Humanities and Educational Sciences Journal
ISSN: 2617-5908 (print)
مجلـــة العلـــوم التربـــوية والدراســـات الإنســـانيـــة
ISSN: 2709-0302 (online)

Psychometric Properties of the Arabic DASS-21 Scale(*)

Dr. Fatimah Sayer Alharbi
Assistant Professor in Mental Health Psychology
Department of Psychology, College of Education, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

Dr. Mugtaba Osman
Consultant Psychiatrist, Armed Forces
Centre for Psychiatric Care, Taif, Saudi Arabia
fsaalharbi@pnu.edu.sa

*) تاريخ تسليم البحث 31/3/2023 تاريخ قبوله للنشر 5/5/2023
*) موقع المجلة: http://hesj.org/ojs/index.php/hesj/index

خصائص القياس النفسي للمقياس العربي للتوتر والقلق والاكتئاب DASS-21

د/ فاطمة ساير الحربي
أستاذ علم نفس الصحة النفسية المساعد، قسم علم النفس
كلية التربية - جامعة الأميرة نورة بنت عبد الرحمن
الرياض - المملكة العربية السعودية

د/ مجتبى عثمان
استشاري الطب النفسي - مركز القوات المسلحة للرعاية النفسية
الطائف – السعودية

الملخص

المقدمة: مقياس التوتر والقلق والاكتئاب DASS-21 هو مقياس ذو تقرير ذاتي مكون من 21 فقرة مع خصائص قياس نفسي مثبتة عبر عدة لغات. لا يُعرف سوى القليل جدًا عن مقياس التوتر والقلق والاكتئاب DASS-21 العربي من حيث خصائص القياس النفسي المتقدمة حيث كان الهدف الأساسي للبحث الحالي هو فحص خصائص القياس النفسي للاستبيان العربيDASS-21.

الطريقة: دراسة مقطعية واسعة النطاق لملائمة نتائج مقياس التوتر والقلق واللإكتئاب DASS-21 العربي.

النتائج: كان عدد المشاركين يبلغ 1235 مشاركًا من بيئات مختلفة. شكل عام، كان معامل الثبات ألفا كرونباخ، لإجمالي نقا DASS-21 هو 0.94 وكان فاصل الثقة CI 95% بين 0.93 و0.94، وهذا يدل على الاتساق الداخلي الممتاز لهذا المقياس ومن ثم تم تجهيز النموذج المكون من ثلاثة عوامل بشكل مقبول لمجموعة البيانات الكاملة المكونة من 21 فقرة. ومع ذلك، لوحظ أن بعض الفقرات لديها عوامل مختلفة عن تركيبها الأولي.

الاستنتاج: تقدم دراستنا دليلًا على الثبات الممتاز والاتساق الداخلي والمصداقية المقاربة لملائمة نتائج مقياس التوتر والقلق والإكتاب DASS-21 العربي ونؤكد هذه الدراسة أيضًا قبول الهيكل الثلاثي العوامل الحالي لمقياس التوتر والقلق والإكتاب DASS-21 في نسخته العربية، وتخلص هذه الدراسة أنه يمكن لهذا المقياس في شكله الحالي DASS-21 العربي استخدامه في العديد من البيئات الصحية العامة والثانوية للكشف عن أعراض الاكتئاب والقلق والتوتر.

الكلمات المفتاحية: الاكتئاب، القلق، التوتر، DASS-21.

Psychometric Properties of the Arabic DASS-21 Scale

Dr. Fatimah Sayer Alharbi
Assistant Professor in Mental Health Psychology
Department of Psychology, College of Education, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

Dr. Mugtaba Osman
Consultant Psychiatrist, Armed Forces Centre for Psychiatric Care, Taif, Saudi Arabia

Abstract

The current study aims to investigate the psychometric properties of the Arabic DASS-21 questionnaire. A large-scale cross-sectional study of the Arabic adaptation of the DASS-21 scores. The participants (n= 1235) came from a variety of backgrounds. Overall, the reliability coefficient, Cronbach's alpha, for the gross DASS- 21 score, was 0.94 (95% confidence interval CI between 0.93 and 0.94), indicative of excellent internal consistency. The three- factor model fitted acceptably for the full 21- item dataset. Nonetheless, some items were noted to load onto different factors to their original structure.

Our study gives evidence of the excellent reliability, internal consistency, and convergent validity of the Arabic adaptation of DASS- 21. We also confirm the acceptability of the current three- factor composition for the DASS- 21 in its Arabic version. We may conclude that, in its current format, Arabic DASS- 21 can be used in many public and secondary health settings to detect depression, anxiety, and stress symptoms.

Keywords: Depression, Anxiety, Stress, DASS-21.

Background:

The DASS- 21 is an established self- report survey that is composed of a total of 21 questions. The respondent assigns a rating to each question, ranging from 0 (indicating no applicability) to 3 (indicating high applicability). The 21 items are further subdivided into three subcategories: 7 items for depression assessment, 7 items for anxiety assessment, and 7 items for stress assessment.

Many studies assessed the psychometric qualities of the original DASS-21 in its English language format over the last three decades [Brown et al., 1997]. The factor structure was reported to be consistent and validity measures were found to be quite good [Lee, 2019].

Many studies attempted to investigate the psychometric qualities of the DASS-21 in its various formats.

The DASS- 21 was first proposed by Lovibond and Lovibond [1995]. They recruited over 700 participants to examine the psychometric qualities of the Depression Anxiety Stress Scales in contrast to the well-known Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI). The calculated relationships of the BDI and BAI for the DASS- 21 were 0.81 and 0.74, respectively. They reported the factor structure to be 'satisfactory' with DASS being superior to BDI in terms of brevity.

Lee [2016] formulated a modified one- factor CFA model of DASS-21. He surveyed a group of 255 students. The latent factor was related to psychological distress, with high- value factor loadings of 0.70. He went further to examine the convergent, discriminant, and nomological validity of this saturated modified one-factor model of DASS- 21. Additionally, he measured the convergent validity to be 0.87 with a high correlation between the three subscales of depression, anxiety, and distress that ranged between 0.5 and 0.75.

A Turkish version of DASS- 21 [Hekimoglu et al., 2012] was found to have excellent discriminant andstable psychometric properties.

A recent Saudi- based study [Mahfouz et al., 2020] utilized the DASS- 21 in investigating the stress levels among Jazan University students and their sleep quality. However, the researchers did not report the psychometric traits of the survey as per the outcomes of their data. It was not clear if they even used an Arabic version of the questionnaire.

Egyptian researchers [Ali et al., 2017] attempted to validate an Arabized version of the DASS- 21 among 149 patients with substance use disorders. Although they did not carry out a full confirmatory factor analysis, they focused their analysis on the α coefficient [which was acceptable, but not excellent]. They calculated coefficients of reproducibility and scalability and found them even less acceptable.

They discovered that a few of the items were highly challenging and had weak discrimination. They thought that these things were 'problematic' and needed more investigation.

Very little, if any, is known about Arabic DASS- 21 in terms of advanced psychometric properties. The primary objective of the current investigation was to examine psychometric properties of the Arabic DASS- 21 questionnaire. We also aimed at evaluating the factor structure of the Arabic DASS- 21 questionnaire, examining its internal unity, and its convergent, discriminant, and nomological validity, in a large- scale sample of Saudi Arabia citizens.

Method for the Validation:

Demographic and DASS- 21 data were collected through a predesigned questionnaire mounted onto anonline portal that was distributed to potential respondents by sharing the unique link. The dataset in total was automatically transferred into the Microsoft Excel system. The advanced statistical methods to examine the psychometric properties included confirmatory factor analysis. We probed different factor structures including one- factor, two- factor, three- factor, and four-factor structures and compared the models in terms of absolute fit indices such as the chi- squared test, root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness- of- fit index (GFI), root mean square residual (RMR), and standardized root mean square residual (SRMR). Cronbach's alpha and hierarchical omega will be used to examine the unity of the total DASS- 21 scale and its three subscales.

DASS-21 Scale Architecture:

The DASS- 21 comprises three subscales: the depression scale, anxiety scale, and distress scale. Each subscale is composed of seven items. Subscores for depression, anxiety, and stress are obtained by adding up the scores for the respective items.

The depression scale of the DASS- 21 encompasses items that assess divergent aspects such as anhedonia (item 3: “I was unable to feel any good emotions at all”), inertia (item 5: “It was tough for me to muster the motivation to take action”), hopelessness (item 10: “It seemed like there was nothing to look forward to”), dysphoria (item 13: “I had a depressed and blue mood”), lack of interest/ involvement (item 16: “I could never get excited about anything”), self- deprecation (item 17: “I considered myself to be a person of little value”), and devaluation of life (item 21: “I believed that life had no purpose”).

On the other hand, the anxiety scale of the DASS- 21 evaluates autonomic arousal (item 2: “I noticed that my mouth was dry”) and (item 19: “When I wasn't physically active, I could feel my heart beating faster or skipping a beat, for example), ” skeletal muscle effects (item 4: “I had a hard time breathing” (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)”) and (item 7: “I experienced trembling (e.g., in the hands)”), situational anxiety (item 9: “I was concerned that there would be circumstances when I'd freak out and seem foolish”), and subjective experience of anxious affect (item 15: “I felt on the verge of panic”) and (item 20: “I experienced fear for no apparent reason”).

The stress scale within the DASS- 21 is specifically designed to identify chronic nonspecific arousal. It assesses diversified aspects such as difficulty in relaxing (item 12: “I had a hard time unwinding”) and (item 1: “My ability to relax was challenging”), nervous arousal (item 8: “I felt that my anxious energy was being expended heavily”), being easily upset/ agitated (item 11: “I could feel my temper rising”), irritability/ overreactivity (item 18: “I felt that I was quite sensitive”) and (item 6: “I often reacted excessively to circumstances”), and impatience (item 14: “Anything that prevented me from completing my task infuriated me”).

Results:

Out of the total participants (n = 1,235), 481 individuals (38.9%) were identified as males, while 754 individuals (61.1%) were females. The majority of participants, specifically 653 individuals (52.9%), were under the age of 25. ***Table 1*** shows a detailed display of the basic demographic factors of the participants. See also ***Supplementary File*** 1 for visualization of the DASS- 21 scores and subscored broken- up according to different sociodemographic characteristics.

Table 1. Baseline demographics of the study participants

Factor	Count (n)/mean	Percentage/SD	DASS-21 mean	*P*-value
Sex				
Males	481	38.9%	17.1	0.0001511
Females	754	61.1%	20.0	
Age				
18 to 25	653	52.9%	20.2	0.000498
26 to 33	230	18.6%	18.1	
34 to 41	149	12.1%	17.2	
42 to 49	121	9.8%	15.7	
50 to 57	65	5.3%	15.7	
Over 58	17	1.4%	22.7	
Marital status				
Married	414	33.5%	16.8	0.00118
Widow	1	0.1%	33.0	
Single	779	63.1%	19.8	
Divorced	41	33.2%	20.0	
Employment				
Employee	462	37.4%	16.4	0.00000218
Student	558	45.2%	20.5	
Unemployed	214	17.3%	19.8	
Education				
Intermediate	38	3.1%	18.3	0.653
Secondary	254	20.6%	18.9	
University	827	67%	19.0	
Postgraduate	116	9.4%	17.4	
Region				
Central	683	55.3%	17.8	0.0135
Eastern	355	28.7%	19.4	
Northern	42	3.4%	23.0	
Southern	57	4.6%	21.7	
Western	98	7.9%	20.4	
Psychiatric history	104	8.4%	27.4 (No = 18.0)	$2.45X10^{-12}$
Current mental issues	220	17.8%	32.1 (No = 15.9)	$< 2X10^{-16}$
On psychiatric medications	65	5.3%	29.2 (No = 18.3)	$9.97X10^{-11}$
Ruqia history	285	23.1%	24.4 (No = 17.2)	$3.32X10^{-16}$
Smoking	166	13.4%	21.6 (No = 18.4)	0.00387
Substance use	22	1.8%	25.5 (No = 18.7)	0.0181
Psychological issues	639	51.7%	23.9 (No = 13.3)	$< 2X10^{-16}$

Normative Values in the Saudi Population:

We utilized the results of our test to estimate the population- related normative values in accordance with Arabized DASS- 21 score, as illustrated in Figure 1 and Table 2.

The normative mean DASS- 21 score in our sample was 18.8 (SD= 13.4), ranging between 0 and 63; the median DASS- 21 score was 16.

The normative mean DASS- 21 depression subscore in our sample was 6.1 (SD = 5.1), ranging between 0 and 21; the median DASS- 21 depression subscore was 5.

The normative mean DASS- 21 anxiety in our sample was 5.5 (SD = 4.6), ranging between 0 and 21; the median DASS- 21 anxiety subscore was 5.

The normative mean DASS- 21 stress subscore in our sample was 7.3 (SD = 5.0), ranging between 0 and 21; the median DASS-21 stress subscore was 7.

Table 2. Normative values for the DASS-21 subscales among our Saudi subjects

Subscale	Normal	Mild	Moderate	Severe
Depression	567 (45.9%)	163 (13.2%)	220 (17.8%)	285 (23.1%)
Anxiety	522 (42.3%)	87 (7%)	205 (16.7%)	421 (34.1%)
Distress	585 (47.4%)	215 (17.4%)	239 (19.4%)	196 (15.9%)

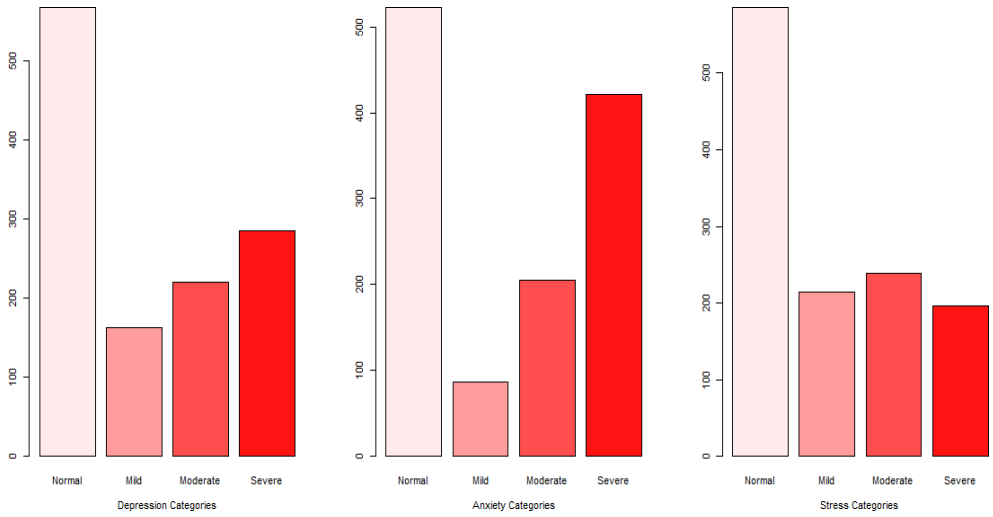

Figure 1. Normative values for the DASS-21 subscales among our Saudi subjects

Reliability and Internal consistency of the Arabic DASS-21:

Overall, the reliability coefficient, Cronbach's alpha, for the total DASS-21 score was 0.94 (95% confidence interval CI between 0.93 and 0.94), indicative of excellent internal consistency. All its items were of comparable impact on the overall reliability estimate. Further information is available in Supplementary File 2.

The reliability coefficient for the depression subscale of the Arabic DASS- 21 was 0.87 (95% CI between 0.86 and 0.88), signifying good internal consistency. None of its items has a significant impact on the overall reliability estimate.

Similarly, the Cronbach's alpha reliability coefficient for the anxiety subscale was 0.84 (95% CI between 0.82 and 0.85), reflecting good internal consistency. All items were comparable in terms of effect on estimates for reliability coefficients.

In addition, the Cronbach's alpha reliability coefficient for the stress subscale was 0.86 (95% CI between 0.85 and 0.87), implying good internal consistency. None of its items has a significan impact on the overall reliability estimate.

Confirmatory Factor Analysis:

We carried out a confirmatory factor analysis to guarantee that the three dimensions of depression, stress, and anxiety conform satisfactorily to the Arabic adaptation of the DASS- 21. We sequentially fitted one- factor, two-factor, three-factor, and four-factor models to the dataset. The three- factor model fitted acceptably for the full 21- item dataset. Nonetheless, some items were noted to load onto different factors to their original structure.

Item 5: "It was tough for me to muster the motivation to take action" exhibited a stronger association with the stress factor compared to the supposed depression factor, although the difference was marginal. Additionally, item 9: "I was concerned that there would be circumstances when I'd freak out and seem foolish" demonstrated a significantly stronger association with the stress factor than the original anxiety factor. Furthermore, item 11: "I could feel my temper rising" showed a slightly stronger association with the depression factor instead of the expected stress factor.

Moreover, item 14: "Anything that prevented me from completing my task infuriated me" deviated from the stress factor and loaded significantly better onto the depression factor. However, a fuller 4- factor structure fitted better than models with fewer factors. An additional dimension (composed of item 1: "My ability to relax was challenging" and item 12: "I had a hard time unwinding") is required for the sample data to conform acceptably to the theoretical covariance structure. See Supplementary File 3 for a detailed account of the four- factor loading. We note that the meaning of those two items can be almost identical when translated into Arabic tongue.

We further attempted to perform the confirmatory factor analysis of a three- factor model after the removal of the two poorly performing items (item 1: "My ability to relax was challenging" and item 12: "I had a hard time unwinding").

Although not a better fit than the 4- factor model, this item- deleted three-factor model was noticeably superior to the full three- factor model in the entire dataset (see Table 3 and Table 5).

The comparative fit index (CFI) > 0.95, Tucker- Lewis index (TLI) > 0.95, and root mean square error of approximation (RMSEA) < 0.06 are chosen for a good fit [Hu et al., 1999]. A good fit to the dataset is revealed with an RMSEA value < 0.05 and an acceptable fit is achieved when the RMSEA is < 0.08 [Browneand Cudeck ,1993].

Table 3. Comparison of four models for the DASS-21 factor structure

Model	Chi-squared (df)	RMSEA	(90% CI)		CFI	TLI	SRMR
One- factor	1238 (189)	0.067	(0.064 to	0.071)	0.989	0.988	0.067
Two- factor	1025 (188)	0.060	(0.056 to	0.064)	0.992	0.991	0.049
Three- factor	701 (186)	0.047	(0.044 to	0.051)	0.995	0.994	0.042
Four- factor	550 (183)	0.040	(0.036 to	0.044)	0.976	0.996	0.039
Three- factor*	838 (186)	0.053	(0.050 to	0.057)	0.993	0.993	0.046
Three factor [missing items 1 & 12]	467 (149)	0.042	(0.037 to	0.046)	0.996	0.995	0.040

CFI, comparative fit index; *TLI*, Tucker- Lewis index; *RMSEA*, root mean square error of approximation; *CI*, confidence interval; df, degrees of freedom; *SRMR*, standardized root- mean- square residuals.
Three- factor*: the original three-dimensional structure.

Table 4: Items that loaded differently to the original DASS-21 three-facture structure

Dimension movement	Item	Verbatim
From depression to stress	5	It was tough for me to muster the motivation to take action.
From anxiety to stress	9	I was concerned that there would be circumstances when I'd freak out and seem foolish.
From stress to depression	11	I could feel my temper rising
From stress to depression	14	Anything that prevented me from completing my task infuriated me.

Table 5: Items to be excluded for the original DASS- 21 three- facture structure to be preserved

Dimension	Item	Verbatim
Stress	1	My ability to relax was challenging
Stress	12	I had a hard time unwinding

Discriminant Validity Analysis:

Discriminant validity is considered an index of the difference between the three underlying constructs (namely, depression, stress, and anxiety).

These constructs are inherently similar; therefore, a strong correlation is expected between them and, hence, low discriminatory power. We opted to use a multiply operationalized procedure method to probe the correlation matrix of *z*- transformed scores of each of the three constructs [Cole et al., 1981].

Table 6: The multiply operationalized correlation of the three constructs of the DASS- 21 scale

Construct	Mean	SD	Biserial correlation	*P*-value
Depression	0	0.7449	0.8020	< 0.0001
Stress	0	0.7396	0.8281	< 0.0001
Anxiety	0	0.7125	0.7710	< 0.0001

The discriminant validity was poor for the three constructs.

Convergent Validity Analysis:

A measurement scale's convergent validity is established when there is a strong correlation between its discrete components. [Duckworth and Kern, 2011]. We examined the correlation between each of the DASS- 21 items and

its corresponding construct. Correlation coefficients were decoded as follows: 0 – 0.19 = extremely weak; 0.20 – 0.39 = weak; 0.40 – 0.59 = moderate; 0.60 – 0.79 = strong; 0.80 – 1.0 = extremely strong [Evans, 1996].

Table 7: Convergent validity of the DASS-21 items

Item	Construct	Biserial correlation	Interpretation	*P*-value
DASS1	Stress	0.6831	Strong	< 0.0001
DASS2	Anxiety	0.6373	Strong	< 0.0001
DASS3	Depression	0.6746	Strong	< 0.0001
DASS4	Anxiety	0.7074	Strong	< 0.0001
DASS5	Depression	0.6137	Strong	< 0.0001
DASS6	Stress	0.6855	Strong	< 0.0001
DASS7	Anxiety	0.7060	Strong	< 0.0001
DASS8	Stress	0.7713	Strong	< 0.0001
DASS9	Anxiety	0.6628	Strong	< 0.0001
DASS10	Depression	0.7750	Strong	< 0.0001
DASS11	Stress	0.8200	Extremely strong	< 0.0001
DASS12	Stress	0.8032	Extremely strong	< 0.0001
DASS13	Depression	0.8092	Extremely strong	< 0.0001
DASS14	Stress	0.6971	Strong	< 0.0001
DASS15	Anxiety	0.7244	Strong	< 0.0001
DASS16	Depression	0.7922	Strong	< 0.0001
DASS17	Depression	0.7449	Strong	< 0.0001
DASS18	Stress	0.7170	Strong	< 0.0001
DASS19	Anxiety	0.7643	Strong	< 0.0001
DASS20	Anxiety	0.7852	Strong	< 0.0001
DASS21	Depression	0.8051	Extremely strong	< 0.0001

Clearly, all the items demonstrated strong convergent validity, with items 11, 12, 13, and 21 whose convergent validity was extremely strong.

Adjusted Effect of Demographic and Clinical Factors on DASS- 21 Score

A thorough explanation of the unadjusted and adjusted impact of environmental factors on the DASS- 21 score is given in Table 8 and the figure in Supplementary File 1.

The DASS- 21 was significantly elevated in the over 85- year- old individuals ($p = 7.869X10^{-05}$), single participants ($p = 0.0042197$), students ($p = 0.0001620$), all regions compared to the central region ($p = 1.666X10^{-09}$, for Southern region), smokers ($p = 9.323X10^{-07}$), and those with substance use issues ($p = 0.0015458$).

Table 8. Adjusted effect of baseline demographics of the study participants on their DASS- 21 score

Demographic factor	Estimate	SE	z value	*P*-value
Sex (male)	-0.0684617	0.0181288	-3.7764	0.0001591 ***
Age 26 to 33	-0.0363249	0.0259297	-1.4009	0.1612443
Age 34 to 41	-0.0748820	0.0337879	-2.2162	0.0266753 *
Age 42 to 49	-0.0121805	0.0383085	-0.3180	0.7505165
Age 50 to 57	0.0052474	0.0434674	0.1207	0.9039119
Age over 58	0.2395384	0.0606677	3.9484	$7.869X10^{-05}$ ***
Marital status (married)	0.0260417	0.0396886	0.6562	0.5117260
Marital status (single)	0.1124530	0.0393020	2.8613	0.0042197 **
Marital status (widowed)	1.1503708	0.1810019	6.3556	$2.077X10^{-10}$ ***
Postgraduate	-0.1478716	0.0457401	-3.2329	0.0012255 **
Education (secondary)	-0.0421562	0.0420877	-1.0016	0.3165240
Education (university)	-0.1684241	0.0407134	-4.1368	$3.522X10^{-05}$ ***
Student	0.0984456	0.0260992	3.7720	0.0001620 ***
Unemployed	0.0297133	0.0230027	1.2917	0.1964511
Region (Eastern)	-0.0317254	0.0167884	-1.8897	0.0587944.
Region (Northern)	0.1777087	0.0344441	5.1593	$2.478X10^{-07}$ ***
Region (Southern)	0.1846474	0.0306345	6.0274	$1.666X10^{-09}$ ***
Region (Western)	0.0809769	0.0250178	3.2368	0.0012089 **
Psychiatric history	0.0906179	0.0260272	3.4817	0.0004983 ***
Current mental issues	0.4644987	0.0166554	27.8888	$< 2.2X10^{-16}$ ***
Psych. meds	0.0659120	0.0311911	2.1132	0.0345863 *
Ruqia history	0.2564579	0.0153681	16.6877	$< 2.2X10^{-16}$ ***
Smoking	0.1048805	0.0213805	4.9054	$9.323X10^{-07}$ ***
Substance use	0.1411576	0.0445862	3.1659	0.0015458 **
Psych. pressures	0.3792604	0.0155212	24.4350	$< 2.2X10^{-16}$ ***

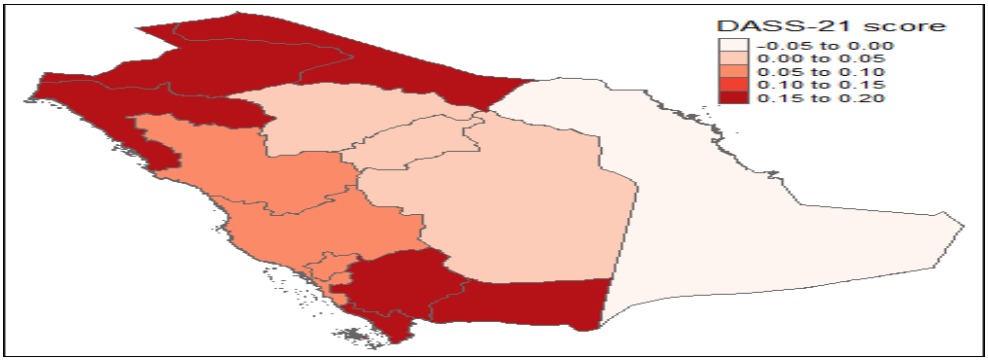

Figure 2: Distribution of DASS-21 score by the adjusted effect of geographic region

Conclusion:

Our study gives evidence to the excellent reliability, internal consistency, and convergent validity for the Arabic adaptation of DASS- 21.

We also confirm the acceptability of the current three-factor structure for the DASS- 21 in its Arabic version. We may conclude that, in its current format, Arabic DASS- 21 can be used in many public and secondary health settings to detect depressive, anxiety, andstress symptoms.

However, we have also identified room for improvement.

A couple of stress-related items seem to topple away from the overall DASS- 21 construct, namely, item 1: "My ability to relax was challenging" and item 12: "I had a hard time unwinding.

Also, a couple of items were detected to go better with the depressive construct rather than the stress construct in the Arabic DASS- 21 adaptation, namely, item 11: "I could feel my temper rising" and item 14: "Anything that prevented me from completing my task infuriated me."

Moreover, a couple of factors performed better with the stress construct rather than the depressiveor the anxiety constructs, namely, item 5: "It was tough for me to muster the motivation to take action" and item 9: "I was concerned that there would be circumstances when I'd freak out and seem foolish."

The three items should be reworded for future research, and focus groups should be organized to learn more about respondents' attitudes toward these particular questions. The current research has numerous strengths. The

specimen size was large and exemplary of Saudi citizens to a great extent. However, the cross- sectional and online design would not elucidate bidirectional associations or selection bias, as computer and internet literacy is an important filter in selecting participants.

References:

Ali AM, Ahmed A, Sharaf A, Kawakami N, Abdeldayem SM, Green J. The Arabic Version of The Depression Anxiety Stress Scale- 21: Cumulative scaling and discriminant-validation testing. Asian J Psychiatr. 2017 Dec; 30:56- 58. doi: 10.1016/j.ajp.2017.07.018. Epub 2017 Jul 18. PMID: 28755630.

Brown TA, Chorpita BF, Korotitsch W, Barlow DH. Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. Behav Res Ther. 1997 Jan;35(1):79-89. doi:10.1016/s0005-7967(96)00068-x. PMID: 9009048.

Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long LS, editors. Testing structural equation models. Newbury Park: Sage; 1993. pp. 136–162.

Cole D, Howard GS, Maxwell SE. Effects of mono-versus multiple-operationalization in construct validation efforts. Journal of Counseling and Clinical Psychology. 1981; 34: 315–321.

Duckworth AL, Kern ML. A meta-analysis of the convergent validity of self-control measures. J Res Pers 2011; 45: 259–68.

Evans J, Straightforward statistics for the behavioural sciences. 1996: Brooks/Cole.

Hekimoglu L, Altun ZO, Kaya EZ, Bayram N, Bilgel N. Psychometric properties of the Turkish version of the 42 item Depression Anxiety Stress Scale (DASS-42) in a clinical sample. Int J Psychiatry Med. 2012;44(3):183-98. doi: 10.2190/PM.44.3.a. PMID: 23586275.

Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equation Model. 1999; 6:1–55.

Lee D. The convergent, discriminant, and nomological validity of the Depression Anxiety Stress Scales-21 (DASS-21). J Affect Disord. 2019 Dec 1;259: 136-142. doi: 10.1016/j.jad.2019.06.036. Epub2019 Jun 30. PMID: 31445339.

Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the DepressionAnxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther. 1995Mar;33(3):335-43. doi: 10.1016/0005-7967(94)00075-u. PMID: 7726811.

Mahfouz MS, Ali SA, Bahari AY, Ajeebi RE, Sabei HJ, Somaily SY, Madkhali YA, Hrooby RH, Shook RN. Association Between Sleep Quality and Physical Activity in Saudi Arabian University Students. Nat SciSleep. 2020 Oct 20; 12:775-782. doi: 10.2147/NSS.S267996. PMID: 33117013; PMCID: PMC7585794.