



The 12-Item Mini-DASS: A Concise and Efficient Measure of Depression, Anxiety, and Stress

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Abstract

The 21-item Depression, Anxiety, and Stress Scale (DASS-21) is a common instrument for measuring dimensions of emotional distress. In the present research, we tested across five studies ($N=2,096$) whether the number of items could be reduced while maintaining high reliability and validity. Specifically, Item Response Theory and Confirmatory Factor Analysis reduced the number of items to 12, which we named Mini-DASS. Our findings revealed the Mini-DASS is as psychometrically robust as the DASS-21. Multigroup Confirmatory Factor Analysis established its invariance across gender and three countries (Brazil, UK, and USA). The Mini-DASS and the DASS-21 demonstrated similar correlation patterns with other well-being measures and the five moral foundations. Notably, we observed negative correlations between depression, anxiety, stress, and the authority and loyalty foundations. In conclusion, the Mini-DASS is a parsimonious, reliable, and valid instrument for measuring depression, anxiety, and stress.

Keywords Depression · Anxiety · Stress · Moral Foundations · Well-being

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Depression (e.g., hopelessness and anhedonia), anxiety (e.g., excessive worrying and physiological hyperexcitability), and stress (e.g., nervous tension and irritability) are three of the most common mood disorders, and their prevalence is increasing (World Health Organization, 2022). Epidemiological data indicate that 20.6% (Hasin et al., 2018) and 33.7% (Bandelow & Michaelis, 2015) of individuals have experienced major depression and some form of anxiety at some point in their lives, respectively. Thus, those mood disorders have a detrimental impact on people's life. For example, individuals with depression exhibit greater suicidal ideation (Ibrahim et al., 2014) and increased suicide attempts (Melhem et al., 2019). Further, those with anxiety report poorer sleep quality (Ng et al., 2022) and more symptoms of eating disorders (Schaumberg et al., 2019). Finally, stressed individuals demonstrate heightened cognitive slowness (Munoz et al., 2015) and increased social avoidance (daSilva et al., 2021).

As a result, accurately measuring depression, anxiety, and stress is crucial for effective referrals, intervention planning, and monitoring to reduce negative emotional states and associated problems (e.g., suicidal ideation, poor sleep quality), as well as for understanding the antecedences and consequences. One of the most well-known and widely used questionnaires to measure these mood disorders is the 21-item Depression Anxiety Stress Scale (DASS-21; Lovibond & Lovibond, 1995). To address calls for shorter questionnaires that save time and reduce the burden on participants (Coelho et al., 2020; Monteiro et al., 2022), the present research aimed to develop a short version of the DASS, which nevertheless adheres to robust psychometric criteria.

The Depression Anxiety Stress Scale

Although anxiety and depression are overlapping constructs, they possess distinct characteristics that set them apart. For instance, low levels of positive affect are more characteristic of depression, and physiological hyperexcitability is more common in anxiety (Clark & Watson, 1991). However, although these differences are known, some questionnaires have failed to differentiate between anxiety and depression, perhaps because they emphasize assessing their shared aspects (e.g., Antony et al., 1998; Henry & Crawford, 2005). This led Lovibond and Lovibond (1995) to develop a novel questionnaire that differentiated between depression and anxiety while still covering both factors' central and most characteristic aspects. While developing this questionnaire, the authors found a third-factor encompassing relaxation difficulties, nervous tension, irritability, and agitation. They called it the stress factor. Consequently, the Depression Anxiety Stress Scale (DASS) emerged. It is now one of the most widely utilized measures to assess negative emotional states (Szabó, 2010): As of April 2023, the article by Lovibond and Lovibond (1995) has garnered 13,130 citations on Google Scholar.

There are two versions of the DASS, one with 42 items and one with 21 items. They encompass seven facets of depression (*dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest, anhedonia, and inertia*), four of anxiety (*autonomic arousal, skeletal musculature effects, situational anxiety, and subjective*

experience of anxious affect), and five stress facets (*difficulty relaxing, nervous arousal, easily upset, irritable, and impatient*). While the DASS is not a diagnostic tool, it has been employed in different contexts and with different samples (clinical and non-clinical). It correlates with varying forms of emotional distress (Crawford & Henry, 2003; Osman et al., 2012) and distinguishes between clinical and non-clinical populations (Brown et al., 1997). The psychometric qualities of the 42- and 21-item versions of the DASS are supported across a range of countries, such as China (Wang et al., 2016), Chile (Román Mella et al., 2014), and Spain and Colombia (Ruiz et al., 2017).

Given the demonstrated utility of both the 42- and 21-item versions of the DASS, as well as the growing need for concise and efficient instruments in research (Rammstedt & Beierlein, 2014), it is vital to consider developing a shortened version of the DASS-21. Shorter scales save money if participants are paid. For example, Coelho et al. (2020) estimated that reducing the lengths of a scale by 12 items would save US-\$0.20/per participant, assuming participants are paid \$10/hour. This is especially relevant if hundreds or even thousands of participants are surveyed. Relatedly, suppose researchers rely on convenient samples (e.g., through social media) and cannot afford to compensate participants. In that case, attracting participants for shorter surveys tends to be easier than for longer surveys. Finally, shorter measures make it less likely for participants to get bored and drop out (Eisele et al., 2022). Of course, shorter measures must be comparable to longer measures regarding reliability and validity.

Existing Shorter Versions of the DASS

Several short versions of DASS have been proposed, such as the DASS-8 (Ali et al., 2021), the DASS-9 (Kyriazos et al., 2018), and a shortened version of the DASS using 12 items (Osman et al., 2012). While they have their merits, they also come with certain limitations. For example, the DASS-8 was proposed using a sample of participants who were in quarantine because they were suspected of or diagnosed with COVID-19. Given the unique circumstances of the pandemic and its significant psychological effects, particularly on infected individuals, developing a shortened measure that is based on this specific population may not accurately capture the constructs in the general population. Depression, stress, and anxiety scores were higher during the pandemic than before (Maia & Dias, 2020). Another point is that the selection process of items of the DASS-8 is not clearly indicated. Also, the authors failed to report the final set of eight items. Additionally, in the DASS-8, the anxiety and depression subscales have three items, and the stress subscale has only two. Given that Lovibond and Lovibond proposed versions that cover seven facets of depression, four of anxiety, and five of stress, the content validity of the DASS-8 might be reduced. Indeed, scales with only a few items can lead to biased results (Bakker & Lelkes, 2018; Hanel & Zarzeczna, 2022). Thus, it is essential to carefully strike a balance between shortness, validity, and reliability.

The DASS proposed by Osman et al. (2012) employs a bifactor model. The authors included the 12 items that had the highest factorial loadings. The authors

did not empirically test whether this version of the DASS provided a good model fit. Lee et al. (2019) later confirmed that the DASS-12 had adequate psychometric properties. Nonetheless, this version omits items that had higher factor loadings on the original factors (Ali et al., 2022), and focused on including items that loaded highly on the general DASS factor. This approach does not align with Lovibond and Lovibond's (1995) procedure, which selected items that discriminated best between the constructs.

In addition, Ali et al. (2022) found that both the DASS-8 and DASS-12 exhibit factors with low internal consistency (α and $\omega < 0.70$). Also, the model fit of both versions was enhanced by allowing error pairs to correlate (Ali et al., 2021, 2022). This included correlations of items from different factors, a practice questioned in the psychometric literature (Hermida, 2015). Similar criticism applies to the DASS-9 (Kyriazos et al., 2018). Therefore, despite the valuable efforts to develop shortened versions of the DASS, these studies exhibit notable limitations, underscoring the need for a more psychometrically sound short version.

The Present Research

Across five studies, we aimed to develop and validate a new shortened version of the DASS-21 using samples from three countries ($N=2,095$). In Study 1, we selected the four most informative items of each subscale using Item Response Theory (IRT) analyses. We sought to obtain good reliabilities and reduce the loss of psychometric information as much as possible while maintaining as many of the facets within each subscale as possible (Lovibond & Lovibond, 1995). This approach is commonly used when reducing existing questionnaires, such as the Need for Cognition Scale (Coelho et al., 2020), Trimmed MACH (Rauthmann, 2013), and the Brief Rosenberg Self-Esteem Scale (Monteiro et al., 2022). Also, to ensure that the scale reduction did not compromise the information quality, we compared the correlations between the new concise version and the DASS-21 with various relevant outcomes (e.g., optimism, positive and negative affects). We expected to find a similar pattern and magnitude of correlations. Participants were recruited from Brazil.

In Study 2, we tested again in a Brazilian sample the structure of the now-called 12-Item Mini-Dass using confirmatory factor analysis and item parameters using Item Response Theory. In Study 3, we seek to provide further evidence for convergent and discriminant validity and the factor structure of the Mini-DASS. We correlated the Mini-DASS in a US-American sample with other measures of depression, anxiety, stress, satisfaction with life, and the five moral foundations (Graham et al., 2009). We speculated that the DASS dimensions would not or only weakly correlate with the moral foundations. In Study 4, we aimed to assess the factorial structure of the Mini-DASS and provide additional evidence for convergent validity in a sample from the United Kingdom. Finally, in Study 5 we tested whether the Mini-DASS is invariant across three countries and gender. Our studies were approved by an ethics committee and participants provided informed consent prior to participating. The data is openly available at https://osf.io/cgbyf/?view_only=dd24e692ad5c4632868f7709fb7bf2b5.

Study 1

Method

Participants and Procedure

Five hundred twenty-nine participants residing in Brazil completed the study, aged between 18 and 72 years ($M=23.2$; $SD=6.35$). Most participants were women (57.7%), self-declared single (85.4%), and middle class (51.4%). Data were collected in person ($N=286$) and online ($N=243$). Data were collected face-to-face with university students in their classrooms or shared online on social media. In the face-to-face collection, participants completed additional scales we used to compute the convergent validity of the DASS-21.

Materials

Depression Anxiety and Stress Scale – Short Form (DASS-21; Lovibond & Lovibond, 1995) Vignola and Tucci (2014) adapted and validated the questionnaire to the Brazilian context. It consists of 21 items, seven per factor, that assess symptoms of depression, anxiety, and stress in clinical and non-clinical populations. Participants used a four-point response scale to indicate the frequency with which they experience symptoms (0 = *Did not apply to me at all*; 3 = *Applied to me very much or most of the time*). Example items include “*I felt that I had nothing to look forward to*” (Depression), “*I was aware of dryness of my mouth*” (Anxiety), and “*I found it difficult to relax*” (Stress).

Scale of Positive and Negative Affects (Gouveia et al., 2019) The questionnaire consists of 10 items, five for each factor. Participants indicated on a seven-point scale (1 = *Totally Unlikely*; 7 = *Totally Likely*) to what extent they experienced recent emotional states such as “*Happy*” (Positive Affects; McDonald’s Omega, $\omega=0.83$) and “*Frustrated*” (Negative Affects; $\omega=0.80$).

Vitality Scale (Ryan & Frederick, 1997) The 7-item questionnaire was adapted for the Brazilian context by Gouveia et al. (2012). The scale measures the energy and vital state of people. Participants indicate how true (1 = *Not at all true* to 7 = *Totally true*) the items describe them (e.g., “*I feel vitalized*”; $\omega=0.91$).

Positivity Scale (Caprara et al., 2012) The 8-item positivity scale was adapted to Brazil by Souza et al. (2014). Using a five-point response scale, participants indicate their level of agreement (1 = *Strongly Disagree*; 5 = *Strongly Agree*) to items such as “*Others are generally here for me when I need them*” and “*I generally feel confident in myself*” ($\omega=0.79$).

Life Orientation Test – Revised (Scheier et al., 1994) The 10-item dispositional optimism scale was adapted for Brazil by Bastianello et al. (2014). Participants are asked to indicate their agreement (1 = *Strongly Disagree* to 5 = *Strongly Agree*) to items such as “*In uncertain times, I usually expect the best*” ($\omega = 0.56$).

Additionally, we also measured *Life Satisfaction* with a single item: “*To what extent are you satisfied with your life?*”. Participants answered it using an 11-point scale, ranging from 0 (*Not at all satisfied*) to 10 (*Completely satisfied*).

Data Analysis

We used SPSS to perform descriptive (i.e., mean, standard deviation) and inferential analyses, specifically Pearson’s correlation. Using the R-package *lavaan* (Rosseel et al., 2023), we performed a Confirmatory Factor Analysis (Maximum Likelihood Robust; MLR) to test the adequacy of the structure of three oblique factors of the DASS-21. We report the following indicators of model fit (in parentheses values for an acceptable model; Hair et al., 2022): χ^2/df (2 to 5), Comparative Fit Index (CFI > 0.90), Tucker – Lewis Index (TLI > 0.90), Root-Mean-Square Error of Approximation (RMSEA < 0.08) and the Standardized Root Mean Square Residuals SRMR (SRMR < 0.06). We used the R-package *psych* package (Revelle, 2023) to compute the reliability coefficients of the scales. We focus on McDonald’s ω (omega) because it is considered to be less biased to Cronbach’s alpha (Hayes & Coutts, 2020). To compute the difficulty, discrimination, and information levels of the Item Response Theory, we used the *Mirt* package (Chalmers et al., 2022) and resorted to the Graded Response Model (Samejima, 1997).

Results

We performed a Confirmatory Factor Analysis to test the assumption of unidimensionality which is necessary for the IRT analyses, using the Robust Maximum Likelihood (MLR) estimation method. Specifically, the fit of the three-oblique factor model (i.e., *Depression*, *Anxiety*, and *Stress*) was acceptable: $\chi^2/df = 2.67$; Robust CFI = 0.93; Robust TLI = 0.92; Robust RMSEA = 0.063 [CI90% = 0.056–0.070]; SRMR = 0.051. All saturations differed statistically significantly from zero ($\lambda_s \neq 0$; $z_s > 1.96$, $ps < 0.05$; see the factor loadings in Table 1). Next, we estimated the individual parameters of the items, specifically difficulty and discrimination, by analyzing each dimension separately (Table 1).

As can be seen in Table 1, the seven items of the *Depression* factor had a mean discrimination of 2.26 ($SD = 0.71$), ranging from 1.13 (Item 5) to 3.32 (Item 21). Regarding difficulty, item 13 had the lowest average difficulty ($b_1 - b_3$; $M = 0.17$), whereas item 3 had the highest average ($M = 1.36$). Further, Item 21 was most informative ($\theta = 7.31$), and Item 5 was least informative ($\theta = 2.20$). For *Anxiety*, the average discrimination value was 2.01 ($SD = 0.43$), ranging from 1.12 (Item 2) to 2.38 (Item 20). Regarding difficulty, item 19 had the lowest average difficulty

Table 1 Factor loadings (CFA) and Item Parameters – Study 1

	λ	a	b_1	b_2	b_3	b_{1-3}	$I(\theta; -3/+3)$
<i>Depression</i>							35.76
Item 3	0.64	1.79	-0.05	1.55	2.59	1.36	4.13
Item 5	0.52	1.13	-1.27	0.83	2.16	0.57	2.20
Item 10*	0.75	2.44	0.02	0.91	1.69	0.87	5.34
Item 13	0.70	1.95	-1.20	0.30	1.42	0.17	4.66
Item 16*	0.73	2.44	0.05	1.06	1.92	1.01	5.61
Item 17*	0.77	2.77	0.02	0.90	1.62	0.84	6.29
Item 21*	0.79	3.32	0.25	0.92	1.49	0.88	7.31
<i>Anxiety</i>							29.58
Item 2	0.51	1.12	-0.39	1.37	2.59	1.19	2.25
Item 4	0.61	1.79	0.50	1.53	2.40	1.47	3.63
Item 7*	0.71	2.16	0.21	0.97	1.63	0.93	4.20
Item 9*	0.74	2.17	-0.09	0.89	1.77	0.85	4.72
Item 15	0.73	2.12	0.33	1.24	2.02	1.19	4.40
Item 19*	0.71	2.34	-0.02	0.86	1.65	0.83	5.05
Item 20*	0.72	2.38	0.17	1.14	1.94	1.08	5.30
<i>Stress</i>							35.21
Item 1*	0.74	2.33	-0.82	0.69	1.53	0.46	5.62
Item 6	0.67	1.76	-0.85	0.50	1.68	0.44	4.00
Item 8*	0.77	2.28	-0.54	0.66	1.63	0.58	5.41
Item 11*	0.75	2.61	-0.86	0.36	1.30	0.26	6.49
Item 12*	0.80	2.93	-0.95	0.30	1.23	0.19	7.60
Item 14	0.61	1.47	-0.72	0.90	1.97	0.71	3.17
Item 18	0.60	1.33	-1.60	0.25	1.47	0.04	2.90

*: Item was included in the short version, the Mini-DASS; λ : factor loadings; a =discrimination; b_1 - b_3 =threshold; θ : Information levels

($M=0.83$) and item 4 had the highest ($M=1.48$). Further, Item 20 was most informative ($\theta=5.30$) Item 2 least informative ($\theta=2.25$). For *stress*, the average discrimination was 2.10 ($SD=0.59$), ranging from 1.33 (Item 18) to 2.93 (Item 12). Regarding difficulty, item 18 had the lowest difficulty ($M=0.04$), and item 14 had the highest ($M=0.72$). Item 12 was most informative ($\theta=7.60$), and Item 18 was least informative ($\theta=2.90$). Graphical information about the items' information levels (Item Information Curves) are present in Fig. 1.

We selected four items of each factor to reduce the length of the DASS-21 to 12 items. Specifically, we selected the items based on informativeness and discrimination values, and that their content covered a wide range of the latent trait for depression (θ between 0.02 and 1.92), anxiety (θ between -0.09 and 1.94), and stress (θ between -0.95 and 1.63; cf. Table 1). The selected items (Depression, Items 10, 16, 17, 21; Anxiety, Items 7, 9, 19, 20; Stress, Items 1, 8, 11, 12) are the most discriminative and among the most informative of their factors. The exception was item 15 from the anxiety factor, which was more informative than item 7. However, the latter

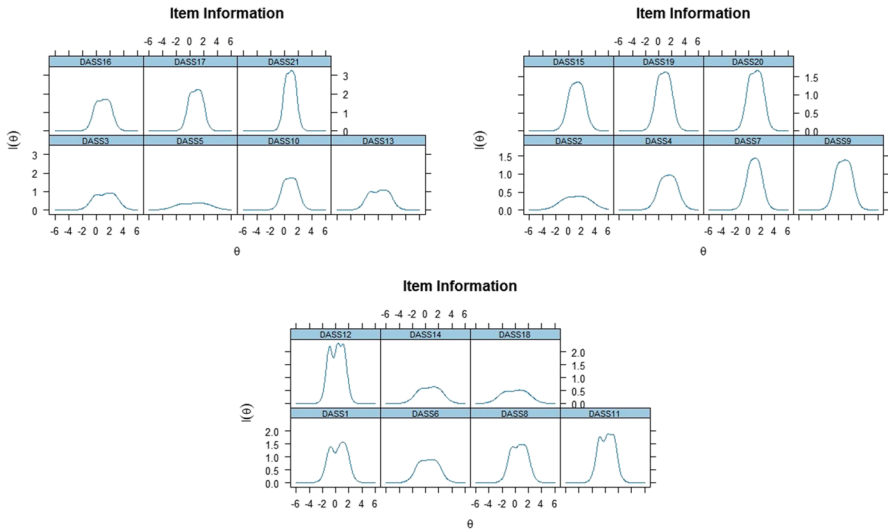


Fig. 1 Item Information Curves – Study 1. *Note.* Depression items: Top left panel, Anxiety items: Top right panel, Stress items: Bottom panel

had a higher information peak and was more discriminative. Furthermore, item 15 covers the subjective experience of anxious affect, which has already been covered by item 20. Therefore, we selected item 7 over item 15 to be part of the short version. Together, the 12-items composing the Mini-DASS helps maintain the full DASS’s psychometric robustness while covering the facets of the three factors. The items are listed at the end of this paper.

To compare the validity of the Mini-DASS with the DASS-21, we correlated both the original and shortened versions with life satisfaction, optimism, positive and negative affects, vitality, and positivity. The pattern of correlations was very similar (Table 2), suggesting that reducing the DASS-21 by nine items does not impact its validity. The Mini-DASS factors were also highly correlated with

Table 2 Correlations of the DASS-21 and Mini-DASS factors – Study 1

	Depression		Anxiety		Stress	
	DAS-21	DAS-12	DAS-21	DAS-12	DAS-21	DAS-12
Satisfaction with life	-0.48**	-0.46**	-0.32**	-0.27**	-0.31**	-0.29**
Optimism	-0.54**	-0.52**	-0.39**	-0.35**	-0.43**	-0.40**
Positive Affect	-0.59**	-0.56**	-0.37**	-0.33**	-0.41**	-0.38**
Negative Affect	0.66**	0.62**	0.48**	0.44**	0.56**	0.51**
Vitality	-0.60**	-0.57**	-0.39**	-0.35**	-0.39**	-0.35**
Positivity	-0.61**	-0.60**	-0.35**	-0.33**	-0.37**	-0.32**

* $p < 0.05$, ** $p < 0.01$

their respective factors in the DASS-21: Depression ($r=0.94$, $p<0.001$), anxiety ($r=0.94$, $p<0.001$), and stress ($r=0.95$, $p<0.001$). Finally, it is noteworthy that the Mini-DASS factors showed high-reliability levels, similar to the levels of the longer versions: Depression (DASS-21, $\omega=0.87$, Mini-DASS, $\omega=0.86$), anxiety (DASS-21, $\omega=0.86$, Mini-DASS, $\omega=0.83$), and stress (DASS-21, $\omega=0.87$, Mini-DASS, $\omega=0.85$).

Study 2

In Study 1 we identified four items for each of the three factors of the DASS with good psychometric properties. In Study 2, we tested the structure of the scale using confirmatory factor analysis and item parameters using Item Response Theory.

Method

Participants, Procedure, Material, and Data Analysis

Participants were 628 individuals living in Brazil aged between 18 and 74 ($M=26.60$; $SD=10.30$). Most participants were women (69.7%), self-declared single (72.6%), and from the middle class (41.4%). Data were collected online, and the survey link was shared on social media. After providing informed consent, participants answered the 12-item version of the DASS we proposed in the previous study. To perform the CFA and assess item parameters, we followed the same procedures mentioned in Study 1.

Results

The Confirmatory Factor Analysis (Robust Maximum Likelihood) revealed that the model fit of the Mini-DASS with three oblique factors was excellent, $\chi^2/df=2.54$; Robust CFI=0.98; Robust TLI=0.97; Robust RMSEA=0.056 [90%CI=0.044–0.068]; SRMR=0.027. Furthermore, all factor loadings were statistically significantly different from zero, $\lambda \neq 0$; $z > 1.96$, $p < 0.05$). Finally, reliabilities of the Mini-DASS were again very high: Depression ($\omega=0.91$), Anxiety ($\omega=0.81$), and Stress ($\omega=0.87$).

In our analysis of individual parameters using IRT (Table 3), we found that the *Depression* factor items had a mean discrimination of 3.78 ($SD=1.05$), with values ranging from 2.51 (Item 5) to 5.06 (Item 10). Item 10 exhibited the lowest difficulty ($M=0.13$), while item 21 had the highest ($M=0.29$). The most informative item was 17 ($\theta=12.21$), and the least informative was item 16 ($\theta=5.21$). For the *Anxiety* factor, the mean discrimination level was 2.22 ($SD=0.38$), ranging from 1.83 (Item 7) to 2.71 (Item 20). Item 9 showed the lowest difficulty level ($M=0.23$), while item 7 had the highest difficulty level ($M=0.67$). Item 20 was most informative ($\theta=5.98$), while item 7 least informative ($\theta=3.67$). Lastly, the *Stress* factor's items had a mean discrimination of 2.92 ($SD=0.53$),

Table 3 Factor loadings (CFA) and Item parameters – Study 2

	λ	a	b ₁	b ₂	b ₃	b ₁₋₃	I (θ ; -3/+3)
<i>Depression</i>							33.51
Item 5	0.85	3.64	-0.42	0.14	0.68	0.13	7.91
Item 8	0.77	2.51	-0.57	0.25	0.85	0.17	5.21
Item 9	0.89	5.06	-0.35	0.16	0.67	0.16	12.21
Item 12	0.86	3.94	-0.16	0.29	0.74	0.29	8.16
<i>Anxiety</i>							18.38
Item 2	0.69	1.83	-0.24	0.66	1.58	0.66	3.67
Item 4	0.71	2.04	-0.51	0.21	0.98	0.22	3.96
Item 10	0.72	2.31	-0.45	0.36	1.07	0.32	4.76
Item 11	0.75	2.71	-0.18	0.49	1.35	0.55	5.98
<i>Stress</i>							28.53
Item 1	0.78	2.55	-1.09	0.10	1.00	0.00	6.21
Item 3	0.80	2.79	-1.01	-0.03	0.87	-0.05	6.78
Item 6	0.77	2.65	-1.35	-0.32	0.54	-0.37	6.30
Item 7	0.84	3.71	-1.17	-0.35	0.36	-0.38	9.24

λ : factor loadings; a=discrimination; b1-b3=threshold; θ : Information levels

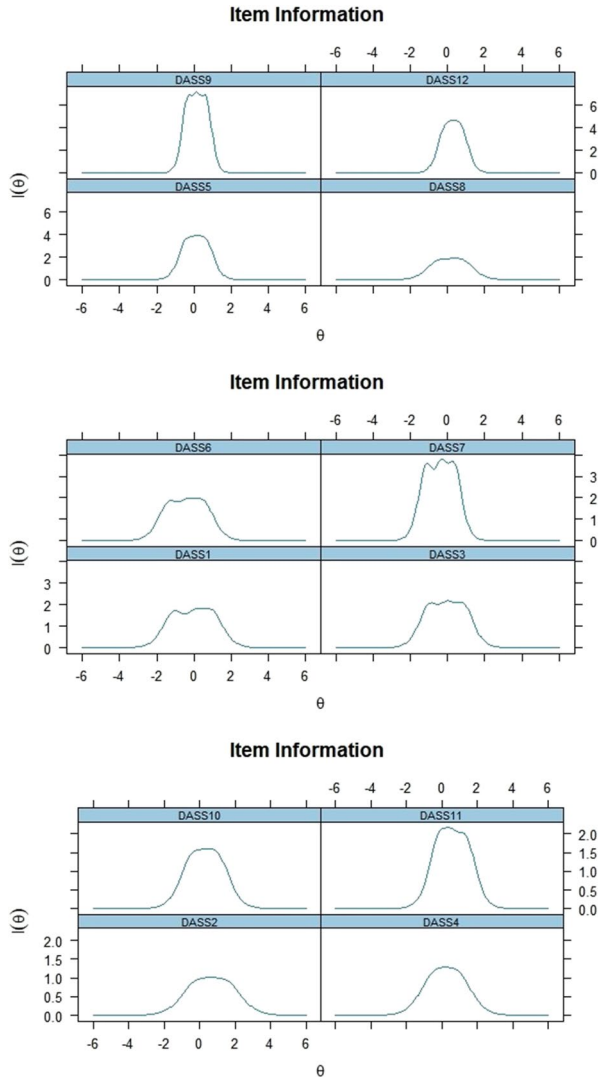
with a range of 2.55 (Item 1) to 3.71 (Item 12). Item 12 had the lowest difficulty ($M = -0.39$), and item 1 had the highest ($M = 0.00$). The most informative item was 12 ($\theta = 9.24$) and the least informative was item 1 ($\theta = 6.21$). Figure 2 displays the information curves for the Mini-DASS items. Overall, Study 2 provided further evidence for the reliability of the Mini-DASS.

Study 3

In Study 3, we aimed to provide more evidence for the convergent and discriminant validity of the Mini-DASS from another country. We opted for the USA because many past studies that used the DASS were conducted there. Specifically, to test for convergent validity, we investigated whether the Mini-DASS correlated with other measures of depression, anxiety, stress, and satisfaction with life similar to the DASS-21. Based on Study 1, we expected the correlations between the DASS-21 and the Mini-DASS factors to be similar.

We included the five moral foundations proposed by Graham et al. (2011) to test for discriminant validity. We did not expect any correlations between depression and stress with any foundations: care, fairness, authority, loyalty, and purity. The only exception was anxiety. Previous research found that the three binding foundations—authority, loyalty, and purity—positively correlated with anxiety, while the others were uncorrelated with anxiety (Strupp-Levitsky et al., 2020). We expected to replicate this correlation with the 7-item and 4-item versions of the DASS-21 and Mini-DASS anxiety scales, respectively.

Fig. 2 Information curves for the Mini-DASS items – Study 2. *Note.* Depression items: Top panel, Stress items: Middle panel, Anxiety items: Bottom panel



Method

Participants and Procedure

The participants were 402 US-American citizens ($M_{age} = 42.77$, $SD = 13.57$; 199 men, 200 women, 1 other gender, 2 missing) recruited through Prolific Academic. To improve the data quality, only participants who had a 100% approval rate and had answered at least 30 studies were included.

Material

DASS-21 Participants completed the DASS-21 (Depression: $\omega=0.96$ for the DASS-21 and $\omega=0.96$ for the Mini-DASS; Anxiety: $\omega=0.91$ and 0.84 , respectively; Stress: $\omega=0.93$ and 0.89 respectively).

Perceived Stress Scale (PSS-4; Cohen et al., 1983) Participants completed this 4-item scale using a five-point response scale (1 = *never*; 5 = *very often*) to indicate how often they felt in the past month in a certain way. Example items include “*In the last month, how often have you felt that you were unable to control the important things in your life?*” and “*In the last month, how often have you felt that things were going your way?*” ($\omega=0.89$).

Generalized Anxiety Disorder (GAD-7) scale (Spitzer et al., 2006) Participants completed this 7-item scale using a four-point response scale (1 = *Not at all*; 4 = *Nearly every day*) to answer how often they were bothered with a range of problems, such as “*Feeling nervous, anxious or on the edge*” and “*trouble relaxing*” ($\omega=0.95$).

Center for Epidemiologic Studies Depression (CES-D) Scale (Radloff, 1977) Participants completed this 20-item scale using a four-point response scale (1 = *Rarely or none of the time*; 4 = *Most or all of the time*) to indicate how often over the past week they felt in a specific way. Example items include “*I felt depressed*” and “*I was happy*” (recoded; $\omega=0.95$).

Satisfaction With Life Scale (Diener et al., 1985) Participants completed this 5-item scale using a seven-point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*) to indicate their agreement to items such as “*In most ways my life is close to my ideal*” and “*I am satisfied with my life*” ($\omega=0.94$).

Moral Foundations Questionnaire (Graham et al., 2011) This 20-item questionnaire measure each of the five foundations with four items. The questionnaire consisted of two parts, each of which consisted of 10 items. Items were averaged across both parts. In the first part, instructions for participants were “When you decide whether something is right or wrong, to what extent are the following considerations relevant to your thinking?” Participants responded to items such as “Whether or not someone suffered emotionally” (care) and “Whether or not someone’s action showed love for his or her country” (loyalty) on a six-point response scale (1: Not at all relevant, 6: Extremely relevant). In the second part, participants were asked to indicate their agreement on a six-point scale (1: Strongly disagree, 6: Strongly agree). Example items include “*Compassion for those who are suffering is the most crucial virtue*” (care, $\omega=0.78$), “*Justice is the most important requirement for a society*” (fairness, $\omega=0.76$), “*People should be loyal to their family members, even when they have done something wrong*” (loyalty, $\omega=0.79$), “*Respect for authority is something all children need to learn*” (authority, $\omega=0.88$), and “*I would call some acts wrong on the grounds that they are unnatural.*” (purity, $\omega=0.76$).

Data Analysis

We again performed all analyses using R. More specifically, we used the lavaan package (Rosseel, 2012) to perform Confirmatory Factor Analyses and the psych package (Revelle, 2023) to compute reliabilities.

Results

In the first step, we ran two CFAs, one with the DASS-21 and one with the Mini-DASS, to test whether the three-dimensional structure would replicate outside Brazil. The fit for the DASS-21 was acceptable: $\chi^2/df = 3.78$; Robust CFI = 0.93; Robust TLI = 0.92; Robust RMSEA = 0.077 [90%CI = 0.068—0.086]; SRMR = 0.048). All loadings were statistically significant and different from zero ($\lambda \neq 0$; $z > 5.99$, $p < 0.001$). The fit for the Mini-DASS was good: $\chi^2/df = 3.59$; Robust CFI = 0.97; Robust TLI = 0.96; Robust RMSEA = 0.072 [90%CI = 0.055—0.089]; SRMR = 0.041). All loadings were statistically significant and different from zero ($\lambda \neq 0$; $z > 6.78$, $p < 0.001$). Thus, we replicated the findings from Study 1.

Correlations between all variables can be found in Table 4. The factors of the DASS-21 and Mini-DASS correlated highly, $r_s = 0.95$ – 0.98 . Also, the means were very similar. As expected, the correlations between the DASS-21 and the Mini-DASS factors with the other variables were very similar. For example, depression correlated with the Center for Epidemiologic Studies Depression Scale with 0.88 (DASS-21) and 0.85 (Mini-DASS), respectively. Anxiety with the Generalized Anxiety Disorder Scale with 0.70 and 0.68, respectively. Stress correlated with the Perceived Stress Scale with 0.63 and 0.63, respectively.

Regarding discriminant validity, the correlations of the DASS factors were surprisingly only non-significant when it comes to the care, fairness, and partly purity foundations. However, all three measures were negatively correlated with authority and loyalty. Importantly for the present paper, the correlations between the DASS-21 and Mini-DASS factors with all five moral foundations were of very similar magnitude (Table 4).

Study 4

In the previous studies, we provided psychometric evidence for the DASS-21 and Mini-DASS in Brazil and the USA. To gather further evidence, we aimed to assess the factorial structure of the Mini-DASS and provide additional evidence of convergent validity in a sample from the United Kingdom. Importantly, we recruited only participants with food allergies to test whether the factorial structure of the Mini-DASS would replicate in a sample that is more prone to experience psychological distress due to the presence of health issues.

Table 4 Correlations between all variables—Study 3

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Depression	1.70	0.81														
2. Anxiety	1.44	0.55	0.68**													
3. Stress	1.70	0.63	0.75**	0.75**												
4. mDepression	1.63	0.84	0.98**	0.64**	0.70**											
5. mAnxiety	1.46	0.58	0.67**	0.96**	0.75**	0.63**										
6. mStress	1.75	0.70	0.74**	0.74**	0.95**	0.70**	0.74**									
7. CESD	1.76	0.66	0.88**	0.67**	0.74**	0.85**	0.66**	0.74**								
8. GAD	1.72	0.77	0.71**	0.70**	0.76**	0.68**	0.68**	0.79**	0.81**							
9. PSS	2.53	0.96	0.78**	0.55**	0.63**	0.75**	0.53**	0.63**	0.83**	0.70**						
10. SWLS	4.16	1.69	-0.58**	-0.35**	-0.48**	-0.57**	-0.35**	-0.46**	-0.64**	-0.50**	-0.66**					
11. Care	4.79	0.88	0.10*	0.11*	0.11*	0.09	0.13*	0.13*	0.03	0.10*	0.01	0.04				
12. Fairness	4.81	0.83	0.04	0.01	0.03	0.03	0.03	0.03	-0.02	-0.02	-0.08	0.06	0.56**			
13. Ingroup	3.40	1.15	-0.31**	-0.12*	-0.22**	-0.29**	-0.15**	-0.23**	-0.28**	-0.20**	-0.29**	0.40**	0.02	0.08		
14. Authority	3.52	1.23	-0.28**	-0.14**	-0.19**	-0.26**	-0.16**	-0.21**	-0.25**	-0.19**	-0.26**	0.36**	-0.05	0.03	0.78**	
15. Purity	3.75	1.35	-0.13**	-0.01	-0.09	-0.12*	-0.04	-0.09	-0.11*	-0.07	-0.11*	0.28**	0.02	0.07	0.60**	0.69**

M and SD are used to represent mean and standard deviation, respectively. m: Mini-DASS factors, CESD: Center for Epidemiologic Studies Depression Scale, GAD: Generalized Anxiety Disorder, PSS: Perceived Stress Scale, SWLS: Satisfaction with Life scale, last five scales are moral foundations. * $p < 0.05$, ** $p < 0.01$

Method

Participants and Procedure

Participants from the British sample consisted of 207 individuals who were between 18 and 72 years old ($M = 36.80$; $SD = 13.17$). They were mostly female (68.6%). One particularity of this sample is that it is composed of individuals with food allergies, which were recruited as part of another study (Coelho et al., 2022). Participants were recruited through Prolific Academic, using the same pre-screeners as for the US-American sample in Study 3.

Material

Additionally to responding to the Mini-DASS, participants answered the following questionnaires:

Short Food Allergy Quality of Life Questionnaire (FAQLQ-12; Coelho et al., 2023) for adults. The FAQLQ-12 is a 12-item measure designed to assess the impact of food allergies on adults' quality of life. Participants rated their level of concern, worry, or fear in various situations related to food allergies on a seven-point scale (1 = "Not at all"; 7 = "Extremely"). The items are equally distributed among four dimensions of quality of life in the context of food allergies: emotional impact (e.g., *How frightened are you because of your food allergy of an allergic reaction?*, $\omega = 0.92$), food allergy health (e.g., *How worried are you because of your food allergy about your health?*, $\omega = 0.83$), risk (e.g., *How troublesome is it, because of your food allergy that labels are incomplete?*, $\omega = 0.85$), and social and dietary limitations (e.g., *How troublesome do you find it, because of your food allergy, that you must always be alert as to what you are eating?*, $\omega = 0.91$). Higher scores indicate a worse quality of life.

Attitudes Towards Food Allergy Scale (ATFAS; Coelho et al., 2022). This scale consists of six bipolar items presented as semantic differentials, with opposing adjectives at each end: bad-good, unsatisfactory-satisfactory, unfavorable-favorable, negative-positive, difficult-easy, and sad-happy. Participants indicated their perspective on food allergies using a bipolar seven-point scale ranging from -3 to +3. Responses near the ends of the scale signify more positive or negative attitudes, while those near the middle (zero) reflect neutrality.

Data Analysis

We again performed all analyses using the R-packages lavaan (Rosseel, 2012) for Confirmatory Factor Analysis and psych (Revelle, 2023) to compute reliabilities.

Results

The Confirmatory Factor Analysis revealed an excellent model fit for the shortened three-factor model of the Mini-DASS in the UK: $\chi^2/df=2.26$; Robust CFI=0.96; Robust TLI=0.94; Robust RMSEA=0.078 [90%CI=0.056–0.10]; SRMR=0.041. All factorial loadings were statistically significant and different from zero ($\lambda \neq 0$; $z > 1.96$, $p < 0.05$). In addition, all three factors presented good reliability levels: Depression, $\omega=0.90$; anxiety, $\omega=0.81$; and stress, $\omega=0.87$.

Furthermore, we performed correlation analyses to provide evidence of convergent validity to the Mini-DASS. As this sample is composed of individuals with food allergies, we used one of the gold-standard questionnaires to measure the specific impact of the disease on quality of life, the FAQLQ, besides attitudes towards food allergies. We found that all three factors of the Mini-DASS were significantly correlated to all dimensions of the FAQLQ. Specifically, depression exhibited a positive correlation with Emotional Impact ($r=0.29$, $p < 0.001$), Food Allergy Health ($r=0.32$, $p < 0.001$), Risk ($r=0.23$, $p < 0.001$), and Social & Dietary Limitations ($r=0.21$, $p < 0.001$). Similarly, anxiety was positively correlated with Emotional Impact ($r=0.39$, $p < 0.001$), Food Allergy Health ($r=0.43$, $p < 0.001$), Risk ($r=0.33$, $p < 0.001$), and Social & Dietary Limitations ($r=0.32$, $p < 0.001$). Lastly, stress was positively correlated with Emotional Impact ($r=0.42$, $p < 0.001$), Food Allergy Health ($r=0.44$, $p < 0.001$), Risk ($r=0.39$, $p < 0.001$), and Social & Dietary Limitations ($r=0.35$, $p < 0.001$). All factors were also related to attitudes towards food allergy: depression ($r=-0.20$, $p < 0.001$), anxiety ($r=-0.201$, $p < 0.01$), and stress ($r=-0.30$, $p < 0.001$).

Study 5

In Studies 2 to 4, we found further support for the structure of the Mini-DASS across Brazil, the United States and the United Kingdom. In Study 5, we tested whether the Mini-DASS is invariant across gender and three countries (Brazil, the United States, and the United Kingdom), using an independent sample from Brazil and the samples from Studies 3 and 4 from the other two countries. Establishing measurement invariance is essential to allow meaningful comparisons across groups (Davidov et al., 2014; Milfont & Fischer, 2010).

Method

Participants, Procedure and Material

The sample from this study consisted of 939 people from Brazil, the United Kingdom, and the United States. The new Brazilian sample consisted of 333 individuals who were between 18 and 56 years old ($M=24.40$; $SD=8.95$), primarily women (73.3%), the majority of participants declared themselves to be single (77.5%) and

from the middle social class (44.1%). Participants were recruited on social media. For details on the samples from the USA and the UK see Studies 3 and 4 above. In all three samples, participants completed the Mini-DASS.

Data Analysis

We performed Multigroup Confirmatory Factor Analysis (MGCFA) with the R-package *semTools* (Jorgensen et al., 2022). We tested for measurement invariance of the Mini-DASS across women and men and across countries. Specifically, we tested whether the factor structure is invariant across groups (configural invariance), whether the loadings are invariant (metric invariance), and whether the intercepts are invariant (scalar invariance). Following the literature (Milfont & Fischer, 2010), we focused on the ΔCFI and $\Delta RMSEA$. For the model to be invariant, the difference between the tested and reference models must be $\Delta CFI < 0.01$ and $\Delta RMSEA < 0.015$ (Chen, 2007).

Results

To assess measurement invariance, we performed two MGCFA, one across participants' gender (men x women) and the other across country (Brazil, the US, the UK). As can be seen in Table 5, the Mini-DASS is completely invariant (configural, metric and scalar) across gender and countries (e.g., $\Delta CFI < 0.01$).

General Discussion

The DASS-21 is a widely used measure for assessing negative emotional states (Szabó, 2010), that is psychometrically robust across numerous countries (e.g., Ruiz et al., 2017; Wang et al., 2016) and across clinical and non-clinical samples (Brown et al., 1997). Despite its recognized psychometric strengths, the length of the DASS-21 can be a potential limitation in data collection. Lengthy questionnaires may negatively impact participant engagement levels, consequently affecting data quality (Rammstedt & Beierlein, 2014). Therefore, researchers have been reducing well-known questionnaires and providing shortened versions that maintain the same levels of information and reliability. Examples of these reductions are the 6-item

Table 5 Results of the MGCFA

	Models	CFI	RMSEA	ΔCFI	$\Delta RMSEA$
Country	Configural	0.966	0.070	-	-
	Metric	0.961	0.070	0.005	0.000
	Scalar	0.952	0.074	0.009	0.004
Gender	Configural	0.978	0.057	-	-
	Métrica	0.980	0.053	0.002	0.004
	Escalar	0.979	0.051	0.001	0.002

Need for Cognition Scale (Coelho et al., 2020), the 10-item version of the Big-5 personality traits (Gosling et al., 2003), a 10-item version of Schwartz's (1992) value types (Lindeman & Verkasalo, 2005), or the 5-item Rosenberg Self-Esteem Scale (Monteiro et al., 2022).

It therefore does not come as a surprise that there has also been an increased interest in creating a shorter, yet valid version of the DASS-21 (Ali et al., 2021; Kyriazos et al., 2018; Osman et al., 2012). However, while these previous attempts have their merits, they also come with serious limitations such as low reliability and content validity, which were calling for further exploration and development of a more psychometrically sound alternative. Recognizing the need for a more reliable and valid shortened version of the DASS-21, our research developed the Mini-DASS through a series of five studies across Brazil, the US, and the UK.

The Mini-DASS

Our findings of Study 1 supported the oblique three-factor structure of the DASS-21 and revealed correlations in the expected direction with variables such as optimism, life satisfaction, and subjective vitality. These results build upon and strengthen prior evidence of the validity of the DASS-21 based on its internal structure and relations with external variables (Patias et al., 2016). Following the results of Item Response Theory analyses, we carefully selected 12 items, four for each factor, that demonstrated optimal difficulty, discrimination, and information levels. The 12 items of the newly developed Mini-DASS comprehensively covered four facets of depression, four of anxiety, and three of stress, ensuring that the factors remained relatively broad and robust.

Reinforcing the excellent psychometric properties of the Mini-DASS, its structure demonstrated good model fit across two independent samples from Brazil and two additional samples from the USA and UK. Notably, the Mini-DASS exhibited invariance across these three countries and between women and men. This means that comparisons between different groups of people are meaningful (Chen, 2007; Davidov et al., 2014). Finally, the Mini-DASS factors presented reliabilities ranging from good to very good across all five studies. Such results are particularly impressive given that broad factors are often associated with lower reliabilities when the number of items is kept constant (Graham et al., 2011). This further emphasizes the robustness and utility of the Mini-DASS as a reliable and efficient measure of depression, anxiety, and stress.

We also correlated the Mini-DASS factors with several variables across our studies. The correlations between the factors of the DASS-21 and the Mini-DASS were very high (Studies 1 and 3) and correlated with external constructs in the expected direction (Studies 1, 3–4), thereby providing evidence of content validity. For example, the DASS factors were negatively correlated with well-being indicators (e.g., vitality, positivity, positive affect, optimism, life satisfaction; Studies 1 and 3), and strongly positively related to other measures of depression, anxiety, and stress (Study 3).

Individuals with high levels of depression, anxiety, and stress are often characterized by low subjective vitality, a positive feeling of liveliness, and personal energy (Gouveia et al., 2012; Ryan & Frederick, 1997). Positivity, which reflects a predisposition to perceive life's various elements in a favorable light (Caprara et al., 2012; Souza et al., 2014), is associated with enhanced well-being (Borsa et al., 2016) and contrasts with the Mini-DASS factors that assess psychological distress. Psychological well-being is typically characterized by high positive affect, low negative affect, and high life satisfaction (Diener et al., 2009). The factors constituting the full and shortened versions of the DASS suggest a strong inclination toward psychological distress. We also found that individuals with depression, anxiety, and stress exhibit lower levels of optimism.

Findings regarding discriminant validity from Study 3 were only partly as expected. The care and fairness, as well as mostly purity foundations, were uncorrelated with the DASS factors. However, authority and loyalty were negatively correlated with all three DASS factors. The negative correlations between anxiety with authority and loyalty challenge previous research that partly found positive or non-significant findings (Strupp-Levitsky et al., 2020; van Leeuwen & Park, 2009). However, the other studies were conducted prior to the Covid-19 pandemic. Trusting in authorities and showing loyalty might have helped some people to cope with the pandemic. Indeed, trust in political institutions was associated with higher well-being and lower anxiety (Roccatò et al., 2021). Notably, the correlations between the DASS-21 and the Mini-DASS factors with external variables were as expected very similar.

Limitations and Future Directions

Despite our significant findings, it is important to highlight potential limitations and suggest future directions. First, while we provide evidence of the factor structure, reliability, and validity across five samples from three countries, including a specialized sample of people with food allergies, we have not included any clinical samples. This would be important if researchers want to use the Mini-DASS as an early screening tool, especially for anxiety and depression. For this to happen, it is also essential to highlight the need to assess the sensitivity and specificity of the Mini-DASS factors. Future research could address this issue by comparing the Mini-DASS to gold-standard clinical questionnaires.

Second, while we established measurement invariance across samples from three countries, it is unclear whether the Mini-DASS is also invariant across more countries. Establishing invariance across countries tends to be difficult, and most studies we are aware of establish invariance of scales only across gender or two countries, which tends to be more accessible. Thus, having established invariance across three countries is already promising. However, future research should explore the Mini-DASS's invariance in more diverse cultural contexts to determine its cross-cultural applicability.

Third, we have not tested for test-retest reliability. This is because most studies that used the DASS-21 are cross-sectional. Hence, we only focused on psychometric

properties relevant for cross-sectional studies (e.g., reliability and validity). Nevertheless, given the importance of longitudinal studies, estimating test–retest reliability of the Mini-DASS would be beneficial. Based on previous research that found satisfactory to good test–retest reliability of the DASS-21 (Bottesi et al., 2015; Kakemam et al., 2022; Silva et al., 2016), we suspect that the results for the Mini-DASS will also be satisfactory to good.

Finally, our research focused primarily on adults, and it remains unclear whether the Mini-DASS is suitable for adolescent or elderly populations. Age-related differences in the experience and expression of emotional states might affect the psychometric properties of the Mini-DASS, necessitating further investigation in these age groups.

Conclusion

In summary, our research shows that the 12-item Mini-DASS is as reliable and valid for assessing depression, anxiety, and stress in the general population as the longer version, the DASS-21. The Mini-DASS maintains the solid psychometric properties of the original DASS-21 and demonstrates invariance across three countries and gender, which allows meaningful comparisons between those groups. As a more efficient and accessible measure of negative emotional states, the Mini-DASS has the potential to enhance research and practice in psychology by facilitating data collection, promoting participant engagement, and contributing to a better understanding of the complex interplay between depression, anxiety, stress, and well-being across diverse populations.

Appendix A: The Mini-DASS scale

(Responses are given on a 4-point scale: 0=Did not apply to me at all, 1=Applied to me to some degree, or some of the time, 2=Applied to me to a considerable degree, or a good part of time, 3=Applied to me very much, or most of the time).

Depression

1. I felt that I had nothing to look forward to
2. I was unable to become enthusiastic about anything
3. I felt I wasn't worth much as a person
4. I felt that life was meaningless

Anxiety

5. I experienced trembling (for example, in the hands)
6. I was worried about situations in which I might panic and make a fool of myself

7. I was aware of the action of my heart in the absence of physical exertion (for example, sense of heart rate increase, heart missing a beat)
8. I felt scared without any good reason

Stress

9. I found it hard to wind down
10. I felt that I was using a lot of nervous energy
11. I found myself getting agitated
12. I found it difficult to relax

Declarations

Conflict of Interest The authors have no conflict of interest to declare. None of the studies was pre-registered.

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