ORIGINAL ARTICLE

Translation and Validation of Computer Vision Syndrome Scale 17 (CVSS 17) – The Malay Version

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ABSTRACT

INTRODUCTION: Computer Vision Syndrome Scale 17 (CVSS17) is a questionnaire to measure computer-related visual and ocular symptoms among video display terminal workers. This study aimed to translate CVSS17 into Malay language and determine its psychometric properties among video display terminal workers. **MATERIALS AND METHODS**: This was a cross-sectional validation study involving 206 workers in Universiti Teknologi MARA UiTM Selayang and Sungai Buloh Campus. The English version of the CVSS17 questionnaire is a 17-item scale measuring two key factors, which are internal symptom factors (11 items) and external symptom factors (6 items). The CVSS17 underwent forward-backward translation, face validation, and field testing to produce the Malay version. Validity of the items assessing psychometric properties was performed using exploratory factor analysis. The reliability testing was performed using internal consistency and test-retest reliability. **RESULTS**: The validated CVSS17-Malay version retained all 17 items with acceptable factor loadings. There were 13 items in the external, and 4 items in the internal symptom factors domain. In comparison to the original version, 4 items (A2, A22, A28, A30) were swapped from internal to external symptom factors and 2 items (C16 and C23) swapped from external to internal symptom factors. The changes of these items into different domains were discussed. The overall Cronbach's α was 0.867 and the intraclass correlation coefficient was 0.866. The Kaiser-Meyer-Olkin was 0.928, and Bartlett's test of sphericity was p-value <0.001. **CONCLUSION**: The CVSS17 Malay version is valid, reliable, and stable over time, to be used in measuring computer vision syndrome among Malay-speaking workers.

Keywords
CVSS17, "Computer vision syndrome" (CVS), "Computer-related vision and ocular symptoms" (CRVOS), validation, translation.

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INTRODUCTION

Computer vision syndrome (CVS) which is also known as computer-related visual and ocular symptoms (CVROS) is a collection of ocular and visual signs and symptoms related to prolonged and uninterrupted exposure to a Video Display Terminal (VDT).[1,2] The postulated pathophysiology of CVS was a combination of extraocular and ocular mechanisms.[3] The extraocular mechanism causes musculoskeletal symptoms.[3] While, the ocular mechanisms are divided into internal symptom factor (ISF) and external symptom factor (ESF).[4]

The ISF is vision-related and based on refractive and oculomotor mechanisms.[2] Common ISF symptoms are blurred vision, double vision, tired eyes, sore eyes, eyes heaviness, headaches, and focusing difficulty. The ISF symptoms are perceived as located behind the eyes.[4] The ESF is ocular surface-related which is based on blinking and contact lens wear mechanism and pathology of the eyelids, conjunctiva, and cornea.[2] Dryness, itchiness, irritation or scratchiness, burning sensation, glare, blurred vision, redness, and tearing or sore eyes are the symptoms

of the ESF.[2,3] The ESF symptoms are perceived as located in front and below of the eyes.[4]

Globally, the prevalence of CVS is 60% to 80%,[5-7] and 68.1% to 89.9% in Malaysia.[8,9] The work performance loss was highest in the self-reported dry eye symptoms (6.06%) group in comparison with the definite dry eye group (5.65%) and control group (4.27%).[10] The visual complaints have also been shown to affect an individual's precision.[3] The workplace environmental variability associated with eye symptoms caused a significant impact on quality of life and physical complaints.[11] Identification of CVS can aid in implementing preventive strategies at the workplace, such as eye ergonomic strategies (correction of refractory errors, regular breaks between VDT works, and treatment of dry eye disease) and working environment modification strategies (humidity, lightning, screen placement, and screen features).[3]

Generally, there are two methods used to measure CVS, either the objective which is the clinical assessment method, or the subjective method based on either clinical questions or questionnaires.[12] Objective methods are measure specific visual or ocular symptoms. The critical fusion frequency (CFF) is an important tool in evaluating visual fatigue.[13] Decreased in CFF indicated a reduction in the activity of the retina or the optic nerve.[13] Blinking rate was used to measure dry eye. Numerous studies reported reduced blinking while using VDT.[14, 15] A pupillary light reflex and pupil size were used as an indicator of visual fatigue. An increased pupil diameter indicating visual fatigue because of the detrimental impacts on focus depth and more demanding tasks and tracking caused a greater increase in pupillary size.[16]

The subjective method of identifying CVS involves completing questionnaires that are sufficient and more cost-effective than the objective method. The subjective method is preferable as patients are not subjected to numerous clinical assessments which can be cost-effective and save time.[12] To date, there is a lack of reliable and validated questionnaires to identify CVS. Most questionnaires are only focused on the frequency of the symptoms[17, 18], or the severity of the symptoms. [19], or focused on both but unstructured.[20]

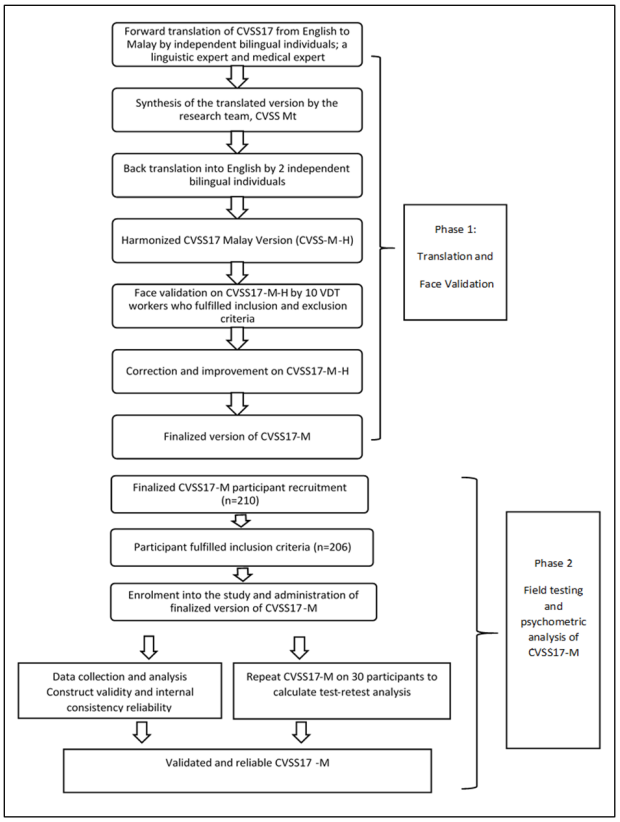
The Visual Fatigue Questionnaire (VF-Q)[21]; Computer Vision Syndrome Questionnaire (CVS-Q)[22] and Computer Vision Syndrome Scale 17 (CVSS17)[23,24] are among validated questionnaires to measure CVS. Of those, the CVSS17 questionnaire is the most comprehensive. The 17 -items of the questionnaire given information on 15 different symptoms and the behaviour of the symptoms closely related to 2 factorial models proposed for CVS.[4] Questionnaires with established validity and reliability are important instruments to be added into routine patient care and clinical trials involving the ocular and visual health-related computer workers. Currently, there is no Malay version questionnaire for identifying CVS. Given the fact that CVSS17 is the most comprehensive tool, a validated Malay version of CVSS17 is needed to measure CVS in the Malaysian setting.

MATERIALS AND METHODS

Study Design and Participants

This is a cross-sectional study and conducted in two phases, Phase 1: Translation of the CVSS17 from English into Malay language and the face validation process; Phase 2: Field testing and psychometric evaluation of the CVSS17-Malay version (CVSS17-M). The outline of the study flow is shown in **Figure 1.** The participants were VDT workers (including clinical, academic, and administrative staff who uses VDTs as a significant part of their routine work, for at least 4 hours a day or 20 hours a week) in UiTM Faculty of Medicine Selayang and Sungai Buloh Campus.

The inclusion criteria of this study are as follow: i) age more than 18 years old ii) using the computer at the workplace for at least 4 hours a day or 20 hours a week, iii) able to read, speak and understand the Malay language, and iv) able to give the informed consent. Those participants with inflammatory or traumatic eye diseases, severe refractive errors (between 6 and 8 diopters), misalignment of the eye, and underlying systemic diseases (diabetic retinopathy) or on medication that could affect their vision (beta-blocker, antihistamine, diuretic) were excluded from the study.



CVSS Mt – CVSS Malay translated

Figure 1: Study flow chart

Study Tool

The study tool comprises of two parts. Part 1 included the demographic details and Part 2 consisted of the CVSS17 questionnaire. The CVSS17 questionnaire is a patient-reported outcome (PRO) measurement to measure CVS.[23, 24] it was developed in 2014 by M Gonzalez-Perez et.al. using a Rasch model. It consisted of 17 items within two main factors; ESF (11 items) and ISF (6 items), with five performance levels representing the symptom severity. The items have different response options and response categories. One item has 7 responses option, six items have 6 responses options and ten items have 4 responses options. The symptom severity based on CVSS 17 score as stated: Level 1 (CVSS score of ≥17 & <23), Level 2 (CVSS score of ≥ 23 & < 29, Level 3 (CVSS score of ≥ 29 & < 36), Level 4 (CVSS score of ≥36 & < 43) and Level 5 (CVSS score of ≥ 43). The higher the level, the more severe the symptoms are. A confirmatory factor analysis (CFA) through discriminant analysis confirmed the two main factors were correctly classified as ESF and ISF.

Phase 1: Forward - Backward Translation and Face Validation

The forward translations into the Malay language were done by an ophthalmologist (M1); who was not blinded to the study objectives and a linguistic expert (L1) from the Academy of Language Studies, UiTM; who was blinded to the study objectives. Backward translation into the English language was carried out independently by a family medicine specialist (M2) and a linguistic expert (L2). The forward and backward translation was done in accordance to establish cross-cultural and translation guidelines.[25, 26] The harmonisation of the forward and backward translation was carried out by the research team to produce the harmonised Malay version of CVSS17 (CVSS17-M-H).

The face validation of CVSS17-M-H was conducted on 10 participants who were naïve to this study and fulfilled inclusion and exclusion criteria. The participants were asked to respond on the clarity and comprehension based on a scale of 0 (not clear and understandable), until 4 (very clear and understandable). The response was then categorised to 0 (not clear and understandable or somewhat clear and understandable) and 1 (clear and understandable or very clear and understandable) for the calculation of the face validity index (FVI). The universal FVI was calculated by averaging the index value of clarity and comprehension. The value of the FVI was 0.83 and considered acceptable. [27] The questionnaire was fine-tuned to produce the final version of CVSS17-M, which was ready for field testing.

Phase 2: Field Testing and Psychometric Evaluation

The CVSS17-M was field-tested amongst participants who fulfilled the same inclusion and exclusion criteria as in Phase 1. Participants in Phase 1 and 2 were mutually exclusive.

Sample size

The subject-to-item ratio of 10:1 was used to determine the sample size.[28] After consideration of 20% of non-

respondent, the study aimed to approach a sample size minimum of 205 participants.

Sampling Method

This study was conducted using a convenience sampling method until the target sample size was achieved.

Participant Recruitment and Data Collection

Participants were recruited at UiTM Selayang and Sungai Buloh Campus between December 2020 and January 2021. Participants were approached at their working station or department. Those interested in participating were given the study information sheet containing information pertaining to the study. Participants who fulfilled the eligibility criteria and agreed to participate were recruited and given written informed consent. Self-administered CVSS17-M were given, and participants were asked to mark the response options that suited them the most.

Phase 2: Data Collection for Test-retest Reliability

Thirty participants were asked for their second attempt response at 2 to the 4-weeks interval after their first attempt response. This time interval was appropriate to ensure that no clinical changes would have occurred and to prevent recall bias.[29]

Statistical Analysis

Data entry and statistical analysis were performed using IBM SPSS Statistics Version 26. Assessment of sampling adequacy and appropriateness of data for further factor exploration was conducted by estimating the Keiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity values. The KMO index was reported in a range of 0 to 1, with values of > 0.50 considered suitable for proceeding to factor analysis.[30] A significant Bartlett's Test of Sphericity with a p-value < 0.05 was suitable for factor analysis.[30] The construct validity of CVSS17-M was then assessed using EFA. The factor extraction was done using Principal Axis Factoring (PAF). This method reduces the dimensionality of the dataset and measured latent variable that defines the interrelationship among items.[31] The number of factors to be retained was determined by several criteria; latent root criterion (factor with eigenvalue>1), scree plot criterion, and percentage of total variance explained criterion of>50% or a priori criterion.[31] A final number of factors will be determined by examining several factor solutions with the different number of factors that conceptually fit the data.[31] A varimax rotation was chosen as the factor pattern obtained is more invariant and has a distinct separation of the factor.[31] Factor loading > 0.4 will be considered significant.[31]

The reliability of the CVSS17-M was assessed using the Cronbach alpha coefficient. Inter-item correlation, item-total correlation (ITC), and Cronbach's alpha if an item is deleted were assessed for the instrument item analysis. The ITC within 0.30 to 0.90 and corrected item-total correlation (CITC) of minimum > 0.3 were considered acceptable.[32] A Cronbach alpha coefficient value of > 0.7 was considered reliable.[33] Intraclass correlation coefficient (ICC) was used to assess the test-retest reliability. The higher the values nearing 1.00, the more stable the items are over time.[34]

Ethical Consideration

Ethical approval was obtained from the Research Ethics Committee of Universiti Teknologi MARA UiTM [600-TNCPI (5/1/6)/ REC/675/19]. Written permission from the original author of CVSS17 to translate into CVSS17-Malay language was obtained.

RESULTS

Translation and face validation

There were two keywords that differently forward translated. The keyword "strain" from item A22 and C21 was difficult to directly translate into Malay word. The translators have to elaborate the meaning of strain. This resulted in a longer Malay sentences as shown; *A22: "Adakah anda perlu* ***memaksa otot mata bekerja untuk memfokuskan mata*** *untuk melihat dengan lebih baik?"* and

C21: "Setelah bekerja menggunakan komputer, saya perlu ***memaksa otot mata bekerja untuk memfokuskan mata*** *untuk melihat dengan lebih jelas".*

The other keyword identified as the issue was "heavy" from items C16 and A17. The team decided to harmonise the meaning of heavy to tiredness as heavy can be misinterpreted as sleepy eyes or strained eyes. The harmonised Malay versions were; *A17:"Setelah bekerja menghadap komputer selama beberapa ketika, adakah mata anda terasa* ***lesu****";* and *C16: "Setelah habis waktu bekerja, mata saya terasa* ***lesu****".* The responses "slightly disagree" and "slightly agree" for items C16, C21, C23, and C24 were translated as "disagree" and "agree" as the response still carries the same meaning.

The FVI for clarity and comprehension was 0.98 and the universal FVI was 0.83, indicating a satisfactory level of face validity as shown in **Table I**.

Recruitment for Field Testing

Out of 210 participants who were approached, only 206 participants were eligible, consented, and completed the self-administered CVSS17-M giving the response rate of 98%.

Demographic characteristic

The participant's sociodemographic are presented in **Table II**.

Table II: Socio-demographic and duration of computer usage of participant

Description		Sample size (n=206)	(100%)	Mean (± SD)
Age				30.8 (5.5)
Gender	Male	50	24.3	
	Female	156	75.7	
Ethnicity	Malay	204	99	
	Indian	1	0.5	
	Others (Bumiputra)	1	0.5	
Educational level	No formal education	2	1.0	
	Secondary school	22	10.7	
	College/University	182	88.3	
Job description	**Executing Group**	**153**	**74.3**	-
	Staff nurse	109	52.9	
	Medical Lab Technician	5	2.4	
	Assistant Pharmacist	16	7.8	
	Radiographer	3	1.5	
	Clerk	6	2.9	
	Medical Attendant	2	1.0	
	Assistant IT Officer	4	1.9	
	Assistant Librarian	8	3.9	
	Professional	**53**	**25.7**	
	Doctor	46	22.3	
	Medical Lab Officer	1	0.5	
	Pharmacist	4	1.9	
	Science officer	2	1	
Duration of computer usage at work per day (in hours)				6.6 (1.8)
Duration of computer usage at works per week (in hours)				32.8 (9.5)
Duration of computer usage out of office hour per day (in hours)				1.7 (1.6)

Table I: The clarity and comprehension rating on the item SS17-M-H by 10 raters

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9	Rater 10	Raters in agreement	I-FVI	UA
Item													
A2	1	1	1	1	1	1	1	1	1	1	10	1	1
A4	1	1	1	1	1	1	1	1	1	1	10	1	1
A9	1	1	1	1	1	1	1	1	1	1	10	1	1
A20	1	1	1	1	1	1	1	1	1	1	10	1	1
A21	1	0	1	1	1	1	1	1	1	1	9	0.9	0
A22	1	1	1	1	1	1	0	1	1	1	9	0.9	0
A28	0	1	1	1	1	1	1	1	1	1	9	0.9	0
A30	1	1	1	1	1	1	1	1	1	1	10	1	1
A32	1	1	1	1	1	1	1	1	1	1	10	1	1
A17	1	1	1	1	1	1	1	1	1	1	10	1	1
A33	1	1	1	1	1	1	1	1	1	1	10	1	1
B7	1	1	1	1	1	1	1	1	1	1	10	1	1
B8	1	1	1	1	1	1	1	1	1	1	10	1	1
C16	1	1	1	1	1	1	1	1	1	1	10	1	1
C21	1	1	1	1	1	1	1	1	1	1	10	1	1
C23	1	1	1	1	1	1	1	1	1	1	10	1	1
C24	1	1	1	1	1	1	1	1	1	1	10	1	1
											S-FVI/Ave	**0.98**	
Proportion Clarity & Comprehension	0.95	0.95	1	1	1	1	0.95	1	1	1	**S-FVI/UA**		**0.83**
The average proportion of item judged clarity& comprehension across the 10 raters = 0.99													

To add footnote for the abbreviations used. I-FVI (item-level face validity index)
UA (Universal agreement)
S-FVI/Ave (scale-level face validity index based **a**he average)
S-FVI/UA (scale-level face validity index based **a**he universal agreement)

Psychometric Evaluation

There was no missing response to the questionnaire items. The KMO value for the CVSS-M was 0.928, and Bartlett's test of sphericity was significant with a p-value of <0.001, indicating that the sample was adequate for factor analysis.

On the first run of EFA using PAF with eigenvalues set at >1, 3-factor solutions were extracted. This 3-factor solution explained a cumulative 51.43% of the total variance explained. Further analysis using the scree plot criterion showed the inflexion point occurred at factor three, suggesting two factors should be retained. Among two to three-factor, a two-factor solution was best fit the study concept.

Varimax rotation was deemed to be the most conceptually appropriate to the CVSS17-M. Therefore, the data were reanalysed by fixing the number of factors at two factors following the scree plot and priori criterion. The eigenvalue for Factor 1 was 7.71, with a variance of 45.35%, while the eigenvalue value for Factor 2 was 1.29, which explained 7.59% of the variance in the data. The total cumulative variance for both factors was 47.31%.

Table III showed the results of the factor loadings of the CVSS17-M. Item A17 cross-loaded with the value of 0.51 into Factor 1 and 0.45 into Factor 2. Item B8 was also cross-loaded with the value of 0.47 into Factor 1 and 0.40 into Factor 2. Both items were retained in Factor 1 as the factor loadings were higher in Factor 1 and they fit better conceptually within Factor 1. From this study, Factor 1 was labelled as ESF and Factor 2 as ISF. There were 13 items within Factor 1 and four items within Factor 2. There were swapping of four items (A2, A22, A28, A30) from the ISF domain into the ESF domain and two items (C16, C23) loaded into the ISF domain that was originally from the ESF domain. Table IV illustrated the comparison between the original CVSS17 and CVSS17-M. This final version of the CVSS17-M underwent reliability analysis with the Cronbach alpha values for Factor 1 was 0.90 and Factor 2 was 0.86, as shown in Table III. The ICC value was 0.87.

Table III: Cronbach's α, Interclass Correlation, Communalities and Factor Loadings of each item

Coding	Item	Cronbach's Alpha	Interclass Correlation Coefficient (ICC) (95%CI)	Communalities	*Factor Loading Factor 1: ESF	*Factor Loading Factor 2: ISF
A2	Did the letters on the screen become blurry?	0.90	0.85 (0.70-0.93)	0.35	0.54	
A4	Did your eyes become tired?		0.90 (0.80-0.95)	0.50	0.66	
A9	Did your eyes hurt?		0.92 (0.84-0.96)	0.46	0.65	
A20	Did you have to blink more than usual?		0.94 (0.88-0.97)	0.41	0.55	
A21	Did your eyes burn?		1.00 (1.00)	0.57	0.69	
A22	Did you have to strain to see well?		0.76 (0.55-0.88)	0.52	0.64	
A28	Did you feel like you were crossing your eyes?		0.59 (0.30-0.78)	0.24	0.44	
A30	Did the letters appear double?		0.80 (0.62-0.90)	0.41	0.57	
A32	Did your eyes sting?		0.72 (0.49-0.85)	0.44	0.62	
A17	After working on the computer for a while did your eyes become heavy?		0.76 (0.56-0.88	0.46	0.51	0.45
A33	After working on the computer for a while did lights bother you?		0.89 (0.79-0.95)	0.44	0.54	
B7	Watery Eyes		0.87 (0.75-0.94)	0.45	0.55	
B8	Eye redness		0.94 (0.87-0.97)	0.38	0.47	0.40
C16	At the end of my working day, my eyes feel heavy	0.86	0.96 (0.92-0.98)	0.51		0.62
C21	After working at the computer, I have to strain to see well		0.88 (0.76-0.94)	0.63		0.76
C23	While I'm working on the computer, my eyes become dry		0.95 (0.90-1.00)	0.63		0.72
C24	After some time at the computer, lights bother me		1.00 (1.00)	0.66		0.75
Overall			0.87 (0.74-0.93)	8.05		

* Rotation using principal axis factoring with varimax rotation

Table IV: Comparison between CVSS17 English Version and CVSS17 Malay Version

Factor	No of item	CVSS17 English version	No of item	CVSS17 Malay version
External symptom factor (ESF)	11	A4. Did your eyes become tired?	13	*A4. Adakah mata anda menjadi letih?*
		A9. Did your eyes hurt?		*A9. Adakah mata anda berasa sakit ?*
		A20. Did you have to blink more than usual?		*A20. Adakah anda perlu mengerlipkan mata lebih daripada biasa?*
		A21. Did your eyes burn?		*A21. Adakah mata anda pedih?*
		A32. Did your eyes sting?		*A32 Adakah mata anda berasa sakit menyucuk?*
		A17. After working on the computer for a while did your eyes become		*A17. Setelah bekerja menghadap komputer selama beberapa ketika, adakah mata anda terasa lesu*
		A33. After working on the computer for a while did lights		*A33. Adakah sinaran cahaya mengganggu anda selepas bekerja menggunakan komputer*
		B7. Watery Eyes		*B7. Mata Berair*
		B8. Eye redness		*B8. Mata menjadi Merah*
		C16. At the end of my working day, my eyes feel heavy		*A2 Adakah huruf-huruf pada skrin menjadi kabur?*
		C23. While I'm working on the computer, my eyes become dry		*A22. Adakah anda perlu memaksa otot mata bekerja untuk memfokuskan mata untuk melihat dengan lebih baik?*
				A28. Adakah anda rasa mata seperti menjadi juling?
				A30. Adakah anda nampak tulisan kelihatan berganda?
Internal symptom factor (ISF)	6	C21. After working at the computer, I have to strain to see well	4	*C21. Setelah bekerja menggunakan komputer, saya perlu memaksa otot mata bekerja untuk memfokuskan mata untuk melihat dengan lebih jelas*
		C24. After some time at the computer, lights bother me		*C24. Setelah beberapa ketika menghadap computer, sinaran cahaya mengganggu pandangan saya*
		A28. Did you feel like you were crossing your eyes?		*C23. Semasa saya bekerja menggunakan komputer, mata saya menjadi kering*
		A30. Did the letters appear double?		*C16. Setelah habis waktu bekerja, mata saya terasa lesu*
		A2. Did the letters on the screen become blurry?		
		A22. Did you have to strain to see well?		

DISCUSSION

The main objective of this study was to report the reliability and validity of the CVSS17-M among Malaysian VDT workers. In this study, two factors were extracted similar to the original study.[23, 24] However, item allocation was not similar to the original CVSS17. The ESF domain consisted of 13 items and the ISF domain consisted of 4 items. The 4 items (A2, A22, A28, A30) that were originally from the ISF domain extracted into the ESF domain can be explained by overlapping of symptoms between ISF and ESF domain.

Theoretically, symptom blurring of vision from item A2 presents in both the ocular surface mechanism of ESF and the vision-related mechanism of ISF.[2] This could be explained item A2 was loaded into the ESF domain. In addition, dry eye disease (DED), as one of the ESF symptoms and study showed that intermittent blurring of vision was the commonest symptom among DED patients.[35] For item A22 which asked about straining and item A28 asked on the crossing of the eyes might be perceived as symptom located in front of the eyes represent the ESF.[2,4] Other factors that contributed to the ESF loading of item A22 was that the Malay translated sentence were lengthy and raised the possibility of confusion. Item A30 which asked on double vision could be misunderstood as blurring of vision, which carries different interpretation. Further clarification is required to evaluate the participant's understanding of this item. It is ideal to rephrase and simplify the items.[36] Unfortunately, there was a limitation in the translated Malay word used.

Two items from ESF loaded into the ISF domain were C16 and C23. Item C16 which asked about heavy eyes was understood as visual fatigue after working resulted in the ISF domain. Item C23 which asked about dry eyes loaded into ISF might be explained due to the refractive error resulting from the dry eye symptom. Other studies supported this study's findings on the fact that dry eye symptoms are more prevalent in a myopia person, particularly the female gender.[37, 38]

Our study has proven that the CVSS17-M is reliable, with a Cronbach's α value of 0.867. It was comparable with the original CVSS17 Cronbach's α of 0.92. The test-retest reliability of the CVSS17-M ICC was 0.87 (95% CI, 0.74-0.93) indicating the CVSS17-M was stable over time. This finding is comparable with the original CVSS17 ICC of 0.85 (95% CI, 0.80–0.89).

Strengths and Limitations

The strengths of this study include a high response rate of 98% and no missing values. This study, however, has several limitations. First, a larger sample size of at least 300 participants would diminish the Type II error in the data thus reducing the chances of false-negative results.[39] To overcome this, factor loading of at least > 0.4 was considered as appropriate to the sample size as suggested by Hair et al.[31]

Second, this study was conducted among VDT workers in UiTM where most of the participants were Malays (99.0%). The findings may not be generalisable to other VDT workers in Malaysia with a multi-ethnic population. Third, a convenience sampling method used in this study may contribute to sampling bias. This sampling method was chosen because of the current COVID-19 pandemic that limited the data collection period. Lastly, CFA and Rasch Model analysis could not be conducted due to the need for a larger sample size and the limited time frame given to complete the study.

CONCLUSION

The CVSS17-M has satisfactory psychometric properties and can be used to measure CVS among VDT workers. Further CFA in confirming the items representing which factors, is recommended to strengthen the validity of the CVSS17-M. Future research should include VDT workers from other working settings.

CONFLICT OF INTEREST

None

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