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The Reliability and Validity of the Simplified Chinese Version of the DASS-21 in Chinese University Students during the Home Isolation of COVID-19 Epidemic

Xiaoling Wang^{1,2}, Xiang Deng^{1,2}, Zaida Nor Zainudin¹, Wan Marzuki Wan Jaafar¹

¹Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Selangor, Malaysia,

²School of Education and Psychological Science, Sichuan University of Science & Engineering, Zigong 643000, China

Abstract

Objective To assess the reliability and validity of the simplified Chinese version of the Depression-Anxiety-Stress Scale (DASS-21) in Chinese university students during the COVID-19 epidemic. **Methods** Using a whole-group sampling method to investigate 7,364 Chinese university students in home isolation with DASS-21, from April to May 2020, the reliability, and validity of the results were analyzed. **Results** the items of each subscale of the DASS-21 had a high correlation with the total score of the subscale; the DASS-21 included 21 items, with Cronbach's alpha for the internal consistency reliability of the simplified Chinese version of the DASS-21 was 0.909, and Cronbach's alpha for the internal consistency reliability of the subscales were 0.709-0.810, the DASS-21 had good convergent validity and discriminant validity, the fit indices of the validation factor analysis were well fitted and the intrinsic construct was consistent with the theoretical conception. **Conclusion** the DASS-21 had good reliability and validity and could be used as a valid tool to examine the psychological status of university students during the COVID-19 epidemic.

Keywords: University Students, The DASS-21, Reliability, Validity, COVID-19

Introduction

At the end of 2019, the outbreak of COVID-2019, a public health event of international concern, had a serious and far-reaching impact on all sectors of society (WHO, 2020), causing widespread, pervasive, and ongoing psychological trauma to the population (Torales et al., 2020). University students in the midst of an epidemic, especially those who were more likely to be home for long periods, restricted to online study, and under pressure from multiple factors such as the epidemic, their studies, and their families (Fu et al., 2021; PAN Xiao et al., 2020; Tuo et al., 2021). In order to better assess the psychological status of university students, this study introduced the Depression, Anxiety, and Stress Scale-21 (DASS-21) to

university students during the home isolation period of the epidemic to examine its reliability and validity, in preparation for the next large-scale survey and analysis of related factors.

DASS-21 was developed by Lovibond et al. in 1995, a psychometric scale to assess common mood disorders such as depression, anxiety and stress, providing aid to clinical diagnosis (Lovibond & Lovibond, 1995). The DASS-21 was formerly known as the self-analysis questionnaire (SAQ), a 42-item scale consisting of three subscales (depression, anxiety and stress subscales), each assessing an individual's self-perception of negative emotions (Hekimoglu et al., 2012). Therefore, The DASS-21 is a revised and streamlined version of the SAQ, with each subscale ultimately retaining seven questions, achieving optimal discrimination and assessment efficiency while simplifying the scale. Studies have shown that the DASS-21 had a consistent factor construct and good reliability levels with the SAQ, making it more suitable than the original version for use in research and as a rapid clinical screening tool (Antony et al., 1998; Lovibond & Lovibond, 1995). The DASS-21 has been proven empirically among university students from different cultural backgrounds with good internal consistency (Ahmad et al., 2018; Antúnez & Vinet, 2012; Beiter et al., 2015; Camacho et al., 2016; Lee & Kim, 2020; Osman et al., 2012). In China, Moussa and his colleagues revised a traditional Chinese version of the DASS-21 in 2001 and administered it in Hong Kong, China, showing that the translation had high reliability and validity (Moussa et al., 2001). In addition, several Chinese researchers have also attempted to use the DASS-21 in their studies, also, the results showed that the scale had good reliability and validity and was sensitive to negative emotional states (Gong et al., 2010; Haijuan et al., 2021; LU et al., 2020; Xu & ZHANG, 2020).

Although these studies showed that the simplified Chinese version of DASS-21 could be a useful instrument for testing the psychological distress of university students, there had not been a psychometric evaluation of the scale for university students during the home isolation of COVID-19 epidemic in China with such a large sample. Due to the special period time, many university students might suffer from psychological health problem, it is important to find a reliable scale in investigating the psychological health of these students in the face of public health emergencies and to explore the impact of the epidemic on university students, to guiding the administrators of universities to improve their ability to cope with public emergencies and turn crises into opportunities.

Based on this above, the aim this study was to understand the applicability of the scale to university students during home quarantine and the stability of its psychometric properties, especially its sensitivity to the psychological state of these students.

Objects and Methods

Objects

The whole group sampling method was used in this study. 9318 university students from Sichuan, China, were selected. A total of 7364 valid questionnaires were collected, with an effective rate of 79.03%, including 3422 male and 3942 female university students. To protect privacy, this survey was conducted anonymously.

Methods

Instrument

Demographic and sociological information included: age, gender, location, grade

The simplified Chinese version of the Depression-Anxiety-Stress Scale (DASS-21) consisted of three subscales: Depression, Anxiety and Stress subscale. Each subscale consisted of seven items that described the participant's recent (usually the last week) negative

emotional experiences or corresponding physiological reactions. The participants chose based on how well the items matched their situations.

The scale uses a 4-point score (0 = not suitable for me at all, 1 = suitable for me to some extent, or in some cases, 2 = suitable for me to a considerable extent, or more often, 3 = very suitable for me, or most of the time). According to the manual guide, multiplying the scores of each subscale by 2 to accommodate the original scale of DASS, which included 42 items. The score of each subscale ranges from 0 to 42, and the higher the score, the higher the pain (Lovibond & Lovibond, 1996).

Prior studies have shown that the DASS-21 has satisfactory psychometric characteristics, with a highly consistent and confirmed one-dimensional structure [7,29,52–55]. Furthermore, it has been proven to have good internal consistency ($\alpha = 0.89$) among Chinese university students (Gong et al., 2010).

Testing Procedures

The assessment was administered at the beginning of the semester, using an online questionnaire distributed to university students during the home quarantine period of COVID-19. The questionnaires were completed and collected in strict adherence to academic ethics, with respondents being informed in advance of the elemental composition of the questionnaire, its use and commitment to confidential information in the instructions.

Data Analysis

The data collected were analyzed by SPSS Version 20.0 and AMOS 22.0. A two-tailed $p < 0.05$ was applied as the level of statistical significance for all tests. Cronbach's alpha coefficient was adopted to test the internal consistency of the DASS-21 (Mishra et al., 2016). We also conducted item analyses (correlation of each item with its corresponding subscale and correlation of other subscales), correlation analyses (using Person correlation coefficients, correlation coefficients between 0.1 and 0.6 were good for individual items and subscales, and correlation coefficients between these subscales were good in a range of 0.3 and 0.8) (Heeringa et al., 2017). AMOS 22.0 software was applied to test structural validity (validation factor analysis of the classical three-factor model by AMOS software). The main indicators of this data analysis included absolute and incremental fit indices (Wang & Wang, 2010).

Results

Item Analysis

The mean and standard deviation of the scores of the 7,364 university subjects on the 21 items (see Table 1).

Table 1

Descriptive statistics for each question item of the DASS-21

Item	M±SD	Item	M±SD	Item	M±SD
S1	0.63±0.736	A2	0.63±0.736	D3	0.47±0.698
S6	0.28±0.561	A4	0.12±0.369	D5	0.85±0.847
S8	0.56±0.741	A7	0.13±0.402	D10	0.44±0.699
S11	0.42±0.659	A9	0.79±0.868	D13	0.44±0.651
S12	0.43±0.671	A15	0.20±0.492	D16	0.32±0.600
S14	0.55±0.726	A19	0.19±0.473	D17	0.11±0.391
S18	0.51±0.713	A20	0.19±0.484	D21	0.15±0.453

Note: D, A and S in the table denote depression, anxiety and stress subscales respectively

As shown in Table 2, the scores of stress items correlated positively with the stress subscale, and the correlation coefficients ranged from 0.625-0.754 ($p < 0.01$); the scores of stress items correlated positively with the anxiety subscale, and the correlation coefficients ranged from 0.500-0.706 ($p < 0.01$); the scores of depression items correlated positively with the anxiety subscale, and the correlation coefficients ranged from 0.621-0.761 ($p < 0.01$).

Table 2

Correlation of each item with the total score of the subscale (n=7364, r)

Item	rD	rA	rS
S1	.457**	.450**	.643**
S6	.475**	.500**	.643**
S8	.501**	.547**	.696**
S11	.614**	.614**	.731**
S12	.613**	.577**	.754**
S14	.395**	.425**	.625**
S18	.493**	.513**	.674**
A2	.397**	.652**	.447**
A4	.319**	.533**	.346**
A7	.299**	.500**	.323**
A9	.485**	.706**	.571**
A15	.590**	.607**	.543**
A19	.453**	.651**	.476**
A20	.517**	.660**	.537**
D3	.673**	.455**	.493**
D5	.685**	.476**	.525**
D10	.761**	.511**	.535**
D13	.740**	.596**	.657**
D16	.721**	.480**	.507**
D17	.621**	.467**	.433**
D21	.674**	.471**	.431**

Note: ** $P < 0.01$

Reliability Tests

Cronbach's alpha for assessing the internal consistency reliability of the Chinese version of the DASS-21 was 0.909 for the total scale. Furthermore, the reliability of the stress, anxiety and depression subscale was good, with a correlation coefficient of 0.804, 0.709 and 0.809, respectively. Overall, the DASS-21 scale had good internal consistency reliability.

Validity Test

Using the original dimensions of the DASS-21 as the basis of composition, combining the results of previous related studies, the basic model for validation factor analysis was initially constructed. The Amos 22.0 statistical software was used to conduct validation factor analysis on the factor construct of the DASS-21 by using the maximum likelihood estimation (MLE) method. The evaluation indicators were: absolute fit index(the root mean square error of approximation, RMSEA; the goodness of fit index, GFI; the adjusted goodness of fit index, AGFI;) and incremental fit index (the incremental fit index; IFI; the Tucker-Lewis coefficient, TLI; the comparative fit index, CFI; the normed fit index, NFI). As shown in Table 3, the chi-squared values for the fit of the theoretical model to the observed data for this scale were: $\chi^2 = 6038.357$, normative chi-squared value (CMIN/DF) was 32.464, and the fit indices: GFI = 0.917, NFI = 0.89, CFI = 0.893, IFI = 0.893, TLI = 0.879, and RMSEA = 0.065. It was generally accepted that $\chi^2/df < 5$, values of CFI, TLI, IFI and NFI > 0.9 , and RMSEA values below 0.08 indicated a good model simulation. In this study, the results of the preliminary validation factor analysis showed that $\chi^2/df > 5$, values of CFI, TLI, IFI and NFI were slightly below the 0.09 criterion, but the RMSEA values were in the acceptable range (< 0.08) (see Table 3). The data suggested that the model was needed to be improved.

Table 3
First validation factor analysis model fit indicators (n=7364)

Modle		χ^2	χ^2/df	GFI	CFI	TLI	IFI	NFI	RMSE A
Three-factor model	first-order	6038.35	32.46	0.91	0.89	0.87	0.89	0.8	0.065
		7	4	7	3	9	3	9	

According to this, the model was revised based on the MI values fitted to the model. In the model for the first CFA, the residual MI values reached 142.762 for item 11 and item 12, 113.230 for item 2, and item 15, 260.263 for item 9 and item 15, 98.752 for item 19 and item 20, and 830.217 for item 17 and item 21. The residual correlations for these items were set separately and the validation factor analysis was re-run. The results of the modified validation factor analysis showed a more significant improvement in the fit indices (see Table 4). The fit indices: GFI = 0.946, NFI = 0.924, CFI = 0.927, IFI == 0.92, TLI = 0.915 and RMSEA = 0.055 were all at acceptable levels. This suggested that the revised model had good construct validity, indicating that the inherent assumption model fit well with the sample data.

Table 4
Modified model fit indicators (n=7364)

Modle	χ^2	χ^2/df	GFI	CFI	TLI	IFI	NFI	RMSEA
Three-factor first-order model	4146.1	23.034	0.946	0.927	0.915	0.927	0.924	0.055

After standardization, the factor loadings ranged from 0.565-0.679 for the depression subscale, 0.379-0.669 for the anxiety subscale and 0.499-0.718 for the stress subscale. (See Figure 1)

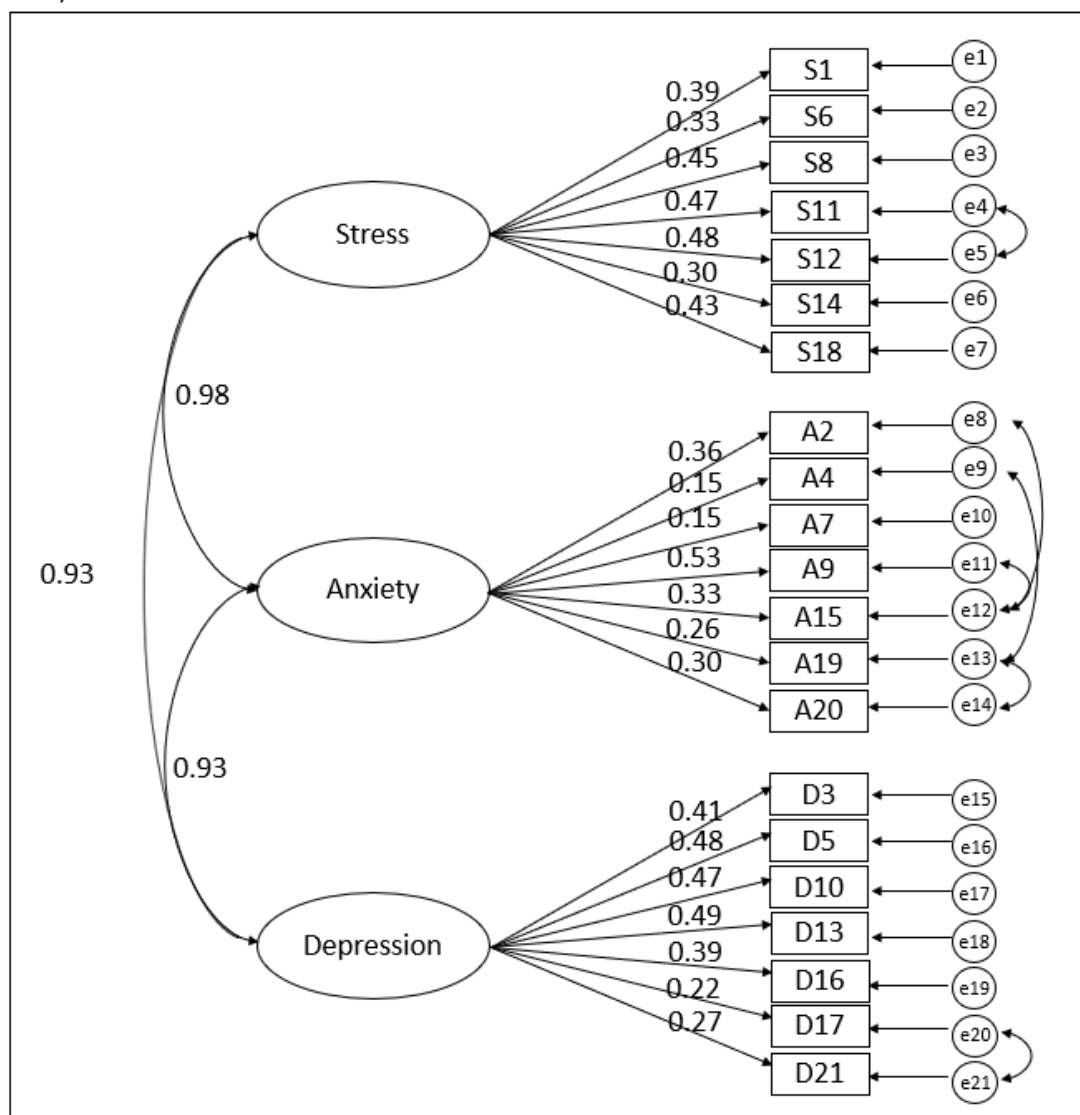


Figure 1 Structural equation model of DASS-21

Note : S-Stress; A-Anxiety; D-Depression;

Discussion

The reliability of the DASS-21 was found to be acceptable in terms of the assessment of psychometric properties in this large sample. The overall Cronbach's alpha of the simplified Chinese version of DASS-21 was 0.909 and the reliability coefficient of the three subscales ranged from 0.709 to 0.810 in this research, with previous results indicating that the internal consistency reliability of the DASS ranged from 0.82 and 0.97 (ZHANG et al., 2019). So, the three subscales and the total scores showed an acceptable degree of internal consistency, which means that the DASS-21 could be applied reliably to evaluate psychological distress of university students in such background. The findings are consistent with those obtained in previous studies (Gong et al., 2010; Lee & Kim, 2020; Osman et al., 2012).

To our knowledge, it is the first research designed to investigate the reliability and validity of the simplified Chinese version of DASS-21 in a large, representative sample of the

general population during home isolation in China. In our research, the item analysis results showed that the items scores were positively higher correlated with measures of its corresponding subscale. In contrast, the correlations with the other subscale scores were moderately low (Gong et al., 2010). In addition, the total scores of the simplified Chinese version of DASS-21 were also significantly correlated with measures of the subscales, and the correlations ranged from 0.888-0.928. In previous research, the Pearson's correlation coefficients ranged from 0.895-0.910 (Yi et al., 2012). Besides, these subscales were positively correlated, and the correlations ranged from 0.706 to 0.928. And the correlation between stress and anxiety subscale was higher than the correlation between stress and depression, which was consistent with previous studies (Bados et al., 2005)

According to the results of the validation factor analysis of the study, the DASS-21 had good construct validity and the intrinsic construct of the scale which was generally consistent with the theoretical conception. The model was modified based on the MI values fitted to the model. The results of the validation factor analysis showed that there was a significant improvement in the fit indices (see Table 4). The fit indexes (GFI = 0.946, NFI = 0.924, CFI = 0.927, IFI = 0.92, TLI = 0.915 and RMSEA = 0.055) all reached acceptable levels. This suggested that the revised model had good construct validity, indicating that the inherent assumption model fit well with the sample data.

Some things could be improved in this research. Considering the extraordinary period of universal home isolation during COVID-19, there were many factors not taken into account in this study. First, we only recruited participants from a community population in one university in Sichuan. This population may not be representative of all the university students in China. Second, this is a cross-sectional study; thus, a longitudinal design should be used in the future. Third, the uneven distribution of grades was not balanced, which might reflect recruitment bias.

In conclusion, the results of this research show that the Simplified Chinese version of the DASS-21 is a valid screening instrument for psychological distress among general Chinese university students during COVID-19.

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