Achilles tendinopathy: new insights in cause of pain, diagnosis and management
van Sterkenburg, M.N.

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Chapter 3

Reliability and validity of the Dutch VISA-A questionnaire for Achilles tendinopathy and applicability to non-athletes

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IN Sierevelt
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IV van Dalen
D Haverkamp
CN van Dijk

Submitted
**ABSTRACT**

**Background**
In 2001, the Victorian Institute of Sports Assessment developed a self-administered questionnaire evaluating symptoms and their effect on physical activity for patients with Achilles tendinopathy. It has proven to be an effective outcome questionnaire in various languages. The aim of this project is to translate and validate the VISA-A questionnaire into the Dutch language (VISA-A-NL) and to assess its applicability to non-athletes.

**Methods**
After translation according to a forward-backward protocol, 101 patients with complaints of Achilles tendinopathy were asked to fill out the VISA-A-NL at two time points together with VAS, FAOS and SF-36 questionnaires. Reliability, internal consistency, construct- and content validity were tested.

**Results**
The VISA-A-NL showed high reliability (0.97 (95% CI 0.95-0.98)). Crohnbach’s alpha (internal consistency) was 0.80. It increased to 0.88 without activity domain. Correlation with other questionnaires was moderate or poorer.

**Conclusion**
The VISA-A-NL proved to be an excellent evaluation instrument for the Dutch physician. If applied to non-athletes, using a modified score (questions 1-6) should be considered.
INTRODUCTION

Achilles tendinopathy is a major cause of chronic pain and disability. This may lead to sub-optimal overall health as physical inactivity is a risk factor for cardiovascular disease. Many studies have been published on a magnitude of treatments for Achilles tendinopathy, but prospective series on the outcome are lacking. One of the factors limiting the quality of research may be the absence of standardised outcome measures to evaluate the outcome of treatment. A patient’s subjective assessment of treatment outcome such as pain, functional ability and satisfaction fulfils the criteria of being valid, reliable and sensitive to change if gathered by a correctly designed and tested patient-centred questionnaire. The Victorian Institute of Sports Assessment- Achilles (VISA-A) questionnaire was created in 2001 to assess clinical severity for patients with Achilles tendinopathy. It is a self-administered questionnaire evaluating symptoms and their effect on physical activity, and displayed reliability and construct validity. Subjective scoring systems can be used in countries other than the ones in which they were developed if translated and validated for a specific language and population. The VISA-A has been translated into Swedish, Italian, and German and proved to be able to determine the clinical severity and provide information about the effect of the management of patients with Achilles tendinopathy in these languages. The aim of this project is to translate and validate the VISA-A questionnaire into the Dutch language (VISA-A-NL) to provide a valid questionnaire for the Dutch population. Moreover, the questionnaire seems to be designed only for athletes as 40% of the points account for activity. As approximately 30% of patients with complaints of Achilles tendinopathy have a sedentary lifestyle, applicability to non-athletes is also evaluated.

METHODS

Translation procedure
A Dutch translation was made using a forward-backward translation protocol according to the guidelines of Guillemin and co-workers. Three people independently translated the English version of the VISA-A questionnaire to Dutch. All three were in the medical field, and had English as a second language. One independent native speaker, not active in the medical field translated this Dutch version back into English. Discrepancies were discussed and adjusted for the final Dutch questionnaire (VISA-A-NL, see addendum). It was assumed that no major cultural differences in lifestyle exist between the Dutch and Canadian population, and that therefore cultural adaptation of the questionnaire was not required.
**Patients**

104 consecutive patients were included from the outpatient clinic of 3 participating Dutch hospitals of whom 47% were female. Mean age was 48.5 years (SD 11.6), 79 (76%) patients were athletes, 25 (24%) were non-athletes.

All patients had complaints of Achilles tendinopathy (including midportion- and insertional tendinopathy, paratendinopathy and retrocalcaneal bursitis).

They were clinically assessed and an AOFAS was taken by the consulting physician. All patients were asked to fill out 2 sets of questionnaires; the first (A= VISA-A-NL, VAS pain, VAS function, FAOS, SF-36) at the day of consultation, the second (B= VISA-A-NL) they were to complete 4-5 days later. Additionally they were asked whether their complaints had changed since the first assessment.

**Questionnaires**

The original English version of the VISA-A questionnaire as designed by Robinson and co-workers contains eight questions that cover three domains; pain (questions 1-3), function (questions 4-6), and activity (questions 7-8). Scores are summed to yield a total of 100 points in an asymptomatic subject: questions 1-7 score a maximum of 10 points each; question 8, on sporting activity, carries a maximum of 30. Pain on undertaking sports will automatically lead to a loss of 10-20 points.

Since question 7 and 8 refer to sport activities (accounting for 40% of points) and the study population contained both athletes and non-athletes, we modified the VISA-A score by deleting both questions and investigated the psychometric properties of both the VISA and the modified VISA.

The FAOS is a 42-item questionnaire divided into 5 subscales: pain (9 items), other symptoms (7 items), activities of daily living (17 items), sport and recreation function (5 items), foot and ankle related quality of life (4 items). Each question can be scored on a 5-point Likert scale (0-4) and each of the five subscale scores is calculated as the sum of the items included. Raw scores are then transformed to a 0-100, worst to best score.

The SF-36 is a self-administered, generic HRQL (health related quality of life) instrument. It comprises 36 items across 8 dimensions (physical functioning, role limitation due to physical problems, bodily pain, perception of general health, energy and vitality, social functioning, role limitation due to emotional problems, and mental health). The 8 dimensions of the SF-36 score are calculated on a 0-100 worst to best scale.

The VAS is a 100 mm visual analogue scale and is used to determine the seriousness of pain and functional problems.

In 1994 the American Orthopaedic Foot and Ankle Society (AOFAS) developed a questionnaire to provide a standard method for reporting clinical status of the ankle and foot. The AOFAS- ankle and hindfoot clinical rating system combines both subjective and objective fac-
tors into numerical scales to describe function, alignment and pain. Since objective aspects are incorporated, this questionnaire has to be completed by the investigator.

Testing
When a questionnaire is developed or translated, the most important consideration is that it must be able to accurately measure that for which it is designed. To evaluate the psychometric properties of the VISA-A-NL, both reliability and validity were assessed.

Reliability
Reliability is defined as the extent to which patients can be distinguished from each other, despite measurement errors.

Test-retest reliability refers to the repeatability of the test and measures the extent to which the same results are obtained on repeated administration when no change in physical functioning has occurred. To determine the test-retest reliability, a second VISA-A-NL (B) questionnaire was given to all patients; 67 patients responded. In 15 patients, complaints had changed at re-test. Test-retest reliability was therefore assessed in 52 patients, using the intra-class coefficient (ICC agreement, two-way random effects model). An ICC >0.75 was considered good. A t-test was performed to determine the presence of a systematic difference between the first and second assessment. Additionally, Standard Error of Measurement (SEM) was calculated as the square root of the within subject variance. The Smallest Detectable Change (SDC) was calculated as 1.96 x √2 x SEM. The SDC is the smallest measurement change that can be interpreted as real change.

Internal consistency of the scale is the extent to which the items are inter-correlated and cover the same construct (homogeneity of the scale). To evaluate the internal consistency of the VISA-A Cronbach’s alpha was calculated. A Cronbach’s alpha of 0.7 was considered to represent an acceptable degree of internal consistency, 0.8 was considered as good and 0.9 as excellent internal consistency.

Validity
Validity relates to the ability of a questionnaire to measure to outcome parameter of interest.

Construct validity was tested by determining the association between the VISA-A-NL questionnaire and the FAOS, SF-36, VAS-scores for pain and function, and the AOFAS, using Pearson correlation coefficients. We evaluated convergent and divergent validity by hypothesizing that correlation coefficients between the VISA-A-NL (with and without the activity questions) and VAS pain, FAOS pain, -symptoms, -sport and recreation and SF-36 bodily pain and physical functioning would be higher than correlations with the other domains.

Content validity examines the extent to which all concepts of interest are adequately represented by the items in the questionnaire. It was evaluated by assessing distribution...
and floor and ceiling effects of the VISA-A-NL. These are considered to be present if more than 15% of responders achieve the lowest or highest possible score \(^{24}\).

**Statistics**
Statistical analysis was performed using PASW statistics 18.0 software (SPSS Inc., Chicago, IL). A p-value of less than 0.05 was considered statistically significant.

**RESULTS**

Of 104 participants, 11 questionnaires were filled out incompletely or erroneously and therefore excluded from analysis (n=93).

**Reliability**

Of 93 patients, 52 (56%) returned the second set of questionnaires. The ICC\(_{\text{agreement}}\) of the questionnaire was 0.97 (95% CI: 0.95-0.98) and Crohnbach’s alpha was 0.78 for the entire study population (table 1). A statistically significant difference between the two assessments was not observed for both versions of the VISA-A-NL in athletes nor in non-athletes (0.29<p<0.67).

<table>
<thead>
<tr>
<th>Table 1. Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletes (n=39)</td>
</tr>
<tr>
<td>Non-athletes (n=13)</td>
</tr>
<tr>
<td>Total (n=52)</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>ICC VISA total</strong> (95% CI)</td>
</tr>
<tr>
<td>0.95 (0.91-0.97)</td>
</tr>
<tr>
<td><strong>ICC VISA modified</strong> (95% CI)</td>
</tr>
<tr>
<td>0.96 (0.92-0.98)</td>
</tr>
<tr>
<td><strong>SEM VISA total</strong></td>
</tr>
<tr>
<td>4.41 (4.4%)</td>
</tr>
<tr>
<td><strong>SEM VISA modified</strong></td>
</tr>
<tr>
<td>2.64 (4.4%)</td>
</tr>
<tr>
<td><strong>SDC VISA total</strong></td>
</tr>
<tr>
<td>12.21 (12.2%)</td>
</tr>
<tr>
<td><strong>SDC VISA modified</strong></td>
</tr>
<tr>
<td>7.32 (12.2%)</td>
</tr>
</tbody>
</table>

ICC= Intra Class Correlation coefficient, SEM = Standard Error of Measurement, SDC = smallest detectable change

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletes (n=71)</td>
</tr>
<tr>
<td>Non-athletes (n=22)</td>
</tr>
<tr>
<td>Total (n=93)</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td><strong>Crohnbach’s Alpha VISA total</strong></td>
</tr>
<tr>
<td>0.72</td>
</tr>
<tr>
<td><strong>Crohnbach’s Alpha VISA modified</strong></td>
</tr>
<tr>
<td>0.83</td>
</tr>
</tbody>
</table>
Validity

Pearson correlation coefficients of the VISA-A-NL with the other questionnaires are shown in table 2. The subscale ‘SF-36 physical functioning’ correlated well with the VISA-A-NL questionnaire, both with and without activity domain. Most other physical domains correlated moderately but, the subscales of FAOS quality of life showed poor correlation with VISA-A. Poor correlation was also observed for the psychological domains (SF-36 social functioning, mental health, role emotional, vitality, general health perception).

The mean scores of the VISA-A-NL questionnaire was 52.4 (SD 19.7) and 22.0 (SD 15.7) for athletes and non-athletes, respectively. The mean scores of the modified VISA-A-NL questionnaire was 36.2 (SD 13.9) and again 22.0 (SD 15.7) for athletes and non-athletes, respectively.

<table>
<thead>
<tr>
<th></th>
<th>VISA-A Total (n=71)</th>
<th>VISA-A Modified (n=71)</th>
<th>VISA-A Modified Non-athletes (n=22)</th>
<th>VISA-A Total entire population (n=93)</th>
<th>VISA-A Modified entire population (n=93)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS Pain</td>
<td>-0.54*</td>
<td>-0.58*</td>
<td>-0.39</td>
<td>-0.54*</td>
<td>-0.57*</td>
</tr>
<tr>
<td>VAS Function</td>
<td>0.52*</td>
<td>0.51*</td>
<td>0.44*</td>
<td>0.50*</td>
<td>0.52*</td>
</tr>
<tr>
<td>AOFAS</td>
<td>0.48*</td>
<td>0.46*</td>
<td>0.31</td>
<td>0.56*</td>
<td>0.50*</td>
</tr>
<tr>
<td>FAOS Symptoms</td>
<td>0.45*</td>
<td>0.52*</td>
<td>0.53*</td>
<td>0.58*</td>
<td>0.60*</td>
</tr>
<tr>
<td>FAOS Pain</td>
<td>0.53*</td>
<td>0.56*</td>
<td>0.52*</td>
<td>0.58*</td>
<td>0.60*</td>
</tr>
<tr>
<td>FAOS ADL</td>
<td>0.56*</td>
<td>0.55*</td>
<td>0.47*</td>
<td>0.59*</td>
<td>0.58*</td>
</tr>
<tr>
<td>FAOS Sport</td>
<td>0.56*</td>
<td>0.61*</td>
<td>0.43*</td>
<td>0.55*</td>
<td>0.59*</td>
</tr>
<tr>
<td>FAOS QOL</td>
<td>0.29*</td>
<td>0.33*</td>
<td>0.14</td>
<td>0.38*</td>
<td>0.37*</td>
</tr>
<tr>
<td>SF-36 Physical function</td>
<td>0.55*</td>
<td>0.63*</td>
<td>0.66*</td>
<td>0.70*</td>
<td>0.71*</td>
</tr>
<tr>
<td>SF-36 Role physical</td>
<td>0.13</td>
<td>0.12</td>
<td>0.58*</td>
<td>0.31*</td>
<td>0.32*</td>
</tr>
<tr>
<td>SF-36 Bodily pain</td>
<td>0.31</td>
<td>0.40*</td>
<td>0.46*</td>
<td>0.49*</td>
<td>0.51*</td>
</tr>
<tr>
<td>SF-36 Social functioning</td>
<td>0.01</td>
<td>-0.04</td>
<td>0.29</td>
<td>0.27*</td>
<td>0.21</td>
</tr>
<tr>
<td>SF-36 Mental health</td>
<td>-0.11</td>
<td>-0.07</td>
<td>0.39</td>
<td>0.21</td>
<td>0.20</td>
</tr>
<tr>
<td>SF-36 Role emotional</td>
<td>-0.06</td>
<td>0.02</td>
<td>0.65*</td>
<td>0.37*</td>
<td>-0.09</td>
</tr>
<tr>
<td>SF-36 Vitality</td>
<td>-0.26</td>
<td>-0.25</td>
<td>0.26</td>
<td>-0.05</td>
<td>-0.09</td>
</tr>
<tr>
<td>SF-36 General health perception</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.28</td>
<td>0.25*</td>
<td>0.21</td>
</tr>
<tr>
<td>SF-36 Physical component scale</td>
<td>0.43*</td>
<td>0.47*</td>
<td>0.36</td>
<td>0.52*</td>
<td>0.51*</td>
</tr>
<tr>
<td>SF-36 Mental component scale</td>
<td>-0.34*</td>
<td>-0.32*</td>
<td>0.49*</td>
<td>0.04</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Floor and ceiling effects were not observed in both versions of the questionnaire, as only 1 subject (1%) scored 0 points, nobody scored 100 points, and 1 patient scored the maximum of 60 points in the modified VISA-A score.

**DISCUSSION**

The aim of this study was to translate the original VISA-A questionnaire on the subjective complaints of patients with Achilles tendinopathy into the Dutch language, to validate it, and to assess its applicability to non-athletes.

The translation procedure did not create any problems, since the items are universal and there is no large cultural difference between Dutch and Canadian patients.

Reliability of the translation was excellent, with a statistically not significant difference between assessments. This outcome may be explained by the fact that, as the procedure for the Dutch Oxford 12-item knee questionnaire taught us, we introduced a question if complaints had changed between assessments. 15/67 patients (22%) answered this question with ‘yes’, and therefore they were excluded from reliability testing.

The smallest detectable change (SDT) in this study indicates that under stable condition, the VISA-A score can vary up to 12 points. For clinical studies, this implies that clinical changes can only be detected if they exceed the 12 points.

The study questionnaire showed good internal consistency (Crohnbach’s alpha 0.80), but there indeed was a negative effect of the activity domain. Subanalysis without these questions showed an increase of Crohnbach’s alpha to 0.88. However, when measuring the effect of a treatment in a mixed group of athletes and non-athletes, the effect of treatment could be underestimated. For example, an athlete can score 0 points with question 7 and 8 before treatment as complaints withhold him/her from being sports active. After treatment, the athlete is complaint-free and scores 100 points. The non-athlete also scores 0 points for questions 7 and 8 before treatment, and is also complaint-free after treatment. However, he/she will never score higher than 60 points as question 7 and 8 will not be answered differently between assessments. The effect of treatment, when using the VISA-A score to measure outcome, is therefore underestimated in non-athletes.

When choosing the VISA-A questionnaire for a mixed population of athletes and non-athletes, deleting questions 7 and 8 can be considered, since the psychometric properties of the modified VISA-A were comparable with the original version.

Generally Pearson correlation coefficients were higher for physical than psychological components. Convergent and divergent validity is confirmed as correlation coefficients were higher for the physical domains of the questionnaires. However, for non-athletes correlation with socio-emotional components was also higher. This could imply that physical restrictions
in this subgroup with chronic Achilles tendinopathy have greater emotional and social consequences than in athletes. Noticeable is the moderate correlation of VISA-A with VAS, which is a validated subjective outcome measure frequently used for scientific means.

Low correlations can be explained by the fact that none of the questionnaires except for the VISA-A were validated for Achilles tendinopathy. Initially it was intended to do so, but this study aim was departed to not further enlarge patient burden as many of these questionnaires are extensive. Given the laborious inclusion of 104 patients in 3.5 years and 56% response rate to both assessments this was well decided. This was also why responsiveness was not tested.

**CONCLUSION**

The VISA-A-NL questionnaire seems suitable for use in athletes. However, in a combined population of athletes and non-athletes results will become incomparable as the highest possible score for non-athletes is 40 points lower than for non-athletes. Psychometric properties of the VISA-A-NL, without questions 7 and 8, are satisfactory for both athletes and non-athletes. It is therefore proposed that the modified VISA-A-NL questionnaire is considered in a mixed population of patients with Achilles tendinopathy.
REFERENCE LIST


21. Silbernagel KG, Thomee R, Karlsson J. Cross-cultural adaptation of the VISA-A
questionnaire, an index of clinical severity for patients with Achilles tendinopathy, with reliability, validity and structure evaluations. BMC Musculoskelet Disord 2005; 6:12.


Addendum: Dutch translation of VISA-A questionnaire

VISA-A-NL VRAGENLIJST

Geboortedatum: / / Datum:

Naam:

IN DEZE VRAGENLIJST STAAT HET BEGRIP 'PIJN' SPECIFIEK VOOR PIJN IN DE OMGEVING VAN UW ACHILLESPEES

1. Hoeveel minuten heeft u stijfheid in de omgeving van uw achillespees nadat u 's ochtends bent opgestaan?

   100 min of langer

   0 min

   PUNTEN

2. Heeft u, na het 'op gang komen' 's ochtends, pijn bij het maximaal rekken van de achillespees op de rand van een verhoging (bijvoorbeeld traptrede)? (met de knie gestrekt)

   Extreem hevige pijn

   geen pijn

   PUNTEN

3. Volgt er pijn in de eerste 2 uur na een 30 minuten durende wandeling op een vlakke ondergrond? (Als u door de pijn geen 30 minuten kunt lopen op een vlakke ondergrond, vul da '0' in bij deze vraag).

   Extreem hevige pijn

   geen pijn

   PUNTEN

4. Heeft u pijn wanneer u normaal de trap af zou lopen?

   Extreem hevige pijn

   geen pijn

   PUNTEN

5. Heeft u pijn tijdens of direct nadat u 10 keer (op één been) op uw tenen gestaan heeft op een vlakke ondergrond?

   Extreem hevige pijn

   geen pijn

   PUNTEN

6. Hoe vaak kunt u hinkelen zonder pijn?

   0 of meer

   PUNTEN

7. Doet u op dit moment aan sport of een andere vorm van lichaamsbeweging?

   Helemaal niet

   0
Aangepast trainingsschema/ trainingsniveau en aangepaste competitie

Volledige training en volledige competitie, maar op lager niveau dan voor het ontstaan van de klachten

Competitie en training op hetzelfde of hoger niveau dan voor aanvang van de klachten

<table>
<thead>
<tr>
<th>PUNTEN</th>
<th>0</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>30</th>
</tr>
</thead>
</table>

8. Van de volgende vraag dient u alleen A, B OF C te beantwoorden.

* U vult vraag A in indien: u GEEN pijn ervaart tijdens sportactiviteiten die de achillespees belasten

* U vult vraag B in indien: u tijdens sportactiviteiten die de achillespees belasten pijn ervaart waarbij u de sportactiviteit NIET hoeft te staken

* U vult vraag C in indien: u tijdens sportactiviteiten die de achillespees belasten een zodanige pijn ervaart dat u uw activiteit MOET staken.

A. Indien u geen pijn heeft tijdens sportactiviteiten die de achillespees belasten, hoe lang bent u dan in staat te sporten/ trainen?

<table>
<thead>
<tr>
<th>NIET</th>
<th>1-10 min</th>
<th>11-20 min</th>
<th>21-30 min</th>
<th>&gt;30 min</th>
<th>PUNTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>14</td>
<td>21</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

OF B. Indien u enige pijn heeft tijdens sportactiviteiten die de achillespees belasten maar waarbij u de activiteit wel af kunt maken, hoe lang bent u dan in staat te sporten/trainen?

<table>
<thead>
<tr>
<th>NIET</th>
<th>1-10 min</th>
<th>11-20 min</th>
<th>21-30 min</th>
<th>&gt;30 min</th>
<th>PUNTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>10</td>
<td>14</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

OF C. Indien u tijdens sportactiviteiten die de achillespees belasten een zodanige pijn heeft dat u de activiteit moet stoppen, hoe lang bent u dan toch in staat geweest te sporten/trainen?

<table>
<thead>
<tr>
<th>NIET</th>
<th>1-10 min</th>
<th>11-20 min</th>
<th>21-30 min</th>
<th>&gt;30 min</th>
<th>PUNTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

TOTALE SCORE (        /100)%