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Cross-Cultural Adaptation of Chinese Victorian Institute of Sports Assessment–Achilles (VISA-A) Questionnaire for Achilles Tendinopathy

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Abstract

Background: Victorian Institute of Sports Assessment (VISA-A) is a patient-reported outcome for assessing symptoms severity associated with Achilles tendinopathy (AT). It is a valid and reliable tool that has been used widely for measuring and monitoring treatment outcomes for AT. This clinical measurement study aims to develop a Chinese version of the VISA-A questionnaire. The study objective is to adapt the VISA-A questionnaire cross-culturally and assess its psychometric property for Chinese-speaking individuals.
Methods: VISA-A was translated and adapted cross-culturally according to international guidelines for self-reported questionnaires. During the establishment of Chinese VISA-A, there are 5 stages involved in the creation process, including translation, synthesis, reverse translation, review, and pretesting, which are performed by professionals in various fields, including orthopaedic surgeons, physiotherapists, and professional translators.
Results: A total of 60 participants were recruited to complete the Chinese VISA-A and 36-Item Short Form Health Survey (SF-36) questionnaires. The overall test-retest reliability was 0.98 (intraclass correlation coefficient = 0.97-0.99). The correlation between Chinese VISA-A and physical function subscale ($r = 0.70$) was strong and statistically significant. There were moderate correlations between Chinese VISA-A, limitations to role of physical function subscale ($r = 0.30$), and bodily pain subscale ($r = 0.42$), which were also statistically significant. There were statistically significant differences in Chinese VISA-A scores between healthy control and pathologic group ($P < .001$), at-risk group, and pathologic group ($P < .001$) respectively.
Conclusion: Chinese VISA-A demonstrated good reliability and validity for measuring symptom severity in patients with AT. Chinese VISA-A can be recommended as a self-reported measure for monitoring symptoms severity and treatment progress of patients with Achilles tendinopathy.
Level of Evidence: Level II, cohort study.

Keywords: Cross-cultural adaptation, Achilles tendinopathy, VISA-A, Chinese version, physiotherapy, rehabilitation, research instrument

Introduction

Achilles tendinopathy (AT) is an overuse musculoskeletal condition commonly found in athletes and nonathletes. AT is a clinical syndrome characterized by a combination of pain, swelling, and impaired functional performance. This clinical condition often becomes chronic as it is hard to treat.

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The main cause of Achilles tendinopathy could be explained by repetitive and immoderate overloading of the Achilles tendon during physical activities.[2] Patients with AT are usually athletes who present with stiffness and tenderness at the posterior side of calcaneus, often described as burning pain that is exacerbated during physical activities and relieved by rest. The underlying cause is likely due to the damage from a vigorous training regime that has exceeded the Achilles tendon's healing ability.[5]

Victorian Institute of Sports Assessment (VISA-A) is a patient-reported outcome for assessing symptom severity associated with AT. It is a valid and reliable tool that has been used widely for measuring and monitoring treatment outcomes for AT.[15] VISA-A contains a total of 8 questions. VISA-A score rates the overall effect of AT on a series of movements involving the Achilles tendon. The results of VISA-A range between 0 and 100 points. Healthy individuals score between 90 and 100 while patients with AT score $<$70. Patients who attain a score $>$90 could be fully recovered from AT.

A study providing observational data suggests elite athletes have a lifetime incidence of Achilles tendinopathy for around 24%.[11] Another study shows that the general population has a lower incidence rate of having Achilles tendinopathy than athletes, with an incidence of 1.85 in 1000 patients.[6] Some known risk factors for Achilles tendinopathy include stop-and-go sports, previous Achilles tendon problems, and sudden increase in duration or intensity of running, obesity, and poor running mechanics.[20]

Clinical examination plays a significant role where the foot and the heel should be inspected for abnormalities such as malalignment, deformity, obvious asymmetry in the tendons size, localized thickening, and any previous scars. The Achilles tendon should also be palpated for tenderness, heat, thickening, nodule, and crepitation.[17] Imaging is mainly for diagnostic purposes, but unfortunately, pain reduction and functional recovery after treatment may not be reflected by restoration of normal medical image.[19] On that account, VISA-A is required to evaluate treatment outcomes and assist development of a new intervention.

VISA-A was commonly used in research and was translated to many languages, including Brazilian, Danish, Dutch, French, German, Italian, Spanish, Persian, and Portuguese.[1,3,7-10,13,14,16] However, the original version was developed in English-speaking countries. VISA-A should be translated, adapted, and validated before applying to the Chinese-speaking population.

There appeared no previous study on cross-cultural adaptation of traditional written Chinese VISA-A. Hence, this clinical measurement study aims to develop a Chinese version of the VISA-A questionnaire. The study objective is to adapt the VISA-A questionnaire cross-culturally and assess its psychometric property for Chinese-speaking individuals.

Methods

Description of Chinese VISA-A

VISA-A consists of 8 questions in total, covering 3 domains: pain (questions 1-3), function (questions 4-6), and activity (questions 7, 8). VISA-A is based on the visual analog scale so that patients may rate their symptoms in a continuum of magnitude. The total score of VISA-A ranges from 0 to 100. Patients with more severe symptoms will score higher. Asymptomatic individuals may score 0.

Translation and Cross-Cultural Adaptation

VISA-A was translated and adapted cross-culturally according to international guidelines for self-reported questionnaires.[4] During the establishment of Chinese VISA-A, there are 5 stages involved in the creation process, including translation, synthesis, reverse translation, review, and pretesting, which are performed by professionals in various fields, including orthopaedic surgeons, physiotherapists, and professional translators.

For the first stage, the 2 translators translated the original English version of the questionnaire into a Chinese version independently. In stage 2, the 2 Chinese versions of the questionnaires created from stage 1 were analyzed until there was a consensus regarding the initial translation, and then they were synthesized to produce 1 Chinese version subsequently. In stage 3, the synthesized Chinese version was translated back into English. The translators rephrased the questions that were lost or misinterpreted. This process was repeated until it matched with the original English version.

In stage 4, the Chinese VISA-A was reviewed by an expert committee comprising orthopaedic surgeon, physiotherapist, and professional translator. The orthopaedic surgeon with more than 10 years of experience made the final decision on any disagreement. In stage 5, the Chinese VISA-A was tested on 5 healthy individuals. They completed the questionnaire and were interviewed by the translators about their understanding of the questions and their chosen responses.

Participant Recruitment and Data Collection

The questionnaire was applied to 60 participants by convenient sampling. The selected participants were informed of the purpose of the research. Ethical approval for this study was obtained from the Clinical Research Ethics Review Committee of the Hospital Authority with the number 2021.353.

Healthy participants, recreational athletes, and patients with AT were recruited to assess the psychometric properties of Chinese VISA-A. All participants should meet the inclusion criteria. They should be between 18 and 65 years

Table 1. Descriptive Statistics.

	Total n	Sex, n		Age, y, Mean ± SD	Days[a], Mean ± SD
		Male	Female		
Healthy controls	20	10	10	24.8 ± 3.2	3.1 ± 1.4
At-risk group	20	9	11	26.1 ± 5.0	3.2 ± 2.5
Pathologic group	20	12	8	50.5 ± 14.3	3.3 ± 1.6

[a]Days: interval between first and second administration of the Chinese Victorian Institute of Sports Assessment–Achilles (VISA-A).

old, read traditional or simplified Chinese, and speak Cantonese or Mandarin. There were respective inclusion criteria for participants included in the 3 subgroups respectively. As for the healthy individual's subgroup, participants should not have had any lower limb injuries in the past 3 months. They should not perform physical exercise involving jumping and running more than twice a week in the past 6 months. As for the at-risk subgroup, participants should participate in sporting activities involving jumping and running twice a week for 6 months. Patients with AT were classified as the pathologic group.

Healthy participants in the healthy group and at-risk group were medical students or research postgraduate students working in clinics or laboratories. They should not suffer from any musculoskeletal conditions during the data collection period. All information collected was self-reported by participants in the control group and at-risk group. No additional physical or imaging examination was conducted for the healthy participants. Ultrasonography assessment was performed by orthopaedic surgeon or physiotherapist at baseline for participants with Achilles tendon pain. They were classified as a pathologic group if they met the diagnostic criteria for Achilles tendinopathy: (1) >1 mm of spindle-shaped thickening of tendinous tissues in Achilles tendon in relation to the contralateral tendon at ultrasonography; (2) color Doppler flow of at least grade 2 of 4 in a modified Öhberg score.

Evaluation of the Reliability of Chinese VISA-A

The reliability was assessed by using the test-retest method. Participants completed the same Chinese VISA-A twice, under similar health conditions, at 2 different time points. Participants received 1 copy of Chinese VISA-A in each visit. There was a 2-5 days' interval between 2 data collection time points. They completed the same Chinese VISA-A without referring to the previous questionnaire. Demographic information was collected during baseline assessment, including age, gender, and physical activity level.

Evaluation of the Validity of Chinese VISA-A

Participants completed the Chinese VISA-A and 36-Item Short Form Health Survey (SF-36) questionnaire at the first time of data collection. The SF-36 questionnaire consists of 36 items related to 8 scales that cover different health domains, such as physical function, bodily pain, and general health.

Statistical Analysis

After data collection, the data were processed in Excel and SPSS, version 26.0. Data were presented as mean, SD, and a 95% CI. To assess the reliability of Chinese VISA-A, test-retest reliability was tested. Intraclass correlation coefficient (ICC) was calculated to present the variation in measurements taken by a tool on the same subject in the same condition.[18]

Spearman correlation coefficient (r) of Chinese VISA-A was calculated to assess the construct validity. This study compared the VISA-A with a validated tool SF-36 to investigate how highly correlated the 2 measures were. Correlations were interpreted as poor (r = 0-0.20), fair (r = 0.21-0.40), moderate (r = 0.41-0.60), very good (r = 0.61-0.80), or excellent (r = 0.8-1.0).[18] Known group validity was measured by the differences between the scores of the control group, at-risk group, and pathologic group. One-way analysis of variance was performed to calculate if statistical significance was present between 3 subgroups. The significant level was set at $P < .05$.

Results

Translation and Cultural Adaptation

There were no major problems during translation and cross-cultural adaptation. To obtain similar effects on respondents from different cultures, attention was given to the meaning of the words in different languages. The expert committee approved the final Chinese VISA-A version (Appendix 1).

Table 1 summarizes the demographic characteristics of the participants. A total of 60 participants were recruited to complete the Chinese VISA-A and SF-36 questionnaires. Among all participants, 40 were healthy participants. They were assigned to the control group and at-risk group based on the physical activity level. Twenty participants who did not perform regular physical exercise involving running and jumping at least twice a week were assigned to the control group. Twenty other participants who reported regular physical exercise training involving running and jumping at least

Table 2. Test-Retest Scores and Ceiling/Floor Effects of the Chinese VISA-A.

	First Test, Mean ± SD	Second Retest, Mean ± SD	Observed Range	Floor Effect, %	Ceiling Effect, %
Healthy controls	93.75 ± 5.23	93.65 ± 4.83	79-100	0.00	20.00
At-risk group	92.70 ± 8.22	93.85 ± 7.35	79-100	0.00	45.00
Pathologic group	59.70 ± 18.89	58.98 ± 20.97	14-86	0.00	0.00

Abbreviation: VISA-A, Victorian Institute of Sports Assessment–Achilles.

Table 3. Reliability of Chinese VISA-A.

VISA-A	ICC (95% CI)
VISA-A score (total of Q1-Q8)	0.98 (0.97-0.99)
Q1	0.77 (0.61-0.86)
Q2	0.92 (0.87-0.95)
Q3	0.97 (0.95-0.98)
Q4	0.92 (0.88-0.95)
Q5	0.91 (0.85-0.95)
Q6	0.73 (0.55-0.84)
Q7	0.93 (0.88-0.96)
Q8	0.96 (0.93-0.97)

Abbreviations: ICC, intraclass correlation coefficient; VISA-A, Victorian Institute of Sports Assessment–Achilles.

Table 4. Construct Validity of Chinese VISA-A.

SF-36 subscales	Chinese VISA-A
Physical function	0.70 ($P < .01$)
Role physical[a]	0.30 ($P < .01$)
Bodily pain	0.42 ($P < .01$)
General health	0.42 ($P < .01$)
Vitality	0.08 ($P = .51$)
Social functioning	0.28 ($P = .02$)
Role emotional[b]	0.15 ($P = .22$)
Mental health	0.01 ($P = .92$)

Abbreviations: SF-36, 36-Item Short Form Health Survey; VISA-A, Victorian Institute of Sports Assessment–Achilles.
[a]Role physical: limitations in physical activities because of health problems.
[b]Role emotional: limitations in usual role activities because of emotional problems.

twice a week were assigned to the at-risk group. In addition, 20 participants were diagnosed with Achilles tendinopathy by the orthopaedic surgeon or physiotherapist during baseline assessment. The participants in the pathologic group fulfilled the diagnostic criteria. Gender was evenly distributed. The average age was 24.8, 26.1, and 50.5 in the healthy control, at-risk group, and pathologic group, respectively. The scores of the total scale in the participants ranged from 14 to 100, with a mean of 81.95 (SD 20.10). Table 2 demonstrates the observed range of VISA-A scores, including the floor and ceiling effects of each subgroup.

Reliability

Test-retest reliability was assessed using the intraclass correlation coefficient. The reliability of each question in Chinese VISA-A ranged between 0.73 and 0.97. The overall test-retest reliability was 0.98 (ICC = 0.97-0.99). Minimal variation was shown in the total scores, indicating good reliability (Table 3).

Construct Validity

The construct validity was assessed by evaluating the correlation between the Chinese VISA-A and the physical function of SF-36 (Table 4). The correlation between Chinese VISA-A and physical function subscale ($r = 0.70$) was strong and statistically significant. There were moderate correlations between Chinese VISA-A, limitations to role of physical function subscale ($r = 0.30$), and bodily pain subscale ($r = 0.42$), which were also statistically significant. Poor correlations were found between Chinese VISA-A and mental health ($r = 0.01$), vitality ($r = 0.08$), social functioning ($r = 0.28$), and limitations to role of emotional health ($r = 0.15$).

Discriminant validity

The results demonstrated that healthy controls obtained the highest mean score, followed by the at-risk group and pathologic group. The mean Chinese VISA-A score in patients with AT was 59.70 (95% CI 50.56-68.24). It was significantly lower than the healthy control score of 93.75 (95% CI 91.30-96.20). The difference between the mean score of healthy controls and the pathologic group was around 34 points. There were statistically significant differences in Chinese VISA-A scores between the healthy control and pathologic groups ($P < .001$) and the at-risk group and pathologic group ($P < .001$).

Discussion

This study discussed cross-cultural adaptation of the VISA-A questionnaire in traditional written Chinese following international guidelines for self-reported questionnaire and described the psychometric testing.

The results of this study confirmed that the process used for the cross-cultural adaptation of the questionnaire was successful in terms of its excellent reliability and validity, thus indicating its use for Chinese-speaking patients with Achilles tendinopathy. The translation and cross-cultural adaptation process was carefully conducted following the guideline of Beaton et al.[4] The key phrases of each question were carefully compared with the original version. Therefore, it highlighted the suitability of the Chinese version of the instrument. There were no missing data and major problems in the cross-cultural adaptation procedure. Test-retest reliability was confirmed by the ICC (0.98) for the total score. The coefficient ranged from 0.73 to 0.97 and that showed good reliability for each question.

Ceiling effects or floor effects were defined as more than 15% of the participants obtaining the highest or lowest scores, respectively, of the VISA-A.[18] The Chinese VISA-A scores ranged between 79 and 100 in both healthy controls and the at-risk group. In the pathologic group, the scores ranged between 14 and 86. No participants scored the minimum score in the first or second test. No participants in the pathologic group scored the highest score. However, some participants from the healthy control group and the at-risk group scored the highest score. Ceiling effects were found in healthy individuals. None of the participants obtained the minimum (0) or maximum score (100). Nevertheless, 20% of healthy controls and 45% of at-risk groups obtain the highest score. There might be some ceiling effects among the asymptomatic individuals. VISA-A might be less sensitive in detecting changes of symptom severity in those who are less severe. As a result, there appeared no floor effect and some ceiling effect of VISA-A based on this study.

The test-retest reliability was presented by the ICC of Chinese VISA-A. Two to 7 days of the interval was allowed between test-retest intervals. The aim was to avoid memory-based response and minimize changes in health conditions. The total ICC (0.98, 95% CI 0.97-0.99) showed excellent test-retest reliability. The reliability of Chinese VISA-A was compatible with different studies on cross-cultural adaptation of VISA-A in other languages.[3,7-10,12,14,16]

Spearman correlation coefficients of Chinese VISA-A with SF-36 subscales confirmed the construct validity (Table 4). As VISA-A was a specific scale for Achilles tendinopathy, it was expected that there would be relatively high correlations with certain relevant subscales of SF-36, including physical function and bodily pain.

Strong correlations of the VISA-A with the physical function subscale of SF-36 were found (r = 0.710, P < .001). It matched with the purpose of Chinese VISA-A, which was to measure physical function associated with Achilles tendinopathy. There were moderate correlations of VISA-A with limitations to role of physical function, bodily pain, and general health subscales of SF-36 (r = 0.30, P < .001; r = 0.42, P < .001; and r = 0.42, P < .001, respectively). VISA-A was based on the visual analog scale. Patients reported a magnitude of pain or stiffness during the activity of daily living. However, the level of pain may depend on different activities. This may explain why moderate correlations were found in the bodily pain subscale of SF-36. The correlations of VISA-A with vitality, social function, and limitations to role of emotional function and mental health subscales were fair or poor (r = 0.08, P = .51; r = 0.28, P = .02; r = 0.15, P = .22; r = 0.01, P = .92, respectively). The reason was that VISA-A did not intend to measure social function and mental health-related domains.

The results of the current study show that it is possible to translate VISA-A into Chinese without losing the psychometric properties of the original version. Therefore, it appears to be more efficient to translate VISA-A into Chinese instead of developing a new scale for Chinese patients with Achilles tendinopathy. Compared with the visual analog scale, Chinese VISA-A reflected the impact on physical function associated with Achilles tendinopathy in addition to the level of pain. The Chinese version of VISA-A appears to be a reliable and valid questionnaire for assessing the severity of the symptoms of Chinese-speaking patients with Achilles tendinopathy. Chinese VISA-A can be recommended in future clinical trials.

The reliability and validity of Chinese VISA-A were equivalent to those obtained with the original version of the VISA-A. Researchers and clinicians may benefit from using this questionnaire. Researchers can use the VISA-A questionnaire as an outcome measure to evaluate the effect of treatments or rehabilitation programs. Also, the application of a standardized questionnaire allows comparisons of research between studies from different countries. Clinicians may enhance the robustness of their evaluation by using the VISA-A as a validated and reliable questionnaire. Therefore, a more suitable treatment plan can be made based on a better understanding of the patient's perception of his or her condition.

There were some limitations in this study. This research was conducted in CUHK and the Prince of Wales Hospital, which could not fully represent the entire Chinese-speaking population with Achilles tendinopathy. On the other hand, participants completed the Chinese VISA-A questionnaires twice with 2-7 days of interval. The health condition of participants may still fluctuate within a short period because of weather, activity level, and medication intake. In addition, patients with Achilles tendinopathy were allowed to receive treatments during the data collection period. The treatment effects may have some impact on the VISA-A and SF-36 scores.

Conclusion

Chinese VISA-A demonstrated good reliability and validity for measuring symptom severity in patients with AT. Chinese VISA-A can be recommended as a self-reported measure for monitoring symptom severity and treatment progress of patients with Achilles tendinopathy.

Appendix I

維多利亞體育學院評估—跟腱問卷
維多利亞體育學院評估—跟腱問卷：跟腱炎的嚴重程度指數
在本問卷中之術語「疼痛」一詞均是針對跟腱部位的痛楚。

1. 當你起床後站立時，跟腱部位的僵硬感覺會持續多少分鐘？

100分鐘 ☐☐☐☐☐☐☐☐☐☐☐ 0分鐘

0 1 2 3 4 5 6 7 8 9 10

2. 當你熱身後，用梯級的邊緣作伸展跟腱時，會感到疼痛嗎？（要保持膝蓋完全伸直）

非常疼痛 ☐☐☐☐☐☐☐☐☐☐☐ 沒有疼痛

0 1 2 3 4 5 6 7 8 9 10

3. 當你在平路上持續步行30分鐘後，接著的兩小時內會感到疼痛嗎？（若因疼痛而不能在平路上持續步行30分鐘，這題得0分。）

非常疼痛 ☐☐☐☐☐☐☐☐☐☐☐ 沒有疼痛

0 1 2 3 4 5 6 7 8 9 10

4. 當你用正常步姿下樓梯時，跟腱會感到疼痛嗎？

非常疼痛 ☐☐☐☐☐☐☐☐☐☐☐ 沒有疼痛

0 1 2 3 4 5 6 7 8 9 10

5. 當你要做10次在平地抬起腳跟的動作時（單腳）或完成動作後，會感到疼痛嗎？

非常疼痛 ☐☐☐☐☐☐☐☐☐☐☐ 沒有疼痛

0 1 2 3 4 5 6 7 8 9 10

6. 在完全不痛的情況下，你可以做多少次單腳跳？

0 ☐☐☐☐☐☐☐☐☐☐☐ 10

0 1 2 3 4 5 6 7 8 9 10

你現時有進行體育運動或健身活動嗎？

0 ☐完全沒有
4 ☐簡化的訓練或簡化的比賽
7 ☐在出現症狀後，參與較低強度的訓練或比賽
10 ☐維持正常甚或參與較高強度的比賽

7. 請選答A，B或C題

- 若你在進行跟腱受壓的運動時沒有疼痛，只需填寫題8A
- 若你在進行跟腱受壓的運動時感到疼痛，但不會因疼痛而終止運動，只需填寫題8B
- 若你在進行跟腱受壓的運動時會因疼痛而終止運動，只需填寫題8C

8A. 若你在進行該運動時沒有疼痛，你可以持續訓練或練習多少分鐘？

完全沒有	1-10分鐘	11-20分鐘	21-30分鐘	>30分鐘
0	7	14	21	30

或

8B. 若你在進行該運動時感到疼痛，但不會因疼痛而終止運動，你可以持續訓 練或練習多少分鐘？

完全沒有	1-10分鐘	11-20分鐘	21-30分鐘	>30分鐘
0	4	10	14	20

或

8C. 若你在進行該運動時會因疼痛而終止運動，你可以訓練或練習多少分鐘？

完全沒有	1-10分鐘	11-20分鐘	21-30分鐘	>30分鐘
0	2	5	7	10

Ethics Approval

Ethical approval for this study was obtained from The Joint Chinese University of Hong Kong–New Territories East Cluster Clinical Research Ethics Committee (ID: 2021.353)

Declaration of Conflicting Interests

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