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Examining psychometric properties of the Sinhala version of the 'Opening Minds Scale for Health Care Providers' to measure stigma towards mental illness using confirmatory factor analysis

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Abstract

Objectives The Opening Minds Scale for Health Care Providers (OMS-HC15) is a self-report questionnaire regarding stigmatising attitudes and behavioural intentions of healthcare providers, towards people with mental illness. In view of the scarcity of validated instruments in local languages in Sri Lanka to assess stigma towards people with mental illness among healthcare providers, this study aimed to culturally adapt OMS-HC15 to Sinhala and examine its psychometric properties among 165 Sinhala-speaking medical students.

Results Confirmatory Factor Analysis for the first-order three-factor model of OMS-HC15 showed acceptable model fit indices ($\chi 2/df = 2.11$, CFI = 0.943, TLI = 0.932, RMSEA = 0.082, SRMR = 0.086), but one item demonstrated inadequate factor loading (< 0.3). Considering the poor factor loading and concerns raised on the relevance of this item by previous researchers, this item was removed. However, as removing this item resulted in a slightly worse model fit, modification indices were examined, and constraints on three error covariances were relaxed. This led to a good model fit for the 14-item scale (CFI = 0.962, TLI = 0.951, $\chi 2/df = 1.88$, RMSEA = 0.074, SRMR = 0.079). Higher-order, bifactor, and unidimensional models were not supported. The 15-item scale showed acceptable reliability ($\omega = 0.80$; $\alpha = 0.69$), which improved after removing Item 11 ($\omega = 0.81$; $\alpha = 0.70$). Subscale reliabilities were lower (Social Distance: $\omega = 0.70$, $\alpha = 0.69$; Disclosure/Help-Seeking: $\omega = 0.62$, $\alpha = 0.61$; Attitudes: $\omega = 0.58$, $\alpha = 0.55$).

Keywords Stigma, Mental health, Mental illness, Healthcare provider/S

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Introduction

Stigma towards mental illnesses contributes to delay in help-seeking, increased care burden [1] and significantly lower quality of life [2] in mentally ill individuals. Anticipation of stigma from healthcare providers is known to deter people from seeking care for their mental illness [3]. Conversely, stigma also affects healthcare workers themselves by influencing their help-seeking behaviours and work environment [4].

Sri Lanka is a developing South Asian country that uses Sinhala and Tamil as its main languages. Although mental illness-related stigma in Sri Lanka has been explored within various contexts [1, 5–8] at the time of writing, there were no validated tools in Sinhala or Tamil exploring stigma regarding mental illnesses specifically in healthcare providers. There was a timely need to develop a tool to assess stigma towards mental illness in healthcare providers in Sinhala or Tamil.

The Opening Minds Scale for Health Care Providers (OMS-HC) was developed by Kassam et al. as a part of the "Opening Minds" anti-stigma initiative by the Mental Health Commission of Canada, considering the need to create a more specific measure of healthcare provider stigma [9]. It is a self-report questionnaire regarding attitudes and behavioural intentions of healthcare providers towards people with mental illness [9]. A 20-item version of the stigma scale was initially developed but was later modified to a 15-item scale (OMS-HC15) [10].

The scale has three subscales, measuring attitudes towards [1] people with mental illness, [2] disclosure and help-seeking, and [3] social distance, and comprises statements that the respondent is to rate according to how much they agree with the statement on a 5- point Likert scale. Higher scores are suggestive of more stigmatising attitudes.

This research aimed to translate and culturally adapt OMS-HC15 to Sinhala and examine the Sinhala version's psychometric properties via confirmatory factor analysis (CFA), using a study population of medical students. The three-factor structure discovered by the original developers of the scale using exploratory factor analysis (EFA) has been confirmed subsequently in several other settings and languages using CFA [11–14]. Therefore, the present study used CFA to test the established three-factor structure in the Sri Lankan context. It was a component of a larger project to conduct a cross-sectional descriptive study to evaluate stigma towards mental illness among mental health care providers in Sri Lanka.

The concept of mental illness in Sri Lankan culture has been recognised and shaped by Ayurvedic medicine, which has been prevalent for over 2000 years in the country. Furthermore, attitudes towards mental illness in Sri Lanka, which has a collectivist culture, may differ from that of a western country. For instance, in Sri Lanka, mental illness is often linked to supernatural or family-based causes, whereas in Western contexts it is more commonly framed within biological and psychological contexts [15]. These culturally-rooted differences influence both attitudes toward affected individuals, and treatment-seeking behaviors. In order to create a tool best reflecting sensitivities of a Sri Lankan society, stigma measures need to be adapted to capture locally relevant beliefs rather than relying solely on Western-developed instruments [16]. Thus, cultural adaptation of the Sinhala version was determined necessary.

The original OMS-HC was developed in English, and its application in South Asian contexts has been limited [17]. There are no known adaptations of the scale in South Asian languages. Thus exploring the psychometric properties of a Sinhala language version of the scale also contributes to a significant knowledge gap about mental illness related stigma in the region.

Methods

Translation and cultural adaptation of the OMS-HC15 into Sinhala

The English version of OMS-HC15 [10] was first translated from English to Sinhala by two independent translators, one who has a background in mental health and one who has no experience in the field. They conducted a synthesis of the translations, which was back-translated to English by two independent translators who were blind to the original version of OMS-HC and neither aware nor informed about the concepts explored. The final Sinhala version was forwarded to an expert committee comprising two consultant psychiatrists and a psychologist, who examined the source and back translations for semantic, idiomatic, experiential and conceptual equivalence. Findings of the literature review were discussed with the expert panel. It was reviewed whether the concept of stigma in the Sri Lankan context was assessed by the questions and whether the items in the scale were acceptable and relevant to the target population. Face and content validity were assessed through a two-round Modified Delphi process with an expert panel. Each item on the scale was rated by the expert panel for relevance for assessing stigma, cultural appropriateness of wording, and acceptability for assessing stigma in the local setup. The process involved two rounds of ratings on a 1–9 scale, with consensus defined as ≥ 70% agreement (scores ≥ 7 for inclusion, ≤ 3 for removal), until all items reached a score of 7 or above.

The translated and culturally adapted version was pretested in a pilot study with the participation of a group of 20 medical students, probing their understanding and acceptability. Final semantic adjustments were made based on findings of this pilot study. The operational equivalence of the new version was assessed regarding

format, instructions, method of assessment and mode of administration through a literature review and through discussion with experts and the members of the target population. The scale was evaluated by the expert panel and for its content validity.

Scale validation via confirmatory factor analysis

The psychometric properties of the Sinhala version of the OMS-HC15 were investigated via Confirmatory Factor Analysis (CFA). Data for CFA was collected through a descriptive cross-sectional study using medical students at the Faculty of Medicine, University of Colombo, Sri Lanka, as participants. Only participants who were fluent in Sinhala were included in the study.

Medical students were used to validate the scale due to their accessibility and feasibility of recruitment. It was considered that their clinical exposure allowed them to identify with healthcare workers' perspectives to a reasonable extent.

According to the "ten subjects per variable" convention [18], the minimal sample size for validation of the questionnaire was as follows:

Number of participants per item = 10.

Items in questionnaire = 15.

Minimum number of participants = 10*15 = 150.

Accounting for 10% non-response rate, sample size = 165.

Table 1 Standardized factor loadings (λ) for OMS-HC items in the original 15-item and refined 14-item models based on confirmatory factor analysis

Item	λ (15-item)	*p* (15-item)	λ (14-item)	*p* (14-item)
Attitudes subscale				
Q1	0.323	< 0.001	0.317	< 0.001
Q9	0.687	< 0.001	0.691	< 0.001
Q10	0.455	< 0.001	0.448	< 0.001
Q11	0.200	0.007	—	—
Q13	0.629	< 0.001	0.555	< 0.001
Q15	0.664	< 0.001	0.593	< 0.001
Disclosure / Help-seeking subscale				
Q3	0.587	< 0.001	0.385	< 0.001
Q4	0.517	< 0.001	0.442	< 0.001
Q5	0.663	< 0.001	0.641	< 0.001
Q8	0.539	< 0.001	0.440	< 0.001
Social Distance Subscale				
Q2	0.553	< 0.001	0.548	< 0.001
Q6	0.649	< 0.001	0.653	< 0.001
Q7	0.677	< 0.001	0.676	< 0.001
Q12	0.537	< 0.001	0.536	< 0.001
Q14	0.727	< 0.001	0.730	< 0.001

Values are standardized factor loadings (λ). All loadings were statistically significant. Q11 was removed in the 14-item version due to a low factor loading (< 0.30). Three correlated residuals were specified in the final 14-item model (Q3–Q8, Q3–Q4, Q13–Q15) to improve fit

An electronic questionnaire was distributed as a Google form to social media messaging groups of students of relevant batches. The form also contained a section providing information about the study. Consent was obtained electronically via the same form. Convenience sampling was done. A self-administered questionnaire with basic demographic data in addition to the Sinhala version of the OMS-HC15 was used.

Data was recorded in an electronic database and analysed using RStudio. CFA was performed using *lavaan* on RStudio to test the known three-factor structure of the OMS-HC. Diagonally weighted least squares (DWLS) were used as the estimator, as Likert items were considered ordinal data. Model fit was assessed using the following goodness-of-fit indices: the ratio of chi-square to the degree of freedom (χ2 /pdf), comparative fit index (CFI), Tucker Lewis Index (TLI), standardised root means square residual (SRMR) and root mean square error of approximation (RMSEA). A good model fit was suggested by χ2 /df smaller than 3. CFI or TLI values ≥ 0.90 and ≥ 0.95 indicated an acceptable and good model fit, respectively. SRMR values ≤ 0.10 and ≤ 0.08 and RMSEA values ≤ 0.08 and ≤ 0.06 also indicated acceptable and good model fit, respectively [19]. Modification indices were examined to identify constraints that could be freed to improve the model fit. Internal consistency of the total scale and subscales was assessed using Cronbach alpha, McDonald's omega and Composite Reliability.

Results and data analysis

Socio-demographic characteristics of the sample

A total of 165 participants were recruited through convenience sampling. Of them, 95 (57.6%) were female and 70 (42.4%) were male. The age ranged from 23 to 28. The mean age of the sample was 25.8 years, with a standard deviation of 1.1.

Confirmatory factor analysis

Confirmatory Factor Analysis (CFA) was performed to test the three-factor model proposed by Modgill et al. [10]. The first order correlated three-factor model for the 15-item version showed acceptable model fit indices with a CFI of 0.943 and TLI of 0.932. The Chi Square value (χ2) was 183.4 with degrees of freedom (df) of 87; χ2/df was 2.11, indicating acceptable model fit. RMSEA was marginally acceptable at 0.082. SRMR was also acceptable (0.086). Item 11 from the *Attitude* factor showed a factor loading less than 0.3, despite having a significant p value (Table 1). Considering the poor factor loading and the questionable relevance of this item to the construct of mental illness-related stigma in healthcare providers, this item was removed. Removal of this item, however, resulted in a slightly worse model fit. To improve the model fit, modification indices were examined, and

constraints on error covariances between three item pairs (i.e. between item 3 and 8, items 3 and 4, and items 13 and 15) were relaxed. This led to a good model fit (CFI = 0.962, TLI = 0.951, $\chi 2/df = 1.88$, RMSEA = 0.074, SRMR = 0.079). Although item 1 had a relatively low factor loading of 0.323, the item was retained as it was considered important for the theoretical comprehensiveness of the scale. The descriptive statistics (mean and SD) for the total score and subscale scores based on the 14-item version are summarized in Table 2.

A higher-order model with an overarching 'mental illness-related stigma' factor showed a less robust model fit (CFI = 0.935, TLI = 0.920, $\chi 2/df = 2.47$, RMSEA = 0.095, SRMR = 0.090). A one-factor model testing whether the scale was unidimensional resulted in even poorer fit indices (CFI = 0.904, TLI = 0.888, $\chi 2/df = 2.8$, RMSEA = 0.105, SRMR = 0.099). A bifactor model was tested, but the model was not identified.

Internal consistency for the overall 15-item scale was acceptable according to McDonald's omega ($\omega = 0.80$), although Cronbach's alpha was slightly below the conventional threshold ($\alpha = 0.69$). When Item 11 was removed, reliability improved ($\omega = 0.81$, $\alpha = 0.70$). Omega hierarchical was modest ($\omega h = 0.41$), indicating that less than half of the reliable variance in the total score could be attributed to a single overarching stigma factor. For the three subscales, *Social Distance* showed $\omega = 0.70$, $\alpha = 0.69$, and CR = 0.77, *Disclosure/Help-Seeking* showed $\omega = 0.62$, $\alpha = 0.61$, and CR = 0.67, and *Attitudes* showed $\omega = 0.58$, $\alpha = 0.55$, and CR = 0.69.

Table 2 Descriptive statistics for OMS-HC total and subscale scores (14-item version)

Scale / Subscale	Number of items	Possible range	Mean	Standard deviation (SD)
OMS-HC Total Score	14	14–70	31.63	6.85
Attitudes	5	5–25	10.12	2.77
Disclosure / Help-Seeking	4	4–20	10.59	2.99
Social Distance	5	5–25	10.92	3.19

OMS-HC Opening Minds Scale for Health Care Providers (14-item version, with Item 11 removed)

Discussion

CFA of the Sinhala version of OMS-HC15 using the three-factor model of attitude, social distance, and disclosure/help-seeking [10] revealed an acceptable model fit. However, a modified 14-item version showed better psychometric properties, including satisfactory internal consistency.

Various versions of OMS-HC15 have been extensively investigated for their psychometric properties. Most initial studies supported a first-order three-factor model [11, 12, 20, 21]. However, studies by Őri et al. [22, 23] while supporting the three dimensions, preferred a higher-order structure with a bifactor model. A few studies have suggested alternative factorial models. These include a one-factor model supported for the Spanish version [24], and the bifactor models supported for the Hungarian version [22, 23].

Factor analysis of the 15-item version of the OMS-HC questionnaire originally done in Canada [10] has also been conducted using its translations to various languages in Italy [21], Singapore [11], Chile [12], Germany and Switzerland [20]. The results confirmed the cross-cultural validity of the three-dimensional factor structure, though some versions required modification of items, and some items showed cross-loadings [11, 20].

It is noteworthy that item 11 ("More than half of people with mental illness don't try hard enough to get better") had inadequate factor loading in the present study, which led to its removal from the scale. The problematic nature of this item has been observed previously in the Hungarian adaptation of OMS-HC as well, where this item was similarly eliminated [23]. As pointed out by Ori et al. [23], the content of item 11 differs from other items in the scale as it refers to the responsibility of people with mental illness, which may not be a direct indicator of the healthcare providers' attitude towards mental illness.

Although item 1 ("I am more comfortable helping a person who has a physical illness than I am helping a person who has a mental illness") also had a relatively low factor loading compared to the other items, it was retained as its factor loading was above the cut-off of 0.3, and its content was theoretically important for the assessment of attitudes towards people with mental illness in the health care setting. However, item 1 has been shown to load poorly on any of the three factors in a validation study conducted in Singapore [11]. These observations warrant further investigation into the psychometric stability of this item across cultures.

In evaluating internal consistency, we reported both Cronbach's alpha (α) and McDonald's omega (ω). Although α for the total scale was marginal (0.69), ω indicated acceptable reliability (0.80). This discrepancy reflects the fact that α assumes tau-equivalence, meaning that all items load equally on the underlying construct, an assumption that was not met in our data given the heterogeneous factor loadings across items. In contrast, ω is derived from the factor model and accounts for differences in item loadings, providing a more accurate reliability estimate [25]. In the original validation by Modgill et al., the alpha value was slightly higher (0.79).

Our CFA results supported a first-order three-factor structure over unidimensional, higher-order, or bifactor models, indicating that mental illness-related stigma in this population is best conceptualized as a

multidimensional construct. The low omega hierarchical value further suggested that reliable variance was driven primarily by the subscales rather than a single overarching factor. This lends support to analyzing OMS-HC scores at the subscale level. However, the internal consistencies of the subscales fell below conventional thresholds, raising concerns about their reliability for precise measurement. Similar limitations in subscale reliability have been observed in other international validations of the OMS-HC including those conducted in Singapore, Chile, and Portugal [11–13]. Consequently, subscale scores may be appropriate for group-level comparisons in research but less suitable for individual-level assessment where precision is necessary. Overall, our findings provide modest support for the use of both total and subscale scores of the OMS-HC, while highlighting the need for careful interpretation.

The translated scale thus shows potential as a measurement tool for mental illness-related stigma in Sinhala-speaking populations. In clinical practice, it could help identify areas where stigma affects patient care and healthcare workers' attitudes. Items with higher scores may help identify key areas to be addressed at a policy level, providing culturally relevant data for mental health education and training. In addition, the scale can be used to shape the content and to evaluate the effectiveness of stigma-reduction interventions in Sri Lanka.

Conclusion

The Sinhala translation of the modified 14-item OMS-HC demonstrated structural validity, with confirmatory factor analysis supporting the established three-factor structure over unidimensional, bifactor, and higher-order models. The total scale showed acceptable reliability,making it suitable as a broad indicator of stigma. However, omega hierarchical was modest, suggesting that much of the reliable variance reflects the subscales rather than a single overarching factor. While the subscales therefore have theoretical relevance,their internal consistencies were below conventional thresholds and should be interpreted with caution. On balance, the scale has potential as a culturally relevant tool to assess mental illness-related stigma in Sinhala-speaking populations. It may be most appropriate to use the total score for overall assessment, while subscale scores can add value for group-level research comparisons and in identifying domains of stigma that are most salient for intervention. In clinical and policy contexts,the OMS-HC can inform education, training,and stigma-reduction strategies in Sri Lanka.

Limitation

Due to time and resource constraints, test-retest reliability was not tested during the study, thus the consistency of the findings over time cannot be fully ensured. As the subscales of the OMS-HC showed low internal consistency, the interpretability of subscale scores is limited. A further limitation is that we did not examine external validity, such as convergent or discriminant validity, which would have provided additional evidence on the scale's construct validity. The use of medical students as a proxy for healthcare workers, using convenience sampling, and using social media to obtain data may have impacted the generalizability of the results, while using participants from a single institution may restrict representativeness. Though participant anonymity was preserved during data collection, as this survey measures attitudes and behaviour, social desirability bias may have affected the answers given by participants.

Abbreviations

CFA	Confirmatory factor analysis
CFI	Comparative fit index
RMSEA	Root Mean Squared Error of Approximation
NIMH	National Institute of Mental Health
OMS-HC	Opening Minds Scale for Health Care Workers
OMS-HC15	Opening Minds Scale for Health Care Workers (15-item version)
SRMSR	Standardised Root Mean Square Residual
TLI	Tucker Lewis Index
Df	Degrees of freedom

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Author contributions

AS, AB and CS designed the study. AS conducted the translation and validation process, and AS and CS coordinated the data collection for factor analysis. AB did statistical analysis, and AB, AS and CS did data interpretation. CS and KR supervised and provided guidance throughout the research process. The manuscript was drafted by AS and revised by all authors. All authors have approved the submitted version of this document.

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Data availability

The datasets generated and analysed during the current study are available in the OSF repository, https://doi.org/10.17605/OSF.IO/75YJH .

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Ethical clearance for the study was obtained from the Ethics Review Committee of the Postgraduate Institute of Medicine, University of Colombo, Sri Lanka.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

All participants who fulfilled inclusion and exclusion criteria were invited to participate in the study. Participants were provided detailed written information regarding the study, its objectives, study design and methods in

English and Sinhalese. Written informed consent was obtained from patients who are willing to participate.
Participants were informed that they could revoke consent at any time with no consequences. The information section (with Sinhala, English and Tamil versions) also contained contact details of the principal investigator.

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