scientific certainty of the instrument (23,28). Focus was on the remaining 22 items with ICC \(<0.70\), where all of these items previously had been rated as “relevant and succinct” or “relevant but needed minor alteration” by the expert panel. As part of the cross-cultural adaptation into the North American context, the Delphi panel guided the adjustments of these items until consensus was achieved (23,28). This procedure, using a Delphi panel of experts, has scientifically strengthened the Flodén ATODAI [North American version] in a satisfactory way.

The main differences between the Swedish version and the North American version of the instrument are due to national context, e.g. legislation and guidelines. In addition, the instrument may assist the professional development of ICU nurses. This model of translation procedure and cross-cultural adaptation is useful in different contexts and provides a validated instrument to compare and apply for an international perspective on ODA.

Conclusion
The translated and tested instrument Flodén ATODAI [North American version] was adapted to be
culturally relevant, yielding valid and reliable results for use in a clinical North American context within a global perspective. Undertaking this multi-step approach has effectively ensured that the cross-cultural adaptation procedure resulted in a stronger instrument for valid and reliable measurements. The North American version of the Flodén ATODAI provides a framework for researchers in general, but clinicians in particular, choosing to utilize this instrument for work in other cultural and geographic settings. Study limitations are that content validity of the 46-item Flodén ATODAI needs to be further scrutinized. Therefore, the next step should be to use the instrument in a large-scale study within North America and implement factor analysis to determine construct validity.

List Of Abbreviations

ATODA, Attitudes Toward Organ Donor Advocacy

ATODAI, Attitudes Toward Organ Donor Advocacy Instrument

ATODAS, Attitudes Toward Organ Donor Advocacy Scale (in Swedish)

CC, Critical Care

ICC, Intraclass correlation coefficient

ICU, Intensive Care Unit

I-CVI, Item - Content Validity Index

OD, Organ Donation

ODA, Organ Donor Advocacy

PI, Primary Investigator

S-CVI, Scale - Content Validity Index

Declarations

**Ethics approval and consent to participate**

This research study complies with the Declaration of Helsinki and the Declaration of Istanbul and obtained Institutional Review Board approvals from St. Vincent Medical Center, Los Angeles, CA (RE: IRB #12-032; RE: IRB #14-005) and Arrowhead Regional Medical Center, Colton, CA (Protocol #14-15). Moreover, the researchers obtained approval from the chief executive officer of each hospital prior to approaching the ICU nurses. All nurses that consented to participate signed a written consent
form.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyses during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Author’s contributions

AF (PI) participated in research design; performance of the research; data analysis; writing and revising the paper; and contributed with the research tool ATODAS (Swedish version of the questionnaire). MS participated in performance of the research; data analysis; writing and revising the paper. RA participated in performance of the research; data analysis of step three to five (Figure 1); writing and revising the paper. SC participated in performance of the research; data analysis of step six, the Delphi procedure (Figure 1); writing and revising the paper. TM participated in performance of the research; and writing and revising the paper. BF participated in research design; performance of the research; data analysis; and writing and revising the paper. All authors read and approved the final manuscript.

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Figures
Step 1: Initial translation by an English-speaking interpreter.

Step 2: Back-translation by a Swedish-speaking interpreter.

Step 3: Review and synthesis of these translations by an international committee of experts.

Step 4: Expert panel of seven designated ICU nurses rating the instrument; Followed by data analysis I (I-CVI and S-CVI).

Step 5: Test and retest of the prefinal version with two weeks in between; Followed by data analysis II (ICC, $\kappa_{weight}$, sign test, and Cronbach’s alpha coefficient). In total, 50 ICU nurses from two hospitals in the greater Los Angeles area participated in the test and retest.

Step 6: A preselected panel (N=15) performed an additional Delphi technique procedure for items that showed an ICC <0.70 in step five. The researchers also made adjustments guided by the panel’s feedback.

The cross-cultural adaptation procedure in six steps (according to Brislin (18) and Delphi technique (23) for translating the 51-item Flodén ATODAS [Swedish version] to the 46-item Flodén ATODAI [North American version].