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A psychometric evaluation of a negative mood scale in the MDS-HC using a large sample of community-dwelling Hong Kong Chinese older adults

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Abstract

Background: negative mood is an important construct when assessing the health of older persons. The profile of mood states questionnaire is commonly used to measure mood; however, it might not be suitable for older adults with low education level and those who are not originated North American.
Objective: to examine a negative mood scale formed by nine items in the Mood Section of the Minimum Data Set-Home Care of the Resident Assessment Instrument.
Methods: a secondary analysis of data from 3,523 older persons aged 60 or over who had first applied for the long-term care services in Hong Kong and completed the screening tool in 2006. Exploratory and confirmatory factor analyses were used to test the factor structure and multiple-group confirmatory factor analysis to test the gender invariance of the Negative Mood Scale in the Minimum Data Set-Home Care. Its reliability using Cronbach's alpha was examined.
Results: both a three-factor model at the first level and a one-factor model at the second level provided excellent fits to the overall data, and held equally well for both males and females, and two randomly split samples. Multiple-group confirmatory factor analyses revealed both genders demonstrating an equivalent pattern of factor loadings. Cronbach's alpha value was acceptable for the overall data (0.66).
Conclusions: the Negative Mood Scale is a reliable and valid scale and both genders responded to it using the same framework and metric, suggesting it could be used to measure negative mood in Chinese community-dwelling older adults. Further testing of the instrument is needed.

Keywords: *negative mood, Minimum Data Set-Home Care, Chinese community dwellers, confirmatory factor analysis, reliability, elderly*

Introduction

Mood is believed to have a direct impact on mental and physical health, ranging from depression and anxiety to addiction, cognitive performance and longevity [1]. Negative mood was associated with mortality, physical health symptoms and poor memory in older adults [2–4]. More importantly, impairment in the regulation in negative moods increases the likelihood of the onset of and maintenance of depression [5].

Mood has been conceptualised as a multidimensional construct including not only depressive symptoms, but also anger, sadness, fear, surprise, tension, joy, guilt and interest [6]. There is a clear distinction between depression and negative mood in terms of duration of the symptoms. Depression is a mood disorder, which represents a clinical illness with the hallmark features of sustained negative moods and a persistent reduction in positive moods, usually with the symptoms last for at least 2 weeks while negative mood is transient; and recovery typically occurs quickly and

without the use of explicit strategies to regulate the sad mood [7]. Mood is commonly measured using the profile of mood states (POMS) questionnaire which consists of six primary dimensions of mood: Depression-dejection, anger-hostility, tension-anxiety, vigour-activity, fatigue-inertia and confusion-bewilderment [8] but it has two major limitations when used with older adult populations in general. First, POMS is recommended for use with adult subjects with at least some high school education [8] that some of the items require a high level of comprehensive ability, making them hard to be understood by older adults with a low education level. Second, in addition to their lengths, the original and several shorten versions of POMS have been criticised for their generalisations to other cultures since some items have a distinct North American orientation [9]. Thus, there is a need for a new screening tool to measure negative mood in older adults in general.

We have validated a new instrument which is short and easy to be understood, the MDS Negative Mood Scale, to measure negative mood in older Chinese community dwellers. The instrument consists of nine negative mood items in Section E1 of the Minimum Data Set for Home Care (MDS-HC), one of the Resident Assessment Instrument (RAI) assessment tools specially developed for the home care setting to provide a comprehensive assessment of older community dwellers [10]. The Hong Kong Chinese version of the MDS-HC has been validated with adequate reliability and concurrent validity [11]. This study further examined the factor structure, reliability and concurrent validity of the MDS-based Negative Mood Scale in a large sample of Chinese community-dwelling older adults who have sought long-term care services in Hong Kong. In addition, we evaluated whether there is a gender difference in factor structure of the MDS Negative Mood Scale.

Methods

Sample and procedure

This is a secondary analysis of data collected from a large cohort of older community dwellers applying for long-term care service in Hong Kong in 2006. The MDS-HC was mandated for use as the placement assessment tool for existing service users to ascertain the care needs of the older adults and match them with appropriate services in Hong Kong. Trained assessors conducted the assessment which included direct questioning of the client and the primary family caregiver, if available, observation of the client in the home environment, and a review of secondary documents when available. A detail account of the assessment procedure has been reported elsewhere [12]. A total of 10,331 clients completed the MDS-HC in 2006. The current analysis consisted of 3,523 older persons aged 60 or more, who lived in their private homes and had no prior or current home care services. This secondary data analysis was approved by the research ethic committee of University of Hong Kong.

Measures

The Negative Mood Scale in the MDS-HC

The Negative Mood Scale of MDS-HC assesses nine emotional problems including (i) feelings of sadness/depressed, (ii) persistent anger with self or others, (iii) expressions of what appear to be unrealistic fears, (iv) repetitive health complaints, (v) repetitive anxious complaints/concern, (vi) sad/pained/worried facial expressions, (vii) recurrent crying/tearfulness, (viii) withdrawal from activities of interest and (ix) reduced social interaction which capture both verbal and non-verbal indicators of negative mood. Each item measures the frequency of occurrence of the symptom in the past 3 days using a three-point Likert scale of 0 = 'none', 1 = 'one to two days' and 2 = 'everyday'.

Data analysis

Reliability

The reliability of the scale was assessed by Cronbach's alpha.

Factor structure and gender invariance

We used both exploratory (EFA) and confirmatory (CFA) factor analyses to examine factor structure of the scale. First, EFA was applied to identify the number of factors in the scale using the whole sample. We used three criteria for factor retention: (i) a Scree plot shows a sharp drop, (ii) the interpretability of the factors and (iii) the factor loadings >0.3. CFA was then used to further confirm this EFA model to evaluate model appropriateness. In this first-order factor model, all latent factors identified were allowed to correlate to each other. We then tested the second-order factor model which hypothesised that the correlations among the first-order latent factors could be represented by a second-order factor (i.e. a general factor of Negative Mood) [13]. To test the stability of the resulting factor structure, we performed cross-validation examination of the model by two randomly split samples and by gender. This second-order factor model would be treated as the baseline model if it provided good fits to the overall, two split and gender samples.

We used an invariance analyses to test whether there is a difference in the factor structure of the MDS Negative Mood Scale across males and females by CFAs [14]. In particular, a sequence of increasingly restrictive CFA models was examined to evaluate the factorial invariance of the scale across gender. The second-order factor model previously obtained was treated as baseline models for male and female samples in the invariance analysis. Then, the invariance routine compared two nested CFAs using multi-group analyses that assessed the fitness of the second-order factor model simultaneously across the gender samples. The first CFA was formed with the baseline models for each gender sample, with no cross-sample constraints imposed (Model 1). If this multi-group model provided a good fit to the data, configural invariance of the factor structure across

gender was supported, which implied both male and female subjects using the same underlying framework when responding to the scale. Given an adequate fit of the data, a more stringent model was further fitted to the samples with all first-order factor loadings constrained to be equal across samples (Model 2). If Model 2 fitted the data as well as Model 1, measurement invariance at the first-order level across gender was supported. Then, Model 3 was formed by further constraining the second-order factor loadings to be equal across samples in Model 2. If Model 3 fitted the data as well as Model 1, measurement invariance at the second-order level across gender was supported, reflecting that both genders responded to the scale using the same metric unit [15].

All the CFAs were performed by the EQS 6.0 package [16] using maximum likelihood estimation with a robust procedure to adjust for non-multivariate normality of the data [17]. Assessment of model fit to the data was based on three fit indices: (i) Robust Comparative Fit Index (R-CFI) [18], (ii) standardised root mean squared residuals (SRMR) [16] and (iii) Robust root mean square error of approximation (R-RMSEA) [19]. The cutting values of R-CFI >0.90, SRMR <0.08 and R-RMSEA <0.08 indicate a good fit to the data and the model will not be rejected [20].

When comparing the more stringent model (for example, Model 2) to the less restricted model (Model 1) in the multiple-group procedure in the invariance routine, two criteria for evaluating model fit were followed. We say that Model 2 fits the data as well as Model 1 if (i) Model 2 also provide a good fit to the data as indicated by the three goodness of fit indexes mentioned above; and (ii) a change in CFI is smaller than or equal to 0.01 [21].

Results

Characteristics of the subjects

The average age of the subjects was 79.6 years (SD = 7.5), 60% were females (n = 2,122) and 21% were living alone (n = 736). Fifty-seven per cent had no formal education (n = 2,008), 32% had taken part of primary education (n = 1,125), 6% had completed primary education (n = 217) and 5% had secondary or higher education (n = 173). Forty-three per cent were married (n = 1,496), 50% were widowed (n = 1,743), 5% had never married (n = 163) and 3% were divorced/separated/other (n = 121).

Factor structure of the MDS Mood Scale

EFA: overall sample and stability by split and gender samples

The nine items were subjected to a principle component factor analysis with varimax rotation based on the correlation matrix. The EFA results revealed a fair clear structure of three distinct factors labelled as 'distress' (Item 1–Item 5), 'sadness' (Items 6 and 7) and 'social withdrawal' (Items 8 and 9) (Table 1). The total variance explained by the three factors was 55.2%. A similar three-factor solution was obtained for the two randomly split samples and the two gender samples, although item 2 'Persistent anger with self or others' loaded on sadness (factor 2) instead of distress (factor 1) for the male sample and the second random split sample.

CFA: overall sample and stability by split and gender samples

The CFA also provided that this three-factor model adequately fit the overall sample, split samples and male and female samples (upper portion of Table 2). The second-order model assuming there was a common latent factor representing the three first-order factors also showed goodness-of-fit statistics similar to those of the first-order factor model, suggesting it is legitimate to create a summary score for the MDS Negative Mood Scale. In addition, an acceptable internal consistency for the summary MDS Negative Mood Scale in the overall sample, the two random split samples and the two gender samples (Cronbach's alpha values > 0.6) (Table 2) [22], and hence we would consider the scale to be reliable in this sample of the Hong Kong community-dwelling older adults.

Table 1. Rotated factor loadings of the exploratory factor analysis for the MDS Negative Mood Scale for overall sample, two split and gender samples (n = 3,523)

Item	Total (n = 3,523)			Split 1 (n = 1,761)			Split 2 (n = 1,762)			Male (n = 1,401)			Female (n = 2,122)		
	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3
1. Feelings of sadness/depressed	0.53	0.19	0.09	0.62	0.21	0.07	0.69	0.22	0.07	0.59	0.11	0.05	0.70	0.08	−0.01
2. Persistent anger with self or others	0.40	0.15	0.11	0.59	0.11	0.04	0.28	0.34	0.18	0.16	0.38	0.20	0.64	−0.02	−0.05
3. Expressions of what appears to be unrealistic fears	0.42	0.09	0.10	0.56	−0.02	0.10	0.52	0.17	0.07	0.67	0.06	−0.09	0.35	0.12	0.15
4. Repetitive health complaints	0.51	0.04	0.14	0.61	−0.01	0.16	0.72	−0.04	0.12	0.78	−0.28	0.11	0.69	−0.10	0.09
5. Repetitive anxious complaints, concerns	0.47	0.15	0.01	0.65	0.17	−0.10	0.56	0.11	0.04	0.42	0.32	−0.09	0.66	0.02	−0.10
6. Sad, pained, worried facial expressions	0.31	0.51	0.12	0.26	0.74	0.11	0.32	0.69	0.13	0.19	0.67	0.05	0.14	0.73	0.08
7. Recurrent crying, tearfulness	0.12	0.58	0.02	0.02	0.86	−0.01	−0.01	0.88	−0.02	−0.18	0.80	−0.02	−0.09	0.91	−0.07
8. Withdrawal from activities of interest	0.13	0.06	0.69	0.08	0.07	0.88	0.10	0.07	0.93	−0.03	0.02	0.88	−0.03	0.01	0.92
9. Reduced social interaction	0.14	0.05	0.69	0.094	0.02	0.88	0.11	0.09	0.92	−0.02	0.02	0.89	−0.01	−0.03	0.92
% variance	27.9	11.4	15.8	26.7	11.9	16.1	29.0	11.1	15.6	25.7	12.2	15.4	28.9	11.4	16.3

F1, Distress; F2, Sadness; F3, Social withdrawal.

Table 2. Results of goodness of fit indices of the first and second-order factor model of the MDS Negative Mood Scale in the overall and two gender samples and measurement invariance across gender samples

Model building	R-χ^2	df	*P*-value	SRMR	R-CFI	R-RMSEA	Alpha
First-order model							
Overall (n = 3,523)	30.40	24	0.17	0.021	0.992	0.009	—
Random1 (n = 1,761)	31.72	24	0.13	0.030	0.981	0.014	—
Random2 (n = 1,762)	18.40	24	0.78	0.023	1.00	0.00	—
Male (n = 1,401)	35.95	24	0.06	0.040	0.955	0.019	—
Female (n = 2,122)	25.85	24	0.36	0.025	0.997	0.006	—
Second-order model							
Overall (n = 3,523)	30.40	24	0.17	0.021	0.992	0.009	0.655
Random 1 (n = 1,761)	31.73	24	0.14	0.030	0.981	0.014	0.645
Random 2 (n = 1,762)	18.40	24	0.78	0.023	1.00	0.00	0.673
Male (n = 1,401)	35.95	24	0.06	0.040	0.955	0.019	0.619
Female (n = 2,122)	25.72	24	0.37	0.025	0.997	0.006	0.675
Measurement invariance	R-χ^2	df	SRMR	R-CFI	R-RMSEA	Model comparison	ΔR-CFI
Model 1 (configural invariance)	63.32	48	0.034	0.982	0.013	—	—
Model 2 (first-order factor loading invariant)	70.52	54	0.039	0.981	0.013	2 versus 1	−0.001
Model 3 (second-order factor loading invariant)	77.12	57	0.049	0.976	0.014	3 versus 1	−0.006

R-χ^2, Robust Chi-square test statistic; df, degree of freedom; R-CFI, Robust Comparative Fit Index; R-RMSEA, Robust root mean squared error of approximation; SRMR, standardised root mean squared residuals; Alpha, Cronbach's alpha.

Table 3. Standardised solutions of the measurement invariance second-order model of the MDS Mood Scale in the two gender subsamples

MDS mood item	Male (n = 1,401)			Female (n = 2,122)		
	F1	F2	F3	F1	F2	F3
1. Feelings of sadness/depressed	0.50	—	—	0.63	—	—
2. Persistent anger with self or others	0.37	—	—	0.45	—	—
3. Expressions of what appears to be unrealistic fears	0.46	—	—	0.36	—	—
4. Repetitive health complaints	0.45	—	—	0.53	—	—
5. Repetitive anxious complaints, concerns	0.42	—	—	0.47	—	—
6. Sad, pained, worried facial expressions	—	0.84	—	—	0.81	—
7. Recurrent crying, tearfulness	—	0.35	—	—	0.48	—
8. Withdrawal from activities of interest	—	—	0.76	—	—	0.85
9. Reduced social interaction	—	—	0.80	—	—	0.82
Second-order factor	0.89	0.63	0.36	0.89	0.65	0.36

F1, Distress; F2, Sadness; F3, Social withdrawal.

Gender invariance

The goodness-of-fit index criteria based on the values of R-CFI, SRMR and R-RMSEA all reflected an excellent fit with the two gender samples simultaneously (Model 1), therefore, configural invariance of the factor structure across gender were supported. Measurement invariance at the first-order level (Model 2) as well as at the second-order level (Model 3) of the MDS Negative Mood Scale was supported across the two gender samples as shown by the good fit with the data and the small changes in R-CFI (<0.01) when compared with Model 1 (lower portion of Table 2). All the first-order and second-order standardised factor loadings are >0.35 in both female and male samples (Table 3). The magnitude of the second-order factor loadings of 'Distress' was the largest, followed by that of 'Sadness' and that of 'Social withdrawal' was the smallest.

Discussion

In this study, we examined the factor structure of the Negative Mood Scale of the Chinese version of the MDS-HC and investigated whether male and female Chinese older adults interpret and correspond to items of the scale differently. Results of both EFA and CFA, using a large community-dwelling sample of older adults seeking long-term care service, supported a three-dimensional structure at the first-order level and a common one-factor structure at the second-order level. We were able to replicate these results of the factor structure of the MDS Negative Mood Scale in two randomly split samples, and female and male samples. These results also suggested that older adults in this study showed a similar interpretation of the items on the scale regardless of their gender. Internal consistency estimate for the MDS Negative Mood Scale was also satisfactory for the overall, two split and gender samples.

Our results also provide important information on the psychometric properties of the MDS Negative Mood Scale, in that the scale had a similar one second-order factor structure in both males and females of Chinese older adults by demonstrating both configural and measurement invariance across gender. Our gender invariance results suggested that an observed gender difference in MDS Negative Mood scores among Chinese older adults would reflect a real difference, rather than different interpretations of the items in the MDS Negative Mood Scale by gender as hypothesised by Liang *et al.* [23]. Such finding contributes to the empirical literature of mood research in Chinese older adults.

The findings of a common second-order factor structure in the scale also suggest we could be able to conceptualise that there are three correlated latent constructs at the first-order level and the covariances among the latent constructs could further be represented as a common latent construct at the second-order level. In CFAs, we found differential contributions of the three first-order latent factors to the general second-order factor of Negative Mood as reflected by the magnitudes of factor loadings, suggesting that negative mood in these three aspects (distress, sadness and social withdrawal) might be associated with different antecedent conditions and subsequent outcomes in older Chinese adults. Again, the findings of these three latent constructs within the MDS Negative Mood Scale would be very useful in designing practical interventions targeting different aspects of negative mood. Further studies are needed to explore this assertion.

There are a number of limitations to the current study that are worth noting. First, the three-factor solution for the Negative Mood Scale was replicated in the same sample and cross-validation using new samples will be necessary to further confirm its factor structure. Second, we only investigated factorial validity of the scale. Further studies on predictive validity and stability of the factor structure of the scale over time and criterion validity with other mood inventories will be needed. Third, although the sample consisted of a large cohort of older Hong Kong adults seeking long-term care services for the first time, replication of the study in representative samples of the community will definitely further enhance the generalisability of the current results.

Measuring negative mood in older adults is an important task in studying health of older adults. In this regard, the Negative Mood Scale embedded in the MDS-HC is short and easy to understand as well as it collects information in a routine manner could be a practical option to recognise symptoms, address unmet needs and enhance long-term care service for older adults.

Key points

- There is a need to develop an instrument to measure negative mood for community-dwelling older adults in general.
- The Negative Mood Scale using all the nine items in the Mood Section of the Minimum Data Set-Home Care of the Resident Assessment Instrument showed satisfactory psychometric properties to measure negative mood with acceptable factorial validity, reliability and concurrent validity.
- Evidence also support configural and metric invariance in the factor structure of the Negative Mood Scale across gender, suggesting that both genders responded to the scale using the same underlying framework and metric.

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The Nottingham Hip Fracture Score as a predictor of early discharge following fractured neck of femur

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Abstract

Background: hip fracture represents a huge medical, social and financial burden on patients, their carers and the health and social care systems. For survivors, return to their own home may be a key outcome. The Nottingham Hip Fracture Score (NHFS) is a validated score, based on admission characteristics, for predicting 30-day and 1-year mortality that may be of benefit in predicting return-to-home, directly from the acute orthopaedic ward.
Objective: to assess the utility of the NHFS as a predictor of return-to-home in patients following hip fracture.
Methods: the NHFS was calculated for all patients admitted from their own home and the correlation between the NHFS and eventual return-to-home was calculated, as well as the probability of discharge by within 7, 14 and 21 days.
Results: a total of 6,123 patients were available for analysis. Of which, 3,699 (60%) were discharged from acute hospital to their own home. Increasing NHFS was negatively correlated with eventual return-to-home ($r^2 = 0.949$) and with the proportion of patients discharged back to their own home at 7, 14 and 21 postoperative days, respectively ($r^2 = 0.84$, 0.94, 0.96, respectively).
Conclusions: the NHFS is a reliable tool for predicting return-to-home. It may be useful for discharge planning, and for the design of future research trials.

Keywords: *hip fracture, prediction, scoring, discharge destination, elderly*