Article

The COVID Stress Scale in a Malaysian Population: Psychometric Properties

Nor Ba'yah Abdul Kadir[1,*], Rusyda Helma Mohd[1], Mohd. Rizal Abdul Manaf [2], Normaliza Ab Malik[3] & Mohd. Amirul Rafiq Abu Rahim[4]

[1]Centre for Research in Psychology and Human Well-being, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[2]Department of Family Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Cheras, 56000 Kuala Lumpur, Malaysia
[3]Faculty of Dentistry, Universiti Sains Islam Malaysia, 55100 Nilai, Negeri Sembilan, Malaysia
[4]PNB Research Institute, 50118 Kuala Lumpur, Malaysia

[*]Corresponding Author: aknbayah@ukm.edu.my

Abstract: The COVID Stress Scales (CSS) were used to assess distress related to Coronavirus Disease 2019 (COVID-19). In line with Malaysia's epidemic prevention and control policies during the pandemic, a Malay version of the CSS was developed. This study validated the psychometric properties and factorial structure of the CSS in a Malaysian sample of 686 adults (431 females, 255 males; aged 18–65 years), addressing the lack of culturally specific tools to measure pandemic-related distress in Malaysia. Using rigorous translation and confirmatory factor analysis, the CSS demonstrated strong internal consistency. The results showed that a six-factor model encompassing danger, socioeconomic impact, xenophobia, contamination, traumatic stress, and compulsive checking for the Malay adaptation of the CSS was a good fit with the data. Concurrent validity was confirmed through significant correlations with established measures of COVID-19 fear, PTSD symptoms, and depression. The novelty of this research lies in providing the first comprehensive validation of the Malay CSS, ensuring its cultural relevance and accuracy for assessing COVID-19 stress within the Malaysian sociocultural context. These findings position the CSS as a reliable, multidimensional instrument with practical applications for mental health research and targeted public health interventions to address pandemic-related psychological distress in Malaysia.

Keywords: COVID-19; stress; psychometric properties; validation; Malaysia

Introduction

People of various ages and ethnicities have been impacted by the COVID-19 pandemic, which has negative short- and long-term effects on the mental health of some at-risk groups (Dell'Acqua et al., 2022; Guillen-Burgos et al., 2022; Lovik et al., 2023). According to Google Scholar, 25,000 articles on the COVID-19 pandemic's consequences on mental health were produced between 2020 and 2023. Chen et al. (2020) found that Chinese college students in isolation due to COVID-19 had increased symptoms of obsessive-compulsive disorder, fear, hypochondria, depression, and neurasthenia. Kshirsagar (2021) also found that COVID-19 has caused stress, anxiety, and depression in people worldwide. One study found that parents of children with special educational needs and disabilities reported experiencing loss, worry, and changes in mood and behaviour due to COVID-19 (Toseeb & Asbury, 2023). In Malaysia, one study found that a majority

experienced moderate levels of anxiety (63%) and depression (68%), with combined moderate to severe psychological distress reported by 71% of respondents (Mohamad, 2022). Mohd Shukry et al. (2024) revealed that the loss of income and financial instability increased pressure on single mothers, exacerbating their stress levels during the pandemic. It also notes that economic difficulties are a significant source of mental health issues and psychosocial challenges for this vulnerable group. Hence, previous studies showed that COVID-19 has had a significant negative impact on people's mental health, and further studies are needed to address this issue.

Along with the tremendous increase in publications on COVID-19, a few attempts have been conducted to determine the prevalence of various outcomes related to mental health worldwide. The papers consistently report high prevalence rates of mental disorders in relation to COVID-19. Arora et al. (2020) found that the pooled prevalence of primary psychological outcomes was 26%, with prevalence rates for symptoms of PTSD, anxiety, stress, and depression ranging from 22% to 33%. Dong et al. (2021) also reported prevalence rates of anxiety, depression, PTSD, insomnia, somatization, and fear in COVID-19 patients ranging from 16.6% to 68.3%. Winkler and colleagues (2020) found that the prevalence of those experiencing symptoms of at least one current mental disorder rose from 20.02% to 29.63% during the COVID-19 pandemic, with major depressive disorder and suicide risk tripling and current anxiety disorders almost doubling. Bueno-Notivol et al. (2021) also reported a pooled prevalence of depression of 25%, which is seven times higher than the global estimated prevalence of depression in 2017. These findings highlight the need for adequate provision of resources for mental health during the COVID-19 pandemic.

Literature Review

The COVID Stress Scales (CSS) have been extensively studied to measure pandemic-specific psychological distress, yet debate remains over the optimal factor structure, with some research supporting a five-factor model that combines danger and contamination fears, while others advocate for a six-factor model treating these as separate constructs. Boehme et al. (2024) provided robust evidence for the factorial invariance and superior fit of the six-factor model across diverse North American demographic groups and highlighted methodological limitations in prior studies that favoured the five-factor solution without adequate model comparison. Complementing this, Estrada et al. (2025) employed both confirmatory factor analysis and Rasch modeling in a U.S. adult sample, also endorsing the six-factor structure and demonstrating strong item-level psychometric properties, minimal gender-related item bias, and meaningful correlations between COVID-related stress and broader mental health and well-being measures. Together, these studies underscore the importance of distinguishing danger and contamination fears within the CSS and incorporating comprehensive psychometric assessments to enhance the scale's validity and clinical utility in diverse populations and future pandemic contexts.

There are at least four scales that have been developed to measure COVID-19 stress. Taylor et al. (2020) developed the COVID Stress Scales, which includes five scales assessing COVID-related stress and anxiety symptoms. Nikčević et al. (2020) developed the COVID-19 Anxiety Syndrome Scale, which has a two-factor structure and is a reliable and valid measure of the COVID-19 anxiety syndrome. Chandu et al. (2020) conducted a scoping review and identified 15 scales measuring COVID-19-associated mental health problems but noted that most of these scales were validated among middle-aged adults in Turkey and none of the available scales focused on suicidal ideation or behavioural responses/coping strategies. Ransing et al. (2021) conducted a narrative review and identified 12 scales that have demonstrated robust psychometric properties but noted methodological concerns in their development and suggested developing guidelines and checklists to improve the design and testing of online-administered scales to assess the mental health effects of the COVID-19 pandemic. Voitsidis et al. (2021) conducted a systematic review of questionnaires assessing the psychological impact of COVID-19 and found that the identified scales tended to be quite short and examine stress, anxiety, or fear. Kira et al. (2020) developed and validated a measure for COVID-19 as traumatic stress, which consisted of three dimensions: "threat/fear of infection and death," "economic hardship," and "disturbed routines/isolation." Therefore, these studies collectively suggested that several scales have been developed to measure COVID-19 stress in different populations.

Previous studies suggested that instruments are essential to measure COVID-19 stress because they provide a standardized and reliable way to assess stress caused by the pandemic, for instance, Miclea et al. (2022) found that the COVID-19 Stress Rating Scales had good psychometric properties for assessing stress caused by COVID-19 in the Romanian population. Hynes et al. (2022) identified three profiles of COVID-19-related stressors using the COVID-19 Stressors Scale, highlighting the need to differentiate types of stressor profiles in individual experiences of COVID-19. In addition, Campo-Arias et al. (2020) reviewed the COVID-19 Pandemic-Related Perceived Stress Scale (PSS-10-C) and noted the need for adjustments in the instrument. Tambling et al. (2021) developed the COVID-19 Stressor Scale, which demonstrated strong internal consistency and validity, providing a useful measure for studying the ongoing stressors associated with the pandemic. Overall, these studies suggested that instruments are needed to measure COVID-19 stress because they provide a standardized and reliable way to assess stress caused by the pandemic.

The COVID-19 Stress Scales (CSS; Taylor et al., 2020) were created to measure the aforementioned characteristics as well as to more thoroughly comprehend and evaluate discomfort connected to the COVID-19, and purposefully created to be easily adaptable for upcoming pandemics (Taylor et al., 2020). Between March 21 and April 1, 2020, Qualtrics, a commercial survey sample and administration organisation, collected data from respondents in Canada and the United States utilising an English-language internet-based self-report survey. All respondents gave their agreement before the survey could start, and the data collecting procedure was authorised by the institutional research ethics board at the University of Regina. In order to generate a population representative sample, Qualtrics invited participation by sampling web-panels to fulfil quotas based on age, sex, ethnicity, socioeconomic position, and geographic area within each nation. To exclude information from respondents who were careless or unfinished, filters were utilised. The sample size was 6854 adults (United States: 3375; Canada: 3479). (M = 49.8 years, SD = 16.2) The respondents ranged in age from 18 to 94. Most (52.3%) were working full- or part-time, and over half (47%) were female.

Originally, the CSS was created by reviewing pertinent literature and speaking with specialists on anxiety related to one's health. The next domains were discovered: (1) Fears about the potential for COVID-19 to be dangerous (14 items); (2) Fears about potential sources of COVID-19-related contamination (i.e., objects, surfaces; 8 items); (3) COVID-19-xenophobia (i.e., Fears that Foreigners are Sources of COVID-19; 7 items); (4) Fears about the potential for COVID-19 to have personal, social, and economic consequences (e.g., Fears of disruption in the supply chain (e.g., unwanted intrusive thoughts or nightmares relating to COVID-19; 7 items). Parallel analysis indicated a 5-factor solution, rather than a 6-factor solution in which each factor corresponded to each of the six scales of the CSS: contamination and danger, socioeconomic effects, xenophobia, compulsive evaluation, and traumatic effects. Instead of a 6-factor solution, which corresponded to each of the six CSS scales-contamination and danger, socioeconomic impacts, xenophobia, obsessive assessment, and traumatic effects-parallel analysis suggested a 5-factor solution.

The CSS instrument was validated for eight nations (Psychology of Pandemics Network, n.d.). The outcomes consistently indicated that the psychometric characteristics of the CSS are acceptable (Adamczykl et al., 2021; Khosravani et al., 2021; Mahamid et al., 2021; Martínez-Lorca et al., 2020). For example, research on Iran intends to evaluate the Persian CSS variant based on clinical assessments (Khosravani et al., 2021). This study was conducted based on a five-factor analysis similar to the initial CSS clinical samples with anxiety disorders and obsessive-compulsive disorder. The CSS and its metrics indicated acceptable validity and reliability. Research conducted for the Spanish population in Peru (Noe-Grijalva et al., 2022) was based on factorial analysis that confirmed six initial CSS factors. These factors have acceptable internal consistency. The factorial approach used for CSS was independent of gender. Hence, the Spanish CSS variant was valid, and it reliably estimated COVID-19 related stress for the Peruvian population. Adamczykl et al. (2021) evaluated CSS' psychometric characteristics in Poland. Data collection was performed twice to determine factor structure, invariance, internal consistency, time-specific stability, and extrinsic associations concerning the Polish CSS variant. Outcomes also indicated that CSS have versatile psychometric characteristics as it does not vary much across countries or periods.

CSS was assessed for concurrent validity using numerous measures like the Depression, Anxiety and Stress Scale (DASS21), Fear of COVID-19 Scale (FCV-19S) (Mahamid et al., 2021; Martínez-Lorca et al.,

2020), COVID-19 vaccination intention, and obsessive-compulsive indications (Adamczykl et al., 2021), panic and social anxiety disorder, generalised anxiety disorder, and phobias (Khosravani et al., 2021). The outcomes indicated that CSS had positive and significant correlations with all parameters (Adamczykl et al., 2021; Mahamid et al., 2021; Martínez-Lorca et al., 2020). The CSS has been extensively employed to evaluate COVID-19 related distress; the questionnaire is now available in 20 languages (Psychology of Pandemics Network, n.b). CSS was translated into Arabic, Albanian, Chinese, Croatian, French, Greek, Hindi, Japanese, Lithuania, Malay, Marathi, Nepali, Persian, Portuguese, Serbian, Spanish, Swedish, Tagalog, Turkish, and Urdu. The CSS is not yet evaluated using a Malaysian sample regardless of extensive use across nations and cultures. Hence, the main goal of this study was to validate the Malay language version of the CSS (CSS-Malay) in order to facilitate study of psychological responses to the COVID-19 pandemic. The first case of SARS-CoV-2 in Malaysia was confirmed on January 25, 2020, and since then more than 4.4 million people of Malaysia have been infected, and 35,547 have died from infections (as of 17 May 2022; https://covid-19.moh.gov.my/). In facing this critical situation, the Malaysian government has introduced a number of social restrictions to prevent any spread of the virus (COVID-19 Malaysia, n.d.) and top of that, a number of those experienced psychological distress during COVID-19 pandemic was also increased (Ganaprakasam et al., 2021). Given the enormous impact of COVID-19, thus a well-validated instrument to measure the psychological impact of the COVID-19 pandemic is important.

The necessity of validating the COVID Stress Scales (CSS) in the Malaysian context is reinforced by the country's unique cultural and linguistic characteristics, which can significantly shape how individuals perceive, and experience stress related to the pandemic. Malaysia's multicultural composition, which including Malay, Chinese, Indian, and indigenous communities, compasses a wide range of cultural beliefs, values, and coping strategies that may differently influence mental health outcomes. Moreover, the Malay language contains nuances and idiomatic expressions that may not be fully conveyed through direct translations of psychological assessment tools originally developed in Western settings.

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While the CSS scale is a novel self-report measure, its criterion-related validity and psychometric features have yet to be investigated among Malaysians. Given the CSS scale's wide application in the general population, it is critical that its psychometric qualities be thoroughly known. As a result, the goal of this study was to assess the criterion-related validity and psychometric features of the CSS scale in a Malaysian population sample. Based on previous research, the following hypotheses were tested: a) the CSS scale would predict a six-factor structure assessing COVID-19 stress among Malaysians, b) the CSS scale would be a reliable instrument to be used in assessing COVID-19 stress among Malaysians, and c) the CSS scale would be a valid instrument in assessing COVID-19 stress among Malaysians.

Methodology

1. Research Design
The present study used a convenience sampling technique combined with purposive to recruit adults aged 18 to 65 years for participation in the online survey. Convenience sampling was selected to facilitate efficient and timely data collection during the COVID-19 pandemic when in-person recruitment was limited by social distancing regulations. Participants were recruited through online platforms such as social media, government agencies, and organizational email lists, allowing access to a broad and diverse participant pool within the target age range. This non-probability sampling approach is commonly utilized in COVID-19 related research to capture a wide range of experiences and responses within feasible constraints.

2. Participants
The 686 Malaysian participants comprised 431 females and 255 males aged 18 and 65 years (M = 30.57, SD = 9.01). The sample comprised 47.2% participants (n = 324) with a bachelor's degree; 51.5% (n = 353) had a job, and the sample had a mean monthly income of RM5,015.76. The sample had 13.1% (n = 90) individuals with chronic conditions. Concerning the residing state, thirty or more participants represented every state, except for Penang, Pahang, Perlis, Perak, and Sarawak. The study inclusion conditions require 18+-year-old Malaysians who resided in the country during the COVID-19 outbreak. Written consent was obtained before considering participating in this study.

3. Measures
The CSS was devised to ascertain COVID-associated stress during the previous week. The scale comprised 36 questions split into six categories: (1) Fears about the dangerousness of COVID-19 (14 items), (2) fears about sources of COVID-19-related contamination (i.e., objects, surfaces; 8 items), (3) COVID-19-xenophobia (i.e., fears that foreigners are sources of COVID-19; 7 items), (4) fears about the personal social and economic consequences of COVID-19 (e.g., fears of disruption in the supply chain, fears of looting or rioting; 10 items), (5) COVID-19-related checking (e.g., checking news media or social media, seeking reassurance from friends or medical professionals; 7 items), and (6) traumatic stress symptoms related to COVID-19 (e.g., unwanted intrusive thoughts or nightmares relating to COVID-19; 7 items). Items were rated on a 5-point scale ranging from 0 (not at all) to 4 (extremely). The checking and traumatic stress items were rated on a 5-point scale ranging from 0 (never) to 4 (almost always). The CSS' internal consistency was in the good-to-excellent range (Taylor et al., 2020). Moreover, the scales demonstrate appreciable cross-cultural steadiness and validity (Khosravani & Asmundson, 2021; Milic et al., 2021; Mahamid et al., 2021; Muta et al., 2020; Noe-Grijalva et al., 2022; Taylor et al., 2020).

The Fear of COVID-19 (FCV-19S) is a unidimensional measure of individual COVID-19-related fear (Ahorsu et al., 2020). This instrument comprises 7 elements (e.g., the seventh item reads, "My heart races or palpitates when I think about getting coronavirus-19"). Scoring is based on a five-point Likert scale, where 1 indicated 'strongly disagree' and 5 indicated 'strongly agree'. The composite score was computed by adding the individual values, suggesting a score range of 7 to 35. Higher numbers are indicative of relatively more COVID-19 fear. The scale exhibits versatile psychometric characteristics like significant internal consistency (Ahorsu et al., 2020). The present research has a Cronbach's alpha of .85, suggesting exceptional internal consistency. Several language translations are available for this scale: Bangla (Sakib et al., 2020), Brazilian (Cavalheiro & Sticca, 2020), Israeli (Bitan et al., 2020), Italian (Soraci et al., 2020), Japanese (Masuyama et al., 2020), Malay (Pang et al., 2020), Pakistani (Green et al., 2021), Polish (Pilch et al., 2021), Portuguese (Soares et al., 2021), Romanian (Stănculescu, 2022), Spanish (Martínez-Lorca et al., 2020), and Turkish (Satici et al., 2020).

Trauma Screening Questionnaire (TSQ) elements require yes or no responses, indicating the presence of symptoms twice or more times a week and symptoms fewer than twice a week, respectively; questionnaire score ranges between zero and ten. It is established that the TSQ exhibits appreciable specificity and sensitivity, indicative of the good-to-excellent range, concerning its ability to estimate PTSD for British data

representing victims of rail crash, crime, Wales assault, and 2005 London attacks. A TSQ threshold of 6 was optimal for these studies. The Malay version of the TSQ used for this result has appreciable internal consistency, measured using Cronbach's alpha (α = .87). The TSQ has been validated in a Malaysia setting (Jaapar et al., 2014).

The Posttraumatic Stress Disorder Checklist (PCL) comprises a self-administered questionnaire comprising 18 items associated with PTSD manifestations as defined by the DSM-IV; it was employed to evaluate post-traumatic stress disorder. Responses are recorded using a five-point scale, where 1 indicated 'not at all', while five indicated 'extremely', to describe how much individuals have been worried about a specific symptom during the preceding month. The PCL-C is a less specific version not associated with a particular event; questions emphasise *"a stressful experience from the past"*. The PCL-C may be answered in the context of a particular traumatic occurrence. Candidates are required to specify the occurrence, and questions target *"the stressful experience"*. The rating scale comprises five points where 1 indicates 'not at all', while 5 indicates 'extremely', representing how much the individual was troubled by that specified symptom over the previous month. The scale records a score range of 17 to 85. The PCL exhibits excellent diagnostic characteristics. Weathers et al. (1993) asserted that a threshold score of 50 is adequate to indicate a likely diagnosis of combat-associated PTSD. Alternatively, individual elements might be employed based on DSM recommendations (i.e., one or more symptoms from the question set 1-5, three or more from the question set 6-12, and two or more from the question set 13-17). Researchers indicate that the threshold value of 3 or more is adequate. This approach exhibits significant psychometric characteristics. Its internal consistency is estimated using Cronbach's alpha ranging between 0.94 (Blanchard et al., 1996) and 0.97 (Weathers et al., 1993). This measure demonstrates test-retest reliabilities of 0.95 and 0.88 at 2-3 days and 1 week, respectively (Blanchard et al., 1996; Ruggiero et al., 2003). The PCL shares a positive correlation with the Mississippi PTSD scale, exhibiting a convergent validity range (r) between 0.85 and .93 (Weathers et al., 1993). Blanchard et al. (1996) reported significant associations with CAPS (.92), IES (.77 to .90), and the MMPI-2 Keane PTSD Scale (.77). PTSD diagnosis using a cut-off score of 50 indicated acceptable specificity (.83 to .86) and sensitivity (.78 to .82). A reduced cut-off score of 44 enhanced specificity (.86), sensitivity (.94), and overall diagnostic efficacy (.90) for MVA victims (Blanchard et al., 1996). This study has remarkable internal consistency, indicated using the high Cronbach's alpha value (α = .96).

The BDI-II is a self-administered questionnaire comprising 21 items and four responses for one item. The BDI-II scale measures several depressive indicators like hopelessness, guilt, fatigue, sadness, loss of appetite, and self-blame. Participants are instructed to select the option that best indicates their perspective concerning every item. BDI-II scores range between 0 and 63 and are typically categorised using 0-13, 14-19, 20-28, and 29-63-point ranges, suggesting zero, mild, moderate, and severe depression, respectively. This scale exhibits versatile psychometric characteristics like significant internal consistency (α = .93). Moreover, it is offered in several languages: Bulgarian (Byrne et al., 1998), Chinese (Yang & Steward, 2020), German (Kühner et al., 2007), Indonesian (Ginting et al., 2013), Iranian (Hamidi et al., 2013), Italian (Sica & Ghisi, 2007), Japanese (Kojima et al., 2002), Korean (Lim et al., 2011), Portuguese (Campos & Gonçalves, 2011), Serbian (Novović et al., 2011), Spanish (Bonilla et al., 2004), Swedish (Byrne et al., 1995), and Turkish (Kapci et al., 2008).

4. Procedures

Participants were recruited through email lists associated with government agencies, non-governmental organizations, and private sector organizations, as well as via social media platforms including Twitter, WhatsApp, and Facebook. This approach allowed targeted outreach to individuals likely to be relevant to the study context while facilitating broad accessibility to the online questionnaire. The sample was thus non-probabilistic, relying on participants' voluntary response to the invitation, which may affect the generalizability of the results. To enhance diversity within the sample, recruitment efforts intentionally included a range of organizational sectors and social media channels. Participants self-selected to join the study based on their interest and willingness to engage. All participants received clear information about the study's purpose, procedures, voluntary nature, rights to withdraw without penalty, anonymity of responses,

and data confidentiality prior to consenting to participate. Ethics approval was granted by the Research Ethics Committee of Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2020-564). Informed consent was obtained electronically before participants completed the questionnaire. No financial incentives were offered.

5. CSS Translation

We used Braken and Barona's procedure for translating and validating in cross-cultural assessments (Braken & Barona, 1991). The English version of the CSS scale was translated into Malay with the help of two different bilingual translators and who are sufficiently educated to have familiarity with the concepts in the field. A blind translation of a translated version back into the English language was performed. The translators and the principal investigator reconciled any discrepancies between the translated versions and the English of CSS scale. The individuals who conducted the back-translation have no prior knowledge of the scale being translated. The translated versions were then checked by two subject matter experts (SMEs or a bilingual review committee), who are bilingual English and Malay speakers and proficient in the field. The SMEs were blinded to the English version of the CSS scale. Based on the feedback of the SMEs, minor changes were made to enhance the lucidity of the translated version, which was then compared again to the English version.

6. Statistical Analysis

A six-factor model was examined through confirmatory factorial analysis using AMOS 5 software. Goodness-of-fit tests were based on the specified criteria: comparative fit index (CFI > .90 or more suitably ≥ .95), standardised root mean square residual (SRMR ≤ .08), and root mean square error of approximation (RMSEA ≤ .06). Descriptive statistics were used to test the characteristics of the CSS scale in Malays for a Malaysian context. Concurrent validity was examined using throughout the correlation test between CSS, FCV-19S, and PCL. The internal consistency reliability was estimated using the Cronbach's alpha coefficient, McDonald's omega, and item-total correlation. Test-retest reliability was used to ensure that the measurements obtained by the scale in one setting are both representative and stable over time.

The Findings

1. Confirmatory Factor Analysis

The overall item correlation was computed using the total CSS score before initiating confirmatory factor analysis (CFA). The outcomes indicated that all thirty-six elements have a significant and positive correlation with the overall CSS score; moreover, there is a conceptual association (DeVon et al., 2007). This framework uses six factors: danger, socioeconomic consequences, xenophobia, contamination, traumatic stress, and compulsive checking (Figure 1). The model fits well (Table 1), as indicated by the incremental indices: SRMR = .05, CFI = .98, RFI = .96, NFI = .97, IFI = .98, and TLI = .98, which are all .90 or more. This framework has a .05 RMSEA, below the threshold of about .06, evidencing good approximate and residual fit. The item loading values ranged from .50 to .87, within the acceptable range of high loading values (all > .50), supporting convergent validity and indicator reliability.

Table 1. Fit indices for CSS

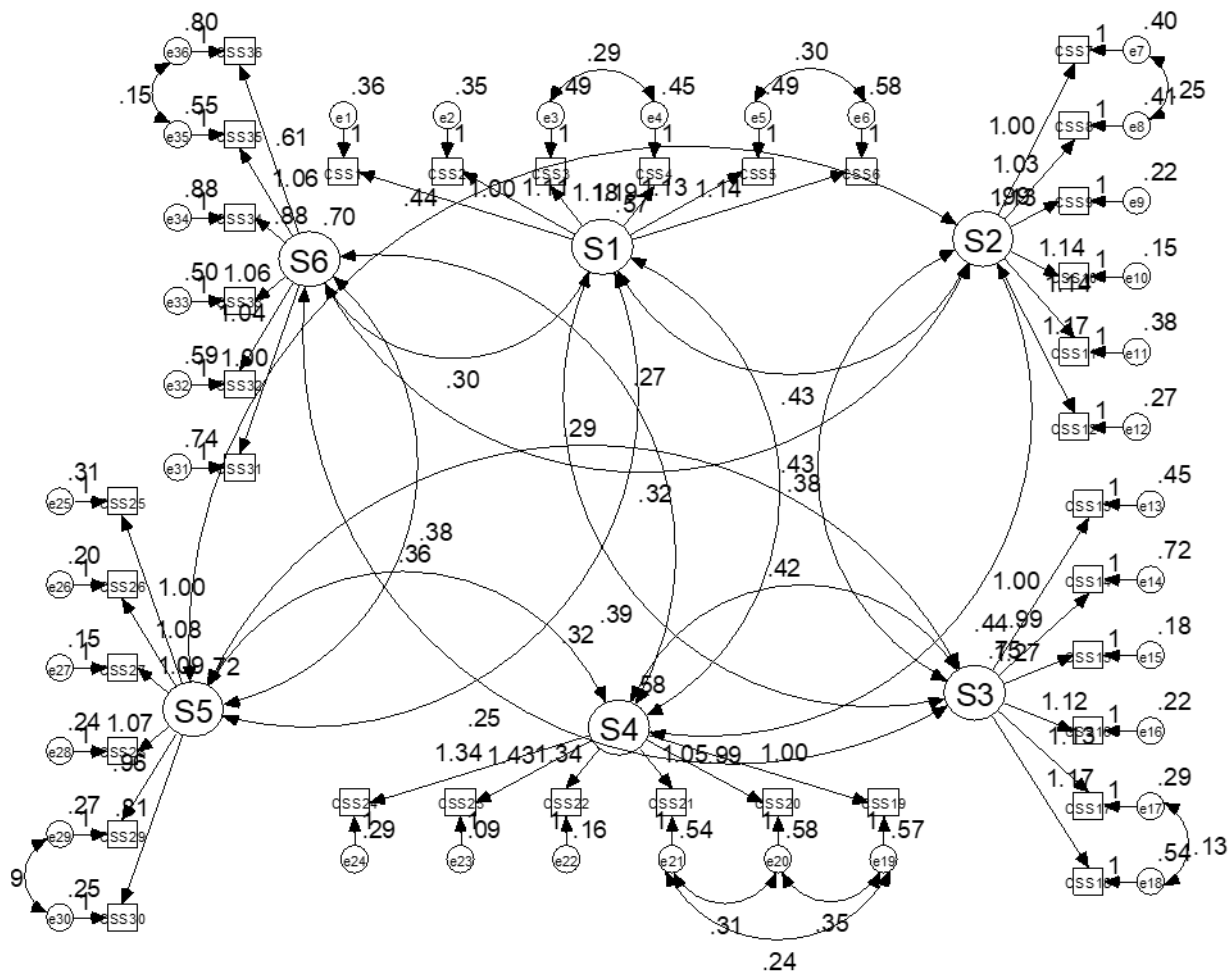| Index	Value
Comparative Fit Index (CFI)	.98
Tucker-Lewis Index (TLI)	.98
Bentler-Bonett Normed Fit Index (NFI)	.97
Bollen's Relative Fit Index (RFI)	.96
Bollen's Incremental Fit Index (IFI)	.98

Figure 1. SEM model for CSS

2. Concurrent Validity

Concurrent validity is used to evaluate several tests concurrently (Lin & Yao, 2014). Pearson correlation coefficient helps understand if the scale can detect the stress of COVID-19 and was calculated between the CSS scale and the Beck Depression Inventory (BDI-21), Fear of COVID-19 scale (FCV-19S), trauma screening (TSQ), and posttraumatic stress disorder (PCL) (Table 2). The CSS correlated significantly with FCV19S ($r = .65$; $p < .01$), TSQ ($r = .31$; $p < .01$), PCL ($r = .52$; $p < .01$), BDI-21 ($r = .35$; $p < .01$). The outcome suggests moderate concurrence with respect to the CSS (Table 2).

Table 2. Concurrent validity of the CSS (n = 686)

Scales	1	2	3	4	5
1. CSS	-				
2. FCV-19S	.65**	-			
3. BDI-II	.35**	.26**	-		
4. TSQ	.31**	.28**	.55**	-	
5. PCL	.52**	.38**	.77**	.65**	-

The correlation significance level is set at .01 (two-tailed).

3. CSS Reliability

Reliability is associated with a measure's consistency and might be determined using several aspects (Heale & Twycross, 2015). McDonald's omega and Cronbach's alpha were computed to ascertain the scale's reliability; data is presented in Table 3. Standardised McDonald's omega, Cronbach's alpha, and split half

values were .959, .961, and .843 indicating adequate reliability concerning the CSS items (Nunnally, 1978). Moreover, corrected item-total correlation coefficients were not below .50. Robinson et al. (1991) suggested a practical technique and thumb rule to check whether the item-to-total correlations exceed .30, in which construct validity is fulfilled. The item-total correlation between the full score of the CSS and 36 items of the CSS were used to examine the construct validity. A modest correlation was found in this analysis. The scale was readministered to assess test-retest reliability to 160 participants six months after the first administration. The correlation between CSS scores at time one and time two was .791 (p < .01) which confirms that the CSS captures a stable construct.

Table 3. Reliability indicators of CSS (n = 686)

Items CSS	Corrected item-total correlation	Cronbach's alpha if item deleted	McDonald's omega if item deleted	Guttman Split half	Total CSS (r)
CSS1	.634	.960	.958	.960	.656**
CSS2	.614	.960	.958	.960	.638**
CSS3	.627	.960	.958	.960	.653**
CSS4	.663	.960	.958	.960	.686**
CSS5	.682	.960	.958	.960	.704**
CSS6	.694	.960	.958	.960	.716**
CSS7	.665	.960	.958	.960	.690**
CSS8	.656	.960	.958	.960	.682**
CSS9	.703	.960	.958	.960	.726**
CSS10	.726	.960	.958	.960	.747**
CSS11	.650	.960	.958	.960	.678**
CSS12	.720	.960	.958	.960	.743**
CSS13	.607	.960	.958	.960	.633**
CSS14	.641	.960	.958	.960	.668**
CSS15	.664	.960	.958	.960	.689**
CSS16	.674	.960	.958	.960	.696**
CSS17	.658	.960	.958	.960	.682**
CSS18	.624	.960	.958	.960	.652**
CSS19	.738	.960	.958	.960	.756**
CSS20	.716	.960	.958	.960	.736**
CSS21	.741	.960	.958	.960	.759**
CSS22	.713	.960	.958	.960	.733**
CSS23	.756	.960	.957	.960	.774**
CSS24	.728	.960	.958	.960	.748**
CSS25	.654	.960	.958	.960	.676**
CSS26	.657	.960	.958	.960	.679**
CSS27	.631	.960	.959	.960	.654**
CSS28	.638	.960	.958	.960	.661**
CSS29	.602	.960	.959	.960	.626**
CSS30	.545	.961	.959	.961	.568**
CSS31	.422	.962	.960	.962	.459**
CSS32	.493	.961	.959	.961	.526**
CSS33	.470	.961	.960	.961	.503**
CSS34	.395	.962	.960	.962	.433**
CSS35	.483	.961	.960	.961	.516**
CSS36	.338	.962	.960	.962	.372**

** p <. 01 (2-tailed)

Discussion

This study employed CSS translation to verify its likelihood as a potential test instrument to assess COVID-19-related stress in Malaysia. McDonald's omega, Cronbach's alpha, and total item correlations established the internal reliability of the CSS scale. These metrics indicated noteworthy concurrent validity because of the established correlation between COVID-19 fear, trauma, depression, and the identification of PTSD in distressed individuals. These findings align well with international research, demonstrating strong internal consistency, reliability, and a supported six-factor structure encompassing danger, socioeconomic impact,

xenophobia, contamination, traumatic stress, and compulsive checking, consistent with validations in other populations such as those in North America, Palestine, and China. The significant correlations found between the CSS and measures of COVID-19 fear, PTSD symptoms, and depression corroborate the scale's concurrent validity and mirror similar results reported in diverse cultural contexts.

Assessment outcomes indicated that the 36-item Malay variant of the CSS has appropriate psychometric and statistical characteristics; hence, it can be used for extensive epidemiological research and studies with randomised experimental designs concerning psychological treatment; moreover, it finds use in the private and public sector perspective to identify COVID-19 associated stress concerning the Malaysian individuals. Significant association with related constructs pertaining to verified scale having the same language is vital for PCL (PTSD) and COVID-19 fear (correlations .52 and .65, respectively). The CSS comprises questions like the psychological aspects of PTSD and associated conditions that are categorised as trauma-and-stressor-associated conditions by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2022).

These observations connect to the validated life events concept (Holmes & Rahe, 1967). Stress may be considered a form of stimulus originating from extensive thoughts concerning stressful happenings (e.g., major life events, catastrophic experiences, cumulative impact, and changes to well-being). The population experienced heightened cumulative effects during the two years of COVID-19, raising the probability of having psychological manifestations (Pieh et al., 2021).

CSS may be used for real-world COVID stress assessment from a Malaysian perspective. This observation aligns with other works that suggest CSS and its use for distinct cultures (Adamczyk et al., 2021; Carlander et al., 2022; Khosravani et al., 2021; Mahamid et al., 2021; Noe-Grijalva et al., 2022). Building a pandemic-related instrument like CSS is a supportive step toward assessing individuals with a higher likelihood of an unhealthy emotional impact during and after the pandemic. Public health authorities can use this information to approve adequate resources for mental well-being interventions (Taylor et al., 2020).

From a dimensionality standpoint, the CSS uses a six-factor approach to evaluate COVID-19 associated stress from a Malaysian perspective, aligning with previous research works (Mahamid et al., 2021; Miclea & Coman, 2022; Milic et al., 2021; Xia et al., 2022). It is suggested that CSS adequately measures COVID-19 associated stress for the Malaysian population. The CSS psychometric properties are also important for ensuring the quality of research and clinical practice. Hence, we suggested that reliability and validity of CSS help the researcher choose the best tool to use.

The primary constraints are related to recruitment challenges. Social distancing and widespread restriction on public movement prevented obtaining a sample that comprehensively represented a more extensive section of society. Moreover, the data gathering process was impacted due to online-only restrictions. Moreover, the 686-individual sample used for this study might impact outcomes, highlighting recruitment challenges during a nationwide lockdown. Nevertheless, this sample is adequate for implementing confirmatory factor analysis.

Future research directions include employing mixed-methods approaches combining quantitative validation with qualitative inquiry such as focus groups and in-depth interviews across Malaysia's major ethnic groups. This would elucidate locally meaningful pandemic stressors, validate item relevance, and explore culturally specific coping strategies, informing potential scale refinements or supplementary culturally grounded modules. Longitudinal cohort studies can track shifts in COVID-19 stress levels alongside evolving public health measures and social dynamics, bolstering understanding of resilience and vulnerability factors.

Measurement invariance testing by ethnicity, religion, gender, and urban-rural residence will be essential to confirm the scale's cross-group equivalence and fairness. Additionally, research could evaluate the CSS's predictive validity concerning real-world mental health outcomes and engagement with healthcare services. Public health initiatives can leverage this culturally validated tool to identify at-risk populations and tailor mental health interventions incorporating traditional and community-based support systems, fostering acceptance and effectiveness. Ultimately, this Malaysian CSS validation contributes to global mental health research by exemplifying the integration of rigorous psychometric assessment with rich cultural

contextualization, essential for accurately measuring and addressing pandemic-related psychological distress in diversified societies.

Beyond psychometric rigor, it is vital to reflect on the cultural dimensions that uniquely influence stress perception and coping behaviours among Malaysians. Malaysia's ethnic diversity includes Malays, Chinese, Indians, and indigenous groups, each with distinct traditions influencing mental health experiences. For example, strong communal and familial ties prevalent in Malay and indigenous communities promote reliance on social support networks, which might buffer individual distress but also complicate disclosure of psychological difficulties due to social stigma about mental illness. Religious practices, predominantly Islam for Malays, Buddhism and Taoism for Chinese, Hinduism for Indians, often serve as primary coping resources through prayer, faith-based resilience, and ritual participation, which can modulate pandemic-related anxiety and fear differently from secular frameworks common in Western contexts.

Traditional healing and beliefs in supernatural influences also persist in various communities, affecting interpretations of COVID-19 as either a biomedical threat or a spiritual challenge. These sociocultural factors can influence responses to items assessing contamination fears or xenophobia, as perceptions of "foreign threat" may be contextually nuanced by cultural history and interethnic relations distinct from Western assumptions. Furthermore, linguistic subtleties in Malay and other local languages necessitated careful translation efforts to capture idiomatic expressions about fear and stress accurately, underscoring the importance of culturally sensitive psychometric adaptation.

Conclusion

This study's validation of the Malay COVID Stress Scales (CSS) offers important implications tailored to clinicians, researchers, and policymakers. Clinicians gain a culturally sensitive and psychometrically robust tool to identify and address multifaceted COVID-19-related stressors including trauma symptoms, compulsive behaviors, and socio-economic fears allowing for informed, individualized treatment plans within Malaysia's diverse cultural landscape. Researchers are provided with a reliable instrument to advance epidemiological and mental health studies that incorporate Malaysia's unique linguistic and cultural factors, promoting measurement accuracy and cross-cultural comparability. For policymakers, the CSS-Malay facilitates evidence-based allocation of mental health resources and the development of targeted public health interventions that respect community values and beliefs, ultimately strengthening Malaysia's capacity to manage pandemic-related psychological distress and improve population well-being through culturally appropriate support programs.

CSS studies are relatively new; therefore, it is vital to employ comprehensively verified measures to perform reliable, generalisable, and structured empirical research. We understand that the self-administered CSS instrument will enhance our capability to comprehend the effects of COVID-19 related stress, specifically from the Malaysian perspective. Hopefully, this work will reduce research gaps concerning identifying, quantifying, and evaluating COVID-19 stress induced by fear, suffering, stigma, and several measures like societal lockdown and quarantine implemented to reduce human contact to hinder disease spread.

Ethical Approval: All procedures performed in this study involving human participants were following the ethical standards of Universiti Kebangsaan Malaysia Research Ethics Board, the American Psychological Association (APA, 2010) and the 2013 Helsinki Declaration.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Informed Consent: Informed consent was obtained from all participants prior to their involvement in the study. Ethical approval was granted by the UKM Research Ethics Committee (JEP UKM) under approval code UKM PPI/111/8/JEP-2020-564 in accordance with established ethical guidelines**.**

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