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ORIGINAL ARTICLE

Validation of DASS-21 among nursing and midwifery students in Brunei

Yan Choo Teo[1] · Asnah Hj Yusuf[1] · Wen Pei Alice Lim[1] · Nur Basirah Ghazali[1] · Hanif Abd Rahman[1] · Naing Lin[1] · David Koh[1,2]

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Abstract

Background The Depression Anxiety and Stress Scale (DASS) is a promising tool compared with traditional measures because of its greater divergent validity. Unlike the original DASS-42, the DASS-21 version still lacks validation studies particularly in Asian populations.

Aim To validate the psychometric properties of DASS-21 among nursing and midwifery students.

Subjects and methods Data were collected at three time points, the beginning, middle and end of the semester, from students enrolling in the positive thinking module. Reliability statistics, floor and ceiling effects, and factor analysis were computed.

Results One hundred twenty-six data points were used where participants reported mild stress levels (mean = 14.8 ± 4.18), moderate anxiety levels (mean = 13.3 ± 3.45) and mild depression levels (mean = 12.3 ± 3.40). DASS-21 showed excellent internal consistency reliability estimates except for item 2. Discriminant validity was an issue, and it was observed that 9 items, instead of 21, provided the best model fit ($\chi^2 = 57.1$, $p < 0.001$, CMIN/DF = 2.380, SRMR = 0.037 and GFI = 0.904).

Conclusion The final model was suggestive of a quadripartite model. Further validation is needed for DASS-21, taking into account these issues and re-testing the instrument to determine whether it is psychometrically sound and valid for use in Asian populations.

Keywords Depression · Anxiety · Stress · Validation · DASS-21 · Nursing and midwifery students

Introduction

Traditional measures of depression and anxiety such as the popular Hamilton scales for anxiety and depression and the trait version of the State-Trait Anxiety Inventory (STAI-T) have failed to detect differences between anxiety and depression constructs, and their items correlate highly with one another, suggesting large overlap between measures (Antony et al. 1998; López et al. 2005).

The Depression Anxiety and Stress Scale (DASS) is a more promising tool than the traditional measures because of its greater divergent validity. DASS was developed from the work of Lovibond and Lovibond (1995), who initially intended to provide maximal discrimination between symptoms of depression and anxiety. However, as the tool was empirically refined through factor analyses, initial items not related to depression and anxiety were grouped, and eventually the third 'stress' scale emerged to form the final version of the DASS questionnaire (Antony et al. 1998; Nazan and Lgel 2010; Bottesi et al. 2015). Brown et al. (1997) demonstrated that the DASS scale could be reliably categorised into depression (DASS-D), anxiety (DASS-A) and stress (DASS-S). The depression subscale assessed lack of incentive, low self-esteem and dysphoria. The anxiety subscale referred to somatic and subjective symptoms of anxiety and acute response to fear. The stress subscale evaluated irritability, impatience, tension and persistent arousal (Bottesi et al. 2015).

Currently, there are two versions of the DASS scale, i.e., the original 42-item version (DASS-42) and the shortened 21-item version (DASS-21), available through an online public domain. DASS-21 has several advantages over DASS-42, such as fewer items, cleaner factor structure and smaller interfactor correlations (Antony et al. 1998). The psychometric properties of the DASS-42 scale have been reported in numerous studies and in various samples and countries such

✉ Hanif Abd Rahman
hanif.rahman@ubd.edu.bn

[1] PAPRSB Institute of Health Sciences, Universiti Brunei Darussalam (UBD), Jalan Tungku Link, Gadong BE 1410, Brunei Darussalam

[2] SSH School of Public Health, National University of Singapore, Singapore, Singapore

as the USA (Antony et al. 1998), Canada (Clara et al. 2001), Australia (Page et al. 2007), Brunei (Mundia 2010) and Malaysia (Imam 2010), to name a few. It has also been translated into several languages such as Chinese (Chan et al. 2012), Indonesian Malay (Damanik 2011) and Greek (Lyrakos et al. 2011). The psychometric properties of the internet-administered DASS-42 version have also been examined (Zlomke 2009).

However, unlike DASS-42, the psychometric properties of DASS-21 were not initially described in the original manual, and studies evaluating its psychometric properties are limited. Only a few of these studies have tested psychometric properties in a non-clinical sample setting. In addition, despite strong evidence that the tool can be used to measure depression, anxiety and stress items, DASS-21, examined in a large non-clinical sample of the UK adult population, reported considerable variation (Henry and Crawford 2005). The depression and anxiety factor correlations were higher with stress factors than with factor correlations with one another, suggesting that despite evidence that the DASS-21 subscales assess the three domains for which they were intended, the stress subscale may not be a distinct construct (Henry and Crawford 2005). Furthermore, there was still a lack of validation studies reported amongst Asian samples where cultural differences may pose significant variations (Oei et al. 2013).

Therefore, the purpose of this article is to report the validation portion of a previous intervention study among nursing and midwifery undergraduate students in Brunei Darussalam, which will contribute towards better understanding of using DASS-21 (English version) in Asian samples.

Methods

Ethics and settings

This intervention study was conducted at the PAPRSB Institute of Health Sciences, Universiti Brunei Darussalam, in August 2014 over 14 weeks. Ethical approval was given by the Research Ethics Committee of Institute of Health Sciences, Universiti Brunei Darussalam. Participation was voluntary and those who agreed to join had signed informed consent forms; however, they could withdraw from the study at any time without giving any reasons. Convenience, comfort and privacy were provided to all participants where necessary.

Sampling and procedure

All 42 nursing and midwifery undergraduate students from Universiti Brunei Darussalam (UBD) who had newly enrolled in bachelor and diploma programmes in August 2014 were recruited for this study. The DASS-21 questionnaire was used on three occasions over 14 weeks to measure changes in the intervention group's mental states at the beginning (Time 1), middle (Time 2) and end of the semester (Time 3).

DASS-21

The English version of the DASS-21 questionnaire was pretested among ten nursing and midwifery students. Based on the feedback from participants, some explanatory words or phrases were added for item 7: "I experienced trembling (e.g. in the hands)".

Statistical analysis

For the purpose of evaluating the reliability of the questionnaire, three-point measures for each participant ($n = 42$) were combined, which gave 126 observations for each item analysed. The DASS-21 scores are shown in Table 1. The descriptive statistics of each item including the floor and ceiling effects (percentages of participants who answer the lowest and highest response respectively) and reliability statistics such as corrected item-total correlation and internal consistency reliability (Cronbach's alpha) were analysed. Pearson's correlation coefficients were also calculated between each subscale. Cronbach's alpha was calculated with a cut-off of 0.7. Corrected item-total correlation of ≥ 0.30 was considered adequate (Bottesi et al. 2015). Further investigation using exploratory factor analysis was carried out to establish the factorial validity of the tool using principal axis factoring with Varimax rotation. Factor loadings < 0.50 were suppressed. Item cross loadings of > 0.20 were removed one at a time. Due to the small sample size, bootstrapping was used with 5000 subsamples and a 95% confidence interval. Finally, a confirmed structural model was developed where model fitness was determined with chi-square statistics, the standardised root mean square residual (SRMR) and goodness of fit (GFI) indices. Statistical analysis was performed using IBM|SPSS v21 and IBM|AMOS v25.

Results

The mean age of the participants was 24.2 years (SD 5.67). There were 4 male (9.5%) and 38 female participants (90.5%).

Table 1 Meaning of DASS-21 scores

	Depression	Anxiety	Stress
Normal	0–9	0–7	0–14
Mild	10–13	8–9	15–18
Moderate	14–20	10–14	19–25
Severe	21–27	15–19	26–33
Extremely severe	28+	20+	34+

Table 2 Descriptive and reliability statistics of DASS-2 items and scales1

Item no.	Brief questions	Mean	(SD)	Floor effect		Ceiling effect		CITC[1]	Alpha[2]
				n	(%)	*n*	(%)		
Stress scale (score)		14.8	(4.18)	2	(1.6)	0	(0.0)		0.91
1	Hard to wind down	2.2	(0.95)	16	(12.7)	5	(4.0)	0.68	
6	Overreact	1.7	(0.86)	24	(19.0)	9	(7.1)	0.72	
8	Using nervous energy	1.9	(0.88)	15	(11.9)	9	(7.1)	0.72	
11	Getting agitated	2.6	(0.90)	36	(28.6)	1	(0.8)	0.78	
12	Difficult to relax	2.1	(0.84)	43	(34.1)	4	(3.2)	0.79	
14	Intolerant	2.1	(0.84)	34	(27.0)	2	(1.6)	0.73	
18	Touchy (sensitive)	2.0	(0.95)	19	(15.1)	17	(13.5)	0.69	
Anxiety scale (score)		13.3	(3.45)	3	(2.4)	0	(0.0)		0.82
2	Dryness of mouth	2.0	(0.83)	24	(19.0)	10	(7.9)	0.25	
4	Breathing difficulty	2.3	(0.89)	70	(55.6)	1	(0.8)	0.57	
7	Trembling	1.8	(0.74)	59	(46.8)	1	(0.8)	0.37	
9	Panic and make a fool of oneself	2.1	(0.87)	11	(8.7)	11	(8.7)	0.72	
15	Close to panic	1.9	(0.81)	40	(31.7)	3	(2.4)	0.71	
19	Aware of my heart	1.9	(0.91)	48	(38.1)	2	(1.6)	0.68	
20	Scared without reason	1.4	(0.64)	47	(37.3)	4	(3.2)	0.65	
Depression scale (score)		12.3	(3.40)	7	(5.6)	0	(0.0)		0.87
3	No positive feeling	2.5	(0.76)	36	(28.6)	1	(0.8)	0.68	
5	Difficult to initiate things	2.5	(0.95)	19	(15.1)	6	(4.8)	0.58	
10	Nothing to look forward	2.6	(0.95)	56	(44.4)	0	(0.0)	0.70	
13	Down-hearted and blue	2.1	(0.87)	41	(32.5)	1	(0.8)	0.72	
16	Unable to be enthusiastic	2.2	(0.92)	48	(38.1)	1	(0.8)	0.62	
17	Not worth as a person	2.1	(0.88)	60	(47.6)	1	(0.8)	0.73	
21	Life was meaningless	2.6	(1.03)	88	(69.8)	2	(1.6)	0.46	

[1] Corrected item-total correlation, [2] Cronbach's alpha

Considering marital status, most were single (83.3%), 14.3% were married, and 2.4% were divorced. The majority were Malay (81%) followed by Chinese (9.5%) and other racial groups (9.5%).

The mean and SD of items and subscales, as well as the numbers and proportions of participants scoring either the lowest (floor) or highest (ceiling), are presented in Table 2. The results showed that the participants reported mild stress levels (mean = 14.8 ± 4.18), moderate anxiety levels (mean = 13.3 ± 3.45) and mild depression levels (mean = 12.3 ± 3.40).

The internal consistency reliability coefficient or Cronbach's alpha for depression, anxiety and stress subscales was 0.87, 0.82 and 0.91 respectively. Corrected item-total correlations were adequate except for item 2 (0.25). The correlations among DASS-21 subscales showed significantly high association, ranging from 0.72 to 0.79 (Table 3).

Figure 1 illustrates the best possible structural model of DASS-21 among nursing and midwifery students. Based on the EFA, only nine items were included to test for model fit using maximum likelihood procedures where model fitness indicated acceptable fit ($\chi^2 = 57.1$, $p < 0.001$, df = 24, CMIN/DF = 2.380), SRMR = 0.037 and GFI = 0.904.

Discussion

This article makes two major contributions. First, the psychometric properties of the English version of DASS-21 used among nursing and midwifery students from Brunei were reported. This is important because, to date, no studies have been found that examine the psychometric properties of DASS-21 in Brunei. Only one study was found, by Mundia

Table 3 Pearson's correlations between DASS-21 subscales

	Anxiety scale	Depression scale
Stress scale	0.77 ($p < 0.001$)	0.79 ($p < 0.001$)
Anxiety scale	–	0.72 ($p < 0.001$)

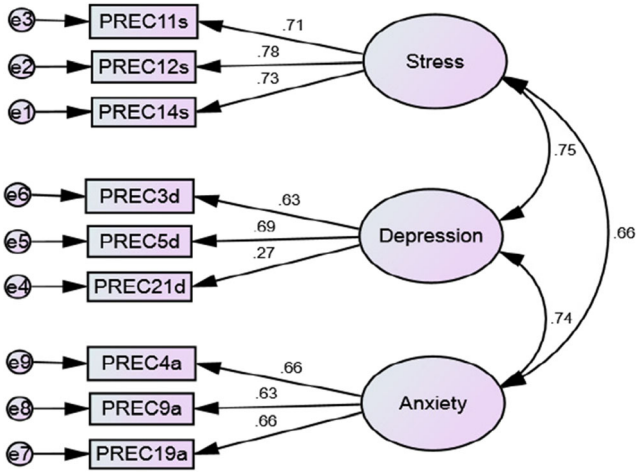

Fig. 1 Standardised regression weight for factor loading and latent factor inter-correlation

(2010), that examined the DASS 42-item version. In terms of internal consistency reliability, the present study reaffirms the excellent internal consistency reliability of the DASS-21 scale, in line with previous studies using the English and translated version, which was also validated among university students, e.g. from Sri Lanka (Rekha 2012) and Turkey (Nazan and Lgel 2010). In terms of the floor and ceiling effect, the result showed similar findings as previous studies where few or no subjects scored at the ceiling. However, the floor effect in this study was greater where the highest proportions for the depression, anxiety and stress subscales were 69.8%, 55.6% and 34.1% respectively compared with another study (Sinclair et al. 2012).

Second, the factor analysis indicated that items 1, 2, 6, 7, 8, 10, 15, 16, 17, 18 and 20 cross loaded highly with one another, indicating that the discriminant validity among the three constructs might not be that different. A higher order latent variable is thus possible. In addition, the final model suggested that a nine-item scale provided the best model fit. Even so, item 21 loaded below the recommended 0.3 and it was not removed because it was holding the model together and of important theoretical significance for depression. The final model also suggested that a quadripartite model is possible for this population where other variables such as cultural values might play an integrated role in the development of symptoms of depression, stress and anxiety.

The study also had several limitations that need to be acknowledged. Primarily, the corrected item-total correlation of item 2 was slightly lower than the adequate cut-off (≥ 0.30) (Bottesi et al. 2015). Arguably, it is difficult to attain > 0.30, let alone > 0.20, in a new sample population where the tool has never been tested as no studies were found that reported a corrected inter-item correlation for better comparison of data in Brunei. Even so, the problem was constrained to the anxiety subscale item 2. This may have been because the sample subjects misunderstood some words as English was usually their second language. A similar issue with item 2 was also demonstrated in the Indonesian (Damanik 2011) and Malaysian versions (Musa et al. 2007) of the DASS, where item 2 showed the lowest corrected item total correlation (0.24 and 0.33 respectively) albeit no postulations were provided. Therefore, item 2 may have reliability issues for samples in this region and warrants further examination in future studies. Next, the sample size in this study was the smallest compared with previous studies. Although bootstrapping was used to overcome this issue, the question of external validity (hence, generalisability) was still a problem. This may be attributed to the relatively small local population. Sample size is probably a common concern faced by researchers here in Brunei and may have contributed to issues of generalisability of findings. For this reason, the data were combined to produce the results in this article. Further studies should consider a larger sample including diverse disciplines.

Finally, the model showed that other variables might be in play when investigating Stress, Anxiety and Depression among this population where other important factors such as cultural values also play a vital role in the individual perception of anxiety, depression or stress in these multicultural settings (Oei et al. 2013). Therefore, future research should focus on the relationship between other factors and DASS to determine whether the psychometric properties including the test-retest reliability, sensitivity and specificity, and concurrent validity, and a more robust model could be developed and validated for use in Asian populations.

Conclusion

The present study proposes that a quadripartite model might be most suitable for adaptation for use in local or even Asian populations compared with the current tripartite DASS model. Discriminant validity of the tool might also be an issue arising from highly correlated items and thus may require deletion or modification of items when used for Asian samples. Future studies using this tool among Asian samples should take these issues into account and re-test the instrument to determine whether it is psychometrically sound and valid for use in Asian populations.

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Compliance with ethical standards

Conflict of interest None declared.

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