

# Short Version of The Depression Anxiety Stress Scal-21: Is It Valid For Jordanian Adults

Odeh Murad (✉ [odehmurad@bau.edu.jo](mailto:odehmurad@bau.edu.jo))

Al-Shoubak University College

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## Research Article

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# Abstract

**Background:** Given the potential utility of depression anxiety stress scale-21 and the availability of a reliable Arabic version, the current study aimed to collect information about the factorial structure and psychometric properties of the Jordanian version by administering it to adult members of the community. Thus, the depression-anxiety-stress scale was used in examining mental disorders in Jordanian adults.

**Methods:** The study included adults of both sexes aged 18 to 72 years. The reliability of the overall DASS-21 scores and the three DASS-21 subscales were calculated. Exploratory factor analysis was used to test construct validity. Confirmatory factor analysis was performed for the two models (one-factor and three-factor models) for DASS-21 to determine the best factor structure for DASS-21 in the adult sample.

**Results:** The findings revealed that the DASS-21 has high reliability and validity indicators, with Cronbach's alpha values exceeding 0.80. Pearson's correlation between DASS-21 and the Beck Depression Inventory-II (BDI-II) and the Beck Anxiety Inventory (BAI) were strongly positive, indicating that DASS-21 has sufficient convergent and divergent validity. The exploratory factor analysis showed that the three-factor model had the best indicators, and the confirmatory factor analysis results confirmed that the three-factor model was the fittest and most appropriate.

**Conclusion:** The current study's findings suggest that the Jordanian version of the DASS-21 can be used as a reliable and valid scale for measuring depression, anxiety, and stress in adults.

## Background

In low- and middle-income countries, especially in resource-poor countries, depression and anxiety are the two most common mental disorders [1–2]. Briefly, the early detection of these problems in primary health care is essential to treat the injured and reduce community disability [3] and mental awareness issues, as the health focus on infectious diseases and malnutrition in these countries is declining. Mental health awareness is growing. There is an increasing need for screening measures that primary care professionals can use to screen patients with common mental illnesses in the community, and clinicians and researchers are interested in the link between depression and anxiety [4–5].

Differences in the prevalence of mental illness do not always indicate true cultural differences. In one culture, specific symptoms may belong to a set of normative cultural experiences, while in another culture, they may be signs of real distress [6]. The definition of a specific disease may vary from country to country; thus, a literal translation cannot be used to assess the symptoms of a particular disease [7]. Cross-cultural psychology emphasizes the importance of cross-cultural evaluation because it is usually assumed that localization tools are evaluating the same phenomenon in different cultures in a similar way [8]. However, if this assumption is confirmed or incorrect, it must adjust the scale accordingly. The procedure is effective if the structure and scale characteristics apply to all specific cultural groups, but this condition is rarely met [9]. Moreover, a new tool called aggregation should be developed if the adoption and adjustment of scales or tools cannot produce satisfactory results. The new instrument should be as cultural as possible.

Therefore, cross-cultural comparability will decrease in this process [10]. Although there is a large amount of empirical evidence that mental disorders are on the rise worldwide, it is regrettable that medical authorities and psychiatrists have failed to identify people with mental disorders, such as depression and anxiety [11–12]. Individuals with mental disorders in clinical and non-clinical samples show why early recognition of people is important for early psychological intervention [11]. Clark and Watson [13] proposed a three-pronged model of depression and anxiety,

and this model indicates that both conditions share several symptoms of a high negative impact, such as discomfort and irritability. Depression is characterized by low levels of positive emotions, including happiness, self-confidence, and excitement, while anxiety is characterized by physiological hypertension [14]. However, there is a significant overlap between these two situations, making it challenging to distinguish them in testing [15].

Various questionnaires can be used to study psychological disorders, such as depression, anxiety, and stress, but there are no tools for evaluating them. Most of the development of DASS is done on non-clinical samples [16–17]. Previously, a clinical consensus was used to select items and subscales. DASS was originally designed to have only two subscales: one for anxiety and the other for depression. Each includes items that are considered unique. However, fuzzy items that are not related to sadness or anxiety are not included in the evaluation, but they serve as controls. This method has been used to generate indicators that effectively distinguish between depression and anxiety [18]. However, control tends to produce a third set of items determined by non-specific chronic arousal. Several items were added to this group, and the third subscale (the stress scale) was born. Lovibond & Lovibond [16] pointed out that although the scale is related to a combination of depression and anxiety, it is a consistent measure.

The trial version was revised using a factorial analysis, and the third factor emerged from word analysis, which led to no difference between anxiety and depression, defined as stress. Its main characteristics are irritability, nervousness, difficulty relaxing and arousal [16]. The latest version of DASS includes 42 items, divided into three subscales: (1) check depression, despair, low self-esteem and low positive mood; (2) anxiety assessment of subjective arousal of anxiety and physical and subjective symptoms of anxiety; (3) stress measures stress, arousal, and side effects [17]. There are two versions of DASS: the full version (42 items) and the abridged version (21 items).

With the intent of developing concise forms that can be used for research and time-limited situations, Lovibond and Lovibond [17] selected seven representative items for each subscale of the questionnaire from the original DASS. The selected items should have good loading factors in the original scale and each score, and a short scale should be very close to the corresponding half of the total score. The internal consistency results for all three parameters (depression = 0.81, anxiety = 0.73, stress = 0.81) were published in a non-clinical sample. Despite the potential relevance of DASS-21, the factor analysis and psychometric characteristics of the aforementioned short scale are not documented [15]. Several studies have examined the psychometric properties of the scale in clinical [19–20] and non-clinical [21–24] adult samples. These surveys show that the three subscales have greater internal consistency, with scores ranging from 0.80 to 0.91. The significant convergent validity ranges from 0.50 to 0.80. The correlation between the three aspects of DASS-21 is moderate to significant, ranging from 0.46 to 0.75.

The psychometric properties of DASS-21, tested in clinical samples from various adult groups with different cultural backgrounds, generally gave positive results [15, 21, 25–26]. These studies showed that all three subscales have strong internal consistency, with Alpha coefficient ranging from 0.83 to 0.94 for depression, 0.70 to 0.87 for anxiety, and 0.82 to 0.91 for stress. Internal consistency for the scale, ranging from 0.92 to 0.96, as a whole was not often reported but has been published in studies [21, 26–27].

The validity of DASS-21 as a standard measure of clinical outcome was also examined, and it was found that the scale responded to improvements in clinical status after treatment [28–29]. Many studies use exploratory and confirmatory methods to evaluate the factor structure of DASS-21, but the results are usually uncertain. Multiple studies have confirmed the three-factor structure of DASS-21 [20, 24]. Although some perform well, they are less adaptable [35]. It was also found that the 21-items form has a clearer factor structure and lower factor correlation than the longer version [21]. However, some studies have shown that the four-factors structure, including depression, anxiety and stress, and general psychological distress factors, provide a better indicator [15, 21–22, 30].

Other studies have reported three-factor designs, in which one or more items are loaded on an undefined scale [26]. In terms of the convergence and discriminative significance of “The Depression and Anxiety Scale-21 items (DASS-21)” shows an acceptable correlation with other anxiety and depression scales. It was found that there was a significant correlation between the BAI and DASS-21 anxiety scales and the BDI and DASS-21 depression scales ( $r = 0.74$ ) ( $r = 0.81$ ), respectively. However, clinical samples showed similar patterns of association [20]. Lovibond & Lovibond [17] found that the reliability assessed by Cronbach's alpha is satisfactory for depression, anxiety, and stress (0.91, 0.84, 0.90) and is equivalent to the value obtained by [20, 31]. It is problematic to extend their results to a wider population because the original criteria were mainly based on only students [17]. The influence of demographics on DASS scores has not been extensively studied during the development of DASS. The analysis was limited to gender and age, although the author of the test did not specify whether age or gender had a significant effect [18].

Several studies have shown that DASS-42 has sufficient convergent validity and discriminate validity in data collected from the normal population [16, 18]. Cronbach's alpha reliability is also acceptable in all three subscales of clinical and non-clinical samples [16, 18, 20, 31]. In the current study, the shortened version of DASS was chosen, as a meta-analysis study that directly checked the two scales in the clinical group showed that DASS-21 was associated with a cleaner factor structure relative to DASS-42 [20, 25]. In addition, there is no Arab study investigating the applicability of DASS-21 validity to general adults. It was observed that DASS-21 had a significantly lower intra-construct association in two independent psychological samples [20], and DASS-21 corresponds to a very high reliability score. However, these are the only studies that investigated the psychometric properties of DASS-21, and no normative data are available. The lack of normative data can be explained by his statement [16] that the DASS-21 score doubled can be directly compared with the DASS-42 score because DASS-21 covers the entire range of symptoms recorded in the longer version of DASS.

DASS-21 has been translated and verified in many languages, including Chinese [32], Malay [33], Italian [34], and Spanish [35]. It was also translated into Arabic and tested on Arab immigrants in Australia [36]. Its effectiveness and reliability have not been tested in the Arab world. DASS-21 is considered a valuable testing scale because it assesses multiple areas and is psychologically effective in both English and non-English contexts [5], but its understanding and the psychometric properties are still to be determined in low-income countries [31]. Therefore, one of the issues currently being investigated is to determine the understanding of characteristics, psychological indicators, including internal reliability, and the effectiveness of the anxiety and depression stress scale as a standard for the study of depression, anxiety, and stress in Jordanian adults. DASS-21 proposes a modern understanding of the nature of negative emotions and its built-in psychological characteristics and assesses depression, anxiety, and stress. DASS-21 is often used in Australian and international research and clinical trials and evaluation of the results [36]. Generally, it is an effective instrument for dealing with clients who do not understand English. It is particularly important to evaluate the psychometric properties of solutions such as DASS-21 in the Arabic context because the psychometric properties recorded in previous studies are culturally different from those in Arab culture.

Some Arab studies of the psychometric properties of the DASS-21 were available within the researcher's knowledge, the first of which was on a sample of Arab immigrants in Australia [36]. The studies were on the following: (a) a sample of nursing workers in Saudi Arabia [37], (b) a group of mentally ill and quarantined patients in Saudi Arabia during the COVID-19 pandemic [38], (c) the psychometric properties of the DASS-21 on a sample of Egyptian drug users [39], (d) a Syrian sample during the COVID-19 pandemic [40], and (e) the confirmatory factor analysis of the DASS-21 on a sample of Algerian secondary school students [41]. Several Arab studies have highlighted that they studied specific clinical and non-clinical samples from the community. Their findings typically concluded that they support the triple structure of DASS-21, comparable to the original version in Australia. These studies identified a strong correlation between each item, the subscale to which it belongs, and the overall DASS-21 score, as well as a

high Cronbach's alpha stability value ranging from 0.91 to 0.94. Ali and Green [39] showed that the single factor structure was best suited in a sample of drug users; hence, four items were deleted from the DASS-21. Its findings revealed that the modified version of 17 items demonstrated that DASS-17 was appropriate for measuring total pressure, and the results of close validation demonstrated that DASS-17 was superior to DASS-21. Several of these studies reported that the DASS-8 and DASS-20 had comparable psychometric characteristics and reliability to the DASS-21. The first Arabic version [36], which issued the first Arabic version of DASS-21, revealed that the Arabic version of DASS-21 discriminated between negative emotional syndromes of depression, anxiety, and tension, and its internal consistency was high. The Arabic DASS-21 was thought to be particularly suitable for regular evaluation and treatment outcome evaluation.

Studies have shown that DASS-21 provides a reliable and accurate assessment of depression, anxiety, and stress in clinical and non-clinical populations from different cultures [30]. Additionally, DASS-21 is an easy-to-use instrument that can be used for clinical and research purposes. Thus, it is necessary to study its psychological measurement and application characteristics on Jordanian samples. Consider the potential use of DASS-21 and its inaccessibility to the adult population of Jordan and the entire Arab region. The main purpose of this study is to collect information about factor structure and psychometric characteristics by distributing the Jordanian version of the questionnaire to key members of adult communities in non-clinical settings. Earlier studies in English-speaking and non-English-speaking countries found significant associations between the scales [17, 35]. However, the current study aimed to investigate especially the structure of the Jordanian DASS-21 factor by performing confirmatory, exploratory factor analysis and internal consistency assessment and checking the construct validity of the scale, using several mental health and well-being scales, such as Beck's depression scale and Beck's anxiety scale.

## Method

### Participants

Nine hundred and thirty-five individuals (51% males) from the general adult population, residing in various cities across Jordan's three regions (North, Central, and South), responded to the study and completed all study elements. The participants ( $M = 33.55$ ,  $SD = 13.43$ ) ranged from 18 to 72 years. Among them, 50% had completed their university education, 50.3% were married, 48.3% were unmarried, 1.4% were divorced, and 58% were not employees. All participants are Jordanians, except for 120 participants of other nationalities. One hundred and twenty-seven students from Al-Balqa Applied University (57% male, mean age = 21,  $SD = 6.7$ ) completed the DASS-21 questionnaire twice, separated by two weeks, to collect data on the temporal stability of DASS-21. All participants were from a non-clinical sample and had no mental or psychiatric illnesses.

### Procedure

Participants were recruited from many sources in the public and private sectors. Each participant received an introduction letter and a DASS-21 form; a subset of participants received and completed two additional self-report scales (Beck for depression, Beck for anxiety). The information was gathered through an anonymous online questionnaire sent across Jordanian WhatsApp, Facebook, and Twitter groups between March 20, 2021, and April 28, 2021. The participants attest that they are over 18 years old and exclusively of Jordanian nationality. Non-Jordanian nationals made up 120 of the competitors. Data were collected from participants who clicked on the questionnaire link on the first page, which included an explanation of the study and its aims in basic English. Data registration of participants has been verified, an anonymous name was provided, and a statement stating that they have the choice

to withdraw from the survey at any time was added. Participants indicated their informed permission digitally by opting to participate in the study.

## Measurements

### Depression, Anxiety Stress Scale-21 (DASS-21)

The Arabic translation phrase was obtained from the DASS official website [[http://www2.psy.unsw.edu.au/dass/Arabic/Arabic percent 20DASS-21](http://www2.psy.unsw.edu.au/dass/Arabic/Arabic%20DASS-21.pdf)] .pdf] (accessed on January 25, 2021). It was validated [36] from the original DASS-21 scale [17], which is a 21-item self-report instrument in three sub domains that assesses depressive symptoms (items 3, 5, 10, 13, 16, 17, 21), anxiety (items 2, 4, 7, 9, 15, 19, 20), and stress (items 1, 6, 8, 11, 12, 14, 18) on a scale of 0 to 3 and shows participants' level of support for symptoms during the previous week's session. The researcher went over the common Arabic version of DASS-21 to ensure that no slang is restricted to a specific category. The scale's translation from English to Arabic was also double-checked by experts to ensure its accuracy. An Arabic language expert proofread and edited it. It turns out that items 1 and 12 were translated from English to Arabic with the same translation and the same meaning, resulting in the item being repeated in the common version. An English language and psychology experts translated the two items into English. A new translation that precisely matches the intended meaning has been approved. Expert assessments of the original version of the DASS-21 revealed excellent clarity for all three subscale items: depression, anxiety, and stress.

### The Beck Depression Inventory-ii (Bdi-ii)

The Jordanian version of the Single Beck Depression Scale developed by Al-Da'asin [42] was used in this study. It is a 21-item self-report scale used to assess the severity of depression's emotional, cognitive, motivational, vegetative, and psychomotor components. For each question, participants were asked to select the statement that best described their feelings and condition over the previous week from a graduated series of four alternatives representing the severity of depression, ranked from 0 to 3. The higher the degree, the greater the level of depression. Al-Da'asin found that the BDI-II had excellent psychometric properties and the internal consistency coefficients were good to excellent. In the current study, Cronbach's alpha was 0.85 for the scale's internal consistency.

### The Beck Anxiety Inventory (Bai)

It is a self-report inventory of 21 items that assess the severity of anxiety. Research [43] on non-clinical samples found that the Arabic version of the BAI has a good psychological scale. For each question, four alternatives representing anxiety symptoms were presented in descending order of severity from 0 to 3, and participants were asked to select the phrase that best described their symptoms of discomfort symptoms over the previous week; the highest score indicates a high level of anxiety. Cronbach's alpha ranged from good to excellent (0.88-0.92), the coefficient of stability was 0.79, and the value of Cronbach = 0.87 in the current study.

## Data Analysis

Descriptive statistics (mean, SD, skewness, and kurtosis) were calculated for the DASS-21 items to examine the distribution indicators. Cohen, Cohen, West, and Aiken (2003) proposed cutoff scores of less than 2 for skewness and less than 7 for kurtosis to test the normality of each DASS-21 item. Internal correlations between the three subscales,

depression, anxiety, and stress, and the overall DASS-21 score were used to assess test-retest repeatability. Values ranging from 0.40 to 0.74 were considered to indicate good reliability [44]. Product moment correlations were calculated to investigate the correlations and temporal stability of the DASS-21 results. In addition to calculating the different correlations between the DASS-21 scores and other measures of similar constructs such as the BDI-II and BAI (convergent/divergent validity), differences in correlations within the sample were tested. In the adult sample, Multivariate analysis of variance (MANOVA) was used to compare the scores of the DASS-21 scales based on demographic variables such as age, gender, educational level, place of residence, marital status, and employment status. Furthermore, using linear regression analyses, the impact of demographic factors on adults' responses to the three subscales was investigated. Varimax rotation, an exploratory factor analysis of the principal axis components, was used to assess construct validity. Factor loading values greater than 0.40 were regarded as robust [22]. A series of CFAs were performed on a sample of study participants to test the different internal structures of DASS-21. Several indicators were used to assess each CFA's suitability. As the chi-square  $X^2$  is very sensitive to sample size, two relative fit indices, non-normal fit index (NNFI) and comparative fit index (CFI), were considered, as both work well with different sample sizes. Acceptable values for these indices are greater than 0.95 and less than 0.97, respectively [45]. The root mean square error of approximation (RMSEA) was used, with an RMSEA value of less than 0.05 indicating a good fit.  $\Delta$ CFI, a qualitative assessment of appropriate indicators, was used to compare models [46]. If the difference in CFIs between two overlapping models is less than 0.01, then the hypothesis that there is no fit difference between the two models should not be rejected. SPSS Version 22.0 was used for all of these analyses.

## Results

### Internal Consistency

For DASS-21 items, distribution indices were computed. Table 1 shows the mean (0.77 to 1.47) for items, means, and standard deviations for the three subscales of depression, anxiety, stress, and the overall DASS-21 score. All DASS-21 items had skewness and kurtosis values less than 2, which are good indicators of normality [47]. Table 2 displays Cronbach's alpha and the correlations between the three subscales of the sample of adults in the population as a whole. Cronbach's alpha coefficients exceeded 0.80, indicating good internal consistency for the subscales and the scale as a whole. Correlations between the three subscales were strong, ranging from 0.69 to 0.80,  $P = 0.01$ . The correlation between each DASS-21 subscale and the overall score was very significant, ranging from 0.87 to 0.94, and all DASS-21 subscales had two-week test-retest reliability (depression  $r = 0.76$ , anxiety  $r = 0.67$ , stress  $r = 0.69$ , total  $r = 0.80$ ). **Table 1 + Table 2 to feature here.**

### Convergent and divergent validity

Pearson's correlation with the Beck depression scale and the Beck anxiety scale was used to determine the DASS-21's convergent and divergent validity. According to Table 2, the depression score in the DASS-21 was more strongly correlated with the contralateral scale BDI-II than with the other non-contrast scales, and the anxiety score in the DASS-21 was more strongly correlated with the contralateral scale BAI than with the other scales. Overall, the results indicated that the DASS-21 had sufficient convergent and divergent validity, and the overall DASS-21 score was similarly correlated with measures of depression, anxiety, and stress.

### Data Distribution

The Kaiser-Meyer-Olkin sampling adequacy scale ( $KMO = 0.957$ ) and Bartlett's test of sphericity ( $X^2 = 10173.778$ ,  $Comp = 0.000$ ,  $DF = 210$ ) results confirmed that the data were suitable for factor analysis and that the model's

adequacy was excellent [55-56].

### Exploratory factor analysis

Various EFAs were performed, and two models (the one-factor model and the three-factor model) were tested. In the single-factor model, it was discovered that all DASS-21 items were loaded on one factor, with a loading factor ranging from 0.472 to 0.778, except for item no. 1, which was loaded on another factor of 0.421 and explained 43% of the total variance. Examination of the three-factor model discovered that items 3, 4, 5, 14, 15, and 19 were loaded on two factors, namely depression and anxiety, with a loading factor greater than 0.30 [44]. Item 8 had a loading factor of 0.389 on the depression subscale and 0.422 on the stress subscale. With a loading factor of 0.343 and 0.419, respectively, item 12 loaded on the anxiety and stress factors. Due to deleting 8 DASS-21 items, we obtained a 13-item DASS-13 scale, as shown in Table 3. **Table 3 to feature here.**

### Confirmatory factor analysis

Three different CFAs were performed to determine the best factor structure for DASS-21 in a sample of Jordanian adults, per the recommendations [48]. The following three models were tested for DASS-21: (a). one-factor, (b). three-factor DASS-21, and (c). three-factor DASS-13. The one-factor model for DASS-21 provided the worst fit (Table 4). **Table 4 to feature here.**

The three-factor DASS-21 model produced appropriate indicators, whereas the three-factor DASS-13 model produced the best indicators. The  $\Delta$ CFI between the three-factor DASS-21 and DASS-13 models was = 0.023 (see Fig. 1, Fig. 2 for models). This supports the hypothesis that there is no difference in fit between the two models. The CFI between the one-factor model and the three-factor DASS model was = 0.009, and this value indicates a difference in fit between the two models, supporting the hypothesis that the three-factor model is the most appropriate. This lends credence to the hypothesis that the three-factor is the best and most suitable. **Fig. 1+ Fig. 2 to feature here.**

### DASS-21 association with demographic variables

The results of the MANOVA to examine the significance of the means differences of the participants' responses to the DASS-21 sub-scales revealed that there are differences between males and females in the scores of the subscales and the total score of the DASS-21, in favor of females. While the analysis revealed no differences in the degrees of the sub-scales or the overall DASS-21 score as a result of other demographic variables (age, educational level, place of residence, marital status, and employment status). This result was confirmed by using linear regression to examine the effect of demographic factors on adults' responses to the three subscales Table 5. **Table 5 to feature here.**

## Discussion

The current study sought to determine the validity of developing a short version of the Jordanian Depression, Anxiety, and Stress Scale-21 on a non-clinical sample of adults despite its utility in differentiating between depressed and anxious patients, concerning the internal structure of the scale. The current study employed methods to assess the internal reliability of the depression, anxiety, and stress subscales and the internal reliability of the scale as a whole. It is essential to assure that the scale is reliable across all population groups. However, there has only been one published assessment of the repeatability of the DASS-21 test and retest, and appropriate statistical tests were used for this purpose. Bottesi et al [15] reported values  $r = 0.75$  for depression,  $r = 0.64$  for anxiety, and  $r = 0.64$  for stress, indicating a moderate positive correlation. The current study calculated Pearson's correlation between the three subscales and the overall DASS-21 score because the Pearson correlation coefficient effectively measures the



relationship between the data test-retest rather than the agreement between them. The DASS-21 formulations were correlated with an acceptable positive correlation in this study. The relationship between anxiety, depression, and stress was at its peak, which supports previous research [24, 49-50]. Positive correlations between the three subscales indicate that there are similarities between items associated with the different scales, which may pose difficulties in detecting signs of depression, anxiety, and stress. This does not fully explain the findings of the construction analysis based on three factors, as suggested by the original scale [17]. These findings demonstrated excellent test and retest validity, indicating that the DASS-21 is appropriate for use with the general adult population in the community. Cronbach's alpha was calculated for each DASS-21 subscale separately and for the overall scale. The scale was found to be reliable in this study, with excellent internal consistency values when compared to those reported in other recent studies [15, 22, 49, 51]. Cronbach's alpha values for the scale as a whole were reported in four studies [15, 37, 49, 51], and these values, along with the values observed in this study, indicated that the DASS-21 had good and acceptable internal consistency and was composed of independent items. The current findings may imply that using the overall DASS-21 score is just as appropriate as calculating the scores of the three subscales individually. This score represents the idea that the DASS-21 is a common overall measure of distress, and the DASS-21 appears to be equally appropriate for research purposes because it measures general distress in a very efficient and economical manner.

In light of the current findings, I believe that DASS-21 may enable the purposeful and effective measurement of depression-anxiety traits and general distress traits, per the findings of a study [22], and this finding is consistent with Clark and Watson's [13] model, which suggests that negative influence can be a common feature of depression and anxiety syndromes, each of which is distinguished by its items. For all DASS-21 scores, the two-week temporal stability was acceptable. In particular, the correlations between the measures were positive and good in the current study's sample of participants, which is consistent with previous findings [15, 19, 24, 33]. Furthermore, the results of the associations between the three subscales and measures of the same different constructs are generally satisfactory, which is consistent with previous research [21, 24, 52].

The research examined the convergent and discriminatory validity of measures of anxiety and depression but did not include a measure of stress. Indeed, the stress scale was positively correlated with both the BDI-II scale and the BAI scale with high reliability, and this result is consistent with previous findings [22]. The analyses revealed only minor associations between age and DASS-21 scores, indicating that the questionnaire is largely insensitive to age, as well as educational level, place of residence, marital status, and employment status. Because the analyses revealed no significant relationship between these demographic variables and any of the DASS-21 scale scores, the current findings regarding age, educational level, place of residence, marital and occupational status, and marital and occupational status provide evidence that the previous demographic characteristics do not affect the results of the Jordanian version of DASS-21, allowing it to be administered to a large population. The analyses revealed strong and positive correlations between gender and total DASS-21 scores on the one hand, and gender and DASS-21 sub-scales scores on the other, indicating the scale's gender sensitivity. Females scored higher on the overall scale and on the DASS-21 subscales, which is consistent with previous findings that show higher levels for women than men of depression [53], anxiety [23], stress [23], and total score for DASS-21 [53]. These findings confirm that the three constructs have high, concordant, and motivating validity, and they are consistent with previous research that has looked at associations between the DASS-21 and other measures. While other studies have found no gender differences in any of the three DASS-21 subscale scores [15], Wang et al [26] found that males scored significantly higher on the depression scale than females in their validation study in China, which could be due to cultural differences.

The structural analysis of DASS-21 reveals some issues, such as forcing some items to be loaded on more than one structure or forcing them to be loaded on nominally unrelated structures. The scale's 20 items were loaded onto a single factor, which is thought to be the general distress factor, except for item 1, which was loaded to a factor other than the general distress factor in the one-factor model. In the three-factor model, items 3, 4, 5, 14, 15, 19 were carried on the depression and anxiety factors, item 8 was carried on the depression and stress factors, and item 12 was carried on the anxiety and stress factors. After removing the eight items, the three-factor model achieved better item adjustment. According to the three-factor model of DASS-21, it was necessary to delete eight items from DASS-21 to achieve an acceptable model fit. Consequently, we obtained a new version, DASS-13, in the current study. A variety of appropriate indicators were used to evaluate the original three-factor model's suitability. The results showed a high level of model agreement, confirming that the Jordanian version measures three distinct structures as suggested by Lovibond and Lovibond [16]. The current result is consistent with previous research [24–25, 27]; this validated the original three-factor model as the best factorial structure. The current study's findings indicate that the representation of DASS-21 sub-scales remains questionable with its various models; however, the current study's findings do not differ from previous studies [24, 51-52], with DASS-21 presenting a clear contrast.

Other exploratory factor analyses of DASS-21 in the adult population sample and previous studies [19, 22, 49] noted the structural problems encountered by the current study's three-factor model. These issues are the primary reason for further investigation, which should include alternative testing models that might fit better. The three-factor model was found to be the most appropriate for adults in most studies [5, 15, 36, 51, 54]. Some of the limitations of the current study included the temporal stability that was made in one group of participants, so the temporal stability results were based on data from a sample of university students. Members of the Jordanian community were sought in the north, center, and south of the country. The characteristics of the participants revealed that the Southern Jordanian regions were more representative than the Northern and Central Jordanian regions. As a result, the population distribution of the participants in the study sample is uneven. Because the participants were from a non-clinical sample of community adults, it is unclear how their findings can be applied to clinical samples; therefore, the current study recommends that future studies on the psychometric properties of the DASS-21 include larger multicenter samples. Based on the current results of the exploratory factor analysis of the DASS-21 in the adult sample, additional studies to extract normative data for DASS-21 are required, as well as a review of some items and further analyses to determine the scale's reliability in other populations.

## Conclusions

We conclude that the Jordanian version of the DASS-13 can be used as a reliable and valid tool for measuring depression, anxiety, and stress in an adult population in Jordan, and providing the psychometric properties of DASS-21 will assist Jordanian clinicians and researchers in quickly examining common mental disorders in the community. Furthermore, the current study's findings contribute to determining the potential benefit of using the scale's overall score as a measure of general distress, because CFA modeling revealed that DASS-21 is a significant common factor of general mental disorder.

## Abbreviations

DASS-21: Depression Anxiety Stress Scal-21, BDI-II: The Beck Depression Inventory-II, **BAI**: The Beck Anxiety Inventory, EFA: Exploratory factor analysis, CFA: Confirmatory Factor Analysis, RMSEA: Root Mean Square Error of Approximation, NNFI: Non-Normal Fit Index, CFI: Comparative Fit Index, RMR: Root Mean Square Residual Index, SRMR: Standardized Root Mean Square Residual Index, WHO: World Health Organization,

# Declarations

## Ethical Approval and Consent

Procedures followed in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration. Authors' confirmed that the experimental protocols were approved by the deanship of the scientific research at Al-Balqa Applied University and the department of planning and follow-up in the Ministry of Health. Informed consent obtained from all subjects.

## Consent for publication

Not applicable.

## Availability of data and material

The datasets analyzed during this study is not publicly available because of ethical restrictions. Contact the corresponding author.

# Competing interests

The author declares that he has no competing interest.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Author contribution

The corresponding author is the one who has done all the work related to the manuscript such as: Supervision, Conceptualization, Methodology, Writing- Original draft preparation and data analysis. Reviewing and Editing. Software, Visualization, Investigation. Data curation Validation. Data curation and Writing.

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## Author details

\*Corresponding Author, Al-Balqa Applied University<sup>1</sup>, Al-Shoubak University College,

P. O .Box (5) Al-Shouback –71911 – Jordan , Phone Number- 00962775082355

Odehmurad@bau.edu.jo

<http://orcid.org/0000-0002-1264-1409>

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## Tables

**Table 1** *Items distribution (n=935)*

Item No.	Mean	SE	SD	Min.	Max.	Skewness	Kurtosis
1	1.24	0.03	0.97	0.0	3.0	0.207	-0.994
2	1.19	0.03	1.0	0.0	3.0	0.394	-0.931
3	1.29	0.03	1.05	0.0	3.0	0.301	-1.114
4	1.19	0.03	1.0	0.0	3.0	0.410	-0.915
5	0.80	0.03	1.0	0.0	3.0	0.883	-0.455
6	0.97	0.03	1.02	0.0	3.0	0.666	-0.787
7	0.82	0.03	1.0	0.0	3.0	0.938	-0.361
8	1.03	0.03	1.0	0.0	3.0	0.598	-0.787
9	1.28	0.03	1.11	0.0	3.0	0.286	-1.267
10	0.91	0.03	1.02	0.0	3.0	0.766	-0.675
11	0.84	0.03	1.0	0.0	3.0	0.915	-0.377
12	1.0	0.03	0.98	0.0	3.0	0.619	-0.686
13	1.47	0.03	1.09	0.0	3.0	0.081	-1.258
14	1.15	0.03	0.95	0.0	3.0	0.410	-0.779
15	1.42	0.03	1.06	0.0	3.0	0.175	-1.182
16	1.28	0.03	1.09	0.0	3.0	0.341	-1.811
17	0.77	0.03	1.02	0.0	3.0	1.05	-0.196
18	0.88	0.03	1.0	0.0	3.0	0.848	-0.488
19	1.07	0.03	1.05	0.0	3.0	0.547	-0.947
20	1.46	0.03	1.12	0.0	3.0	0.083	-1.365
21	1.20	0.03	1.20	0.0	3.0	0.408	-1.40

**Table 2** *Summary statistics for the DASS-21 (N=935), Convergent and Divergent Validity*



	Cronbach' alpha	M	SD	Range	1	2	3	Total
DASS-21								
1. Depression	0.89	15.6	11.64	42	1.0	0.80**	0.69**	0.92**
2. Anxiety	0.87	16.9	11.0	42		1.0	0.72**	0.94**
3. Stress	0.82	14.2	9.6	42			1.0	0.87**
Total	0.94	46.62	29.32	126				1.0
BDI-II	0.85	22.4	10.1	63	0.51**	0.41**	0.46**	0.51**
BAI	0.87	23.2	9.8	63	0.50**	0.62**	0.49**	0.63**

BDI-II: Beck Depression Inventory-II; BAI: Beck Anxiety Inventory.

\*\*  $p < 0.01$

**Table 3** Exploratory factor analysis (DASS-21 One Factor, DASS-21 Three Factors, DASS-13 Three Factors)

Subscales	Item NO.	Communalities		DASS-12 One Factor	Factor Loadings DASS-21			Item NO.	Factor Loadings DASS-13		
		Initial	Extraction		1	2	3		1	2	3
Depression	3	0.619	0.610	0.760	0.534	0.530	3	Deleted			
	5	0.532	0.526	0.726	0.513	0.406	5	Deleted			
	10	0.536	0.545	0.711	0.607		10	0.623			
	13	0.570	0.584	0.720	0.590		13	0.597			
	16	0.578	0.624	0.730	0.699		16	0.698			
	17	0.448	0.489	0.624	0.640		17	0.655			
	21	0.525	0.593	0.677	0.714		21	0.730			
Anxiety	2	0.340	0.360	0.550		0.507	2		0.503		
	4	0.612	0.619	0.778	0.492	0.547	4	Deleted			
	7	0.379	0.374	0.581		0.434	7		0.488		
	9	0.550	0.581	0.716		0.625	9		0.639		
	15	0.487	0.478	0.661	0.471	0.486	15	Deleted			
	19	0.541	0.511	0.716	0.428	0.445	19	Deleted			
	20	0.560	0.635	0.718		0.691	20		0.732		
Stress	1	0.320	0.244	0.421		0.405	1		0.355		
	6	0.436	0.603	0.472		0.759	6		0.851		
	8	0.420	0.416	0.629	0.389	0.422	8	Deleted			
	11	0.495	0.536	0.608		0.619	11		0.529		
	12	0.361	0.349	0.554		0.343	0.419	12	Deleted		
	14	0.471	0.425	0.654	0.407	0.388	0.330	14	Deleted		
	18	0.518	0.510	0.663		0.502		18		0.493	

**Table 4** *Confirmatory factor analysis*

Model	n	$\chi^2$	df	P	NNFI	CFI	RMSEA	RMR	SRMR
Unidimensional	935	720.524	170	0.000	0.932	0.945	0.059	0.041	0.0384
DASS-21	935	628.169	167	0.000	0.942	0.954	0.054	0.038	0.0350
DASS-13	935	168.925	55	0.000	0.968	0.977	0.047	0.032	0.0290
Cut-off (Schermelleh-Engel, Moosbrugger, & Muller, 2003)					>0.90	>0.95	<0.05	<0.05	<0.05

**Table 5** *Demographic variables and psychological impact*

Factor	N	Depression			Anxiety			Stress		
		R <sup>2</sup>	AR	B	R <sup>2</sup>	AR	B	R <sup>2</sup>	AR	B
Age	935	0.038	0.037	-0.196	0.037	0.036	-0.193	0.006	0.005	0.080
Gender										
Male	471	0.029	0.028	0.171*	0.047	0.046	0.216*	0.023	0.022	-0.151*
Female	464									
Education Level										
Elementary	16	0.002	0.002	-0.041	0.000	-0.001	0.000	0.002	0.001	0.144
Secondary	174									
Diploma	273									
Bachelor's	319									
Higher Education	153									
Residential Area										
North Province	211	0.005	0.004	0.073	0.005	0.004	0.068	0.000	-0.001	0.010
Middle Province	196									
South Province	528									
Marital Status										
Single	452	0.018	0.017	-0.135	0.017	0.016	-0.130	0.001	-0.001	-0.023
Married	470									
Divorced	13									
Employment Status										
Yes	394	0.001	0.000	0.030	0.000	-0.000	0.020	0.009	0.008	-0.094
No	541									

R<sup>2</sup>: R –Squared; AR: Adjusted R –Squared; B: Beta 95%; \*  $p < 0.05$

## Figures

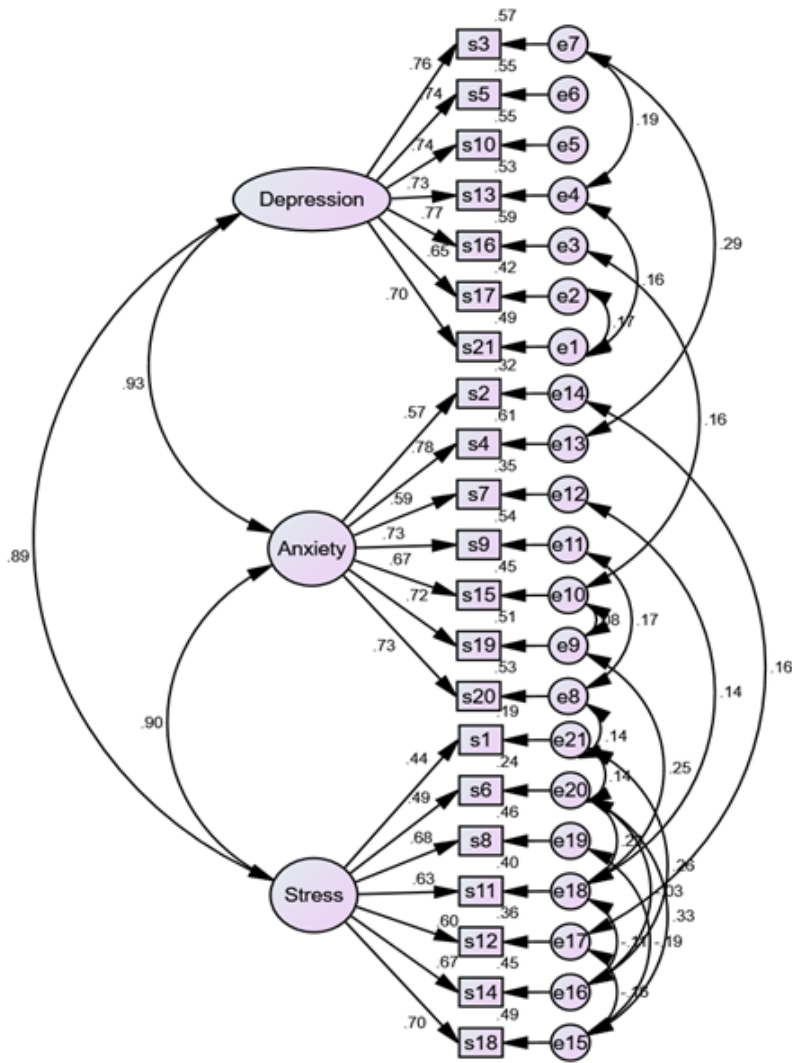


Figure 1

DASS-21 Model

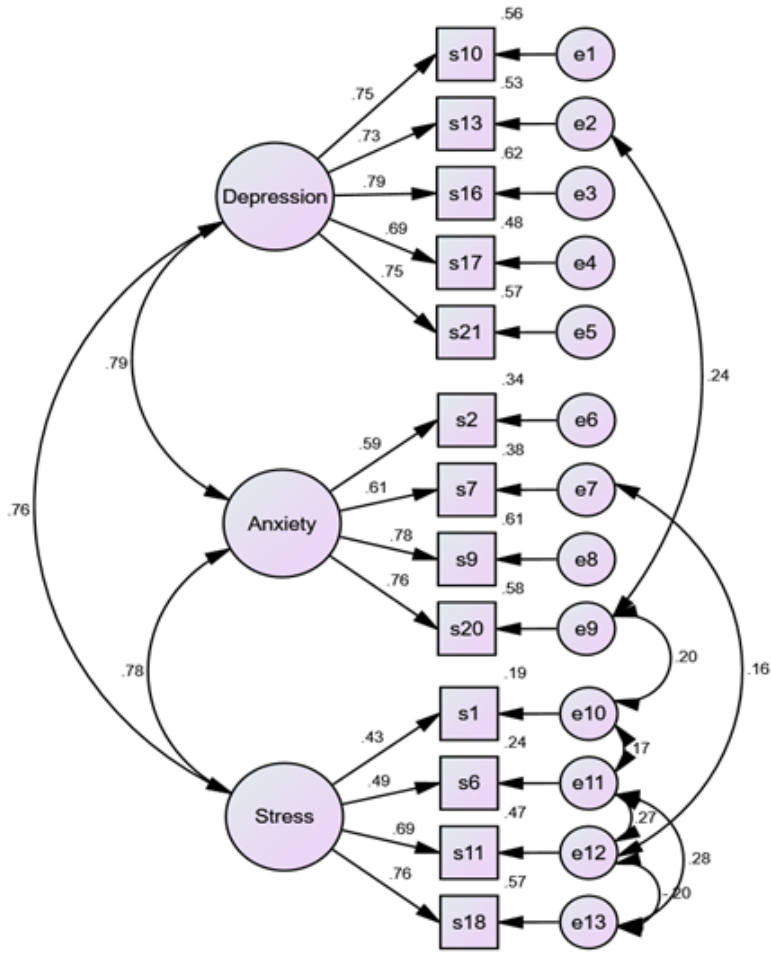


Figure 2

DASS-13 Model

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Dass21.pdf](#)