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Psychometric Properties of the 21-item Depression Anxiety Stress Scale (DASS-21)

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Abstract

Depression, anxiety and stress are recognised as global public health problems especially in developing countries. Early detection of these disorders is essential to provide psychological interventions for individuals experiencing these negative emotional conditions. This study determined the Nigerian psychometric properties for the 21-item version of the depression, anxiety and stress scale among a sample of medical students. Two hundred and forty medical students from the Lagos State University College of Medicine, Lagos, Nigeria completed the depression anxiety and stress scale, state trait anxiety inventory and self-rating depression scale. The reliability, discriminative, concurrent and convergent properties were determined. The reliability of DASS-21 showed that it has excellent Cronbach's alpha values of 0.81, 0.89 and 0.78 for the subscales of depressive, anxiety and stress respectively. It was found to have excellent internal consistency, discriminative, concurrent and convergent validities. The depression and anxiety subscales of DASS-21 had good correlations with self-rating depression scale and state trait anxiety inventory. The DASS-21 was found to have

commendable psychometric properties. It is reliable, valid and easy to administer. Its utility by clinicians will enhance the diagnoses of depression, anxiety and stress among university students.

Key Words: DASS-21, depression, anxiety, Stress, psychometric properties, Lagos, Nigeria

Introduction

Recent World Health Organisation (WHO) estimates noted that about 615 million people suffer from common mental disorders such as anxiety and depression (WHO, 2017). Close to 10% of the world's population is affected by these mental disorders and mental disorders account for 30% of the global non-fatal disease burden (WHO, 2017). Previous published documents also showed that mental disorders account for about 13–14% of the world's total burden of ill-health (Prince, 2007; WHO, 2017). Depression and anxiety disorders cost the global economy about US \$1 trillion each year. Similarly, WHO estimates that as many as 1 in 5 people could be affected by depression and anxiety (WHO, 2017). Depression has been reported to be the leading cause of ill health and disability globally and studies have shown that more than 300 million people are now living with depression, an increase of more than 18% between 2005 and 2015 (Prince et al, 2007; WHO, 2017). Depression is a common mental disorder, characterized by persistent sadness and a loss of interest in activities that you normally enjoy, loss of energy, accompanied by an inability to carry out daily activities, for at least two weeks. In addition, people with depression also may experience change in appetite; sleeping more or less; anxiety; reduced concentration; indecisiveness; restlessness; feelings of worthlessness, guilt, or hopelessness; and thoughts of self-harm or suicide (WHO, 2017).

With regards to anxiety, it is an emotional state characterised by feelings of tension, worried thoughts and physical changes such as increased blood pressure. Individuals experiencing anxiety may also have recurring intrusive thoughts or concerns (APA, 2017). Concerning stress, stress is an uncomfortable emotional experience accompanied by predictable biochemical, physiological and behavioural changes that can lead to health consequences which can also affect the immune, cardiovascular, neuroendocrine and central nervous systems (APA, 2017).

Despite several empirical evidence demonstrating that mental disorders are on the increase globally most especially in low and middle-income countries, it is however unfortunate that individuals suffering from common mental disorders such as depression and anxiety were not recognised by medical officers, general and family physicians not alone manage them (Prince et al, 2007; WHO, 2006; WHO, 2008). For this very important reason, early detection of persons living with common mental disorders in clinical and non-clinical settings will assist in providing early psychological interventions (Prince et al, 2007; WHO, 2006, WHO, 2008).

Since the prevalence of common mental disorders appeared to be on the increase developing countries (WHO; 2006; Prince et al, 2007; WHO, 2017; Sarkar et al, 2017), it is also important that there should be a psychometric instrument that clinicians can use to quickly screen and diagnose common mental disorders in clinical and non-clinical settings. Likewise, studies have shown that symptoms of depression, anxiety and stress could often overlap making their detection difficult for non-experienced clinicians (WHO; 2006; Prince et al, 2007; WHO, 2017; Sarkar et al, 2017).

The Depression, Anxiety and Stress Scale was designed to fill the gap in detecting common mental disorders. One useful benefit of the DASS-21 is that it was designed as a single instrument to measure symptoms of depression, anxiety and stress (Lovibond & Lovibond, 1995a; Lovibond and Lovibond, 1995b; Vignola et al, 2014; Bottesi et al, 2015; Wang et al, 2015). Since its design, DASS has been widely used as a screening instrument to measure symptoms of stress, anxiety and depression in clinical settings (Lovibond & Lovibond, 1995a; Lovibond and Lovibond, 1995b). The DASS has been translated to different languages and used in many validation studies and it was found to be

psychometrically sound (Mahmoud et al, 2010; Hashim et al, 2011; Haibi et al, 2017). The DASS also has an advantage over other psychometric instruments in that it does not only screen for psychopathology; it assists towards diagnoses of depression, anxiety and stress (Mahmoud et al, 2010; Hashim et al, 2011; Haibi et al, 2017).

Some other psychometric assessment instruments such as Beck depression inventory, Beck anxiety inventory and Hospital Anxiety and Depression Scale were designed to assess anxiety and depression but these instruments do not have ability to measure stress which has also been reported to be on the increase in developing countries (Habib et al, 2017; APA, 2017; Sarkar et al, 2017). Therefore, it is essential that the psychometric properties of an important tool such as the DASS-21 be determined in Nigeria. This is because the reported psychometric properties in the literature were published in other cultures which were relatively different from the Nigerian culture. Likewise, the psychometric properties of the DASS have not been studied or reported in any sub-Saharan country. A study on the psychometric properties of DASS in the sub-Saharan Africa cannot be over emphasized. This study therefore aimed to determine the internal consistency reliability estimates, convergent and discriminant validities of the DASS-21 among a sample of Nigerian medical students.

Materials and Methods

Design and Settings

This study aimed to measure the properties and psychometric equivalence of the DASS-21. The psychometric tool's validity was defined by its ability to demonstrate that it measures the indicators it is intended to measure, in this case, depression, anxiety and stress. The study was conducted at the Lagos State University College of Medicine, Ikeja, Lagos, Nigeria.

Participants

Medical students from the second year to the sixth year were invited to take part in the study. All the participants were informed about the aims of study and needed information about the psychometric tools. The participation was entirely on voluntary basis and they were all assured of the confidentiality of the study. Of the total 250 students, only 240 agreed to participate in the study making a response rate of 96%. The study was approved by Research and Ethics Committee of the College of Medicine. Written consent was also obtained from all the participants of this study.

Measures

The participants were invited to complete assessment questionnaires made up of the socio-demography form and the twenty-one version of the Depression Anxiety and Stress Scale (Lovibond and Lovibond, 1995a). The DASS-21 was administered concurrently with other two psychometric instruments that measure depression and anxiety, the Self-rating Depression Scale (Zung, 1965) and the State Trait Anxiety Inventory (Spielberger et al, 1970).

The DASS-21 item is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety and stress. Each of the three DASS scales contains 7 items. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest or involvement, anhedonia, and inertia; the anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect while the stress scale is sensitive to levels of chronic non-specific arousal. It also measures difficulty relaxing, nervous arousal, and being easily agitated, irritable, and impatient. When completing the DASS-21, the respondent is required to the presence of a symptom over the previous week. Each item is scored from 0 (did not apply to me) to 3 (applied to me very much or most of the time). The DASS-21 is a short form of the DASS-42, the final score of each domain is multiplied by two. For the depression domain,

normal scores range from 0-9 and while higher scores range from 10 to 28. For the anxiety domain, the normal scores range between 0-7, while pathological scores range from 8 to 20 while for the stress domain, the normal scores range from 0-14 while the pathological scores range from 15 to 34.

The Self-Rating Depression Scale (Zung, 1965) was the third instrument used to measure symptoms of depression among the participants. The SDS is a 20-item inventory on four Likert rating scale designed to assess the cognitive, affective, psychomotor, somatic and social interpersonal dimensions of depression. Jegede (1979) provided the psychometric properties for Nigerian Samples. The normative means scores are: 50–59, mild depression; 60–69, moderate depression and 70–80, severe depression. The SDS has a reliability of .93 and concurrent validity of .79. Scores higher than the norms indicate that the clients manifest clinical depression disorder, while scores lower than the norms indicate absence of clinical depression.

The State-Trait Anxiety Inventory-Y2 (Speilberger et al, 1970) was also used to collect data from the participants. STAI-Y2 is a 20-item inventory that measures anxiety. The instrument is on a four Likert rating scale. Omoluabi (1987) provided the psychometric properties for Nigerian Samples. The instrument has both direct and reverse scoring items. Its psychometric norm is 34.54 for both male and female Nigerian Samples. It has a reliability of .86 for Nigerian samples using university students. The concurrent validity coefficients are between .35 and .51. Scores higher than the norms indicate manifestation of anxiety while scores lower than the norms indicate absence of anxiety. The direct score items are: 22, 24, 25, 28, 29, 31, 32, 35, 37, 38, 40 while the reverse Score items: are 21, 23, 26, 27, 30, 33, 34, 36, 39. Both direct and reverse scores are added together to obtain the client's total score in STAI-Y2.

Statistical Analysis

The 16th edition of the IBM Statistical Product for Scientific Solution (IBM; SPSS-20) was used to analyze the data collected. Descriptive statistics were calculated for the sociodemographic variables. The Cronbach alpha was used to determine the internal consistency and Spearman's correlational analysis was used to determine the relationship between DASS, STAI and SDS. The statistical significant value (p) was put at <0.05.

Results

A total of two hundred and forty medical students participated in the study. Their ages ranged between 25 and 34 years, (mean 25 years; SD = 4.5), 120 (50%) were females. A large majority of the participants 229 (95.4%) were single as depicted in Table 1. Since the DASS-21 is a short form of the DASS-42, the final score of each domain was multiplied by 2 to simulate the scores of the full-scale version. The symptoms assessed by the DASS according to the subscales of depression, anxiety and stress are shown in Table 1.

Table 2 shows the cutoff points as given by the authors of DASS. (Lovibond and Lovibond, 2004). Table 3 shows the means and standard deviations for the three subdomains of the DASS-21. The means of the subscales were 5.32 (SD=6.76), 6.04 (6.50) and 8.74 (SD=7.40) for depression, anxiety and stress respectively. While the means and standard deviations for the SDS and STAI were 30.60 (SD=12.7) and 30.20 (SD=20.2) respectively. The reliabilities (internal consistencies) of the DASS-21 were calculated using Cronbach alpha. The overall score for DASS-21 which included the three domains was $\alpha = .91$. However, the alpha coefficients were slightly lower for the depression subscale ($\alpha_{\text{Depression}} = .81$) anxiety subscale ($\alpha_{\text{Anxiety}} = .89$) and stress subscale ($\alpha_{\text{Stress}} = .78$) as reflected in Table 4.

Table 5 showed Product moment inter-correlations matrix values between the three domains of DASS-21, SDS and STAI. These inter-correlations values were found to be moderately strong. The

highest of the three inter-correlations was observed to be between the subscales of depression and stress (.658) which was also statistically significant. It could be hypothesized that the depression domain of DASS-21 correlated positively and strongly with SDS (.701). In the same vein, the anxiety subscale of the DASS-21 correlated positively and strongly with STAI (.517).

Table 1: The Subscales of Depression, Anxiety and Stress and symptoms they assess

| Subscales | Depression | Anxiety | Stress |
|-----------|---|--|---|
| Symptoms | Inertia Anhedonia Dysphoria Lack of interest Self-depreciation Devaluation of life Discouragement | Excitation of ANS Musculoskeletal effects Situational anxiety; Subjective anxiety | Difficulty to relax; Nervous excitation; Easy agitation Irritability |

Table 2: Normal scores and severity ratings of Depression Anxiety and Stress Scale (Lovibond and Lovibond, 2004)

| DASS Rating | Zscore | Percentile | Depression | Anxiety | Stress |
|------------------|---------|------------|------------|---------|---------|
| Normal | <0.5 | 0-78 | 0 - 9 | 0 - 7 | 0 - 14 |
| Mild | 0.5-1.0 | 79-87 | 10 -13 | 8 - 9 | 15 - 18 |
| Moderate | 1.0-2.0 | 88-95 | 14 - 20 | 10 - 14 | 19 - 25 |
| Severe | 2.0-3.0 | 96-98 | 21 - 27 | 15 - 19 | 26 -33 |
| Extremely Severe | >3.0 | 99-100 | > 28 | > 20 | > 37 |

Table 3 Means and standard deviations of the psychometric instruments (DASS-21, SDS and STAI)

| Instruments | N | Mean | Standard Deviation | Range |
|------------------|-----|-------|--------------------|-------------|
| DASS-21 | | | | |
| DASS -Depression | 240 | 5.12 | 6.76 | 4.10-5.29 |
| DASS - Anxiety | 240 | 6.00 | 6.50 | 5.79-7.65 |
| DASS - Stress | 240 | 8.70 | 23.7 | 6.70-9.51 |
| SDS | 240 | 30.60 | 12.7 | 28.43-33.68 |
| STAI | 240 | 30.20 | 20.22 | 29.32-35.20 |

Table 4 Internal consistency and inter-item correlations of the DASS-21

| DASS-21 | Cronbach alpha | Inter-item correlation |
|------------------|----------------|------------------------|
| DASS- Depression | .81* | .40 -.70* |
| DASS- Anxiety | .89* | .56 - .78* |
| DASS - Stress | .78* | .54 - .67* |

Note: * All correlations are significant at $p < 0.001$ level (2-tailed)

Table 5 Intercorrelations matrix between the domains of DASS-21, SDS and STAI

| Measures | DASS-D | DASS-A | SDS | STAI |
|------------|--------|--------|-------|-------|
| DASS-21: D | 1.00 | .604* | .270* | -.010 |
| DASS-21: A | .604* | 1.00 | .217* | .118 |
| SDS | .270* | .217* | 1.00 | .126* |
| STAI | -.010 | .217* | .126 | 1.00 |

Note: * Correlation at $p < .0001$ is significant (2-tailed).

SDS = Self-rating Depression Scale; STAI = State Trait Anxiety Inventory

Discussion

This study determined the psychometric properties for the 21-item version of the Depression, Anxiety and Stress Scale among a sample of medical students. The reliability of the DASS-21 using the Cronbach alpha for each scale showed the subscales values as $p=.81$, $p=.89$ and $p=.78$ for depression, anxiety and stress respectively. These Cronbach alpha values showed that the DASS-21 is reliable psychometric instrument with good internal consistency. These Cronbach alpha values were found to be in agreement with other studies from other workers using young samples ((Lovibond and Lovibond, 2004; Lovibond & Lovibond, 1995a; Lovibond & Lovibond, 1995b). The findings were also in agreement with findings from other countries. For example similar findings were recorded in Bangladesh, (Alim et al, 2014), Greek (Lyrakos et al, 2011), Malaysia (Hashim et al, 2011; Ramli et al, 2011), Turkey (Zana & Nuran, 2011), and Vietnam (Le et al, 2017).

The concurrent, convergent and divergent validities of the depression and anxiety subscales were determined with STAI-Y2 and SDS using the Pearson's correlation analysis were found to be moderately strong. For example, a moderately strong value was found depression and stress (.658) which was also statistically significant. The depression domain of DASS-21 also correlated positively and strongly with SDS (.701). Likewise, the anxiety subscale of the DASS-21 correlated positively and strongly with STAI (.650). The positive correlational values between these two domains meant that the participants that experienced depression also experienced symptoms of stress.

Despite the comorbidity between these two domains, they can also be distinguished. The correlation between depression and anxiety was also observed to be moderately strong and positive. These positive correlation values indicated that symptoms of depression were inter-correlated with symptoms of anxiety and stress among the respondents. In this regard, the concurrent validation criterion coefficients of the DASS-21 demonstrated positive associations between the three instruments. These coefficients also demonstrated the concurrent presence of depression and anxiety in the participants. Thus, the DASS-21 was found to concurrently measure depression and anxiety

simultaneously and distinctively among the respondents. These concurrent coefficient values were also similar to other findings of other workers from other countries (Mahmoud et al, 2010; Ramli et al, 2011; Osman et al, 2012; Le et al, 2017; Haibi et al, 2017).

Our determined normative scores for depression, anxiety and stress were 5.12, 6.0 and 8.74 respectively. These normative scores were also similar to the normative scores from the original authors which were 6.34, 4.70 and 10.11 for depression, anxiety and stress respectively. However, these normative data were determined on a sample that represents students of a tertiary institution.

The limitation of this study was not being able to find a standardised psychometric instrument for measurement of stress; therefore, there were no intercorrelation values for the stress domain of the DASS. Nonetheless, future studies on psychometric properties of DASS-21 should involve larger multi-centred samples. Although this, study used a homogeneous sample of medical students from one university only. The participants were medical students therefore the results may not be generalisable to Nigerian university students.

Conclusion

The depressive and anxiety domains of the DASS-21 correlated moderately strong with the self-depression rating scale and the state trait anxiety inventory. Our findings also supported other published evidence that DASS-21 is a reliable and suitable research tool useful for quick screening of depression, anxiety, and stress among university students. It has a good internal consistency and adequate concurrent validity. Thus, the provision of the psychometric properties of the DASS-21 will aid Nigerian clinicians and researchers to quickly screen common mental disorders among students population of tertiary institutions.

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