Cross-cultural validation of the Dutch version of the Vertigo Symptom Scale – Short Form questionnaire in general practice

Anisa S. Y. Noordzij

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Berend Terluin

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Johannes C. van der Wouden

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Henriëtte E. van der Horst

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Rosie Essery

University of Southampton

Lucy Yardley

University of Southampton

Otto R. Maarsingh

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Vincent A. van Vugt (✉ v.vanvugt@amsterdamumc.nl)

Amsterdam UMC, Vrije Universiteit Amsterdam, Amsterdam Public Health research institute

Research Article

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Abstract

Background

The Vertigo Symptom Scale – Short Form (VSS-SF) is a widely used questionnaire to measure vestibular symptoms such as dizziness and vertigo. We aimed to translate and cross-culturally validate the Dutch version of the VSS-SF.

Methods

We performed a psychometric evaluation study in general practice. First, we followed international guidelines to translate the VSS-SF into Dutch. We assessed the comprehensibility of the Dutch translation by interviewing 20 older adults with dizziness. Next, we used data from patients aged 50 years and older with chronic dizziness who participated in British (n=296) and Dutch (n=322) randomized controlled trials to evaluate measurement invariance. In this cross-cultural validation analysis we used ordinal logistic regression to detect potential differential item functioning (DIF) and differential test functioning (DTF).

Results

According to the 20 patients we interviewed, the Dutch translation of the VSS-SF was clear and comprehensible. We detected small DIF on 2 of the 15 items of the questionnaire. However, the effect of these DIFs on the overall scale was negligible.

Conclusions

We developed a comprehensible and cross-culturally valid Dutch translation of the VSS-SF. This questionnaire can be used to assess vestibular symptoms in general practice.

Background

Patients in general practice commonly experience vestibular symptoms, such as dizziness and vertigo.(1) The 12-month prevalence of dizziness is 5% and its annual incidence is 1.4%.(2) Dizziness cannot be measured objectively and therefore can only be assessed reliably using patient-reported outcome measures. The Vertigo Symptom Scale – Short Form (VSS-SF) is a widely used questionnaire to assess the severity and frequency of dizziness. The VSS-SF was developed in the United Kingdom (UK). The questionnaire consists of 15 questions to which patients can respond on a scale from 0 (never) to 4 (very often) to indicate how frequently and severely they experienced dizziness and its related symptoms in the last month (see appendix A for the original British English questionnaire).(3) Previous studies have shown good discriminative ability (area under the curve 0.87), good internal consistency (Cronbach's α 0.90) and good test-retest reliability (intraclass correlation coefficient 0.88) of the VSS-SF.(4) The VSS-SF has been translated and cross-culturally validated in several languages such as Japanese, the central Kurdish dialect and Norwegian.(4–6) As far as we know, a Dutch version of the VSS-SF currently does not exist. A translated and cross-culturally validated version of the VSS-SF may aid Dutch general

practitioners in adequately measuring and quantifying dizziness. The aim of this study was to develop a Dutch version of the VSS-SF and to assess if this translated version measures the same construct as the original British questionnaire. In order to do so, the following questions needed to be answered:

I. Is our newly developed Dutch translation of the VSS-SF comprehensible for Dutch patients with chronic dizziness?

II. Is there measurement invariance at item and scale level (differential item functioning (DIF) and differential test functioning (DTF)) when comparing VSS-SF scores between British and Dutch patients with chronic dizziness who fill out the questionnaire?

Methods

2.1. Study design

We carried out a psychometric evaluation study, which had two components each addressing one of the aforementioned research questions. The first component was an interview study that was part of the translation process of the VSS-SF, the second part concerned the cross-cultural validation of the Dutch version of the VSS-SF. This study was approved by the Medical Ethics Committee of the VU University Medical Center (2021.0300).

2.2. Translation

2.2.1 Translation process

To develop the Dutch translation we followed the international guideline for cross-cultural adaptation.⁽⁷⁾ First, independent forward translations were made by two Dutch native speakers with adequate English language proficiency and expertise in the field of dizziness (authors OM and VV). Together they synthesized a single version of the forward translation, resolving any discrepancies. This version was sent to a professional translator at an independent translation agency. This British English native speaker, who possessed no specific knowledge on this subject, used the forward translation to develop a backward translation. Next, a meeting between the research group (authors OM, VV, JW and HH) took place. In this meeting, the original version, the Dutch forward translation and the British backward translation were compared with each other. Discrepancies were discussed and subsequently resolved. This process resulted in the provisional version of the Dutch translation of the VSS-SF, ready to be tested for comprehensibility (see appendix B for the Dutch questionnaire).

2.2.2 Patients and setting

We performed an interview study to complete the translation of the VSS-SF. We invited Dutch patients who previously participated in a randomised controlled trial (RCT) that investigated the effectiveness of a multifactorial intervention for chronic dizziness in older people (≥ 65 years) in general practice.⁽⁸⁾ At the time, chronic dizziness was defined as a giddy or rotational sensation, loss of balance, faint feeling,

lightheadedness, instability, and/or tendency to fall. Patients with severe cognitive impairment, terminal illness, severe psychiatric problems, and insufficient mastery of Dutch were excluded. None of the patients had ever seen the VSS-SF. We sent invitation letters to all patients who previously gave permission to be approached to participate in future studies (n=100). We excluded patients when they were unable to fill out questionnaires and/or partake in interviews due to severe physical or mental illness. The aim was to include between five and eight patients, which is in accordance with current recommendations.⁽⁹⁾ A researcher (author AN) interviewed and observed the eligible and consenting patients while they were filling out the paper-and-pen Dutch version of the VSS-SF. This was done according to the Three-Step Test-Interview (TSTI) method⁽¹⁰⁾ in order to assess the comprehensibility of the Dutch translation of the VSS-SF. The TSTI method is an interview method created to test the comprehensibility of questionnaires and consists of (1) observation of response behavior while the participant thinks aloud, (2) follow-up probing to remedy gaps in the previously gathered data, and (3) debriefing aimed at eliciting experiences and opinions.⁽¹⁰⁾ The interviews were audio recorded and transcribed verbatim. A team of researchers who are experts in the field of dizziness (authors JW, OM and VV) discussed the transcribed interviews to determine whether the final Dutch version of the VSS-SF needed to be amended.

2.3. Cross-cultural validation

2.3.1. Patients and setting

For cross-cultural validity, we assessed the measurement equivalence of the VSS-SF across Dutch and British respondents. The equivalence of scores of measurement instruments is also called measurement invariance at item level or differential item functioning (DIF).⁽¹¹⁾ We also investigated the impact of DIF on the overall scale score, called differential test functioning (DTF). Because the VSS-SF was originally developed in the UK, we compared a sample of British patients who filled out the original questionnaire with a sample of Dutch patients who filled out the translated version. We used baseline patient data from two RCTs (12,13) that investigated the effectiveness of online vestibular revalidation in patients aged 50 years and older with chronic dizziness. The British RCT (n = 296) (13) and the Dutch RCT (n=322) (12) applied the same eligibility criteria. Therefore, we expected that most patient characteristics would be comparable and differential item and test functioning would likely be related to linguistic or cultural differences.

2.3.2. Statistical analysis

To assess if patients in the British and Dutch samples were comparable, we statistically analysed differences in gender, age, duration of dizziness, VSS-SF total and subscale scores. We also checked the dimensionality of the VSS-SF by performing a confirmatory factor analysis. We used logistic regression analysis to detect DIF. Logistic regression analysis has been shown to be an appropriate method to assess DIF.⁽¹⁴⁾ The item response in the VSS-SF is an ordinal variable and therefore we used ordinal logistic regression analysis for each item. The dependent variable in this analysis was the item response. The independent variables were the overall scale score, the dichotomous variable 'original questionnaire

versus translated version', and an interaction term for 'questionnaire version'.⁽¹¹⁾ We used linear regression analysis to determine DTF. We used IBM SPSS Statistics for Windows v22 (IBM Corp., Armonk, NY) to prepare and organise the data. For the DIF and factor analysis, we used the software program R v3.5.1 (The R Foundation for Statistical Computing, Vienna, Austria).

Results

3.1. Translation

3.1.1. Inclusion

Out of the 100 potential interview participants, a total of 27 gave permission to be interviewed. Out of those, five were not able to participate within the timeframe of the study and two fell ill before the interview could take place. Eventually, we interviewed 20 patients.

3.1.2. Patient characteristics

The group of interviewed patients consisted of eleven women and nine men. At the time of the interview, the mean age of the patients was 84 years (range 72-93 years). The average duration of their dizziness was 9.6 years (median 6.5 years). The time it took them to complete the questionnaire was 4 minutes and 15 seconds (2.36 -8.33 minutes).

3.1.3. Analysis

After summarising and analysing the interview transcripts, it was clear that all questions of the VSS-SF were generally well-interpreted by the 20 interviewed patients. Only minor issues were mentioned by participants. First, the introductory text was often skipped as patients tended to immediately start filling out the questionnaire. Even if they had read the introduction, for many patients it was not clear that they were supposed to put an 'x' in the correct answer box instead of coloring the entire box black. Sometimes, questions were accidentally skipped because some of the answer boxes were smaller than the others.

The minor issues that arose from the summary and analysis of the interview transcripts were discussed by our expert team. We concluded that no changes to the individual questions were necessary, and only minor changes should be made. To make sure the introduction will be read, we decided it would be better to present it on a separate page where the questions cannot be seen yet. We amended the introduction to describe how to fill out the questionnaire and reshaped the answer boxes to an equal size to prevent the accidental skipping of questions. We expect that these changes will reduce errors made by a minority of patients when filling out the questionnaire, and will not have a measurable effect on the overall results.

3.2. Cross-cultural validation

3.2.1. Patient characteristics

The characteristics of the British and the Dutch patients are described in Table 1. The percentage of women, mean age and VSS-SF balance subscale score are not statistically different. The time since vestibular diagnosis, mean VSS-SF total score and VSS-SF anxiety subscale score do show a statistically significant difference. The Dutch patients' dizziness generally had lasted less time than that of the British patients and was less severe.

3.2.2. Analysis

In the confirmatory factor analysis to check the dimensionality of the VSS-SF, we were not able to find a well-fitting factor model. This indicates that the VSS-SF is not 'essentially unidimensional', which would mean that the item responses are mainly driven by a single large general factor and that smaller factors don't have too much impact on the scale scores.⁽¹⁵⁾ This reinforced our choice of performing the DIF analysis using ordinal logistic regression.

The ordinal logistic regression analysis showed that two items, number 3 and 13, demonstrate DIF with ΔR^2 0.043 and 0.022 (Figure 1). This means that these questions were filled out differently by British and Dutch patients. Item 3, the question about "Nausea (feeling sick), vomiting", was 'more severe' for Dutch patients, meaning that Dutch patients were likely to score this item lower compared to British patients. Item 13, the question about "Feeling unsteady about to lose balance, lasting less than 20 minutes", appeared to be 'less severe' for Dutch patients, meaning that Dutch patients were more likely to score this item higher compared to British patients. In terms of ΔR^2 effect size the level of DIF was negligible for both item 3 and 13.⁽¹⁶⁾ Because the two DIF items favour different groups (one is "more severe" and the other is "less severe" for Dutch patients), DIF cancelation occurs and an effect on the scale scores is negated. This can be seen in the analysis of the DTF. Figure 2 shows that the effect of the two DIF items on the DTF of the overall score was negligible.

Discussion

4.1. Summary

This psychometric evaluation study shows that the Dutch translation of the VSS-SF is comprehensible for Dutch older adults with chronic dizziness. Although the cross-cultural validation analysis showed small DIF on two items, we found no effects on the overall score of the VSS-SF.

4.2. Strengths and limitations

Strengths of the study are our strict adherence to the guidelines during the translation process and the large sample size of our study populations. We translated the VSS-SF according to the recommended stages of cross-cultural adaptation.⁽⁷⁾ For our interview study, the inclusion of 20 patients is well over the recommended 5 to 8 patients.⁽⁹⁾ All patients were older adults with chronic dizziness. Because the VSS-SF is comprehensible for older patients, it is reasonable to assume that the VSS-SF is comprehensible for patients of all ages. Since the prevalence of dizziness increases with age, our patients formed a good

representation of the population for whom this questionnaire is intended. None of the patients had seen the VSS-SF questionnaire prior to participating in this study. However, they did have some experience with questionnaires concerning the subject of dizziness because they had filled out the Dizziness Handicap Inventory (DHI) questionnaire in a previous study.(8) In the cross-cultural validation analysis, both the British and the Dutch sample consisted of more than 200 patients. This is considered 'very good' according to the COSMIN Risk of Bias checklist.(17)

There were also a few limitations. The RCT that provided the Dutch sample for the cross-cultural validation used the provisional version of the VSS-SF before the interviews with the patients had taken place.(12) Ideally, the interviews would have taken place before the questionnaire was used in the RCT, but this was not possible due to time constraints. Because the results of the interviews indicated that the pre-final version needed no amendments to the individual items, we do not expect that this influenced the results of our cross-cultural validation. Another limitation was the concurrent use of both paper-and-pencil (interview study) and web-based (British and Dutch RCT sample) VSS-SF questionnaires. It is possible that DIF exists between these different methods. However, previous studies in other patient-reported outcome measures indicate that questionnaires administered on paper and electronic devices are often quantitatively comparable.(18,19) Furthermore, even when DIF would exist between these methods, it would not have impacted the results of our cross-cultural validation where both British and Dutch participants filled out a web-based version of the VSS-SF.

4.3. Comparison with other literature

For the cross-cultural validity analysis, multiple ways to detect DIF can be used. We chose to use ordinal logistic regression but one could argue that item response theory (IRT) techniques are better because of their ability to indicate the size of the effect the DIF has on the results if present. However, IRT techniques can only be applied if the scale to be measured is 'essentially unidimensional'.(15) The VSS-SF has previously been shown to consist of three factors correlating with the two subscales.(4,5) We performed a confirmatory factor analysis ourselves that also demonstrated that the VSS-SF was not unidimensional. Therefore, we found that IRT techniques were not a suitable option to detect DIF in the VSS-SF.

The Dutch translated and cross-culturally validated version of the VSS-SF is a relevant addition to other available Dutch tools to assess dizziness. Another questionnaire that was previously translated into Dutch is the Dizziness Handicap Inventory (DHI).(20) Globally, the DHI questionnaire is the most used questionnaire in vestibular medicine and can be used to measure dizziness-related impairment.(21) In daily practice, the Dutch VSS-SF can now complement the DHI. General practitioners can choose the DHI when they want to quantify the impact of dizziness on daily life, and employ the VSS-SF when they would like to determine the severity/frequency of vestibular symptoms. The DHI and VSS-SF can also be used to assess treatment effects, because cut-off points for clinically relevant changes have previously been established for both questionnaires.(12, 22) By increasing the toolbox of both the general practitioner in clinical practice and the researcher who studies vestibular symptoms, we may increase our understanding of dizziness and ultimately improve management of symptoms.

Conclusions

We developed a comprehensible and cross-culturally valid Dutch translation of the VSS-SF. The VSS-SF is now ready to be used by Dutch general practitioners to assess the severity and frequency of their patients' dizziness.

Declarations

Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the VU University Medical Center (6-7-2021/ 2021.0300). A data sharing agreement was set up between the VU University Medical Center and the University of Southampton. All participants included in the study provided written informed consent.

Availability of data and materials

The datasets used and/or analysed 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 contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by AN and VVV. The first draft of the manuscript was written by AN and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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References

1. Bösner S, Schwarm S, Grevenrath P, Schmidt L, Hörner K, Beidatsch D, et al. Prevalence, aetiologies and prognosis of the symptom dizziness in primary care – a systematic review. *BMC Family Practice*. 2018;19(1).
2. Neuhauser HK. The epidemiology of dizziness and vertigo. *Handb Clin Neurol*. 2016;137:67-82.
3. Yardley L, Masson E, Verschuur C, Haacke N, Luxon L. Symptoms, anxiety and handicap in dizzy patients: Development of the Vertigo symptom scale. *J Psychosom Res*. 1992;36(8):731-41.
4. Wilhelmsen K, Strand LI, Nordahl SHG, Eide GE, Ljunggren AE. Psychometric properties of the Vertigo symptom scale – Short form. *BMC Ear, Nose and Throat Disorders*. 2008;8(1).
5. Kondo M, Kiyomizu K, Goto F, Kitahara T, Imai T, Hashimoto M, et al. Analysis of vestibular-balance symptoms according to symptom duration: dimensionality of the Vertigo Symptom Scale-short form. *Health and Quality of Life Outcomes*. 2015;13(1).
6. Zmnako SSF, Chalabi YI. Cross-cultural adaptation, reliability, and validity of the Vertigo symptom scale–short form in the central Kurdish dialect. *Health and Quality of Life Outcomes*. 2019;17(1).
7. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*. 2000;25:3186-91.
8. Stam H, van der Wouden JC, Hugtenburg JG, Twisk JWR, van der Horst HE, Maarsingh OR. Effectiveness of a multifactorial intervention for dizziness in older people in primary care: A cluster randomised controlled trial. *PLOS ONE*. 2018;13(10).
9. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for Patient-Reported Outcomes (PRO) measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*. 2005;8(2).
10. Hak T, van der Veer K, Jansen H. The Three-Step Test-Interview (TSTI): An observation-based method for pretesting self-completion questionnaires. *Survey Research Methods*. 2008;2(3):143-50.
11. de Vet HCW, Terwee CB, Mokkink LB, Knol DL. *Measurement in Medicine*. New York: Cambridge University Press; 2011. 181–182.
12. van Vugt VA, van der Wouden JC, Essery R, Yardley L, Twisk JWR, van der Horst HE, et al. Internet based vestibular rehabilitation with and without physiotherapy support for adults aged 50 and older with a chronic vestibular syndrome in general practice: three armed randomised controlled trial. *BMJ*. 2019;367:l5922.
13. Geraghty AWA, Essery R, Kirby S, Stuart B, Turner D, Little P, et al. Internet-based vestibular rehabilitation for older adults with chronic dizziness: A randomized controlled trial in primary care. *Ann Fam Med*. 2017;15:209-16.

14. Petersen MA, Groenvold M, Bjorner JB, Aarason N, Conroy T, Cull A. Use of differential item functioning analysis to assess the equivalence of translations of a questionnaire. *Qual Life Res.* 2003;12(4):373-85.
15. Strout WF. A new item response theory modeling approach with applications to unidimensionality assessment and ability estimation. *Psychometrika.* 1990;55:293-325.
16. Jodoin MG, Gierl MJ. Evaluating Type I Error and Power Rates Using an Effect Size Measure With the Logistic Regression Procedure for DIF Detection, *Applied Measurement in Education*, 2001;14:4:329-349,
17. Mokkink LB, de Vet HCW, Prinsen CAC, Patrick DL, Alonso J, Bouter LM, et al. COSMIN Risk of Bias checklist for systematic reviews of Patient-Reported Outcome Measures. *Qual Life Res.* 2018;27:1171-9.
18. Muehlhausen W, Doll H, Quadri N, Fordham B, O'Donohoe P, Dogar N, et al. Equivalence of electronic and paper administration of patient-reported outcome measures: a systematic review and meta-analysis of studies conducted between 2007 and 2013. *Health Qual Life Outcomes.* 2015;13:167.
19. Terluin B, Brouwers EPM, Marchand MAG, de Vet HCW. Assessing the equivalence of Web-based and paper-and-pencil questionnaires using differential item and test functioning (DIF and DTF) analysis: a case of the Four-Dimensional Symptom Questionnaire (4DSQ). *Qual Life Res.* 2018;27(5):1191–200.
20. Vereeck L, Truijen S, Wuyts F, van de Heyning PH. Test-retest reliability of the Dutch version of the Dizziness Handicap Inventory. *B-ENT.* 2006;2(2):75–80.
21. Jacobson GP, Newman CW. The development of the Dizziness Handicap Inventory. *Arch Otolaryngol Head Neck Surg.* 1990;116:424-7.
22. Tamber AL, Wilhelmsen KT, Strand LI. Measurement properties of the Dizziness Handicap Inventory by cross-sectional and longitudinal designs. *Health Qual Life Outcomes* 2009;7:101.

Tables

Table 1: Characteristics of the British and the Dutch patients with chronic dizziness. Differences in percentage of women, mean age, mean VSS-SF total score, VSS-SF anxiety subscale score and VSS-SF balance subscale score were assessed with independent-samples t tests. Differences in time since vestibular diagnosis were assessed with a chi-square test.

Characteristics	British (n = 296)	Dutch (n = 322)	P-value
Women, n (percentage)	197 (67)	197 (61)	.165
Age in years, mean (SD)	67.4 (10.2)	67.0 (9.5)	.689
Time since vestibular diagnosis, n (percentage)*			<0.001**
One to six months	25 (8)	50 (16)	
Six months to two years	63 (21)	94 (29)	
Two years to 10 years	126 (43)	123 (38)	
More than 10 years	80 (27)	52 (16)	
VSS-SF total score, mean (SD)	15.4 (10.2)	13.7 (8.6)	.023**
VSS-SF anxiety subscale score, mean (SD)	5.8 (5.0)	5.0 (4.5)	.026**
VSS-SF balance subscale score, mean (SD)	9.6 (6.5)	8.7 (5.6)	.070

* Data missing for two British participants and three Dutch participants

** Statistically significant, P-value < .05

Figures

Item 3 ($\Delta R^2 0.043$)*

“Nausea (feeling sick), vomiting”

Item 13 ($\Delta R^2 0.022$)*

“Feeling unsteady about to lose balance,
lasting less than 20 minutes”

Figure 1

Differential item functioning of VSS-SF (15 items)

Differential item functioning (DIF). Expected item scores for the Dutch and British trial groups in relation to the underlying trait for Item 3 and 13. * ΔR^2 effect size. <0.35 is negligible DIF; $0.35-0.70$ is moderate DIF, >0.70 is large DIF.

Figure 2

Differential test functioning of VSS-SF overall scale

Differential test functioning (DTF). Expected test scores for the Dutch and British trial groups in relation to the underlying trait.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [2022.01.10.AppendixA.OriginalBritishversionVSSSF.pdf](#)
- [2022.01.10.AppendixB.TranslatedDutchversionVSSSF.pdf](#)