Reliability and validity assessment of the Mental Health Continuum – Short Form for Bangladeshi adults

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ABSTRACT

There is a shortage of psychological tools to assess the mental well-being of Bangladeshi people covering the hedonic and the eudaimonic aspects of well-being. This study aimed to assess the reliability and validity of the Mental Health Continuum Short Form as this instrument assesses both the hedonic and the eudaimonic aspects of well-being. This study utilized online survey data (n = 361). Item analysis results showed that this scale had good discrimination indices, internal consistency reliability, and acceptable average inter-item correlations. Confirmatory factor analysis lent support to the three-factor correlated model with good model fits and sufficient factor loadings. Results from the multidimensional graded response model also supported the efficiency of this scale to assess the mental well-being of Bangladeshi adults. This scale had moderate correlations with perceived stress and anxiety. Overall, findings suggested this scale as a reliable and valid tool for assessing mental well-being. This scale would help mental health practitioners to assess mental well-being and formulate relevant interventions.

1. Introduction

The general view about the understanding of mental health is the 'absence of mental illnesses'. Last few decades, this understanding has been changing considerably. Mental health also includes well-being – emotional, social, and psychological (Keyes, 2007). The World Health Organization (WHO, 2004) states that mental health is “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (p. 12). This definition covers both the positive dimension (well-being) and the negative dimension (distress).

Traditionally, well-being can be divided into two categories: hedonic and eudaimonic. In the hedonic approach, well-being includes satisfaction with life and experience of pleasant experience that includes both positive and negative affects (Diener, 1984; Keyes, 2005). This approach primarily focuses on the emotional well-being aspect of mental health. In the eudaimonic approach, well-being includes self-realization about own potential and how well an individual perceives him functioning in life (Ryff, 1989; Ryff and Keyes, 1995). This approach focuses on psychological well-being (Ryff, 1989) and social well-being (Keyes, 1998). Combining the both approaches, well-being can be recognized as a multidimensional construct that includes emotional, social, and psychological well-being (Gallagher et al., 2009).

There are several psychological assessment tools to assess well-being. However, some of these cover few aspects of well-being, or some of these are too long. Keyes et al. (2008) developed the Mental Health Continuum – Short Form (MHC-SF) to overcome these limitations. This scale is the shorter form of the Mental Health Continuum – Long Form (Keyes, 2002), a 40-item well-being assessment scale. The MHC-SF assesses emotional, social, and psychological well-being. This scale contains 14 items – three items assess emotional well-being (hedonic aspect of well-being), five items assess social well-being (eudaimonic aspect of well-being), and the rest of the six items assess psychological well-being (eudaimonic aspect of well-being). These items are derived from Ryff's psychological well-being model (Ryff, 1989), Keyes's social well-being model (Keyes, 1998), and Bradburn's affect balance scale (Bradburn, 1969). The MHC-SF has good psychometric properties across different cultures and age groups (i.e., Dore et al., 2017; Karas et al., 2014; Luijten et al., 2019). Most of the studies confirmed the three-factor structure of the scale, while some studies supported the bi-factor model (three specific factors along with one general factor) (see, Lamborn et al., 2018; Luijten et al., 2019; Machado and Banderia, 2015; Petrillo et al., 2014). The MHC-SF and its subscales have lower to moderate correlation with life.
satisfaction, psychological distress, anxiety, depression, etc. (Doire et al., 2017; Fonte et al., 2020; Karás et al., 2014; Machado and Bandeira, 2015; Orpana et al., 2017; Perugini et al., 2017; Luijten et al., 2019).

In the current COVID-19 pandemic, mental health problems increased globally (see Ahmed et al., 2020a, b; Li et al., 2020). Life becomes stagnant due to pandemic waves that come one after one. Studies reported elevated perceived stress, anxiety and depression symptoms, sleep problems, etc. (i.e., Beck et al., 2021; Kowal et al., 2020; Ramiz et al., 2021; Wang et al., 2020). Researchers are utilizing a number of psychological scales to assess mental health (i.e., General Anxiety Disorder-7 [GAD-7: Spitzer et al., 2006], Patient Health Questionnaire – 9 [PHQ-9: Kroenke et al., 2001], Depression Anxiety Stress Scales [DASS: Lovibond and Lovibond, 1995], the Mental Health Continuum Short Form [MHC-SF: Keyes et al., 2008], etc.).

In this study, we examined reliability and validity of the MHC-SF for Bangladeshi adults. There are several adapted scales available for assessing the mental health of Bangladeshi people. For example – the General Health Questionnaire 28 (GHQ-28: Goldberg, 1978; Bangla version of GHQ-28: Banoo, 2001), the Strengths and Difficulties Questionnaire (SDQ: Goodman, 1997; Bangla version: Mullick and Goodman, 2001), the Warwick-Edinburgh Mental Well-being Scale (WEMWBS: Tennant et al., 2007; Bangla version: Rahman and Imran, 2013); etc. However, none of these assess the complete state of mental well-being. Therefore, we aimed to assess the psychometric features of the MHC-SF to assess the mental well-being of Bangladeshi adults. In this study, psychometric properties of the scales assess utilizing both classical and modern test theory approaches.

2. Methods

2.1. Data and participants

In the present study, we utilized the data of the cross-cultural collaborative project titled “COVID-19, Personality and Quality of Life: Self-enhancement in the time of Pandemic” (Zemojtel-Piotrowska et al., 2020). This project was conducted following the Declaration of Helsinki and other comparable ethical standards and informed consent was taken from participants. As part of this project, the data were collected from Bangladesh from 29/04/2020 to 25/05/2020 through ‘Ariadna’ (an online-based data collection platform). Before conducting the survey, the study questionnaire was translated into Bangla following the translation-back translation procedure. The survey link was distributed to Messenger and WhatsApp contacts. Besides, this link was on Facebook and invited to participate in this survey. A total of 1306 people responded to this survey. Among them, 321 participants completed the entire survey questionnaire. The rest of the data were incomplete or didn’t meet the inclusion criterion (aged 18 or older).

The Ethical Review Committee of the Department of Psychology, University of Chittagong, Bangladesh approved this study (ERB-PSY-CU-51-2021). The present study data comprised responses from 361 participants (58.7% male). Their mean age was 24.74 years (standard deviation = 6.02 years). Among participants, 25.2% described their economic condition as below average, 62.6% average, and 12.2% above average. Regarding educational qualifications, 18.8% completed upper secondary education, 47.9% completed bachelor or equivalent education, 31.6% completed master or equivalent education.

2.2. Measures

2.2.1. Mental Health Continuum Short Form (MHC-SF)

The MHC-SF is the short form of the Mental Health Continuum Long Form (Keyes, 2002). This 14-item scale (termed MHC in the supplementary questionnaire [page 3]) assesses three aspects of well-being – emotional, social, and psychological. Participants rated their last month’s experience using a six-point Likert-type scale (‘never’ (0) – ‘very often’ (4)). Total scores ranged 0–15 for the emotional well-being subscale, 0–25 for the social well-being scale, 0–30 for the psychological well-being scale, and 0–70 for the full scale.

2.2.2. Perceived Stress Scale Short Form

The Perceived Stress Scale Short Form (PSS-SF; Cohen et al., 1983) is a valid tool for quick assessing perceived stress. This short version of the scale comprised four items (e.g., “In the last month, how often have you felt that you were unable to control the important things in your life?”). Based on their last month’s experience, participants responded on this scale using a five-point Likert-type scale (‘never’ (0) – ‘very often’ (4)). Total scores ranged from 0 to 40, and the higher the score, the higher the stress perception. Supplementary Table 1 presents the descriptive statistics of the PSS-SF. In this study, the PSS-SF had acceptable internal consistency reliability (α = .693; α = .686). Confirmatory factor analysis suggested acceptable model fit of the PSS-SF Bangla version in the present study (χ² = 7.256, df = 2, p = .227, CFI [comparative fit index] = .876, TLI [Tucker-lewis index] = .927, SRMR [standardized root mean square residual] = .051, and RMSEA [root mean square error of approximation] = .088).

2.2.3. State-Trait Anxiety Inventory Short Form

The State-Trait Anxiety Inventory (Trait Anxiety Inventory) (Spielberger, 1983) is a commonly used valid tool for assessing anxiety. This scale assesses state anxiety and trait anxiety. The short form of this scale (Marteau and Bekker, 1992) has 6 items – 3 items for assessing each type of anxiety. Based on their last month’s experience, participants responded using a five-point Likert-type scale (‘never’ (0) – ‘very often’ (4)). Higher scores suggest higher anxiety symptoms. Supplementary Table 1 presents the descriptive statistics of the STAI-SF. In this study, the STAI-SF had good internal consistency reliability (α = .861; α = .859). Confirmatory factor analysis suggested acceptable model fit of the STAI-SF Bangla version in the present study (χ² = 4.611, df = 8, p = .798, CFI = 1.00, TLI = 1.00, SRMR = .030, and RMSEA = .00).

2.2.4. Fear of COVID-19 scale

The Fear of COVID-19 Scale (Ahorsu et al., 2020a; Ahmed et al., 2021 [Bangla version]) is one of the widely used scale to assess the COVID-19 related fear. In the present study, participants rated their agreement on seven items utilizing a seven-point Likert-type scale, ranging from ‘I strongly disagree’ to ‘I strongly agree’. Total scores ranged between 7 and 49. Supplementary Table 1 presents the descriptive statistics of the Fear of COVID-19 Scale. In the present study, the FCV-19SB had good internal consistency reliability (α = .895, α = .897). Confirmatory factor analysis suggested acceptable model fit of the STAI-SF Bangla version in the present study (χ² = 34.298, df = 14, p = .002, CFI = .990, TLI = .985, SRMR = .065, and RMSEA = .067).

2.3. Statistical analysis

The Rstudio, JASP 0.14.0.0, and Microsoft Excel 365 were utilized for the data management and analysis. We assessed reliability and validity of the Mental Health Continuum Short Form Bangla (MHC-SF-B) using both classical test theory approaches (CTT) and item response theory (IRT) approaches. Under CTT, corrected item-total correlation, mean inter-item correlation, and total consistency reliability (Cronbach's alpha and McDonald's omega) were computed. Using confirmatory factor analysis (CFA), three models of the MHC-SF-B version (one factor model, three-factor correlated model, and bi-factor model) were examined. Besides, average variance extracted (AVE), and composite reliability were computed. Under the IRT, the multidimensional graded response model (MGRM) was utilized for item analysis. Before that, monotonicity (both statistically and graphically) and local independence (LD) [G2 LD index; Chen and Thissen, 1997] were examined. In multidimensional GRM, slope coefficients (a) and threshold coefficients (b) were computed. The multidimensional GRM through the R package mirt version 1.32.1 provides intercepts (-d) that were transformed into threshold values for each item
using the following formula (\(-d/a\)). Besides, Rho coefficient and IRT reliability for each subscale were assessed.

Finally, correlation coefficients computed to assess the association of MHC-SF-B with stress, anxiety, and fear of COVID-19.

### 3. Results

Item-level properties of the MHC-14 are presented in Table 1. Skewness values (\(-1.02 - .22\)) and kurtosis values (\(-1.32 - .28\)) are lower than the suggested cut-off (\(\pm 2\) and \(\pm 7\) respectively; Kim, 2013). These values indicated the normality of the data. Table 1 shows that all subscales had higher corrected item-total correlations (ranging between .58 and .72 for the emotional well-being subscale, between .54 and .71 for the social well-being subscale, and between .57 and .73 for the psychological well-being subscale). All of these values are above the suggested cut-off (.40).

Confirmatory factor analysis results (model fits and factor loadings) are presented in Table 2. From Table 2, bi-factor uncorrelated model \((\chi^2/df = 1.879, \text{CFI} = .996, \text{TLI} = .995, \text{RMSEA} = .049, \text{SRMR} = .043\)) had good model fit compared to unifactor model \((\chi^2/df = 8.361, \text{CFI} = .963, \text{TLI} = .956, \text{RMSEA} = .143, \text{SRMR} = .092)\) and three-factor correlated model \((\chi^2/df = 3.085, \text{CFI} = .990, \text{TLI} = .988, \text{RMSEA} = .076, \text{SRMR} = .059)\). However, factor loading of item 3 and 4 in specific factors were negative and some other loadings were also substantially low. Therefore, bi-factor uncorrelated structure of the MHC-SF-B is not acceptable. Comparing the model fits and factor loadings, three factors correlated model is acceptable. Factor loadings were ranged between .715 and .887 for the emotional well-being subscale, between .640 and .794 for the social well-being subscale, and between .673 and .818 for the psychological well-being subscale. Correlations between factors ranged between .633 and .761.

Table 3 presents the scale-level psychometric properties of the MHC-SF-B. Floor (ranged between .3 to 1.9) and ceiling (ranged between 1.9 to 7.2) effects are between the suggested cut-off (<15%). Average inter-item correlations of the emotional and psychological well-being subscales were just above the recommended range. Table 3 also showed that the MHC-SF-B had good internal consistency reliability (alpha = .80 – .86, and omega = .81 – .86). The AVE values (.55 – .63) were above the recommendation cut-off (>.5). Moreover, this scale had good composite reliability (.84 – .89), discrimination power (Ferguson delta = .97 – .99), IRT reliability (.85 – .89), and Rho coefficient (.81 – .87). Table 3 also shows that the MHC-SF-B had an acceptable standard error of measurement (1.65–2.30).

Supplementary Table 2 presents the monotonicity results and local dependence results. From Supplementary Table 2, there was one violation in item 8 and item 10. But, these violations were non-significant. Critical values are 11 and 1 for item 8 and item 10, respectively. These values are below the suggested cut-off for the critical values (40; Molenaar and Sijtsma, 2000) to indicate the absence of monotonicity. Supplementary Figure 1 also shows the monotonicity of all items graphically. There was no substantial lower bound to suggest the possible presence of monotonicity. Table 4 also presents \(G^2p\) values. All of the \(p\) values are higher than .05. Therefore, there was no local dependence issue. Both monotonicity results and \(G^2p\) values suggested that all assumptions for applying an IRT model were met.

Slope coefficient (discrimination parameters), from Table 1, ranged between 1.980 and 3.691 for emotional well-being subscale (mean = 2.547), between 1.371 and 2.260 for social well-being subscale (mean = 1.846), and between 1.703 and 2.771 for psychological well-being subscale (mean = 2.221). Among items, only item 8 had ‘high’ slope and rest of the items had ‘very high’ slope. All items of the MHC-SF-B provided sufficient information about mental health that this scale assesses and able to discriminate among people in terms of poor or better mental health. Results regarding the threshold coefficient in Table 1 shows that all subscales required a lower theta or latent trait to endorse items of these subscales. Item 12 had the lowest initial threshold value (−3.170), and item 6 had the highest initial threshold value (−1.335). It appears that fewer participants endorsed the initial response category for item 12 than for item 6. Similarly, item 14 had the lowest final threshold value (.515), and item 8 had the highest final threshold value (2.545). It appears from this result that fewer participants endorsed the last response option for item 8 than item 8. Threshold values suggested that the MHC-14 Bangla efficiently assesses lower to above average levels of latent traits, mental well-being. Supplementary Figure 2 presents the category characteristic curves of this scale.

Table 1 shows non-significant mean differences in emotional well-being (t-value = −.793, p = .428), social well-being (t-value = −1.545, p = .123), psychological well-being (t-value = −2.35, p = .814), and mental well-being (t-value = −1.003, p = .316) between females and males. The total score of the MHC-14 Bangla had moderate correlation.

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### Table 1. Item level properties of the Mental Health Continuum Short Form Bangla version.

| Items | M | SD | Skewness | Kurtosis | Corrected item-total correlations | Slope coefficient | Threshold coefficient | b₁ | b₂ | b₃ | b₄ | b₅ |
|-------|---|----|----------|----------|----------------------------------|------------------|----------------------|----|----|----|----|----|
| Emotional well-being: M = 9.63, SD = 3.69; Female: M = 9.46, SD = 3.81; Male: M = 9.77, SD = 3.59; t-value = −.793, p = .428 |
| Item 1 | 2.92 | 1.50 | –.54 | –.81 | .64 | 1.980 (187) | −1.911 | −1.012 | −.756 | .137 | 1.536 |
| Item 2 | 3.40 | 1.41 | –.87 | −.17 | .58 | 1.969 (198) | −2.433 | −1.410 | −1.089 | −.330 | .999 |
| Item 3 | 3.32 | 1.44 | –.84 | −.23 | .72 | 3.691 (539) | −1.856 | −1.162 | −.885 | −.225 | .918 |
| Social well-being: M = 14.45, SD = 6.02; Female: M = 13.87, SD = 6.22; Male: M = 14.86, SD = 5.86; t-value = −1.545, p = .123 |
| Item 4 | 3.27 | 1.55 | –.63 | −.76 | .58 | 1.851 (187) | −2.243 | −1.286 | −.799 | −.169 | .839 |
| Item 5 | 3.50 | 1.52 | –.84 | −.46 | .59 | 1.801 (183) | −2.431 | −1.484 | −.925 | −.468 | .595 |
| Item 6 | 2.71 | 1.75 | –.23 | −1.32 | .71 | 2.260 (238) | −1.335 | −.769 | −.311 | .182 | 1.098 |
| Item 7 | 2.93 | 1.52 | −.26 | −1.02 | .63 | 1.947 (190) | −2.173 | −1.110 | −.450 | .288 | 1.159 |
| Item 8 | 2.04 | 1.56 | −.52 | −1.16 | .54 | 1.371 (154) | −1.299 | −.337 | .236 | 1.128 | 2.545 |
| Psychological well-being: M = 20.86, SD = 6.14; Female: M = 20.77, SD = 6.20; Male: M = 20.92, SD = 6.11; t-value = −2.35, p = .814 |
| Item 9 | 3.26 | 1.36 | −.74 | −.28 | .57 | 1.703 (164) | −2.594 | −1.548 | −1.086 | −.181 | 1.337 |
| Item 10 | 3.37 | 1.35 | −.82 | −.08 | .68 | 2.124 (193) | −2.411 | −1.526 | −1.053 | −.228 | 1.055 |
| Item 11 | 3.43 | 1.29 | −.86 | −.14 | .68 | 2.277 (214) | −2.430 | −1.615 | −1.015 | .283 | 1.004 |
| Item 12 | 3.58 | 1.25 | −.84 | −.07 | .60 | 1.869 (185) | −3.170 | −1.756 | −1.269 | −.384 | .849 |
| Item 13 | 3.61 | 1.36 | −1.02 | −.28 | .73 | 2.771 (270) | −2.236 | −1.484 | −1.063 | −.472 | .602 |
| Item 14 | 3.61 | 1.35 | −.87 | −.06 | .69 | 2.579 (240) | −2.425 | −1.555 | −1.026 | −.406 | .515 |

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with stress (−.488 [−.565, −.403], p < .001), and anxiety (−.454 [−.534, −.366], p < .001), and low correlation with Fear of COVID-19 (−.164 [−.265, −.060], p = .002) (Table 4). These results suggested the validity of this scale.

Table 4. Correlation coefficient between scores of the Mental Health Continuum Short Form, the Perceived Stress Scale Short Form, the State Trait Anxiety Inventory Short Form, and the Fear of COVID-19 Scale.

| Variables          | MHC-SF | PSS-SF | STAI-SF |
|--------------------|--------|--------|---------|
| MHC-SF             | .445   | .280   | .490    |
| PSS-SF             |        | .488   | .395    |
| STAI-SF            |        |        | .411    |

MHC-SF = Mental Health Continuum Short Form, PSS-SF = Perceived Stress Scale Short Form, STAI-SF = State Trait Anxiety Inventory Short Form, FoCS = Fear of COVID-19 Scale.

4. Discussion

In this study, we assess the psychometric properties of the MHC-SF Bangla version to estimate its efficiency to assess the well-being of Bangladeshi people. Items’ of the MHC-SF-B had good discrimination indices (corrected item-total correlations). These items can differentiate effectively between having a higher well-being score (flourishing) and having a lower well-being score ( languishing). Same as the original factor structure, MHC-SF-Bangla had three factors structure. This result about factor structure is consistent with other versions studies that assessed factor structure of this scale across different cultures and groups (i.e., Polish [Karaś et al., 2014], Canadian [Doré et al., 2017; Orpana et al., 2017], Irish [Donnelly et al., 2019], Portuguese [Fonte et al., 2020], etc.). This scale had good internal consistency reliability to assess mental health among Bangladeshi people. Other studies (i.e., Echeverria et al., 2017; Keyes et al., 2008; Rafey et al., 2017) also reported good internal consistency reliability of the MHC-SF. Besides, we also estimated the IRT reliability of this scale. Subscales of the MHC-SF-B had good IRT reliability. This type of reliability differs from alpha or omega as this is the ratio of explained variance in the response patterns to the error in the response patterns (Kim and Feldt, 2016; Sireci et al., 1991).

We also explored the efficiency of the MHC-SF-B through the multidimensional GRM of the item response theory. IRT assumption tests (local dependence and monotonicity) confirmed that there was no violation of assumptions. Slope parameters suggested that the emotional well-being subscale provides highest information, and the social well-being subscale provides least information. Results also showed that the social well-being scale items are more difficult than the other two subscale's items. Category characteristics curves (Supplementary Figure 2) show that the third response option 'About Once a Week' overlapped with other response options in most items. This overlapping suggested this option as redundant. Online data might be a possible reason for this overlapping. Moreover, this data is part of a cross-cultural COVID-19 project and collected during the first wave of the COVID-19 outbreak in Bangladesh. COVID-19 outbreak might have impacted the response pattern of participants on this scale. Further studies would be undertaken to cross-check this issue. This scale would be conducted offline first with
six-point Likert-type response option. If overlapping of this option would happen again, then this scale would be re-conducted again with a five-point Likert-type response option or with the same response options after completing re-translation.

Negative moderate correlations of MHC-SF-B with stress and anxiety suggested convergent validity of this scale (Fonte et al., 2020; Guo et al., 2015; Karas et al., 2014; Machado and Bandeira, 2015). Overall, the MHC-SF-B is a psychometrically reliable and valid tool for assessing the positive mental health of Bangladeshi adults.

4.1. Limitations and recommendations

This study has several limitations. Firstly, we utilized online data in this study to assess the reliability and validity of the MHC-SF-B. Online data contain responses only from educated people who have internet and smartphone/computer facilities. Therefore, sample representation is in question. Secondly, the data utilized in this study were self-rated. Self-rated data might be subjected to biases (i.e., social desirability bias, memory recall, etc.). Thirdly, there is no information about the clinical sample in the data. How this scale will perform to assess the mental well-being of the clinical sample is unknown. These limitations would be overcome by conducting several studies with a representative sample of all ages and groups.

4.2. Conclusions

Despite the limitations, the findings show that the Mental Health Continuum – Short Form - Bangla is a reliable and valid tool to assess the mental well-being of Bangladeshi people. This measure will also be helpful to mental health practitioners assessing the mental health state of adult clients in Bangladesh. It would help to formulate necessary interventions to alleviate psychological distress and strengthen psychological well-being.

Declarations

Author contribution statement

Fatema Akhter Hiramoni and Oli Ahmed: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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