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CHAPTER 4

Psychometric properties of the Depression, Anxiety and Stress Scale (DASS-21) in a large non-clinical sample

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ABSTRACT

Background

Symptoms of depression, anxiety and stress occur frequently, and contribute to a large public health problem. The Depression, Anxiety and Stress Scale (DASS) could help monitor these symptoms at population level, but evidence of its psychometric properties is lacking. This study aims to assess the psychometric properties of the Depression, Anxiety and Stress Scale (DASS-21) in a Dutch non-clinical, community-based sample.

Methods

We obtained cross-sectional data on a non-clinical sample of 8,037 adults. We assessed the scale structure of the DASS using factor analyses and the internal consistency of its scales and subscales.

Results

Principal components factor analysis with varimax rotation revealed a simple factor structure for each of the three DASS subscales. All the items loaded on their corresponding factors with factor scores of over .46. The three factors – depression, anxiety and stress – accounted for 48.8% of the variance. Confirmatory factor analysis also supported the latent three-factor structure of the DASS-21. Cronbach's alphas for the depression, anxiety and stress subscales and the full scale were .83, .76, .82 and .90, respectively.

Conclusion

The results of this study indicate that the psychometric properties of the DASS-21 are sound in a general population for assessing the symptoms of depression, anxiety and stress. It can be used in non-clinical samples without adjustments.

Key words

Depression, anxiety, stress, psychometrics, adults

INTRODUCTION

Depression, anxiety and stress are major and still growing public health problems. Depression is one of the most widespread of diseases with the highest burden [1], with a lifetime prevalence of up to 15% in men and 24% in women [2,3]. Depression, anxiety and stress symptoms affect both the individuals suffering from these symptoms and wider society. Individual level consequences include difficulties with social relationships and work functioning. Societal effects concern sickness absence from work or school and productivity loss at work. [4]

Good instruments are required to estimate the population prevalence and to monitor this public health issue. The Depression, Anxiety and Stress Scale (DASS) is a short self-report measure of the symptoms of depression, anxiety and stress developed by Lovibond and Lovibond [5], which could be suitable for use in public health monitoring. The shortened 21-item version of the DASS consists of three subscales of 7 items each. It was derived from the original 42-item DASS version by selecting the highest loading items from each its subscales.[5,6] Anthony concluded that the DASS-21 had several advantages over the 42-item version because it was shorter, and had a clearer factor structure and narrower inter-factor correlations, suggesting a better distinction between the three factors [7]. The DASS-21 has previously been tested in clinical and non-clinical samples [7-12], among specific groups [13,14] and in other cultures [15], generally supporting its construct validity. However, other studies found differing factor structures or some items being allocated to deviant constructs.[13,16] The psychometric properties of the DASS-21 in a Dutch, non-clinical, community-based setting are unknown.

The aim of this paper is to examine the psychometric properties of the short version of the Depression, Anxiety and Stress Scale (DASS-21) in a large adult community-based sample in the Netherlands.

METHODS

Participants

The study sample comprised a community sample of 9,453 (response 65%) parents of primary school children. Data were obtained in a Preventive Child Healthcare (PCH) setting, which is provided free of charge to all Dutch parents. We excluded the 1,416 respondents who had completed the questionnaire jointly with their partner. This resulted in a final sample of 8,037 unique subjects. Participation in this study was voluntary and all participants signed an informed consent form. The Medical Ethics Committee of the University Medical Center of Groningen approved the study design, procedures and informed consent.

Measures

Respondents were asked to complete questions on their background (i.e. age, education, work situation and ethnicity) and on three dimensions of negative emotional states, namely depression, anxiety and stress. The 21-item Depression, Anxiety and Stress Scale (DASS) was used

to assess general symptoms of depression, anxiety and stress in these adults. The short version of the Depression, Anxiety and Stress Scale (DASS-21) consists of three subscales of 7 items each: a depression scale, an anxiety scale and a stress scale. Participants rated the extent to which they had experienced each symptom over the previous week on a four-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). DASS-21 scores were multiplied by 2 to generate comparable outcomes to the 42-item version of the DASS. Accordingly, the minimum score on the DASS-21 is 0 and the maximum score is 126. The minimum score for each of the subscales is 0 and the maximum score is 42. Socio-demographic characteristics included gender, ethnicity, educational level, work situation and participant age.

Statistical analysis

We first assessed the background characteristics of the sample. Next, a principal component analysis was performed to assess the DASS-21 factor structure. The number of factors was determined by the eigenvalues (>1). Subsequently, confirmatory factor analysis was applied to assess whether our data fitted the structure and allocation of items to the three DASS subscales, as proposed by Lovibond and Lovibond [5]. Goodness of fit was evaluated using the Root Mean Square Error of Approximation (RMSEA) – a value below 0.05 indicating a close fit. Furthermore, we used the Comparative Fit Index (CFI) indices to assess the improvement in the fit of the model compared to a baseline model in which the uncorrelated observed variables were assumed. A CFI above 0.95 is indicative of a very good fit.[17,18] Finally, we assessed the internal consistency of the DASS-21 and calculated Cronbach's alphas. Inter-item correlations and mean inter-item correlations were calculated to verify their interrelationships. Data were analysed using Predictive Analytics SoftWare (PASW) 20.0 and Lisrel 8.80.[19]

RESULTS

Missing data

Only fully completed DASS scales (n=7,428) were used in the factor analyses. At least one DASS item was missing for 609 respondents (7.5%). The number of missing scores on the DASS-21 was higher among respondents with lower education (Cohen's w=.03, p<.001), among immigrants (Cohen's w=.09, p<.001), and among respondents working less than 12 hours a week (Cohen's w=.03, p<.01).

Descriptive statistics

In most cases, the questionnaire was completed by the mother (91.7%). The mean age of the participants was 42.10 (SD=4.69). Furthermore, 27.2% of the sample had higher education, 70.6% worked for more than 12 hours a week and 5.3% of the respondents were of non-Dutch origin (Table 1).

Table 1 | Socio-demographic characteristics of the respondents (n=8,037)

		n[a]	%
Gender	Men	7371	(91.7)
	Women	666	(8.3)
Education	Low	2053	(26.2)
	Mid	3658	(46.6)
	High	2133	(27.2)
Work	Paid job > 12hrs/wk	5544	(70.6)
	No paid job > 12 hrs/wk	2309	(29.4)
Ethnicity	Dutch	5702	(94.7)
	Non-Dutch	318	(5.3)
Age (mean, SD)		42.1	(4.69)

[a] Sum of categories does not always equal the total number due to missing values

Table 2 shows the means, medians, SDs and ranges for each of the three DASS scales. A DASS total score of 20 corresponds to the 90th percentile.

Table 2 | Summary statistics for the DASS

		Depression	Anxiety	Stress	Total
N[a]		7709	7714	7719	7719
Mean		1.94	1.19	4.08	7.21
SD		3.98	3.02	5.27	10.67
Median		0	0	2	4
Range		0–42	0–42	0–40	0– 120
	90	6	4	12	20
Percentile	95	10	6	14	28
	98	14	10	19	40

[a] Totals differ due to missing data

Factor analysis

The principal component analysis resulted in a three-factor solution based on eigenvalues ≥1. The first three factors together accounted for 48.87% of the variance, with eigenvalues of 7.57, 1.44 and 1.26. Factor loadings varied (after varimax rotation) from .46 to .71, and a loading of ≥.40 was

used as cut-off point (Table 3). All items had their highest loading on their corresponding factors (Table 3). Nevertheless, two items had a factor loading higher than .40 on another factor: one of the depression items (item 13) also loaded high (.43) on the anxiety factor and one of the anxiety items (item 15) loaded high (.42) on the depression factor.

Table 3 | Items and factor loadings for the Dutch DASS-21 (n=7,428)

		Factor loadings[a]		
		Depression	Anxiety	Stress
DASS Depression				
3	I couldn't seem to experience any positive feeling at all	**0.53**	0.14	0.37
5	I found it difficult to work up the initiative to do things	**0.46**	0.11	0.35
10	I felt that I had nothing to look forward to	**0.69**	0.14	0.21
13	I felt down-hearted and blue	**0.63**	0.15	*0.43*
16	I was unable to become enthusiastic about anything	**0.65**	0.19	0.26
17	I felt I wasn't worth much as a person	**0.69**	0.20	0.25
21	I felt that life was meaningless	**0.72**	0.24	0.04
DASS Anxiety				
2	I was aware of dryness of my mouth	0.01	**0.51**	0.22
4	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0.13	**0.62**	0.13
7	I experienced trembling (e.g. in the hands)	0.08	**0.61**	0.23
9	I was worried about situations in which I might panic and make a fool of myself	0.31	**0.51**	0.15
15	I felt I was close to panic	*0.42*	**0.58**	0.13
19	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0.15	**0.59**	0.22
20	I felt scared without any good reason	0.38	**0.61**	0.06
DASS Stress				
1	I found it hard to wind down	0.12	0.23	**0.62**
6	I tended to overreact to situations	0.15	0.16	**0.64**
8	I felt that I was using a lot of nervous energy	0.14	0.26	**0.69**
11	I found myself getting agitated	0.28	0.28	**0.65**
12	I found it difficult to relax	0.33	0.21	**0.64**
14	I was intolerant of anything that kept me from getting on with what I was doing	0.30	0.17	**0.58**
18	I felt that I was rather touchy	0.23	0.10	**0.72**

[a] Principal Component Analysis with Varimax rotation

The three-factor structure was also found in the confirmatory factor analysis (CFA) (Table 4). All factor loadings were statistically significant at the $p<0.05$ level. Goodness of Fit indices for this model were good: RMSEA=0.024, $p<0.01$ (90% CI: 0.022–0.025) and CFI=1.00. Correlations between the resulting *latent* factors were: r=.84 (depression-anxiety), r=.85 (stress-depression), and r=.84 (stress-anxiety).

Table 4 | Items and factor loadings for the Dutch DASS-21 (n=7,428)

		Factor loadings[a]		
		Depression	Anxiety	Stress
DASS Depression				
3	I couldn't seem to experience any positive feeling at all	0.78	--	--
5	I found it difficult to work up the initiative to do things	0.68	--	--
10	I felt that I had nothing to look forward to	0.83	--	--
13	I felt down-hearted and blue	0.88	--	--
16	I was unable to become enthusiastic about anything	0.84	--	--
17	I felt I wasn't worth much as a person	0.86	--	--
21	I felt that life was meaningless	0.89	--	--
DASS-Anxiety				
2	I was aware of dryness of my mouth	--	0.60	--
4	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	--	0.71	--
7	I experienced trembling (e.g. in the hands)	--	0.73	--
9	I was worried about situations in which I might panic and make a fool of myself	--	0.77	--
15	I felt I was close to panic	--	0.90	--
19	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	--	0.73	--
20	I felt scared without any good reason	--	0.87	--
DASS Stress				
1	I found it hard to wind down	--	--	0.70
6	I tended to overreact to situations	--	--	0.72
8	I felt that I was using a lot of nervous energy	--	--	0.80
11	I found myself getting agitated	--	--	0.86
12	I found it difficult to relax	--	--	0.84
14	I was intolerant of anything that kept me from getting on with what I was doing	--	--	0.76
18	I felt that I was rather touchy	--	--	0.81

[a] Confirmatory factor analysis (CFA)

Reliability and item analysis

The internal consistencies (Cronbach's alpha) of the three subscales were: .83 for the depression scale, .76 for the anxiety scale, .82 for the stress scale and, .90 for the DASS total score (Table 5). Deletion of items did not improve alpha coefficients. Inter-item correlations varied from .16 to .64. Mean inter-item correlations varied from .32 to .44. The correlation between the *subscale sum*

scores were: r=.59 (depression-anxiety), r=.66 (stress-depression), and r=.58 (stress-anxiety), all significant at the p<.05 level.

Table 5 | Internal consistency of the DASS-21 (n=7,709)

	Cronbach's alpha	Inter-item correlations Range	Mean
Depression	.83	.28 − .54	.44
Anxiety	.76	.24 − .54	.32
Stress	.84	.34 − .64	.44
Total	.90	.16 − .64	.32

DISCUSSION

The aim of this study was to examine the psychometric properties of the DASS-21 in a non-clinical, Dutch population of adults. Researchers and public health practitioners need instruments to assess and monitor the prevalence of depression, anxiety, and stress symptoms in the population. Furthermore, these instruments are needed to evaluate the effect of interventions developed to prevent or to tackle these symptoms.

This study provides normative data concerning the DASS in a community-based Dutch sample. Population means were rather low compared to UK data, for instance.[10] Our sample was predominantly composed of middle-aged women (mothers). In the Netherlands the prevalence of mental disorder in people living with a partner and children is low.[3]

Furthermore, this study supports the construct validity of the Dutch DASS-21 in a non-clinical, community-based setting. From our data, a consistent three-factor structure for the DASS-21 emerged. All items loaded high on the construct they were intended to represent. Moreover, the three-factor model provided a good fit to the data, demonstrated by the confirmatory factor analysis. All factor loadings were statistically significant. Furthermore, the internal consistency of the DASS-21 scales and subscales are good, judging by the satisfactory Cronbach's alphas.

The results from this study are in line with earlier studies of the psychometric properties of the DASS-21 in other populations. The DASS-21 has shown to be of consistent quality in groups of patients diagnosed with various mental disorders and compared to a Canadian community-based sample[7,12], in young adolescents[13], in different racial groups (African-American, Caucasian, Hispanic/Latino and Asian)[15], and in different age groups.[14,20]

Since all items loaded highest on the construct they were intended to represent, we conclude that they clearly distinguish the three different constructs of depression, anxiety and stress. Depression and anxiety often co-occur and demonstrate a high degree of overlap in clinically diagnosed subjects.[7,8,21] That could imply that these constructs are indeed more separate in non-

clinical groups. In contrast, the factor inter-correlations were quite high, which could imply that the three concepts do not diverge that much. In this regard, Lovibond and Lovibond argued that high correlations between the subscales could reflect common causes for depression, anxiety and stress instead of measuring overlapping constructs.[5]

Strengths and limitations

This study is based on a large sample and shows that the construct validity of the DASS in a Dutch community sample is good. It concerns a specific sample: parents of young children. However, the background characteristics of the study sample do not deviate much from the general population.

Nevertheless, item non-response rates were higher for respondents with lower education, immigrants and people working less than 12 hours a week. This could have influenced the results though the effect sizes were very small. The results therefore need confirmation for these less favourable groups.

Implications

The current study provides further support for the use of the DASS-21 as an indication for depression, anxiety and stress symptoms in adult subjects in a non-clinical sample in the Netherlands. This supports its use for community-based monitoring. Furthermore, the DASS-21 has some important advantages over the 42-item DASS[7], for example. It shows a clear distinction between the depression, anxiety and stress constructs and it is a short self-report measure which is easy to apply in large epidemiological prevalence studies.

Further research is required to check the stability of the DASS-21 over time by test-retest analysis. Moreover, divergent and convergent validity need to be verified by using other instruments measuring contrastive and/or similar constructs. The same holds for the use of the DASS-21 in evaluations of interventions. Research of the validity of the DASS-21 should be focused on its sensitivity for change in mental state over time.

Conclusion

We conclude that the psychometric properties of the DASS-21 were satisfactory in this Dutch non-clinical sample. The DASS is a good instrument for measuring symptoms of depression, anxiety and stress in non-clinical community samples.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SAR, DEMCJ and WS conceived, developed and designed the study. WS carried out the data analysis and wrote the final manuscript, which was discussed, edited and revised by all the authors. All the authors read and approved the final version for submission.

REFERENCES

1.	Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: Global burden of disease study. *The Lancet*. 1997;349(9064):1498-1504.

2.	Hirschfeld RA, Keller MB, Panico S,et al. THe national depressive and manic-depressive association consensus statement on the undertreatment of depression. *JAMA*. 1997;277(4):333-340.

3.	Bijl RV, Ravelli A, Van Zessen G. Prevalence of psychiatric disorder in the general population: Results of the netherlands mental health survey and incidence study (NEMESIS). *Soc Psychiatry Psychiatr Epidemiol*. 1998;33(12):587-595.

4.	Bültmann U, Rugulies R, Lund T, Christensen K, Labriola M, Burr H. Depressive symptoms and the risk of long-term sickness absence. *Soc Psychiatry Psychiatr Epidemiol*. 2006;41(11):875-880.

5.	Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. (2nd ed.). NSW Australia: Psychology Foundation of Australia, Sydney. 1995.

6.	Henry JD, Crawford JR. The short-form version of the depression anxiety stress scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *Br J Clin Psychol*. 2005;44(2):227-239.

7.	Antony MM, Cox BJ, Enns MW, Bieling PJ, Swinson RP. Psychometric properties of the 42-item and 21-item versions of the depression anxiety stress scales in clinical groups and a community sample. *Psychol Assess*. 1998;10(2):176-181.

8.	Brown TA, Chorpita BF, Korotitsch W, Barlow DH. Psychometric properties of the depression anxiety stress scales (DASS) in clinical samples. *Behav Res Ther*. 1997;35(1):79-89.

9.	Nieuwenhuijsen K, de Boer,A G E M., Verbeek JHAM, Blonk RWB, van Dijk FJH. The depression anxiety stress scales (DASS): Detecting anxiety disorder and depression in employees absent from work because of mental health problems. *Occup Environm Med*. 2003;60(suppl 1):i77-i82.

10.	Crawford JR, Henry JD. The depression anxiety stress scales (DASS): Normative data and latent structure in a large non-clinical sample. *Br J Clin Psychol*. 2003;42(2):111-131.

11.	Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther*. 1995;33(3):335-343.

12.	Ng F, Trauer T, Dodd S, Callaly T, Campbell S, Berk M. The validity of the 21-item version of the depression anxiety stress scales as a routine clinical outcome measure. *Acta Neuropsychiatr*. 2007;19(5):304-310.

13.	Szabo M. The short version of the depression anxiety stress scales (DASS-21): Factor structure in a young adolescent sample. *J Adolesc*. 2010;33(1):1-8.

14.	Wood BM, Nicholas MK, Blyth F, Asghari A, Gibson S. The utility of the short version of the depression anxiety stress scales (DASS-21) in elderly patients with persistent pain: Does age make a difference? *Pain Medicine*. 2010;11(12):1780-1790.

15.	Norton PJ. Depression anxiety and stress scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety, Stress & Coping*. 2007;20(3):253-265.

16.	Shea T, Tennant A, Pallant J. Rasch model analysis of the depression, anxiety and stress scales (DASS). *BMC Psychiatry*. 2009;9:21.

17.	Kaplan D. Evaluating and modifying structural equation models. In: Kaplan D, ed. *Structural equation modeling, foundations and extentions.* Thousand Oaks London New Delhi: Sage Publications; 2009:106-129.

18.   van Wilgen CP, Stewart R, Patrick Stegeman PT, Coppes M, van Wijhe M. Fear of movement in pre-operative patients with a lumbar stenosis and or herniated disc: Factor structure of the tampa scale for kinesiophobia. *Man Ther*. 2010;15(6):593-598.

19.   Jöreskorg K, Sörbom D. *LISREL 8: User's reference guide. SSI scientific software international.* Lincolnwood, IL; 1999.

20.   Gloster AT, Rhoades HM, Novy D, et al. Psychometric properties of the depression anxiety and stress scale-21 in older primary care patients. *J Affect Disord*. 2008;110(3):248-259.

21.   Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *J Abnorm Psychol*. 1991;100(3):316-336.

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