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Psychometric Properties of Depression Anxiety Stress Scale 21-item (DASS-21) Malay Version among a Big Sample Population

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Abstract

Establishing the psychometric properties of a measurement tool is paramount in order to determine the validity of any study results. The Depression Anxiety Stress Scale (DASS)-21 has preliminary evidence of a good tool in Malaysia. This study among a very big sample size would further strengthen this evidence. Objectives: To validate the DASS-21 Malay version among 367, 860 completed online assessment by looking at its Exploratory Factor Analysis and Construct validity. Methodology: The data was captured through online web-based assessment. Incomplete entries were excluded and analysis was based on 367, 860 completed entries which fulfilled the inclusion criteria. We obtained Cronbach's alpha values of 0.95, 0.85 and 0.87 respectively for Depression, Anxiety and Stress domains. Rotated component analysis showed very good factor loading for most items to their respective domains. The non-fixed analysis showed the Malay DASS-21 consisted of 2 domains and Stress items loaded equally to Depression and Anxiety domains. The current findings further enhanced the evidence that (DASS)-21 is an excellent tool for Malaysians.

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1. Introduction

Ever since the establishment of the Malay version of Depression Anxiety Stress Scale 21's validation, namely MDASS-21, around 12 years ago, the version has been widely used in Malaysia. The translation and initial validation work of DASS-21 was initiated by the first author 12 years ago. The permission to translate DASS-21 into Malay was obtained from the original DASS author; Professor Dr Lovibond.

Up to this date, MDASS-21 has been used by over 400 research projects in Malaysia. The validation publications of MDASS-21 have been cited by 350 articles (based on Scopus index and Google Scholar).

As we know, DASS has 2 versions. The original version is 42-item (DASS-42). Eventually the original author (Prof Dr Lovibond) decided on a shorter version which consists of 21 items only (DASS-21). The 21-item version has 7 items for each domain namely Depression, Anxiety and Stress (Parkitny & McAuley, 2010). Studies overseas have found that DASS-21 is as good as the original 42-item version and is even more practical and time saving (Antony, Bieling, Cox, Enns, & Swinson, 1998; Lovibond, Lovibond, & therapy, 1995; Szabó, 2010).

In Malaysia, both versions are valid and have good psychometric properties (Edimansyah, Rusli, & Naing, 2007; Musa, Fadzil, & Zain, 2007; Ramli, Rosnani, & AR, 2012). The DASS was initially designed as a measurement for general population. In Malaysia, it was also found to be a reliable and valid tool for both hospitals and general populations (Ramli et al., 2012).

With the total number of 7 local publications related to DASS Malay version, we could say that there is significant evidence that DASS Malay version is a valid and reliable tool in Malaysia (Azma, Rusli, Quek, Noah, & Health, 2014; Edimansyah et al., 2007; Musa et al., 2007; Musa, Ramli, Abdullah, & Sarkarsi, 2011; Nordin, Kaur, Soni, Por, & Miranda, 2017; Ramli et al., 2012; Ramli & Salmiah, 2009).

In this study, we used a very big data to analyse the psychometric values of the DASS-21 Malay version. With extremely large sample size, the results of this study will further prove on the current evidence that this tool is applicable to Malaysia. This will further add more values to the choices of psychological tools that could be used in Malaysia.

2. Methods

We obtained the data through a public online survey and assessment at www.ramlimusa.com. The website has been established since 2018 and currently is receiving increased public attention. It is open to public and is accessible to anyone worldwide. Currently, it has received more than 11.5 million hits and a total of 412 000 visitors. In average, there are about 1 500 visitors per day.

The inclusion criteria are those aged 12 years and older (although the online scale could also capture the category of below 12-year-old). The exclusion criteria are the incomplete entries of the 21-item Malay DASS. Any member of the public who administered the DASS Malay version will be captured by the system.

The survey consists of 2 parts. First part is on respondents' demographic profile and the second part is the DASS-21 in Malay language.

3. Results

Based on our system, a total of 399 577 visitors administered the DASS-21 Malay version (up to the time of analysis). However, we only analysed 367 860 who completed the scale. The rest of the incomplete entries were excluded from our analysis.

Table 1. Socio-demographic data of the respondents

Variable	N (N=95 119)	Percentage (%)	Total
Gender			
Male	77 715	21.13	367 829
Female	290 114	78.87	
Age (years old)			
12-17	28 160	7.7	367 860
18-24	183 831	50.0	
25-34	115 137	31.3	
35-44	31 868	8.7	
45-54	7 236	2.0	
55-64	1 461	0.25	
65 and above	167	0.05	
Ethnic			
Malay	334 134	90.85	367 789
Chinese	4 040	1.10	
Indian	2 687	0.73	
Others	26 928	7.32	
Marital status			
Single	268 731	73.1	367 860
Married	93 464	24.4	
Divorced/widow(er)	5 665	2.5	
Highest level of education	6 685	1.8	367 859
Primary school	69 665	18.9	
Secondary school	291 509	79.3	
College/university			
Occupational status			
Professional	105 734	28.7	367 860
Skilled	25 290	6.9	
Semi-skilled	33 320	9.1	
Students	161 454	43.9	
Unemployed	42 062	11.4	

Based on Table 1, 79% of our respondents were females, 91% were Malay and 73% were single and 50% were young (aged between 18 to 24-year-old). For socio-demographic profile, 79% of the subjects obtained tertiary education, 44% were students and 29% were professional workers.

3.1 Analysis of Sample Adequacy

The calculated Kaiser-Meyer-Olkin (KMO) conformity measure is 0.97. Compared to the critical KMO value, the value of 0.97 is considered as very high and excellent. Bartlett Sphericity Test score for the same data was calculated as 4459972.56 and significant at $p< 0.001$. Similarly, Hotelling's T-squared value measured was 238.5. These values show that data obtained are very much suitable for factor analysis. The quantity of the sample is more than adequate for factor analysis.

3.2. Reliability

There was excellent internal consistency reliability among the domains with Cronbach's alpha values in the range of 0.95 to 0.85 and the overall value of 0.95 (Table 2). All items consistently have high Cronbach's alpha values if item is deleted (Table 3). This indicates that all items are important to be included in order to get an excellent overall Cronbach's alpha value (0.95). Scree plot shows that there are 2 factors/domains with Eigenvalue less than 1 (Figure 1).

Table 2. Reliability analysis (internal consistency) of the Malay-DASS-21

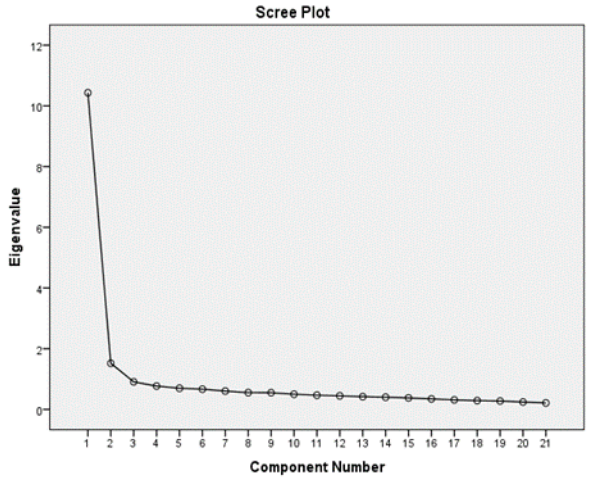
Domains	Items	Cronbach's alpha
Overall	1-21	0.95
Depression	3,5,10,13,16,17,21	0.95
Anxiety	2,4,7,9,15,19,20	0.85
Stress	1,6,8,11,12,14,18	0.87

Table 3. Scale mean, scale variance and Cronbach's alpha if item is deleted.

Items	Scale Mean if Item is Deleted	Scale Variance if Item is Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item is Deleted
1-S	44.53	171.39	0.65	0.946
2-A	44.40	173.77	0.45	0.949
3-D	44.58	169.87	0.67	0.946
4-A	44.83	171.07	0.57	0.947
5-D	44.30	168.42	0.70	0.945
6-S	44.59	169.79	0.63	0.946
7-A	44.76	171.26	0.54	0.947

8-S	44.32	171.09	0.58	0.947
9-A	44.43	166.19	0.68	0.945
10-D	44.43	163.80	0.73	0.945
11-S	44.46	164.94	0.79	0.944
12-S	44.53	166.81	0.76	0.944
13-D	44.32	163.84	0.78	0.944
14-S	44.34	169.85	0.62	0.946
15-A	44.71	168.28	0.71	0.945
16-D	44.50	166.58	0.73	0.945
17-D	44.48	162.74	0.75	0.944
18-S	43.81	170.14	0.59	0.947
19-A	44.54	169.90	0.58	0.947
20-A	44.55	165.55	0.72	0.945
21-D	44.78	163.73	0.74	0.944

Figure 1. The Scree plot of the rotated component.



Validation Analysis

We run the Exploratory Factor Analysis (EFA) to determine the construct validity of the scale by looking at factor loading of each item. We used rotated component analysis by using Varimax rotation.

When we run the rotation by fixing them into 3 domains/factors, we found that all items load high factor loading values (>0.4) to their respective domains except for only one item, item no 9 (Table 4). Item no 9 should belong to Anxiety domain but it loads higher in Stress domain (0.58). It just loads 0.33 into the Anxiety domain. Clearly all items in Depression domain consistently show better factor loadings (0.63 to 0.82) as compared to items in the other 2 domains.

Table 4. Factor Loadings based on Principal Component Analysis (fixed to 3 factors). Rotation Method: Varimax with Kaiser Normalization.

DASS items	Depression	Anxiety	Stress
3-D	0.63		
5-D	0.68		
10-D	0.81		
13-D	0.71		
16-D	0.77		
17-D	0.82		
21-D	0.80		
2-A		0.53	
4-A		0.75	
7-A		0.67	
9-A		0.33	0.58
15-A		0.53	
19-A		0.76	
20-A		0.52	
1-S			0.61
6-S			0.71
8-S			0.59
11-S			0.46
12-S			0.56
14-S			0.70
18-S			0.43

In our second analysis, when we run the rotated component analysis without fixing the number of factors, we found a few interesting findings. We obtained 2 domains instead of 3. All items in domains Depression and Anxiety had nice factor loadings in their respective domain (Table 5). However, Stress items were loaded dividedly between domains of Depression and Anxiety. This finding will be discussed further in the Discussion on the theoretical aspect.

Table 5. Factor Loadings based on Principal Component Analysis (non-fixed). Rotation Method: Varimax with Kaiser Normalization.

Items	Depression	Anxiety
3-D	**0.68**	
5-D	**0.72**	
10-D	**0.83**	
13-D	**0.76**	
16-D	**0.79**	
17-D	**0.84**	
21-D	**0.82**	
2-A		**0.48**
4-A		**0.70**
7-A		**0.69**
9-A		**0.55**
15-A		**0.71**

19-A		**0.73**
20-A		**0.61**
1-S	0.48	0.49
6-S	0.48	0.47
8-S	0.23	0.67
11-S	0.59	0.57
12-S	0.56	0.57
14-S	0.49	0.44
18-S	0.50	0.37

4. Discussion

In all, there are 9 publications related to validation of DASS in Malaysia. Most DASS validation studies in Malaysia mainly focused on the Malay versions. There is only 1 local study to look at the psychometric properties of the English version in Malaysia (Majid, Hamid, Alwi, & Sulaiman, 2019). The English version showed acceptable internal consistency (Cronbach's alpha > 0.7). However, the authors concluded that the validity of the English version in Malaysia was not up to the expected standards.

Out of 8 remaining articles, there are 2 articles aimed at validating the Malay DASS-42 (DASS longer version)(Edimansyah et al., 2007; Ramli et al., 2012).

The DASS-21 Malay version has been proven, at least by 6 local studies, that it has good psychometric values for both reliability and validity (Azma et al., 2014; Musa et al., 2007, 2011; Nadia, Brian, & Chee, 2004; Nordin et al., 2017; Ramli & Salmiah, 2009). From these 6 studies, 1 study analysed the DASS-21 Malay version on the aspect of Confirmatory Factor Analysis (CFA) (Azma et al., 2014) and 1 study on Concurrent validity comparing Malay DASS-21 and Malay Hospital Anxiety and Depression Scale (M-HADS) (Musa et al., 2011). The remaining 4 studies tested the Malay DASS-21 on different subgroups of Malaysian population. Among them were attendees of health clinics (Musa et al., 2007; Nadia et al., 2004; Ramli & Salmiah, 2009) and diabetes patients (Ramli & Salmiah, 2009).

In this study, with enormous number of subjects, the results of the DASS-21 Malay version showed overall better psychometric values as compared to the other previous studies. In term of Cronbach's alpha, this study obtained 0.95, 0.85 0.87 respectively for Depression, Anxiety and Stress domain. The Cronbach's alpha values in this study are comparable with other studies in other part of the world. The range obtained by other studies in other part of the world is between 0.70 and 0.92 (Nieuwenhuijsen et al., 2003; Tran, Tran, & Fisher, 2013; Xavier et al., 2016). Our study is recorded as the highest number of subjects up to today (367 860). In our literature search, we found a study by Pezirkianidis *et al* was recorded to have quite a high number of subjects (N = 12, 868) and they obtained high Cronbach's alphas of

0.85, 0.84 and 0.84, respectively for Depression, Anxiety and Stress domain (Pezirkianidis, Karakasidou, Lakioti, Stalikas, & Galanakis, 2018).

For comparison with local studies, Nadia *et al* (2004) was the earliest study to look at the validity of DASS-21 Malay version. However, this study did not analyse the construct validity and no Cronbach's alpha or psychometric value was recorded. The study simply compared the Malay DASS-21 with clinical assessment (Nadia et al., 2004).

In 2007, Ramli *et al* carried out a translation effort from English to Malay according to the US Census Bureau Guideline and they obtained Cronbach's alpha values of 0.84, 0.74 and 0.79 respectively for Depression, Anxiety and Stress domains. This study was conducted among 263 subjects recruited in 3 government clinics in Klang Valley (Musa et al., 2007). The Malay translated version is available at the University of New South Wale website - http://www2.psy.unsw.edu.au/dass/translations.htm

In the same year (2007), Edimansyah *et al* (2007) also published a paper validating Malay DASS-42. They obtained Cronbach's alpha of 0.91, 0.88 and 0.89 respectively for Depression, Anxiety and Stress domains (Edimansyah et al., 2007).

Another study, also by Ramli & Salmiah (2009), tested on the same DASS-21 version among diabetic patients. Results showed almost similar results (0.75, 0.74 and 0.79 respectively for Depression, Anxiety and Stress domains) as compared to their previous study (Ramli & Salmiah, 2009). In a study in Johor with bigger sample size of 402 respondents, Cronbach's alpha values of 0.86, 0.84 and 0.85 were obtained for Depression, Anxiety and Stress domains with overall value of 0.84 (Nordin et al., 2017).

In this study, Exploratory Factor Analysis by using Varimax rotated component showed that all items have very good factor loadings to their respective domains. Item 9, which is an Anxiety item, seems to load higher to Stress domain. Comparing with other previous studies on Construct validity of Malay DASS-21, results consistently showed that most items were loaded with good values to their respective domains (Musa et al., 2007; Nordin et al., 2017; Ramli & Salmiah, 2009).

Up to date, there is only 1 study analysing Malay DASS-21 using CFA (Azma et al., 2014). The CFA is generally said to be better evidence as compared to EFA (Van Prooijen & Van Der Kloot, 2001). Results from the study showed that in order to obtain model fitness, 1 item (item no. 3 in Depression domain) had to be omitted. Three-factor model seemed to be a preferred fitting model than two- or four-factor model. In comparison to our current study, result seems to be better with 3 domains.

The non-fixed analysis showed there were only 2 domains. Unfortunately, with 2 domains, the Stress items were divided between Depression and Anxiety domains. This is in line with theoretical explanation that stress symptoms are overlapping of anxiety and depression symptoms (Arnau-Soler et al., 2019).

Apart from DASS, Beck Depression Inventory (BDI), Hospital Anxiety and Depression Scale (HADS), Hamilton Depression Rating Scale (HDRS) and Hamilton Anxiety Rating Scale (HARD) are among the scales that we can use to measure depression and anxiety in Malaysia. These scales are available in Malay version and have been validated locally (Mukhtar, Oei, & treatment, 2011).

As for limitations, despite the total number of subjects in this study is very big, the racial composition of our population does not represent the actual Malaysian population. Malay was overrepresented as compared to Chinese and Indians. Based on a report by the Current Population Estimate Malaysian 2018-2019, Malaysian population consists of 69% Malays, 23% Chinese and 6.9% Indians (Hwok-Aun & Leng, 2018; Leng, Samsurijan, Gopal, Malek, & Hamat, 2018). This factor could hinder the ability of generalization of the findings to the actual Malaysian population. However, with enormous number of subjects, the factor can be minimised. In our sub-analysis, we analysed the EFA among non-Malay subjects where we obtained almost similar good results. Hence, this evidence could neutralize the setback that we mentioned before.

This study is only focusing on Construct validity or Exploratory Factor Analysis (EFA) of the MDASS-21. In the future, we aim to analyse the same sample for Confirmatory Factor Analysis and other higher aspects of psychometric dimension.

5. Conclusion

The DASS-21 Malay version has been tested on various analyses and also on different populations. We concluded that this is the most robust data based on the highest number of sample size for the Construct validity. The DASS-21 Malay version is proven to be reliable and valid for Malaysians. This study also proved that Stress items are actually an overlapping entity between Depression and Anxiety domains.

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