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The depression anxiety stress scales (DASS-21): an Indonesian validation measure of the depression anxiety stress

Ifdil Ifdil[*)1], Yuda Syahputra[2], Rima Pratiwi Fadli[3], Nilma Zola[3], Yola Eka Putri[3], Berru Amalianita[3], Itsar Bolo Rangka[2], Kadek Suranta[4], M. Fahli Zatrahadi[5], Gian Sugiana Sugara[6], Dominikus David Biondi Situmorang[7], Linda Fitria[8]
[1]Universitas Negeri Padang, Padang, Indonesia
[2]Universitas Indraprasta PGRI, Jakarta, Indonesia
[3]Indonesian Institute for Counseling, Education, and Therapy (IICET), Padang, Indonesia
[4]Universitas Pendidikan Ganesha, Bali, Indonesia,
[5]Universitas Islam Negeri Sultan Syarif Kasim Riau, Pekanbaru, Indonesia
[6]Universitas Muhammadiyah Tasikmalaya, Indonesia
[7]Universitas Katolik Indonesia Atma Jaya, Jakarta, Indonesia
[8]Universitas Putra Indonesia YPTK, Padang, Indonesia
[*)] Corresponding author, e-mail: ifdil@konselor.org

Abstract
This study attempts to evaluate the Indonesian adaptation of the DASS-21, a scale adapted from Peter F. and Sydney H. Lovibond 1995 to assess levels of stress, anxiety, and depression. Multistage random sampling taking from 1478 Indonesian. Additionally, we use The Rasch measurement model to examine psychometric properties of DASS-21. The results indicate that the DASS-21 fulfills the psychometric measurement aspect by providing evidence as a valid and reliable instrument, with a very good item reliability value .99 and sufficient person reliability (.89), as well as a Cronbach alpha value KR-20. of .91, meaning that the quality of the items is very good for revealing depression, anxiety, and stress. Furthermore, the results are reinforced by the Principal Component Analysis (PCA) value to the residual of 39.7%, meaning that the items in DASS-21 are representative for measuring depression, anxiety, and stress. Therefore, it can be said that the DASS-21 is valid and reliable for assessing the levels of stress, anxiety, and depression. The Indonesian translation of the DASS-21 constructs can also be used to assess the stress, anxiety, and depression levels.

Keywords: Depression anxiety stress scale-21 (DASS-21), rasch, validity, reliability

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Introduction

The World Health Organization (WHO) estimates that over 615 million people worldwide suffer from common mental diseases like anxiety and depression, which has drawn a lot of attention to the

development of the DASS scale (World Health Organization, 2017). This mental illness affects up to 10% of the global population, and it contributes 30% of all non-fatal diseases worldwide (World Health Organization, 2017). Additionally, previously released data demonstrates that 13–14% of the global burden of disease is caused by mental diseases (Prince et al., 2007). Additionally, according to the WHO, up to 1 in 5 adults may experience sadness or anxiety (World Health Organization, 2017). According to research, more than 300 million people are now living with depression, an increase of more than 18% between 2005 and 2015. Depression has been identified as a main cause of poor health and disability worldwide (Ifdil, Amalianita, et al., 2020; Ifdil, Fadli, Gusmaliza, et al., 2020; Prince et al., 2007; World Health Organization, 2017). Depression is a frequent mental illness that is marked by chronic melancholy, loss of interest in activities, exhaustion, and the inability to carry out daily tasks (at least for two weeks).

Additionally, those who suffer from depression may experience changes in their appetite, more or less sleep, concern, diminished attention, indecision, anxiety, and thoughts of self-harm or death (World Health Organization, 2017)Therefore, it is essential to precisely quantify the symptoms of anxiety and depression as a first screening step before treatment is administered in order to prevent illness or mental incapacity. The Depression Anxiety Stress Scales (DASS) were created to evaluate depression and anxiety-related variables and to solve the inability of earlier emotional measures to distinguish between depression and anxiety (S. H. Lovibond & Lovibond, 1995). Depression (DASS-D), anxiety (DASS-A), and stress/tension were the three aspects of negative emotional states that the original DASS measured with 42 items (Lovibond & Lovibond, 1995). Dysphoria, hopelessness, loss of energy, and anhedonia are difficulties associated with depression, whereas subjective symptoms and somatic anxiety are problems associated with anxiety. Measures of stress include behaviors like impatience, difficulty relaxing, nervous tension, irritability, and overreacting to stressful situations (Ifdil, Yuca, et al., 2020). EFA results and confirmatory factor analysis (CFA) in clinical and nonclinical populations were used to construct the three-factor DASS model (Crawford & Henry, 2003; Gloster, Rhoades, Novy, Klotsche, Senior, Kunik, ..., et al., 2008; P. F. Lovibond & Lovibond, 1995; S. H. Lovibond & Lovibond, 1995; Norton, 2007).

The three-factor DASS model shows better fit than some alternative models (Crawford & Henry, 2003; S. H. Lovibond & Lovibond, 1995). The researchers analyzed Cronbach's Alpha on the DASS, depression (0.91 to 0.97), anxiety (0.81 to 0.92), and stress (0.90 to 0.95; Antony et al., 1998; Chan et al., 2012; Crawford & Henry, 2003). In addition, a higher Cronbach DASS Alpha value has also been reported as 0.96 (Chan et al., 2012; Crawford & Henry, 2003; Page et al., 2007).

The original DASS consisted of 42 items, with 14 items each measuring symptoms of depression, anxiety, and stress. Later, a shorter version of the DASS was developed (Lovibond & Lovibond, 1995) to reduce administration time and make it easier to screen for symptoms at different levels of depression, anxiety, and stress commonly referred to as DASS-21. DASS-21 is often administered by a psychologist or doctor before starting treatment given in person by pencil-paper or a structured clinical interview (Antony et al., 1998). In addition, DASS-21 was found to differentiate clinical groups in a manner comparable to DASS-42 (Antony et al., 1998; Clara et al., 2001). Finally, DASS-21 has been used in more diverse populations than DASS-42, such as samples of young adolescents and the elderly (Gloster, Rhoades, Novy, Klotsche, Senior, Kunik, ., et al., 2008; Szabó, 2010).

Cross-cultural validity is an important consideration in questionnaire development, especially if it is used across different cultures (Rogler, 1989). This applies to DASS as it has been translated in more than 35 different languages to date. Three-factor structures as well as psychometric indices have been reported in Spanish (21 items; Daza, P. et al., 2002), Portuguese (21 items; Vignola & Tucci, 2014), Dutch (42 item; Nieuwenhuijsen et al., 2003) and other non-English versions (Tran et al., 2013). DASS-21 items adapted and evaluated in Taiwan by (Oei et al., 2013). However, the DASS has not been translated into Indonesian, therefore this study aims to adapt the DASS, which will be adapted and evaluated is the Indonesian version of DASS-21.

This study designed the validation of the Depression Anxiety Stress Scale-21 (DASS-21) using Rasch modeling with the help of the WINSTEP 4.7.0 application (Linacre, 2011). The validation process is carried out by evaluating the psychometric properties of DASS-21 which meet the standards of the research instrument. In addition, we also took a close look at how respondents positioned themselves to respond to all items. The Rasch model is an approach from Item Responses Theory (IRT; Boone et al., 2014; Erwinda et al., 2018; Syahputra et al., 2019, 2020). In contrast to the Classical Test Theory (CTT)

which relies heavily on samples, is non-linear, and is limited to a range score, then the RMT has a different perspective (Bond & Fox, 2015; Boone et al., 2014). The Rasch model returns data according to its condition, while the characteristics of the Rasch model analysis are not relying on samples, overcoming differences between metric items, generating scores which has been lifted from pure error measurements, overcomes missing, linear data, and provides independent and objective measurements/invariants (Bond & Fox, 2015; Linacre, 2011).

Method

The steps of the adaptation procedure are translating, language validation, and back-translation. Translation conducting by English-Indonesian Translation expertise. This process is carried out to maintain the validity of DASS-21, where the "meaning" of each item must be understood in the same context as the original language (Hambleton et al., 2004). There are several translation procedures that can be used by researchers. However, this procedure needs to be carried out objectively, to avoid cultural bias (Canino & Bravo, 1999; Jones et al., 2001). c (Lenz et al., 2017).

The Indonesian version of DASS-21 was then tested on 1478 respondents (age range …..) spread throughout Indonesia using multi-stage random sampling. The data obtained were then analyzed to test the validity and reliability of DASS-21. The validity test was carried out using the Rasch measurement model, the Rasch model measuring objective measurement, reliability and separation index, threshold: partial credit model, estimation validity through principal component analysis, and item measure (Bond & Fox, 2015; Ifdil, Fadli, et al., 2018; Ifdil, Putri, et al., 2018; Marsinun et al., 2020; Sandjaja et al., 2020; Sumintono & Widhiarso, 2015).

Results and Discussions

Reliability

The reliability of an instrument refers to the stability of a measurement and consistency in measurement. To get information about the reliability of the person and the reliability of the item can be displayed in summary statistics. The statistical summary results are further explained in the following Table 1.

Table 1. Summary Statistics

Estimation	Measure
Items reliability	.99
Person reliability	.89
Mean Measure Person	-.88
Cronbach alpha (KR-20) person raw score "test" reliability	.91
Item separation index	13.05
Person separation index	2.82

In Table 1, it can be seen that the person's reliability score is 0.89, indicating that the quality of the answers given by the person is good. However, what attracted the researchers' attention was the item reliability score of 0.99, meaning that the reliability score was very good or it could be stated that the quality of the items was very good for revealing depression, anxiety, and stress in individuals. Furthermore, Cronbach's alpha value (KR-20) is 0.91 which indicates that the interaction between person and item is good. In addition, it also discusses the grouping of people in answering and grouping items, it is known from the separation value using the person strata formula, H = [(4*separation) + 1]/3 (Sumintono & Widhiarso, 2015). The value of separation person is 2.82, then H = [(4*2.82) + 1]/3, H = 4.09 (rounded up to 4). This shows that four individual groups were formed during DASS filling (very heavy, heavy, light, and normal abilities). The value of the separation item is known to be 13.05, then the value of H = 17.73. The value of the separation item shows a very perfect strata result, where the scale can be grouped into 18 or the scale can measure individuals with any depression, anxiety, and stress conditions (ranging from very severe to normal).

In line with some researchers regarding the good internal consistency of DASS-21, Cronbach's alpha values ranged between 0.81 and 0.94 (Antony et al., 1998; Crawford & Henry, 2003; Gloster,

Rhoades, Novy, Klotsche, Senior, Kunik, ..., et al., 2008; S. H. Lovibond & Lovibond, 1995; Norton, 2007). Good convergent and discriminant validity have been established with the Beck Depression Inventory Beck et al., 1961) and Beck Anxiety Inventory (BAI; Antony et al., 1998; Beck et al., 1988; Gloster, Rhoades, Novy, Klotsche, Senior, Kunik, ., et al., 2008; P. F. Lovibond & Lovibond, 1995). DASS-21 retest reliability has been found to be 0.19 to 0.47 in college students over 3 to 8 years (Lovibond, 1998); weeks in a clinical sample of patients with anxiety and mood disorders (Brown et al., 1997); and 0.70 to 0.73 in a sample of depressed patients for about ten days (Page et al., 2007)

Validity

Construct Validity

Construct validity explains how well the measurements match theoretical expectations (Sumintono, B., & Widhiarso, 2015). This means that the various measures exist in various theoretical contexts, all of which must show relationships with other concepts that can be predicted and interpreted in that context. The DASS (Depression Anxiety Stress Scale) scale is evaluated for whether it is able to measure what it should be measured using the Principal Component Analysis (PCA) of the residuals, which measures the extent of diversity. PCA analysis uses two parameters, the first is the total raw variance in observation (minimum 20%) and the second is the total raw unexplained variance (minimum 15%) (Linacre, 2011). Further details are presented in the following two tables.

Table 2. Standardized Residual Variance

	Observed		Expected
Total raw variance in observations	100.0 %		100.0 %
Raw variance explained by measures	39.7 %		40 %
Raw unexplained variance (total)	60.3 %	100.0 %	60 %
Unexplned variance in 1st contrast	5.6 %	9.3 %	
Unexplned variance in 2nd contrast	4.8 %	7.9 %	
Unexplned variance in 3rd contrast	4.4 %	7.3 %	
Unexplned variance in 4th contrast	3.9 %	6.4 %	
Unexplned variance in 5th contrast	3.5 %	5.8 %	

In the two tables above, it can be seen that the total raw variance is 39.7%, not much different from the expected value of 40%. This shows that the construct on a good scale means that the items are representative for the measurement of depression, anxiety, and stress (as evidenced by the unidimensional value of 20% that has been met; (Linacre, 2011). While the results are all unexplained variances (1 st to 5 th) below 15% which indicates the level of independence of the items in a good scale. Thus this condition states that the unidimensional requirements of the scale are met and it is stated that the DASS-21 items used to measure depression, anxiety, and stress are valid. very well formed, as evidenced by the curve that contains and has a high peak (figure 1), meaning that the DASS-21 scale is able to measure individuals with any conditions of depression, anxiety, and stress (from very severe to normal).

In line with findings from other countries, similar findings were recorded in Bangladesh (Alim et al., 2014), Greece (Lyrakos et al., 2011), Malaysia (Hashim et al., 2011), Turkey (Zanan & Nuran, 2010), and Vietnam (Le et al., 2017). The concurrent, convergent, and divergent validity of the depression and anxiety subscales determined by STAI-Y2 and SDS using Pearson correlation analysis were found to be quite strong (Coker et al., 2018). For example, quite strong values were found for depression and stress (0.658) which were also statistically significant. The depression domain DASS-21 was also positively and strongly correlated with SDS (0.701). Likewise, the DASS-21 anxiety subscale is positively and strongly correlated with the STAI (0.650). The positive correlation value between these two domains means that participants who experience depression also experience symptoms of stress (Coker et al., 2018).

Instrument Validity

Furthermore, to find out the distribution of respondent abilities and items in knowing depression, anxiety and stress conditions, it can be proven from the results of variable maps (figure 1), the distribution of respondent abilities on the left and the distribution of item difficulty levels on the right (Sumintono & Widhiarso, 2015). First, the wright map on the left shows that the individual conditions related to depression, anxiety, and stress are in a mild condition, as evidenced by the individual's M (average) value being lower than the average item. Second, the Wright map on the right explains the distribution of logit values, which are divided into three parts, depression items are marked in red, anxious in green and stress

in blue. This condition shows that the most difficult item to answer is item D7 (item from depression) with a logit of +1.77.

Item Validity

In addition to estimating the maps variable, the researcher also analyzed the items, and saw the relationship between items on the DASS-21 scale. Table three shows the item measure describing the distribution and order of items from the easiest to the most difficult. The item code D7 (depression item) is the most difficult item for all respondents to answer. On the other hand, the item code S1 (stress item) is the item most easily answered by all respondents. Furthermore, all items in DASS-21 have MNSQ outfit values and Point Measure Correlation according to the criteria. In addition, table three also shows the relationship between items from DASS-21, items coded S5 (stress items) have the strongest relationship to the DASS-21 scale, and code A1 (anxiety items) has the weakest relationship with other items. In line with the functioning of the differential person, it shows the depression items that are the most difficult for respondents to answer (figure 2).

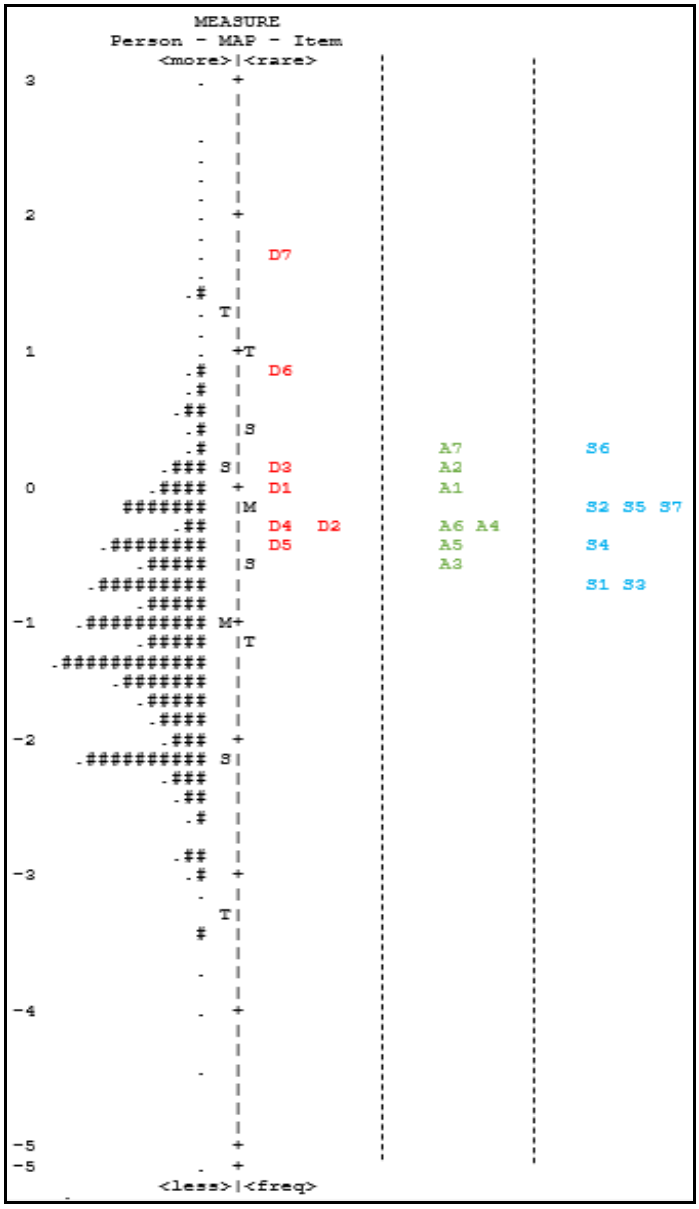

Figure 1. Variable Map (1478 People and 21 Items)

Table 3. DASS Measure Items (Items = 21)

Code Item	Measure	OUTFIT MNSQ	PTMEA Corr.	Perceived
D7	1.77	1.06	.62	difficult
D6	.94	.97	.64	
7	.39	1.06	.65	
S6	.35	1.04	.56	
D3	.28	1.08	.59	
A2	.24	1.27	.54	
D1	.08	.82	.61	
A1	.05	1.27	.41	
S5	-.08	.80	.67	
S2	-.10	1.13	.52	
S7	-.12	1.02	.58	
D2	-.20	.80	.63	
A4	-.21	1.22	.59	
A6	-.26	.99	.63	
D4	-.27	.94	.65	
A5	-.32	.89	.59	
D5	-.37	.77	.65	
S4	-.37	.84	.66	
A3	-.49	1.19	.50	
S3	-.64	1.01	.56	
S1	-.67	.77	.60	easy

MNSQ = Mean Square = 0.5 > MNSQ < 1.5 (Bond & Fox, 2015; Linacre, 2011)
PTMEA Corr. = Point Measure Correlation = PTMEA Corr. = > 0.40 (Bond & Fox, 2015)
D = Depresi; A = Anxiety; S = Stress

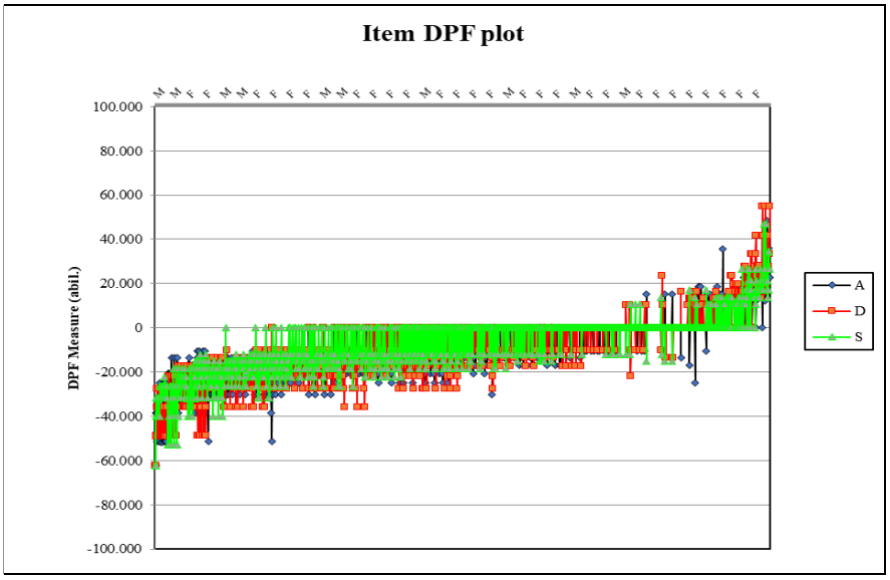

Figure 2. Differential Person Functionality (DPF)

Rating Scale Validation

The rating scale provided on the DASS-21 scale must be well understood by respondents. The scale using a 4-point Likert scale is presented in Figure 3.

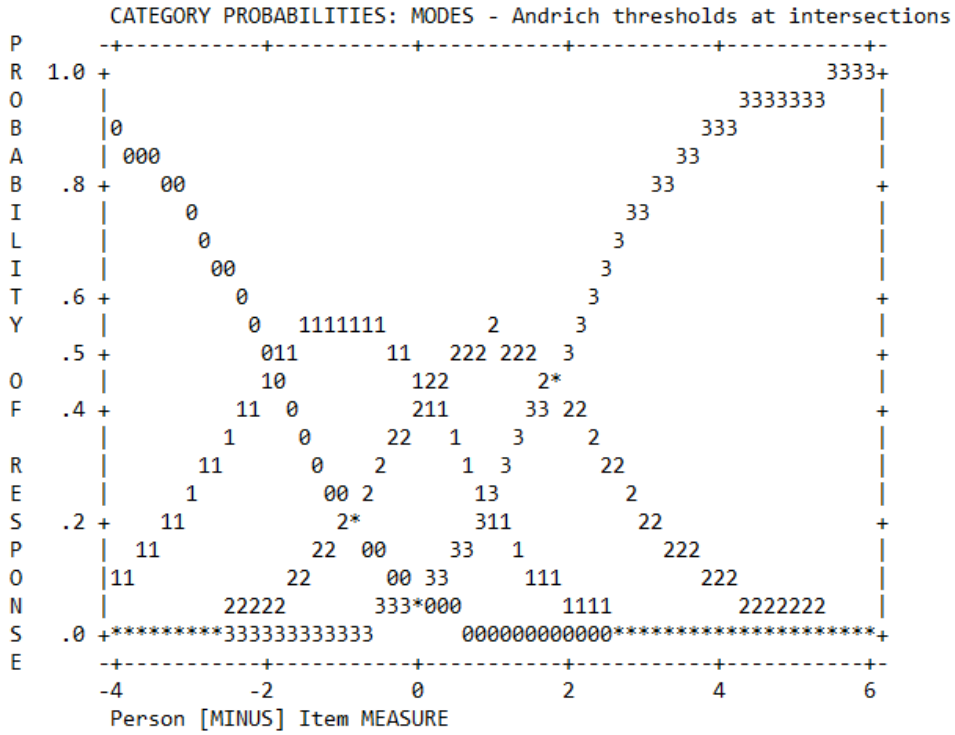

Figure 3. Probability of Response

The answer choices in DASS-21 show the numbers 0 = never, 1 = rarely, 2 = often, and 3 = very often. This means that the response points given by DASS-21 have been understood by respondents, marked by numbers that form a curve or have peaks. These findings indicate that the four choices given are valid. Furthermore, the discussion about the integration of measurements with the Andrich Threshold category is presented in the following table:

Table 4. Andrich Threshold

Category Label	INFIT MNSQ	OUTFIT MNSQ	Andrich Threshold
0	.98	.99	NONE
1	.96	.92	-1.89
2	.97	.96	.11
3	1.13	1.17	1.77

Based on table 4, it shows that the answer choices provided by DASS-21 are appropriate, as evidenced by the MNSQ outfit and infit values which are close to the value of 1.00. In addition, the Threshold value in the choice is never up to very often it meets the standards between ratings (difference between ideal ratings of 1.4 – 5.0; Engelhard Jr & Wind, 2017). The answer choices provided by DASS-21 are valid and not confusing for individuals who answered the scale. However, the condition of the scale that has odd answer choices often has a social bias, the social bias in question is the desire to make the interviewer feel happy because he wants to be a respondent. Whereas respondents will tend to answer by choosing neutral (point in the middle; Garland, 1991).

The findings in this study indicate that the items in the Indonesian version of DASS-21 are valid and highly reliable. Based on the findings in this study, researchers recommend that psychologists, doctors, counselors, and therapists can be used as a measuring tool for early identification or screening before giving treatment (Milfayetty et al., 2020). In line with (Snaith & Zigmond, 1994) described DASS-21 and HADS are screening for anxiety and depression after traumatic brain injury (TBI). The performance of the

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HADS-A as a screening measure for anxiety was aided by items reflecting tension and worry, whereas for the DASS these symptoms were reported separately on the DASS-S scale. The DASS-D shows the best overall outcome as a screening measure for mood disorders (Dahm et al., 2013). While items reflecting anhedonia in DASS-D and HADS-D are indicators of depression, DASS-D performance is enhanced by additional items reflecting self-deprecation and hopelessness. An unexpected finding was that the DASS-D also performed best overall as a screening measure for anxiety disorders. By screening those at risk for anxiety and mood disorders, and following up with clinical diagnostic assessments (Dahm et al., 2013).

Ifdil, Fadli, Suranata, et al. (2020) stated that during the COVID-19 outbreak in Indonesia, several practitioners such as counsellors, psychiatrists, psychologists, therapists, and social workers have developed their own initiatives to assist with psychological first aid and to improve the psychological state of society in general, including overcoming high levels of stress. high blood pressure, anxiety, depression, OCD, and other psychological conditions. The intervention is carried out through online counseling, distribution of disease prevention brochures, websites, YouTube video tutorials, videos, short films, online discussions through WhatsApp groups, and other means (Ifdil, Fadli, Suranata, et al., 2020).

In addition, a study conducted in 2003-2004 with outpatients from 50 randomly selected public hospitals in Beijing identified 73 cases that met the DSM-IV criteria for major depressive episodes (Dahm et al., 2013; Wang et al., 2016). Among these 73, only 10 (14%) were identified by doctors, and only four (5%) sought help from a psychiatrist or psychologist (Zhang et al., 2006). A short questionnaire containing 21 items that has the potential to screen those at high risk of experiencing three different negative emotional states would be a useful tool for clinicians (Dahm et al., 2013; Wang et al., 2016).

Conclusions

The results of the validity and reliability analysis that were tested on 1478 Indonesian showed that the items in the Indonesian version of DASS-21 were valid and reliable. Based on the results of this study, it can be concluded that the DASS-21 fulfills the psychometric measurement aspect, with a very good item reliability value (.99) and a good person reliability (.89) to measure depression, anxiety, and depression, stress on respondent. In addition, the items on the DASS-21 are representative for measuring the depression, anxiety, and stress as evidenced by the raw value of 39.7% variance. All items in DASS-21 have outfit values MNSQ and Point Measure Correlation according to the ideal criteria set 0.5 > MNSQ < 1.5 and PTMEA Corr. = > 0.40. Another finding shows that the answer choices provided by DASS-21 are valid and do not confuse individuals in answering the DASS-21.

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