The Psychometric Properties of the 21-Item Depression Anxiety and Stress Scale (DASS-21) among a Sample of Young Adults

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Abstract

The 21-item shortened version of the Depression Anxiety and Stress Scale (DASS-21) is frequently used in non-clinical research to measure mental health factors in healthy young adults. Yet the psychometric properties, including its dimensionality, have not been investigated in non-clinical samples. The purpose of this paper was to investigate the dimensionality, internal consistency, and construct validity of the DASS-21 in a sample of young adults. In a cross-sectional study, 508 undergraduate students aged 18-24 completed mailed surveys which included the DASS-21. Coping strategies and life satisfaction were assessed using the Brief COPE Inventory and an adapted version of the Brief Students' Multidimensional Life Satisfaction Scale. Exploratory factor analysis was used to investigate the dimensionality of the DASS-21. Construct validity was evaluated based on the transactional model of coping and the quality of life model of life satisfaction. Findings supported the reliability, validity, and the 3-factor dimensionality of the DASS-21. The DASS-21 is a useful instrument for distinguishing between depression and anxiety.

Keywords: DASS-21, psychometric prosperities, exploratory factor analysis, reliability, construct validity, young adults

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Introduction

This paper aims to examine the reliability and validity of the 21-item shortened version of the Depression Anxiety and Stress Scale (DASS-21)[1] in college students. The DASS-21 is a self-report 4-point Likert-type measure of three dimensions of mental health: depression, anxiety, and stress. The 42-item DASS was developed to better distinguish between depression and anxiety than previous scales had done, scales that produced considerable overlap between these two constructs.[2]

The development of the DASS was based on the tripartite model of depression and anxiety.[3] Items related to low positive affect, low self-esteem, hopelessness, and lack of incentives loaded on one factor and were categorized as depression while items related to autonomic arousal and fearfulness were categorized as anxiety. Nonetheless, there was a group of items which neither loaded on depression nor on anxiety, but loaded on a third factor of irritability and over reactivity. This 3-dimensional property of the DASS has been confirmed in several studies.[2,4,5]

Items included in the DASS-21 were selected by the authors to represent all subscales;[1] however, the use of factor analysis to investigate the scale's dimensionality was not found. When the psychometric properties of the DASS-21 were evaluated in clinical and nonclinical samples, acceptable alpha reliabilities for the DASS–21 subscales were reported;[4] however, the exploratory factor analysis conducted in that study involved only the clinical sample.

Even though the DASS-21 has been widely used for measuring depression, anxiety, and stress among non-clinical populations, to date there is only one study that examined its dimensionality and construct validity among a non-clinical population.[6] In this study, the 3-dimensional nature of the DASS-21was supported using a confirmatory factor analysis (CFA); however, it was conducted on a heterogeneous community sample aged 18 to 91 years ($M = 41 \pm 15.9$). Considering the fact that age is one of the important factors that may be associated with an increase or decrease in certain psychological symptoms such as depression[7] and that this study did not display whether the 3-dimensional factor structure was consistent across the different age groups, it is essential to further examine the dimensionality and construct validity of the DASS-21 among an age-homogenous non-clinical sample.

A recent study examining the dimensionality of the DASS-21 in young adolescents and children indicated that this instrument is unidimensional and questioned its ability to distinguish between depression, anxiety, and stress.[8] They concluded that the psychological distress symptoms, included in this measure, cannot be categorized into three distinctive constructs in this age group. They proposed that the three-dimensional structure of these symptoms emerge in the late adolescence and cannot be identified until the adulthood. Since young college students (age 18 – 24) are in a transitional developmental stage between adolescence and adulthood,[9-11] it is important to investigate the structure of these symptoms among them.

The specific aims of this study were to: investigate the dimensionality of the DASS-21, examine its internal consistency, and evaluate its construct validity in a sample of young adults. One recommended method for assessing the construct validity of an instrument is examining the correlation of the measure being evaluated with variables that are assumed to

be theoretically related to the constructs measured by the instrument.[12] According to the transactional model of coping (TMC),[13] adaptive coping refers to the effectiveness of coping in improving the adaptation outcome. Thus, adaptive coping behavior is seen as a buffer which neutralizes the impact of a stressful situation and promotes psychological well-being and functional status. Conversely, maladaptive coping is failing to resolve the stressful situation successfully and may result in psychological distress symptoms such as depression, anxiety, and stress.

On the other hand, according to the quality of life (QOL) model of life satisfaction,[14] individuals' overall life satisfaction consists of the sum of satisfactions in particular domains or areas of life that are valued as important by an individual. Positive affect and pleasant emotions stem from satisfaction with met or fulfilled needs while negative affect results from unmet needs in valued areas of life.[15] Based on these two models, three hypotheses were generated to test construct validity.

1. Depression, anxiety, and stress, as measured by the DASS-21, are associated with maladaptive coping.
2. Depression, anxiety, and stress, as measured by the DASS-21, are negatively associated with adaptive coping.
3. Depression, anxiety, and stress, as measured by the DASS-21, are negatively associated with life satisfaction.

Method

Design and Sample

This is a secondary analysis of cross-sectional data collected in 2007 to evaluate the general well-being of University of Kentucky college students. After Institutional Review Board approval and with the assistance of the Office of the Registrar, a sample of 1,700 full-time undergraduate students, ages 18-24 years, was randomly selected. Students were passively consented by cover letter which was mailed to them with the questionnaire, a two-dollar bill incentive, and a stamped and addressed return envelope. Acknowledgment postcards were sent to students who responded and follow-up reminder ones were sent to those who did not respond to the initial survey mailing one week later. Finally, a second survey package was sent to those who had not yet responded within a three-week period. Out of the 1,700 mailed questionnaires, 109 were undeliverable. The response rate was 32% ($N = 511$); of these, three respondents identified themselves as graduate students and were excluded from the data analysis.

Instruments

Depression, Anxiety & Stress Scale (DASS-21).[1] DASS-21 is a short form of DASS which is a self-report 4-point Likert scale and composed of three subscales: Depression (DASS-D), Anxiety (DASS-A), and Stress (DASS-S). The DASS-21 measures each of the three mental health conditions, over the past week, through seven items. Responses on each item range was from 0 (*did not apply to me at all*) to 3 (*applied to me very much*). The intensity of any of the three conditions is determined by the sum scores of responses to its 7-item subscale. The alpha reliability coefficients for the DASS–21 subscales have been examined in clinical and nonclinical samples and reported as .94 for DASS-D, .87 for DASS-A, and .91 for DASS-S.[4]

Brief COPE Inventory (BCI).[16] BCIis the abbreviated version of the original 60-item COPE Inventory.[17] It is a 28-item self-report 4-point Likert-scale instrument containing 14 2-item scales, which are categorized as adaptive and maladaptive. Responses on each item range from 0 (*I usually don't do this at all*) to 3 (*I usually do this a lot*). Coping is the sum of the 28 items ranging from 0 – 84; adaptive coping is the sum of 16 items ranging from 0 – 48, and maladaptive coping is the sum of 12 items ranging from 0 – 36. Higher scores on either scale indicate more frequent use of that coping style. Both the adaptive and maladaptive scales had good internal consistency with Cronbach's alphas of .88 and .81, respectively, in this sample.

The Brief Students' Multidimensional Life Satisfaction Scale (BSMLSS).[18] The BSMLSSis a 40-item self-report instrument that measure satisfaction with different aspects of life. Responses on each item range from 1 (*terrible*) to 7 (*delighted*). For the purpose of this study, eleven items were selected to represent different aspects of life satisfaction. The Cronbach's alpha of this 11-item shortened scale was .85 in this sample. Life satisfaction is the sum of 11 items ranging from 1 – 77. The higher the score on this scale the greater the life satisfaction.

Procedure

Statistical analyses were conducted using the SPSS (version 11.0, SPSS Inc, Chicago, Ill). The data set was first checked for the assumptions of regression analysis using the residual scatter plot and the normal probability plot. Scores of depression and anxiety were found to be positively skewed (*skew* = 1.65, 2, respectively); however, having a large enough sample size ($N = 508$) and more than 10 observations for each predictor make the regression robust to departures from normality.[19] Tolerance values were found to be greater than .10, while VIF values were smaller than 10. Thus, no problem of multicollinearity was found to exist.

In the first phase of analysis, descriptive statistics were used to characterize the demographics of the sample and the distribution of the three mental health factors among students. To examine the factor structure of the DASS-21, an oblique (oblimin) rotation was chosen to account for the fact that the three separable structures of the DASS-21 are moderately correlated.[20] Internal consistency reliabilities for the DASS-21, BCI, and the adapted 11-item BSMLSS were examined using Cronbach's alpha. In order to test the three hypotheses related to the construct validity of the DASS-21, three separate multiple regressions were run to evaluate the ability of adaptive coping, maladaptive coping to predict each of the three mental health factors, depression, anxiety, and stress. Alpha was set at $P < .05$.

Results

Sample Description

The students' demographic characteristics are displayed in Table 1. The total number of undergraduates who participated in this study was 508, of these, 355 (66%) were female. Students' mean age was 20 ($SD = 1.6$), and their mean GPA was 3.2 ($SD = .60$). Female and male students were similar in their mean age, class standing, residency, ethnicity, religiosity, and parents' marital status. On the other hand, female students were more likely to belong to a social organization and have higher academic performance, as measured by GPA, than males. In addition, female students scored higher on anxiety and stress subscales and used coping strategies, both adaptive and maladaptive, more frequently than males. Female and male students reported similar levels of depression and satisfaction (see Table 2). With regard to students' scoring on the DASS-21 subscales, 29% of the students were depressed, 27% were anxious, and 24% were stressed.

Dimensionality, Internal Consistency, and Construct Validity of the DASS-21

Dimensionality. Principal components analysis was conducted to investigate the dimensionality of the DASS-21. The number of factors to be retained and rotated was determined by examining the magnitude of the Eigenvalues and inspecting the scree plot. Only factors before the drop-off point were retained.[21] Since the three subscales are moderately intercorrelated,[1,4] which was supported by evidence from the current study ($r = .75$ to $.76$), oblique rotation (oblimin) was applied to obtain the final factor solution. This technique was chosen because it allows for intercorrelation among the factors thereby minimizing the number of cross-loading items and maximizing the number of the extracted factors which have as many primary loadings as possible.[22] The item-contribution to a certain factor was determined by a factor loading equal to or greater than .40 on that factor.

Three factors had Eigenvalues greater than 1 (10, 1.3, 1.2) accounting for 60% of the variance. The application of the oblimin rotation to the first three principal components produced the factor structure reported in Table 3. Loading for all items were .40 in magnitude or greater. A few items displayed a different loading pattern from that of the DASS.[2] For example, item # 14, (*I was intolerant of anything that kept me from getting on with what I was doing*) and item #18, (*I felt that I was rather touchy*),which were categorized in as related to stress,[2] had clear loadings on the depression factor. In addition, item # 15, (*I felt I was close to panic*), an anxiety item in the DASS, had a clear loading on the depression factor. On the other hand, there were two items related to autonomic arousal and fearfulness, classified in the DASS as related to anxiety, item # 2, (*I was aware of dryness of my mouth*), and item # 9, (*I was worried about situations in which I might panic and make a fool of myself*), that had clear loadings on the stress factor. Item # 8, (*I felt that I was using a lot of nervous energy*), a stress item in DASS, double loaded on stress and anxiety.

Internal consistency. Cronbach's alpha was computed for each of the three subscales before and after factor analysis, where only items with primary loadings were included. The reliability of the items forming each dimension remained nearly the same. Cronbach's alphas before the factor analysis were .90 for Depression, .83 for Anxiety, .86 for Stress. After factor analysis, the alpha remained the same for the Depression and decreased by .03 and .04 for Anxiety and Stress, respectively. Thus, no modification in the items categorization was suggested.

Construct validity. To test the three hypotheses related to the construct validity of the DASS-21, separate multiple regression models were run for the DASS-21 total and subscales scores. The aim of each model was to examine the ability of maladaptive coping, adaptive coping, and satisfaction to predict each of these three mental health factors and the DASS-21 total score. The standardized regression coefficient, Beta (*β*), was used to determine the strength and direction of the association (see Table 4).

Findings support the first hypothesis; maladaptive coping predicted depression, anxiety, and stress. For the second hypothesis, adaptive coping only predicted depression. The third hypothesis was supported; life satisfaction predicted all the three constructs.

Discussion and Conclusion

This study is the first to run an EFA for the DASS-21 in a non-clinical young adult sample. The findings supported the 3-dimensional structure of this scale which was outlined in previous CFA study.[6] Further, the factor pattern was almost

consistent with that of the DASS[2] and supported the theoretical perspective of the tripartite model[3] with regard to how anxiety and depression were distinguished from each other. In the present sample, depression was defined by items related to low positive affect, low self-esteem, hopelessness, and lack of incentives while anxiety was mainly defined by those related to autonomic arousal. Stress was defined by difficulty relaxing, irritability, and over reactivity.

Consistent with findings from similar studies among adults[4] and elderly,[23] our findings indicated that the psychological symptoms measured by the DASS-21 can be distinguished into three main constructs in young adult college students, depression, anxiety, and stress. The high correlations and coexistence of depression, anxiety, and stress in this population shouldn't be misinterpreted as an indicator of their unitary structure.[24] Rather it highlights the importance of evaluating these symptoms simultaneously but distinctively.

The findings supported the theoretical relationships between the three main constructs measured by the DASS-21 and coping proposed in the TMC model.[13] Depression, anxiety, and stress were associated with maladaptive coping. In addition, the current findings are consistent with the QOL model of life satisfaction;[14] the higher the life satisfaction, the lower the scores on the three DASS-21 subscales. These results supported the validity of the DASS-21 and the findings of previous validation studies.[4,6] In conclusion, this study provides support for the reliability and validity of the DASS-21 as a measure for distinguishing among the three constructs of depression, anxiety, and stress in young adult college students.

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Table 1. Sample Demographics by Gender

Characteristics/ Categories, *n* (%)	Total sample (*N* = 457)	Male (*n* = 156)	Female (*n* = 301)	*P*
Class Standing				*Ns*
Freshman	111 (24)	33 (21)	78 (26)	
Sophomore	94 (21)	32 (20)	62 (21)	
Junior	111 (24)	37 (24)	74 (25)	
Senior	141 (31)	54 (35)	87 (29)	
Residency				*Ns*
On-campus	164 (36)	49 (31)	115 (38)	
Off-campus	293 (64)	107 (69)	186 (62)	
Living with someone	401 (88)	137 (88)	264 (88)	
Living alone	56 (12)	19 (12)	37 (12)	
Religiosity				*Ns*

Religious	355 (78)	117 (75)	238 (80)	
Not religious	102 (22)	39 (25)	63 (20)	
Ethnicity				Ns
Caucasian	412 (91)	138 (90)	274 (91)	
Others	42 (9)	16 (10)	26 (9)	
Belonging to social organization				< .01
Yes	98 (21)	19 (12)	79 (26)	
No	358 (79)	137 (88)	221 (74)	

Table 2. Mean and Standard Deviations of Mental Health Factors, Coping, and Life Satisfaction by Gender

Categories, $M \pm SD$	Total sample ($N = 457$)	Male ($n = 156$)	Female ($n = 301$)	P
Mental health factor				
Depression	7.70 ± 8.10	6.71 ± 8.26	8.27 ± 9.00	ns
Anxiety	5.15 ± 6.69	3.94 ± 5.93	5.81 ± 7.00	< .01
Stress	10.42 ± 8.90	8.44 ± 8.12	11.55 ± 9.00	< .0001
Coping	32.35 ± 12.65	28.72 ± 13.39	34.25 ± 13.39	< .0001
Adaptive	22.89 ± 9.27	20.74 ± 10.00	24.00 ± 8.70	< .001
Maladaptive	9.47 ± 5.50	8.00 ± 5.20	10.25 ± 5.52	< .0001

Life satisfaction   54.70 + 9.60 54.21 + 10.0054.83 + 9.51   *ns*

Table 3. Factor Pattern Matrix for the Oblique Rotation of Three Factors for the DASS-21(N =508)

	Factor[b]		
Items (Original subscale)[a]	I	II	III
21. I felt that life was meaningless (D).	.89	- .17	.07
17. I felt I wasn't worth much as a person (D).	.86	- .10	.09
16. I was unable to become enthusiastic about anything (D).	.78	.00	.11
10. I felt that I had nothing to look forward to (D).	.77	.05	.08
13. I felt down-hearted and blue (D).	.73	.27	- .13
18. I felt that I was rather touchy (S).	.50	.14	.07
5. I found it difficult to work up the initiative to do things (D).	.54	.29	- .09
3. I couldn't seem to experience any positive feeling at all (D).	.53	.13	.23
14. I was intolerant of anything that kept me from getting on with what I was doing (S).	.42	.37	- .01
15. I felt I was close to panic (A).	.40	.16	.36
1. I found it hard to unwind (S).	- .06	.80	- .03
12. I found it difficult to relax (S).	.18	.73	- .04
11. I found myself getting agitated (S).	.17	.70	.00

8.	I felt that I was using a lot of nervous energy (S).	- .12	**.60**	**.41**
9.	I was worried about situations in which I might panic and make a fool of myself (A).	.06	**.57**	.16
2.	I was aware of dryness of my mouth (A).	.05	**.47**	.14
6.	I tended to over-react to situations (S).	.30	**.41**	.08
19.	I was aware of the action of my heart in the absence of physical exertion (A).	.06	.01	**.74**
20.	I felt scared without any good reason (A).	.20	- .09	**.73**
4.	I experienced breathing difficulty (A).	00	.11	**.72**
7.	I experienced trembling (A).	.01	.07	**.70**

[a] DASS-21subscales: D = Depression, A = Anxiety, S = Stress.

[b] Factor I = Depression, Factor II = Stress, and Factor III = Anxiety.

Note: loadings ≥ .40 are in boldface type.

Table 4. Standardized Regression Coefficients Describing Relationships of Adaptive Coping, Maladaptive Coping, and Life Satisfaction with the DASS-21 and its Subscales (N =508)

	Predictors in the Model		
Outcome	Maladaptive Coping	Adaptive Coping	Life Satisfaction
DASS-21 Total Score	.58***	- .05	- .29***

Depression	.56***	- .12**	- .35***
Anxiety	.54***	- .04	- .18***
Stress	.54***	.03	- .23***

** *P* < .01, *** *P* < .0001