

**THE VISA-A QUESTIONNAIRE: A VALID AND RELIABLE INDEX OF THE
CLINICAL SEVERITY OF ACHILLES TENDINOPATHY**

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ABSTRACT

Objective—There is no disease-specific, reliable and valid clinical measure of Achilles tendinopathy. We aimed to develop and test a questionnaire-based instrument that would serve as an index of severity of Achilles tendinopathy.

Methods—We used item generation, item reduction, item scaling and pretesting to develop a questionnaire to assess the severity of Achilles tendinopathy. The final version consisted of 8 questions that measured the domains of pain, function in daily living and sporting activity. Results range from 0-100 where 100 represents the perfect score. We then tested its validity and reliability in a population of non-surgical patients with Achilles tendinopathy (n=45), pre-surgical patients with Achilles tendinopathy (n=14) and in two normal control populations (total n=87)

Results— The VISA-A questionnaire had good test-retest ($r=0.93$), intra-rater (3 tests, $r=0.90$) and inter-rater ($r=0.90$) reliability as well as good stability when compared one week apart ($r=0.81$). The mean (95% CI) VISA-A score in the non-surgical patients was 64 (59-69), in pre-surgical patients 44 (28-60) and in control subjects it exceeded 96 (94-99). Thus, the VISA-A score was higher in non-surgical than in pre-surgical patients and higher in control subjects than in both patient populations ($p<0.00$).

Conclusions—The VISA-A questionnaire is reliable and displayed construct validity when means were compared in patients with a range of severity of Achilles tendinopathy and control subjects. The continuous numerical result of the VISA-A questionnaire has the potential to provide utility in both the clinic setting and research. The test is not designed to be diagnostic. Further studies are needed to determine whether VISA-A score predicts prognosis.

Key Terms: Achilles; tendinopathy; tendinitis; outcome; questionnaire

INTRODUCTION

Achilles tendinopathy is a major cause of prolonged pain and disability in sportspeople and those who undertake an active lifestyle such as hiking and walking¹⁻³. It may cause between 2% and 16% of people to abandon playing^{1 2 4 5}. In some settings, 20-30% of patients who present with this condition require surgical treatment⁶⁻⁸. Furthermore, as physical inactivity is a risk factor for many multi-system diseases⁹, Achilles tendinopathy can lead to suboptimal overall health, not just sporting inconvenience.

There have been many studies published on the subject of Achilles tendinopathy, but there remain very few prospective studies of treatment outcome^{4 10-13}. One factor limiting efficacy studies in Achilles tendon research is the lack of a standardised outcome measure by which to evaluate treatment of Achilles tendinopathy¹⁴.

Several quantitative tests of ankle function¹⁵ have been used to measure outcome in Achilles tendinopathy⁴ and there are tests to evaluate Achilles tendon function after complete rupture¹⁶. However, condition-specific numerical scales generally have greater sensitivity and specificity than do general-purpose scales¹⁷⁻²⁰. The inventor of the much-used Lysholm scale for knee instability emphasised the need for 'different or modified scoring systems for the follow-up of patients with different diagnoses'¹⁸. A specific scale for patients with patellar tendinopathy¹⁹ has proven useful in numerous peer-reviewed

studies ²¹⁻²³. Therefore, the aim of this study was to develop and test a questionnaire-based instrument to measure the severity of Achilles tendinopathy.

METHODS

To develop the questionnaire we performed item generation, item reduction, item scaling and pretesting as outlined below. We then tested its validity and reliability in clinical and control populations. Ethics approval was obtained from the University of British Columbia Ethics Committee.

Item generation

The Victorian Institute of Sport tendon study group (Melbourne, Australia) first developed an index of severity for patellar tendinopathy, ¹⁹. We used this as a template from which to develop a questionnaire specifically for use in Achilles tendinopathy. A literature review was done to find items that would be appropriate for inclusion. In addition, colleagues were consulted to find unpublished items used in clinical practice. The second step involved interviewing colleagues with expertise in the area of Achilles tendinopathy. Finally, patients were informally interviewed regarding symptoms they felt important.

Item reduction

A focus group consisting of the principal questionnaire developer, a primary care sports medicine physician and two physiotherapists reviewed the items generated. They decided that three domains – pain, functional status and activity were necessary and they allocated three questions to each domain (Table 1) ²⁴⁻²⁷

Item scaling

A visual analog scale (VAS) is more accurate and sensitive than categorical verbal scales^{25 28-32}. The first 6 questions utilise a VAS so that the patient may report magnitude of a continuum of subjective symptoms. Activity is best measured using a categorical rating system based on an incremental range of values³³. Thus, the final two questions used a categorical rating scale.

Pretesting

Prior to being shown the working version of the questionnaire, a group of fifteen clinicians expert in the field of tendon injuries were asked to identify questions they felt were important in assessing the severity of Achilles tendon disorders. The group comprised 8 physiotherapists, 4 primary care physicians, one orthopaedic surgeon and one rehabilitation specialist.

The same 15 participants were then shown the VISA-A score and asked to evaluate the questionnaire. They were specifically asked if there were any questions they would add, delete, or modify. Fourteen of the participants had no questions to add, none wanted any deleted or modified.

Weighting

The questionnaire tests the three significant domains of dysfunction with three questions for each (question 8 is effectively 2 questions, one relating to pain with activity and the other to duration of activity). By removing redundancies and eliminating items of less

importance weighting of the remaining items may be the same (each question is scored out of 10) without affecting the value of the questionnaire ²⁰. The final version of the questionnaire was called the Victorian Institute of Sport Assessment-Achilles questionnaire (VISA-A) (Table 1).

Reliability and validity testing

We administered the VISA-A questionnaire to four populations. Group 1—non-surgical patients (n=45), were those who attended a primary care sports medicine clinic. Group 2—surgical patients (n=13), were those who had been referred to a sports orthopaedist for tendon surgery. Group 3—university students (n=63), represented a convenience sample of young normally active people to serve as a control group and Group 4—members of a running club (n=24), represented active, but non-injured individuals whose age matched the patient groups. As imaging does not provide a gold standard for tendon disorders, diagnosis was by assessment of 2 expert clinicians as has been justified in other tendon studies ³⁴⁻³⁶. For inclusion into the study, subjects in all groups had to be adults older than 18 who were able to give written informed consent. For groups 1 and 2 subjects had to have a diagnosis of Achilles tendinosis, paratendinitis or partial rupture with or without a retrocalcaneal or Achilles bursitis. For groups 3 and 4 subjects had to belong to the two groups as defined. Women who were pregnant or nursing were excluded, as were patients with a total rupture of the Achilles tendon. Subjects with previous or current Achilles tendon symptoms, but who were not currently undergoing

treatment for the condition, were not excluded from the control groups as these groups were designed to reflect the populations.

We tested construct validity in two ways. First, the 45 non-surgical patients in Group 1 completed the VISA-A test and two other generic tendon grading systems^{37 38} at one visit. Second, we tested the VISA-A scale in both surgical patients (Group 2) who are generally considered to have the most significant degree of disease, and two control populations (Groups 3 and 4).

All patients in Group 1 attended our research centre on two occasions one week apart and completed the VISA-A questionnaire 3 times to test its reliability. At either the first or second visit, patients completed the questionnaire twice with a 60-minute interval to measure test-retest reliability. Short-term reliability was measured by comparing VISA-A scores at one-week follow-up with the baseline measure. To test inter-tester reliability, the chief investigator (JR) and one of two other trained researchers administered the VISA-A questionnaire in a subset of 16 subjects. We also tested inter-tester and test-retest reliability studies in a control group (Group 4). **We did not test reliability in the surgical patients as they travelled to a tertiary referral centre and were not available for the one-week followup (short-term stability) measure.**

Statistical methods

All data were entered on a personal computer and results analysed using SPSS Version 7.0. Descriptive data are reported as mean, standard deviation and 95% confidence

interval (95% CI). Correlation of VISA-A scores in Group 1 patients with the other scoring scales was by Spearman's rank correlation coefficient for nonparametric data, as the data were not normally distributed. Reliability data were analysed by Pearson's r as these data were normally distributed. VISA-A score in the various study groups were compared using single factor analysis of variance (ANOVA) with Tukey's post-hoc test.

RESULTS

Subjects

Descriptive data concerning study participants are shown in Table 2. Twelve Group 1 non-surgical patients (24 tendons) had bilateral symptoms and 33 patients had unilateral symptoms, giving a total of 57 symptomatic tendons and 33 asymptomatic tendons. As the presence of Achilles tendon pain was not an exclusion from any group in the study 2 university students and 3 running club subjects reported pain in the Achilles tendon.

Questionnaire

The final version of the VISA-A questionnaire contained eight questions that covered the three domains of pain (questions 1- 3), function (questions 4-6) and activity (questions 7 & 8.) Questions one to seven are scored out of 10 and question 8 carries a maximum of 30. Scores are summed to give a total out of 100. An asymptomatic person would score 100 (Table 1). **When a participant answers question 8 he or she must answer only part A, B or C. If the participant has pain when undertaking sport it means that he or she automatically loses at least 10, and possibly 20 points.**

Reliability

Reliability of the VISA-A questionnaire is summarised in Table 3. There was no difference in scores whether the test-retest questionnaires were done at the first visit or at the second visit. ($p=0.58$).

Validity

The construct validation is illustrated (Figures 1 and 2). The VISA-A score was significantly correlated to both Percy and Conochie's grade of severity (Spearman's $\rho=0.58$; $p<0.01$) and to that of Curwin and Stanish (Spearman's $\rho=-0.57$; $p<0.001$).

The second part of construct validity testing compared scores in various patient and control groups. Comparing the VISA-A scores of all 4 groups revealed that the Achilles tendinopathy patient groups' (both Group 1 and 2) mean VISA-A scores were significantly lower ($p=0.00$) than those of the control groups (both Group 3 and 4) (Figure 3). Furthermore, patients with Achilles tendinopathy in Group 1 (non-surgical patients) had a significantly higher mean VISA score than patients in Group 2 (pre-surgical patients) (Figure 3).

DISCUSSION

To be in a position to practice evidence-based medicine, the sports-medicine community must conduct studies with objective outcome measures. To date there is no tool designed for this purpose in patients with Achilles tendinopathy. The present study suggests that the VISA-A questionnaire may fill this void, as it is valid, reliable and user-friendly.

Strengths of the VISA-A questionnaire

The VISA-A questionnaire displayed construct validity when used in 2 populations of patients with Achilles tendinopathy and control subjects. The questionnaire avoids the redundant components of non-specific scoring systems such as that developed for hind foot problems by the American Orthopaedic Society ^{17 27}, and those devised for Achilles tendon rupture ^{39 40}. The VISA-A questionnaire also compares favourably with two generic tendon-grading systems ^{37 38} that use a categorical rating scale. There are no published validation or reliability data for either of these scales and categorical scales have been criticised for being insensitive to subtle changes in a clinical condition ^{41 42}.

We believe that the questionnaire's excellent reliability reflects the uncomplicated nature of the questions and the use of a visual analogue scale that has proven reliable in questionnaires ⁴³. Because the questionnaire can be self-administered with a minimum of investigator assistance it avoids some potential for observer bias that can diminish inter-observer reliability.

As well as being valid and reliable, the VISA-A questionnaire is easy to use. It generally takes less than 5 minutes to administer, even in patients with chronic and severe symptoms. Also, we found that a medical student and a sports medicine physician obtained virtually identical results so specialised training is not required to administer the

test. In clinical practice, we have found that patients who have had the questionnaire administered once by an investigator or clinician can easily complete the questionnaire alone on future occasions. Although this aspect of questionnaire use was not tested formally in the present study, we believe the instrument has the potential to be self-administered after the baseline test.

The continuous numerical result of the VISA-A questionnaire is ideal for comparing patient's progress in the clinical setting. As tendinopathy takes some time to resolve, weeks can elapse between physician visits. The VISA-A score could be used to monitor patients' progress. However, until the VISA-A scale is tested in longitudinal studies we can only suggest it has potential for use in this way.

In the research setting, this index of severity of Achilles tendinopathy could prove very useful in descriptive studies as well as providing an outcome measure in intervention studies. **However, we consider that any such studies would be greatly strengthened if they were carried out in homogenous groups of athletes (e.g., runners only, volleyball players only) as the VISA-A score has not yet been shown to respond equally to change in Achilles tendon function in different sports.** Nevertheless, our data show it is suitable for patients being managed both conservatively and surgically. Because the test requires no equipment and is not subject to observer bias it may prove suitable for as part of the data collected in multi-centre studies.

Clinically-relevant methodological issues when administering the VISA-A (new subhead)

We note in question 8 that participants answer only part A, B or C. However, we found that after we explained this concept to participants they had no trouble understanding it subsequently. The question is scored in this way to differentiate patients who have a certain functional level without pain, and those who perform to a similar level of function despite pain. Clearly the latter is not as close to perfect as the former, and the VISA-A score reflects that because of the three stems of question 8.

As a corollary of this point, the recreational person who has Achilles tendinopathy, or for example, an archer, could only score a maximum of 70 on the VISA-A score as outlined. In this clinical setting, once the patient reached 70, both the patient and the doctor would realise that represented that the patient was cured. In randomised controlled trials where the VISA-A is used as an outcome measure, researchers could standardised the score as a percentage, or, as is most usual, report change, either in absolute units or as a percentage of baseline. Thus, just as knee extension strength (a measurement) is sometimes used as a raw score (in kg), adjusted for height in the data (in kg/cm), or corrected for in regression, so the VISA score has the potential to be used in a variety of ways depending on the setting.

Although there was a statistically significant difference between population mean VISA-A scores in the non-surgical and surgical patient groups, this does not mean that the VISA-A score has any role to play in the decision as to whether or not surgery is indicated. The only indication for surgery in Achilles tendinopathy is failure of conservative management and this remains a clinical decision to be made between doctor and patient.

Limitations of the VISA-A questionnaire

We emphasise that the VISA-A questionnaire is an index of the severity of a clinically diagnosed condition – it is not a diagnostic tool. Thus, other conditions that influence lower limb function (such as ankle sprain) will reduce a patient's VISA-A score.

Furthermore, limitation of function (such as severe sciatica) limits the subject's ability to score well in question 8, even though the Achilles tendon may be uninjured. This has not proven a problem in the patellar tendon research²¹⁻²³ that used the similarly designed VISA questionnaire for that condition (VISA-P).

A limitation of the present study is that we do not have longitudinal change data – so cannot comment on the sensitivity of the VISA-A to detect change with intervention. This aspect of the instrument will be evaluated in a future study. **Further studies should also test the reliability and the short-term stability of the VISA score in the setting of a surgical population. Nevertheless, we have no reason to suspect that it would be inferior to the reliability data reported here.**

We conclude that the VISA-A questionnaire provides a valid, reliable, and user-friendly index of the severity of Achilles tendinopathy. Although the limited time for consultation in routine clinical practice means that the main role of this tool is likely to be as an outcome measure in treatment studies, the VISA-A scale can be easily administered in clinical practice. Further studies are needed to determine whether VISA-A score predicts prognosis.

Take home message: There is a need for a quantitative index of pain and function in patients with Achilles tendinopathy. The VISA-A questionnaire is a valid, reliable and easy-to-administer measure of the severity of Achilles tendinopathy and appears suitable for both clinical rating and quantitative research.

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Figure Legends

Figure 1. Scatter Plot of VISA-A score compared to modified Percy and Conochie's grade of severity

Figure 2. Scatter Plot of VISA-A score compared to Curwin and Stanish's grade of severity

Figure 3. Box Plot showing VISA-A scores among the 4 groups of participants in this study

Table 1. The VISA-A questionnaire: An index of the severity of Achilles tendinopathy

IN THIS QUESTIONNAIRE, THE TERM PAIN REFERS SPECIFICALLY TO PAIN IN THE ACHILLES TENDON REGION

1. For how many minutes do you have stiffness in the Achilles region on first getting up?

100 mins

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 0 mins

0 1 2 3 4 5 6 7 8 9 10

POINTS

2. Once you are warmed up for the day, do you have pain when stretching the Achilles tendon fully over the edge of a step? (keeping knee straight)

strong severe pain

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 no pain

0 1 2 3 4 5 6 7 8 9 10

POINTS

3. After walking on flat ground for 30 minutes, do you have pain within the next 2 hours?
(If unable to walk on flat ground for 30 minutes because of pain, score 0 for this question).

strong
severe
pain

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no pain

0 1 2 3 4 5 6 7 8 9 10

POINTS

4. Do you have pain walking downstairs with a normal gait cycle?

strong severe pain no pain

0 1 2 3 4 5 6 7 8 9 10

POINTS

5. Do you have pain during or immediately after doing 10 (single leg) heel raises from a flat surface?

strong severe pain no pain

0 1 2 3 4 5 6 7 8 9 10

POINTS

6. How many single leg hops can you do without pain?

strong severe pain/unable no pain

0 1 2 3 4 5 6 7 8 9 10

POINTS

7. Are you currently undertaking sport or other physical activity?

- 0 r Not at all
- 4 r Modified training ± modified competition
- 7 r Full training ± competition but not at same level as when symptoms began
- 10 r Competing at the same or higher level as when symptoms began

POINTS



8. Please complete **EITHER A, B or C** in this question.

- If you have **no pain while undertaking Achilles tendon loading sports** please complete **Q8a only**.
- If you have **pain while undertaking Achilles tendon loading sports but it does not stop you from completing the activity**, please complete **Q8b only**.
- If you have **pain which stops you from completing Achilles tendon loading sports**, please complete **Q8c only**.

A. If you have **no pain** while undertaking **Achilles tendon loading sports**, for how long can you train/practise?

NIL	1-10 mins	11-20 mins	21-30mins	>30 mins
r	r	r	r	
0	7	14	21	30

POINTS

OR

B. If you have some pain while undertaking **Achilles tendon loading sport**, but it does not stop you from completing your training/practice for how long can you train/practise?

NIL	1-10 mins	11-20 mins	21-30mins	>30 mins
r	r	r	r	
0	4	10	14	20

POINTS

OR

C. If you have **pain that stops you** from completing your training/practice in **Achilles tendon loading sport**, for how long can you train/practise?

NIL	1-10 mins	11-20 mins	21-30mins	>30 mins
r	r	r	r	r
0	2	5	7	10

POINTS

TOTAL SCORE (/100)

%

Table 2. Descriptive characteristics of the study population

	Age (yrs)			Duration of symptoms (mths)			VISA-A score		
	Mean	SD	95% CI	Mean	SD	95% CI	Mean	SD	95% CI
Group 1 (n=45, 18F, 27M)	42.3	11.4	38.9- 45.7	21.0	25.5	7.7-23.1	64	17	59-69
Group 2 (n=14, 6F, 8M)	44.3	14.8	35.4- 53.3	19.2	4.1	14.8-19.2	44	28	28-60
Group 3 (n=63, 31F, 32M)	23.0	2.9	22.3- 23.7		N/A ¹		96	7	94-98
Group 4 (n=20, 9F, 11M)	40.9	9.1	38.7- 43.1		N/A ¹		98	3	97-99

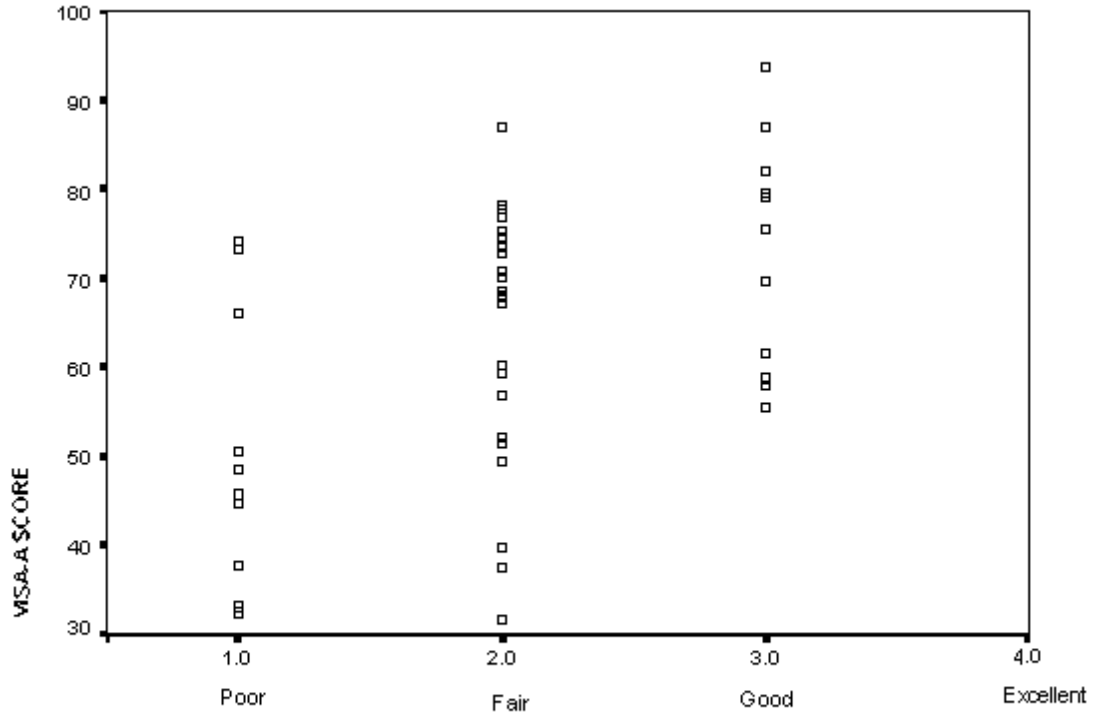
¹ Although a total of 4 control subjects had Achilles tendon symptoms for from 0.5-2 months but they are not tabled here as they are not representative of the group.

Table 3. Summary of Reliability of VISA-A score

Reliability (2 tests except where stated)	Group 1, non-surgical patients		Group 4, running club	
	n	Pearson's r	n	Pearson's r
Test-retest reliability	45.	0.93	24	0.98
Intrarater reliability (3 trials)	29.	0.90	-	-
Interrater reliability	16.	0.90	24	0.97
Short term (one week) reliability	45.	0.81	12	0.98

Figure 1.

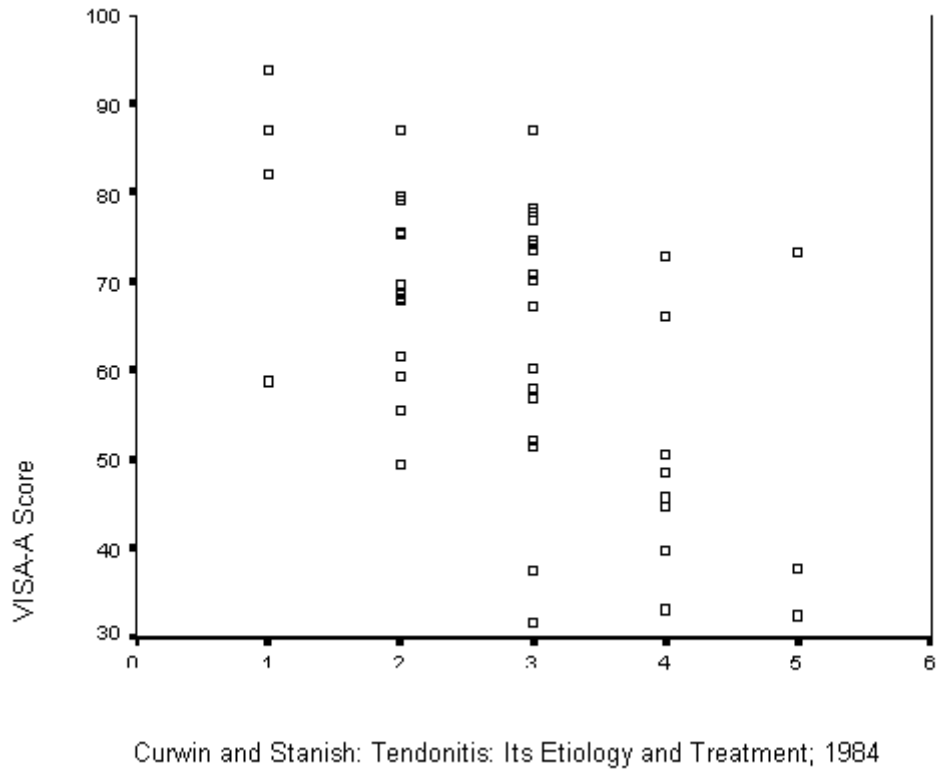
Scatter Plot of VISA-A score compared to Percy and Conochie's grade of severity.



Percy and Conochie: *Am J Sports Med*, 1978; 6(3)132-6.

Figure 2.

Scatter Plot of VISA-A score compared to Curwin and Stanish's grade of severity.



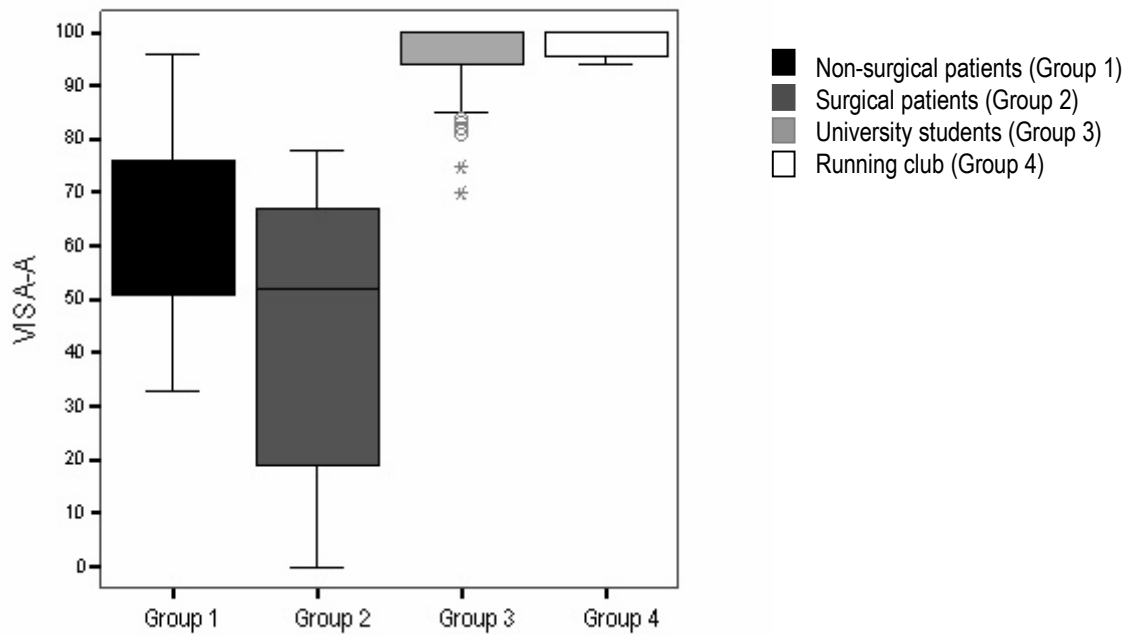


Figure 3. Box Plot showing VISA-A scores among the 4 groups of participants in this study

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