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The Italian version of the Depression Anxiety Stress Scales-21: Factor structure and psychometric properties on community and clinical samples

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Abstract

Objective: The Depression Anxiety Stress Scales-21 (DASS-21) is the short version of a self-report measure that was originally developed to provide maximum differentiation between depressive and anxious symptoms. Despite encouraging evidence, the factor structure and other features of the DASS-21 are yet to be firmly established.
Method: A community sample of 417 participants and two clinical groups (32 depressive patients and 25 anxious patients) completed the Italian version of the DASS-21 along with several measures of psychopathology.
Results: Confirmatory factor analyses suggested that the DASS-21 is a measure of general distress plus three additional orthogonal dimensions (anxiety, depression, and stress). The internal consistency and temporal stability of the measure were good; each DASS-21 scale correlated more strongly with a measure of a similar construct, demonstrating good convergent and divergent validity. Lastly, the DASS-21 demonstrated good criterion-oriented validity.
Conclusion: The validity of the Italian DASS-21 and its utility, both for community and clinical individuals, are supported.

1. Introduction

Depression and anxiety are highly comorbid conditions characterized by both shared and distinctive features. Their frequent co-occurrence, as well as the inability of traditional self-report measures to discriminate between them, is well known [1–3]. With regard to this, the Depression Anxiety Stress Scales (DASS) is a self-report questionnaire created with the initial aim of providing maximum differentiation between the core symptoms of depression and anxiety; the major development of the DASS was conducted on non-clinical samples [4,5]. Items and scales were identified a priori on the basis of clinical consensus and were then empirically refined using factor analysis. A third factor emerged from the analysis of the items, which resulted in inadequate discrimination between anxiety and depression. It was labeled "stress" in that it was mainly characterized by irritability, nervous tension, difficulty relaxing, and agitation [4]. Thus, the final version of the DASS consisted of 42 items comprising three scales: (a) depression, assessing a lack of incentive, low self-esteem, and dysphoria; (b) anxiety, referring to somatic and subjective symptoms of anxiety, as well as acute responses of fear; (c) stress, evaluating irritability, impatience, tension, and persistent arousal [4]. Attempts to ascertain whether the stress scale measured a distinct syndrome or a general distress factor related to both depression and anxiety (likewise the Negative Affect postulated by the tripartite model, [6]) led to mixed results [7–9].

With the aim of developing a short form for use in research as well as in settings characterized by time constraint, Lovibond and Lovibond [5] selected seven representative items from the original DASS for each scale of the questionnaire; the identified items should have good factor loadings on the original measure and scores for each

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reduced scale should be very close to half of the respective full-scale score. This short measure was named the DASS-21. In the original manual, internal consistency data on a non-clinical sample are reported for the three scales (depression: $\alpha = .81$; anxiety: $\alpha = .73$; stress: $\alpha = .81$), whereas neither factor analyses nor psychometric properties of the short scales are described [5].

Despite the potential importance of the DASS-21, few studies have examined the psychometric properties and factor structure of this measure in clinical [1,10] and non-clinical [7,11–13] adult samples. In general, such studies showed excellent[1] internal consistency of the three scales of the DASS-21 ($.80 < \alpha s < .91$) [7,11–13], large convergent/divergent[2] validity coefficients (rs ranging from .50 to .80, and from −.16 to −.48, respectively) [7,12,13], and good construct validity [11]. Medium to large correlations between the three DASS-21 dimensions (rs ranging from .46 to .75) [1,10,13] have been found. However, in several studies, correlations between stress and depression and stress and anxiety emerged as higher than those between depression and anxiety factors [1,10].

Overall, the results from confirmative factor analyses (CFAs) supported the original three-factor structure [1,7,10,11,13], and only a few alternative solutions have been reported [7,12]. For instance, Clara et al. [10] investigated the internal structure of the DASS through eight CFAs in a sample of patients with mood disorders: the original 42-item DASS [4]; the revised three-factor structure of the 42-item DASS proposed by Brown et al. [14], where two items were allowed to load on both the stress and anxiety factors; the original DASS-21 [4]; a version of the DASS-21 comprising the 21 items of the 42-item DASS that were excluded from the original DASS-21; and four different sub-sets of the DASS items, previously identified by Lovibond and Lovibond [4] and representing theoretically defined syndromes of anxiety, depression, and stress (i.e. "tripartite models") [10]. The results highlighted that the original DASS-21 model showed better fit indices than the two DASS-42 models and the other DASS-21.

Henry and Crawford [7] observed that a four-factor (quadripartite) model, consisting of the three depression, anxiety, and stress dimensions plus a general distress factor, represented the optimal fit of all the structures they tested. Thus, their findings sustain the hypothesis of the three factors as independent but acknowledge the existence of a more general factor that shares variance with the three of them. On the other hand, Osman et al. [12] conducted exploratory and confirmatory item bifactor analyses on the DASS-21 in order to investigate the extent to which each item is associated with a domain-specific dimension (i.e., the three DASS-21 factors) or a general dimension; they concluded that the DASS-21 may measure a general distress dimension rather than independent dimensions of depression, anxiety, and stress.

Partial support for the three-factor structure and good psychometric properties of the DASS-21 also came from studies validating foreign versions of the questionnaire [15–18]. For instance, in a recent study, Oei et al. [19] examined the cross-cultural validity of the DASS-21 among six Asian community samples (i.e., Malaysian, Indonesian, Singaporean, Sri Lankan, Taiwanese, and Thai). Three factors emerged from the exploratory factor analysis (EFA), and three items were removed from the stress scale due to loadings on more than one factor. Three different solutions were then compared by means of CFA: three-factor DASS-21, three-factor DASS-18, and one-factor DASS-18. The three-factor DASS-18 resulted in the best solution; it also showed good-excellent internal consistency values ($.70 < \alpha s < .86$) and satisfactory convergent validity ($.50 < rs < .60$) with the Beck Depression Inventory-Second Edition (BDI-II) [20], the Beck Anxiety Inventory (BAI) [21], and the Positive and Negative Affect Schedule, Negative Affect subscale (PANAS-NA) [22].

The use of the DASS-21 in research and clinical practice may hold great promise: the questionnaire is in the public domain; its widespread use is well documented; its relatively short format guarantees a good ease of use in different settings since it is not a time-consuming self-report measure; lastly, it has been shown to be responsive to change in clinical status [23,24]. Furthermore, the DASS-21 has a comparable or even clearer latent structure than the original version [1,7,10]; it is as reliable and discriminative as the DASS [1]; its factorial structure is similar in both clinical and non-clinical samples [1,7,10,11,13]; and its psychometric properties and factor structure have been found to converge across different cultures [16,18,19,25].

Nonetheless, an Italian validation of the DASS-21 is not available to date. Although Severino and Haynes [26] previously developed an Italian version of the original DASS, at least four limitations currently prevent its use in the Italian clinical and research contexts. First, the items are not written in a good and sound Italian language. Second, the participants were a particular sub-sample of the Italian population, that is, Italian adults who had emigrated to Australia. Third, the age of the sample (55–90) was not typical of questionnaire validation studies. Lastly, no clinical sample was considered in the study. Therefore, a more readable version of the questionnaire, administered to a more representative Italian sample as well as to clinical individuals, is needed and could provide more reliable data.

[1] The following systems have been adopted throughout the manuscript to describe internal consistency and correlations coefficients: Internal consistency values: $\alpha \geq .90$ = "optimal"; $.90 > \alpha \geq .80$ = "excellent"; $.80 > \alpha \geq .70$ = "good"; $.70 > \alpha \geq .60$ = "sufficient"; $.\alpha < .60$ = "insufficient". Pearson's correlation coefficients: $r \geq .50$ = "large association"; $.50 > r \geq .30$ = "medium association"; $r < .3$ = "small association".

[2] Convergent/divergent validity has been tested by administering the Positive and Negative Affect Schedule, Positive and Negative Affect subscales [22] in the study by Henry and Crawford [7]. Sinclair et al. [13] assessed convergent validity by using the SF-8 health survey, Mental Health and Physical Health subscales (SF-8) [59], and the Rosenberg Self-Esteem Scale (RSES) [60].

Furthermore, despite the above-mentioned potentialities of the DASS-21, a number of issues still have to be further explored. First, no complete agreement in regard to the factor structure of the DASS-21 has been achieved (one-factor vs. three-factor vs. bifactor structure; see previously mentioned studies); second, data about temporal stability are lacking; third, a scarce (and inconsistent) number of findings regarding gender differences have been reported [11,25,27]; likewise, the relationships between the DASS-21 and age and education in adult samples have not been investigated. Fourth, it is also important to note that, whereas the convergent/divergent validity of the DASS, as well as that of the DASS-21, has mostly been investigated for anxiety and depression scales, only one study has adopted specific measures of stress to study the convergent/divergent validity of this measure [12]. Lastly, only a few studies tested the psychometric properties of the DASS-21 on clinical samples that were composed of depressive and anxious patients [1,10,15,16,25].

1.1. The current study

In consideration of the potential utility of the DASS-21, as well as its current unavailability in Italy, the main aim of the present study was to provide data on the factorial structure and psychometric properties of the Italian version of the questionnaire by administering it both to community and clinical individuals.

In the first place, the current study aimed to explore the factor structure of the Italian DASS-21 by performing three CFAs that tested three different models: a unidimensional model, a three-factor oblique model, and a bifactor model. Furthermore, we sought to explore the internal consistency, temporal stability, and construct validity of the Italian DASS-21 in both clinical and non-clinical samples, as well as criterion validity as concurrent validity, i.e., whether DASS-21 subscale scores can adequately discriminate between known groups such as non-clinical participants and depressed and anxious patients. Moreover, we addressed novel issues scarcely investigated in previous studies. First, we analyzed the associations between the three original DASS-21 scale scores and age and education in our adult sample (>18 years), speculating that we would find small correlations between these variables. Furthermore, since few statistics on gender differences have been reported in the literature, we aimed to further investigate them in the present sample. Overall, the results from the few studies taking into account this issue reported that females obtain higher scores than males in the DASS-21 scales, but different patterns have been found [11,25,27]. Lastly, since we did not have sufficient data to formulate a clear hypothesis on clinical participants with respect to the DASS-21 stress scale, we speculated that scores on this scale should be higher in all patients compared to normal controls, with few differences among patients, because the scale measures a general state of tension and irritability.

2. Method

2.1. Participants and procedure

Four hundred and seventeen individuals (42.9% male), who reside in 10 different middle-sized communities in northern and central Italy and who had responded to advertisements requesting potential volunteers for psychological studies, entered the study. All participants were Caucasian. The mean age of the sample was 36.39 (SD = 13.71; range = 18–80) and the mean years of education was 14.18 (SD = 3.45; range = 5–23). Marital status was 48.8% single, 47.4% married or cohabitating, 2.2% separated or divorced, and 1.6% widowed. The employment profile of the total sample was: 47.7% full-time employed, 27.3% student, 4.8% part-time employed, 2.6% unemployed, 3.8% retired, 2.6% full-time homemaker, and 11.2% other. To obtain data about the temporal stability of the DASS-21, a sample of 142 undergraduate students, recruited at the University of Padova (78.2% female; mean age = 20.84; SD = 1.21), completed the questionnaire on two occasions two weeks apart. As for community individuals, all students were Caucasian.

Clinical individuals were patients whose most severe problem was either *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text Revision* (DSM-IV-TR) [28] diagnosed depressive disorders (depressive group, DG) or any DSM-IV-diagnosed anxiety disorder except OCD and simple phobia (anxious group, AG). OCD sufferers were excluded since anxiety has been demonstrated not to be the main specific component characterizing the disorder (consistently, in light of its heterogeneity, OCD is no longer categorized within the anxiety disorders category of the fifth version of the DSM [29]); on the other hand, simple phobias are very specific conditions more linked to fear than anxiety. Patients with secondary comorbid Axis-I or Axis-II diagnoses were included. Non-suitable patients were those with a current or past psychotic disorder, dementia, mental retardation, or a current substance use disorder. All patients were recruited from 6 different private settings located in northern and central Italy. During the routine assessment phase, patients were interviewed by one of the members of our research team (all PhD-level psychologists experienced in diagnosing psychiatric disorders) using the Structured Clinical Interviews for DSM-IV [30,31] to establish DSM-IV diagnoses. Although inter-rater reliability for the main diagnosis was not formally examined, each case was audio-recorded and carefully reviewed in supervisory meetings and all diagnoses were reached by rater consensus.

After being assessed, suitable patients were invited to participate in the study. One anxious patient and one depressive patient refused to participate after the screening process. The final sample consisted of 32 depressive patients and 25 anxious patients (all were Caucasian). In the former group, the frequency of each principal depressive disorder diagnosis was as follows: 60% major depressive disorder, 20% dysthymia, 10% cyclothymia, 10% other. Likewise, in the latter group, the frequency of each principal anxiety

disorder diagnosis was as follows: 44% panic disorder without agoraphobia, 20% panic disorder with agoraphobia, 20% generalized anxiety disorder, and 16% social phobia. In addition, we found that, in the DG, 31% had a secondary comorbid Axis-I diagnosis (8 = anxiety disorders, 2 = other) and 22% had an Axis-II diagnosis (1 with a dependent personality disorder, 1 with an histrionic personality disorder, 1 with a narcissistic personality disorder, 1 with a borderline personality disorder and 3 with a personality disorder NOS). In the AG, 16% had a secondary comorbid Axis-I diagnosis (3 = depressive disorders; 1 = other) and 24% had an Axis-II diagnosis (2 with a dependent personality disorder, 1 with a narcissistic personality disorder, and 3 with a personality disorder not otherwise specified [NOS]). Table 1 provides descriptive statistics on the various demographic variables for the two clinical groups.

The study was conducted in accordance with the Declaration of Helsinki and was approved by the institutional board of the University of Firenze. All individuals participated on a voluntary basis and gave their written consent before entering the study. No incentives for participation were offered. Eligible participants were requested to complete a battery of self-report measures that were individually administered. The sequence of measures was rotated to control for order effects.

2.2. Measures

2.2.1. Translation of the DASS-21

The standard steps that are outlined in the psychology literature guided the translation process used in this study [32]. In the first step, three independent researchers translated the questionnaire from English to Italian and then reached agreement on a common version. Idiomatic Italian at the sixth-grade level was used for this step. Moreover, the researchers reviewed the common version to ensure there were no colloquialisms, slang, or esoteric phrases that would make interpretations difficult. The shared form was then back-translated by a bilingual individual with extensive knowledge of psychological research. The back-translation proved to be nearly identical to the original one. As a final step, the DASS-21 items of the Italian version were rated by 5 experts in anxiety and depressive disorders (each of them had extensive experience [i.e. more than 10 years], in the psychological treatment of these psychopathologies). Each expert rated the items on a 5-point scale (1 = not at all, 5 = extremely) for clarity (the extent to which the item is clearly described). The experts' ratings indicated excellent clarity (mean across all items = 4.6; SD = .5), suggesting that further item refinement was unnecessary.

2.2.2. Other measures of psychopathology

All participants completed a background information questionnaire and the following measures:

The Beck Anxiety Inventory (BAI) [21] is a 21-item, self-report inventory that measures the severity of anxiety. Previous studies, conducted on non-clinical and clinical samples (654 undergraduates, 831 community controls, and 64 anxious patients), suggested that the Italian version of the BAI had good psychometric properties [33,34]. Good to excellent Cronbach's alpha values were observed also in the present study (community: α =.90; AG: α = .87; DG: α = .76).

The Beck Depression Inventory-II (BDI-II) [20] is a 21-item, self-report scale that assesses the severity of affective, cognitive, motivational, vegetative, and psychomotor components of depression. In previous studies, the Italian version of the BDI-II was administered to 733 undergraduates, 354 community controls, and 135 depressed patient; results showed that the BAI was characterized by excellent psychometric properties [34,35]. Internal consistency coefficients were good to excellent also in the samples employed in the present study (community: α = .82; AG: α = .77; DG: α = .89).

The Perceived Stress Questionnaire 20- item form (PSQ-20) [36] measures the individual's subjective perception and emotional response to stress. It was originally developed in Italy (and made available both in Italian and English language versions) for studying the effect of stress on the course of diseases such as ulcerative colitis, duodenal ulcer, asthma, and the like [37]. The instructions ask the participant to rate on a 4-point scale how often the described experience applies to him/her in general (e.g., "How often do…..." "you feel rested," "you have many things to do," "you feel frustrated").

Table 1
Demographic data and levels of symptomatology across groups.

	DG (n = 32)	AG (n = 25)	CC (n = 34)	χ^2 Or F associated probability	Significant SNK post-hoc comparison ($p < .05$)
Age	43 (12.4)	30.8 (7.5)	37.6 (13.8)	.005	DG > AG
Years of education	14.5 (3.8)	14.9 (3.6)	14.7 (3.0)	NS	-
% of females	59	48	65	NS	-
% of married/cohabitant	44	20	50	NS	-
% of employed	47	48	60	NS	-
BDI-II	26.5 (10.6)	17.7 (7.0)	5.9 (4.3)	.001	DG > AG > CC
BAI	14.6 (6.6)	28.9 (11.0)	8.9 (9.2)	.001	AG > DG > CC

NS = nonsignificant; standard deviations in brackets; SNK = Student–Newman–Keuls; DG = depressive group; AG = anxious group; CC = community controls (a sub-group extracted by the large community sample for comparative purposes); BDI-II = Beck Depression Inventory-Second Edition; BAI = Beck Anxiety Inventory.

Levenstein et al. [37] suggested that a time frame be specified in the instructions (e.g., in the last month, year, etc.); in addition, because the items are generic, the questionnaire can be administered to different healthy and clinical adult samples in different settings. The original 30-item Italian version was reduced to 20 items following a series of studies involving a total of 2458 participants who were mostly psychosomatic medicine patients [36]. The PSQ-20 is composed of three factors representing typical stress reactions (i.e., worry, tension, lack of joy), and a fourth one that focuses on an environmental dimension of perceived stress (demands). Reliability (Cronbach's alpha) of the single factors exceeded .70, whereas the figure for the overall score was at least .85. The questionnaire correlated positively with the Trier Inventory of Chronic Stress [38] and negatively with a short measure of quality of life by the World Health Organization [39]. Lastly, all scales differentiated patients from healthy adults. In the present study, in accordance with Levenstein et al.'s guideline [37], we used a timeframe of a month. A subsample of 196 individuals from the community sample completed the PSQ-20; the Cronbach's alpha for the overall score was .88.

2.3. Data analysis

To test the different internal structures of the DASS-21, a series of CFAs on the community sample was performed using R 3.0.2 [40], specifically the R package *lavaan* [41]. The variance of the factors in each model was set to 1.0. Given that the data were ordinal, the weighted least squares mean and variance (WLSMV) robust estimator was employed in all CFAs. An assessment of the fit of each model was based on several indices. Since the χ^2 statistic is extremely sensitive to sample size, two relative fit indices have been considered: the nonnormed fit index (NNFI) and the comparative fit index (CFI), as they both perform well with small and large samples. For these indices, values that are >.95 and >.97 are associated with acceptable and good fit, respectively [42]. The root mean square error of approximation (RMSEA) was also used. This is an absolute fit index that assesses the approximation of parameter estimates to true parameters in the population. RMSEA values that are <.05 can be considered a good fit, whereas values between .05 and .08 are thought to be an adequate fit [42]. Next, the models were compared using both a qualitative evaluation of the fit indices and the ΔCFI criterion [43]. As recommended by Cheung and Rensvold [43], if the difference in the CFIs between two nested models (ΔCFI) is smaller than |0.01|, the hypothesis of no difference in fit between the two competing models should not be rejected. Given that under certain conditions traditional fit indices could be biased in favor of the bifactor solution among other more parsimonious rival models [44], the hierarchical omega squared was calculated in order to have a better evaluation of the bifactor solution, not only in terms of fit indices [45].

Product-moment correlations were computed to examine inter-correlations and the temporal stability of the DASS-21 scale scores, as well as various associations among the DASS-21 scale scores and other variables (convergent/divergent validity). To test for differences of correlations within a sample, Fisher's *r to z* transformation was utilized. Partial correlations were used to determine the specificity of each subscale when controlling for the other two subscales.

One-way analyses of variance (ANOVAs) were performed to compare the DASS-21 scale scores by gender in the community sample. Furthermore, analyses of covariance (ANCOVAs) were conducted to compare the two clinical groups and a third group randomly extracted from the community sample (see the paragraph on criterion-oriented validity below) on the DASS-21 scale scores: since the groups differed by age, this variable was entered as covariate. Student–Newman–Keuls (SNK) post-hoc comparisons were used to assess the differences among groups. To evaluate the magnitude of the significant differences, eta squared values (η^2) were also computed by comparing groups in pairs. According to Cohen [46], $\eta^2 = .01$ corresponds to a small effect size, $\eta^2 = .06$ to a medium effect, and $\eta^2 = .14$ to a large effect size.

All of these analyses were performed using the software Statistical Package for Social Science (SPSS) version 20 (SPSS, Chicago, IL).

3. Results

3.1. Factor structure

In order to identify the best factor structure of the Italian DASS-21 in the community sample and following the recommendations by Reise et al. [45], we conducted three different CFAs that tested three respective models: A) a unidimensional model (all 21 items loading on a single factor); B) a three-factor oblique model (the original DASS-21 model) [4]; and C) a bifactor model in which each of the 21 items is constrained to load on a general factor and on one out of the three (uncorrelated) domain-specific factors (model C is represented in Fig. 1; for a graphic representation models A and B, refer to Reise et al. [45]). Please note that we decided not to test the fit of a second-order model (three dimensions plus a common higher-order distress factor) in light of the fact that this model would have produced identical fit as the three-factor oblique model [47].

Table 2 reports the means, standard deviations, and correlations for all items of the DASS-21.

The unidimensional model demonstrated the worse fit (χ^2 (189, n = 417) = 656.275, $p < .001$; NNFI = .901; CFI = .911; RMSEA = .077), whereas the three-factor oblique model showed good fit indices: (χ^2 (186, n = 417) = 353.672, $p < .001$; NNFI = .964; CFI = .968; RMSEA = .046). Correlations between factors in the three-factor oblique model were strong: anxiety-depression

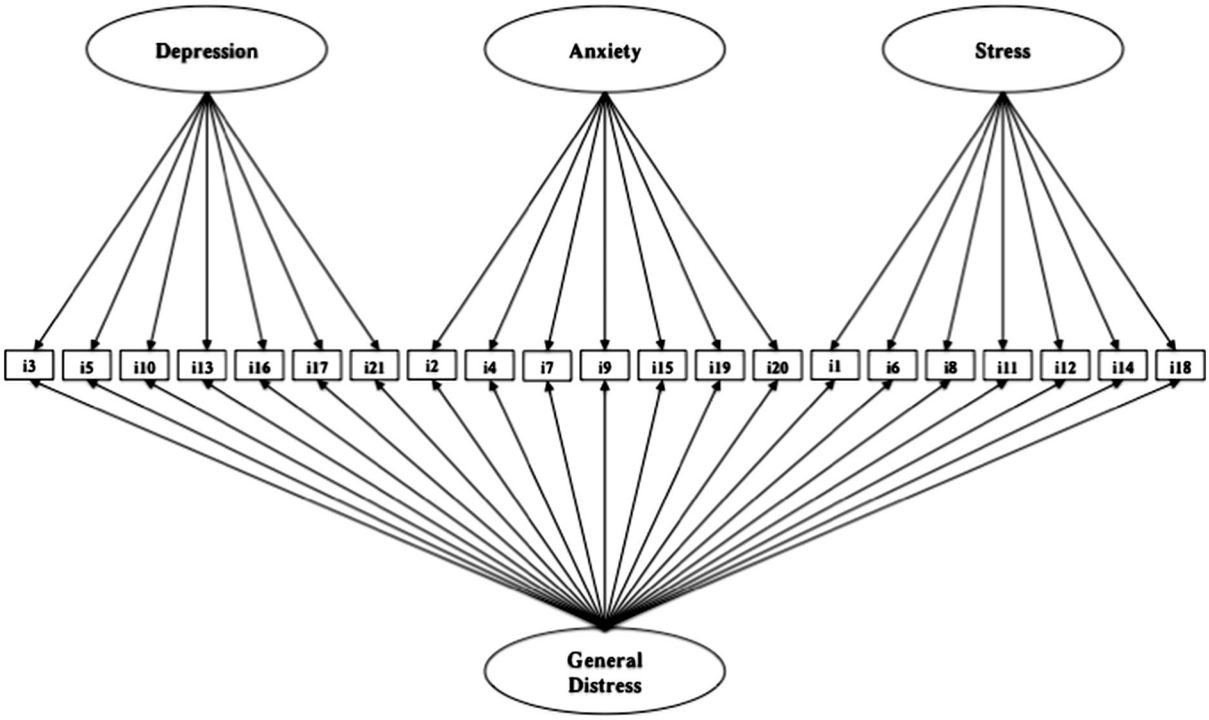

Fig. 1. The theoretical bifactor model.

r = .69, anxiety-stress r = .74, and depression-stress r = .69. The bifactor model resulted the best factor solution, χ^2 (168, n = 417) = 271.292, p < .001; NNFI = .975; CFI = .980; RMSEA = .038. The ΔCFI between the bifactor and the three-factor oblique model was .012, thus supporting the hypothesis that the bifactor model is the most appropriate in reproducing the observed data.

In Table 3, the standardized factor loadings and the proportions of explained variance of the bifactor model are presented. All loadings associated with the general factor were significant at p < .05 and had a satisfactory size, whereas three loadings associated with the specific group factor were not significant.

Lastly, the omega hierarchical coefficient for the total score based on our bifactor solution was .87, thus supporting the presence of a relatively strong general DASS-21 factor, at least in our non-clinical sample [45]. In other terms, if a composite were formed based on summing the DASS-21 items, it can be concluded that 87% of the variance of this composite could be attributable to variance on the general factor.

3.2. Distribution and item analyses

Means and standard deviations for the three scales and the total score of the DASS-21[3], Cronbach's alpha coefficients, and correlations among the three subscales for the community and clinical samples as a whole are shown in Table 4.

Cronbach's alpha coefficients exceeded .70 both in the community and clinical samples as a whole; no item removal was indicated to improve internal consistency values, thus indicating good to excellent internal consistency. Corrected item-total correlations were never smaller than .30 in either group in either scale, while mean inter-item correlations were always well above .40, which is considered an adequate value for narrow constructs [48].

Correlations among the three subscales were overall medium, both for the community (mean r = .59, i.e., 35% of common variance) and clinical samples (mean for group: r = .54, i.e., 29% of common variance). Not surprisingly, in both groups the correlation between each DASS-21 subscale and the total score was large.

Lastly, two-week test–retest reliability values computed on the undergraduate student sample were large for all the DASS-21 scale scores (DASS-21 anxiety scale: r = .64; DASS-21 depression scale: r = .75; DASS-21 stress scale: r = .64; DASS-21 total: r = .74; all ps < .001).

3.3. Association of the DASS-21 scores with age, education, and gender for community sample

In the community sample, age was negatively correlated with the DASS-21 depression (r = −.11, p = .03) and stress (r = −.12, p = .02) subscales. Furthermore, the DASS-21 stress subscale positively correlated with education (r = .12, p = .01). Such correlations are considered small. No other significant correlations emerged, either with age or with

[3] Mean values reported for the three DASS-21 subscales and total scores were not doubled. Therefore, in order to compare obtained scores with those of the DASS-42, or with English norms and some other published results for the DASS-21, they should be multiplied by two [4].

Table 2
Means, standard deviations (SD), and correlations between the DASS-21 items (n = 417).

	Means (SD)	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20	Item 21
Item 1	.80 (.70)	.22	.30	.32	.23	.39	.10	.46	.35	.18	.46	.44	.39	.35	.25	.20	.13	.41	.36	.28	.09
Item 2	.56 (.70)		.18	.17	.20	.24	.23	.18	.22	.14	.22	.17	.20	.23	.14	.09	.22	.20	.21	.27	.12
Item 3	.52 (.65)			.18	.19	.17	.15	.27	.18	.30	.28	.32	.33	.28	.18	.43	.23	.15	.14	.20	.27
Item 4	.33 (.57)				.16	.21	.22	.33	.21	.10	.29	.30	.25	.23	.28	.22	.10	.19	.42	.31	.19
Item 5	.82 (.78)					.27	.12	.33	.24	.19	.31	.33	.30	.32	.14	.26	.28	.26	.19	.26	.21
Item 6	.91 (.72)						.15	.44	.29	.20	.38	.37	.34	.29	.24	.22	.19	.46	.26	.24	.12
Item 7	.22 (.51)							.15	.20	.11	.12	.06	.13	.10	.19	.06	.10	.11	.20	.26	.10
Item 8	.81 (.77)								.35	.26	.56	.49	.44	.41	.20	.33	.19	.46	.34	.19	.22
Item 9	.32 (.56)									.25	.28	.28	.39	.34	.35	.19	.29	.22	.27	.35	.23
Item 10	.41 (.61)										.25	.23	.53	.32	.19	.40	.41	.22	.12	.12	.33
Item 11	1.24(.79)											.66	.42	.40	.32	.27	.14	.50	.31	.30	.23
Item 12	1.00(.81)												.41	.38	.25	.31	.21	.38	.38	.29	.28
Item 13	.69 (.69)													.41	.33	.39	.42	.38	.27	.23	.37
Item 14	.56 (.67)														.24	.30	.21	.37	.22	.24	.27
Item 15	.14 (.38)															.16	.19	.23	.27	.35	.20
Item 16	.38 (.55)																.31	.25	.21	.21	.38
Item 17	.36 (.62)																	.20	.15	.24	.49
Item 18	1.00(.72)																		.34	.25	.10
Item 19	.52 (.72)																			.42	.22
Item 20	.24 (.48)																				.27
Item 21	.16 (.42)																				

education. In regard to gender, no difference between males and females on the DASS-21 scale scores was found (all *p*s > .05).

Table 3
The estimated bifactor model (n = 417).

Item	Factor loadings				Proportion of explained variance		
	General	Depression	Anxiety	Stress	By general factor	By specific group factor	Total
3	.49	.31			.24	.10	.34
5	.52	*.06*			.27	.00	.28
10	.49	.59			.24	.35	.60
13	.72	.36			.52	.13	.64
16	.54	.50			.29	.25	.54
17	.49	.55			.24	.30	.55
21	.58	.53			.34	.28	.62
2	.41		.22		.17	.05	.22
4	.56		.40		.31	.16	.47
7	.39		.46		.15	.21	.36
9	.67		*.16*		.45	.03	.48
15	.67		.33		.45	.11	.55
19	.59		.41		.35	.17	.51
20	.63		.49		.40	.24	.64
1	.64			.23	.41	.05	.46
6	.57			.24	.32	.06	.38
8	.68			.33	.46	.11	.57
11	.63			.66	.40	.44	.83
12	.66			.45	.44	.20	.63
14	.67			*.05*	.45	.00	.45
18	.57			.32	.32	.10	.43

All structural coefficients are standardized. All factor loadings are significant at .05 except for those in italics, for which *p* > .05.

3.4. Convergent and divergent validity

The convergent and divergent validities of the DASS-21 were determined by Pearson correlations with other measures of similar constructs (i.e., the BAI, the BDI-II, and the PSQ-20), computed on the community sample (Table 5). The anxiety score of the DASS-21 correlated more strongly with the corresponding scale (i.e., the BAI) than with the other non-corresponding scales (*z* values >1.96, *p*s < .05); the DASS-21 depression score correlated slightly more strongly with the corresponding scale (i.e., the BDI-II) than with the other non-corresponding scales (*z* values >1.96, *p*s < .05); lastly, the DASS-21 stress scale correlated more strongly with the corresponding scale (i.e., the PSQ-20) than with the BDI-II (*z* values >1.96, *p* < .05). Importantly, these correlations remained significant after controlling for the other DASS-21 subscales: DASS-21 anxiety (partial *r* = .38), DASS-21 depression (partial *r* = .33), and DASS-21 stress (partial *r* = .41). Such correlations were medium in size, suggesting an adequate specificity of the three DASS-21 subscales. Overall, such results indicated adequate convergent and divergent validity of the DASS-21. Lastly, as expected, the DASS-21 total score correlated similarly with measures of anxiety, depression, and stress.

3.5. Criterion-oriented validity

To ascertain criterion-related validity, the mean scores on each DASS-21 subscale, as well the total score, were compared across three groups: the two clinical groups and a third group of 34 individuals, who were randomly selected from the sample of 417 nonclinical subjects belonging to the community (community controls, CC) for comparative

Table 4
Descriptive statistics (means and standard deviations), internal consistency values (Cronbach's αs), and inter-correlations (Pearson *r*s) between the DASS-21 subscales and total score both in community and clinical groups.

	Community sample (n = 417)						Clinical sample (n = 91)					
	Mean	SD	Cronbach's αs	2	3	4	Mean	SD	Cronbach's αs	2	3	4
1. DASS-21 Anxiety	2.4	2.6	.74	.57*	.60*	.82*	5.5	4.6	.88	.36*	.75*	.83*
2. DASS-21 Depression	3.5	3.2	.82		.61*	.85*	7.7	5.6	.91		.50*	.78*
3. DASS-21 Stress	6.4	3.8	.85			.89*	8.9	4.2	.83			.88*
4. DASS-21 Total	12.3	8.3	.90				22.1	12.1	.92			

* $p < .001$.

purposes. The three groups were equivalent with respect to all demographic variables (all *p*s > .10) except age. As expected, the DG scored significantly higher than the AG on the BDI-II, whereas the AG scored higher than the DG on the BAI; the CC group reported significantly lower anxiety and depressive scores than the two clinical groups (please refer to Table 1 for descriptive statistics and statistical comparisons).

As shown in Table 6, post-hoc analyses revealed that the DG scored significantly higher than anxious patients on the DASS-21 depression subscale; the AG scored significantly higher than depressive patients on the DASS-21 anxiety subscale, the DASS-21 stress subscale, and the total score; lastly, the CC group reported significantly lower scores on all DASS-21 scales than the two clinical groups (in all analyses, the covariate age was non-significant).

The analysis of eta-squared values suggested that the magnitude of the differences was generally small when patients were compared to each other and medium when patients were compared to the CC group. In addition, the η^2 value for the DASS-21 stress subscale and total score was rather small when the two clinical groups were compared, suggesting very little difference on these scales across the two groups.

4. Discussion

The present study aimed to evaluate the factor structure and psychometric properties of the Italian DASS-21 on a large community sample, as well as its utility in discriminating between depressive and anxious patients. With respect to the internal structure of the questionnaire, results from the series of CFAs suggested that, despite the original three-factor oblique model [4] showing good fit indices, the best factor solution is a bifactor model. This was further supported by the evaluation of the omega hierarchical coefficient for the total score based on our bifactor solution. In line with findings by Osman et al. [12], our results support the idea of the DASS-21 as a measure of a general common trait (i.e. "general distress") plus additional orthogonal traits. This may indicate that use of the total score could be as appropriate as calculating the three subscale scores separately. Consequently, the DASS-21 appears to be particularly suitable for research purposes because it offers a very efficient and economical way to measure general distress, a condition characterizing general psychopathology and mood problems. Since in many studies, both on community and clinical individuals, it is crucial to either measure or control for general distress [49,50], we believe that, in light of present findings, the DASS-21 may allow for measuring anxiety, depression, and stress features in a meaningful and efficient way.

Notably, this finding is somewhat in line with Clark and Watson's model [2,6], stating that Negative Affect (i.e. "nonspecific distress inherent in the syndromes of depression and anxiety and largely responsible for their co-occurrence" [6], p. 329) could represent a common feature shared by anxiety and depression syndromes, which, at the same time, are also characterized by their own peculiar elements. Our results could be rather interpreted as an extension of this model: as a matter of fact, each symptom measured by the DASS-21 is the expression of both a common "general distress" trait and the specific syndrome it refers to (i.e., depression, anxiety, and stress). Therefore, taking into account both the common and unique features characterizing specific syndromes is essential to gaining a comprehensive explanation of the high co-occurrence of depression, anxiety, and stress in clinical practice. Notably, current findings also suggest that the stress dimension of the DASS-21 does not coincide with the "general distress" trait; rather, present data suggest that it represents a syndrome.

With respect to psychometric properties, the Italian DASS-21 showed very good reliability. The internal consistency values of the three scales and total scores in both community and clinical samples were good to excellent and in line with those reported for the original DASS-21

Table 5
Correlations (Pearson *r*s) between the DASS-21 and measures of anxiety (BAI), depression (BDI-II), and stress (PSQ-20) observed in the community sample (n = 417).

	BAI	BDI-II	PSQ-20
DASS-21 Anxiety	.60*	.38*	.30*
DASS-21 Depression	.44*	.52*	.44*
DASS-21 Stress	.51*	.42*	.57*
DASS-21 Total	.61*	.52*	.54*

n = 417, except PSQ-20 figures (n = 196); BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory–Second Edition; PSQ-20 = Perceived Stress Questionnaire 20 item form.

* $p < .01$.

Table 6
Group comparisons on the DASS-21 subscales with age as covariate.

	DG (n = 32)	AG (n = 25)	CC (n = 34)	Analysis of covariance outcome	Significant SNK post-hoc comparison ($p < .05$)	η^2 values (DG vs. AG)	η^2 values (DG vs. CC)	η^2 values (AG vs. CC)
DASS-21 Anxiety	4.9 (.7)	10.3 (.8)	2.6 (.6)	$F_{(2,87)} = 27.8$*	AG > DG > CC	.25	.12	.45
DASS-21 Depression	11.9 (.7)	8.9 (.8)	2.9 (.7)	$F_{(2,87)} = 41.6$*	DG > AG > CC	.11	.55	.45
DASS-21 Stress	9.4 (.6)	11.7 (.7)	6.4 (.6)	$F_{(2,87)} = 15.7$*	AG > DG > CC	.07	.16	.34
DASS-21 Total	26.2 (1.6)	30.9 (1.8)	11.9 (1.5)	$F_{(2,87)} = 37.7$*	AG > DG > CC	.08	.41	.55

Standard error are in parentheses; NS = nonsignificant; SNK = Student–Newman–Keuls; DG = depressive group; AG = anxious group; CC = community controls (a sub-group extracted by the large community sample for comparative purposes).

* $p < .01$.

[1,5,7,10,11,13] and other foreign validations of the questionnaire [15–17,19,25,51,52]. Furthermore, the two-week temporal stability was good for all the DASS-21 scale scores; in particular, in agreement with our hypotheses, the DASS-21 depression subscale showed the highest correlation value across time. Lastly, inter-correlations between scales were large in the community sample and medium-large in the clinical sample, which is consistent with the previously observed values [13,15–18,25].

Findings concerning the correlations of the three subscales with measures of the same/different constructs were overall satisfactory, which is in line with other studies [7,13,16,19]. Results emerging from partial correlations further supported the specificity of the DASS-21 subscale scores. Previous studies generally tested convergent/divergent validity in regard to the anxiety and depression scales, whereas only one study included a specific measure of stress (but convergent/divergent validity with the DASS-21 subscales scores was not reported) [12]. Notably, the DASS-21 stress dimension refers to a rather specific construct, as shown by the results obtained in the community sample (by including a specific measure of stress, the PSQ-20, in the present study). Indeed, the DASS-21 stress scale correlated more strongly with the PSQ-20 than with the BDI-II, whereas the correlation of the stress dimension with a measure of anxiety (i.e., the BAI) was as strong as the one observed with the PSQ-20. This is not at all surprising, considering the overlapping features of stress and anxiety. Lastly, the Italian DASS-21 total score showed large correlations with all external measures of anxiety, depression, and stress; therefore, consistent with findings reported by Osman et al. [12] and with results from the present CFA, this result may imply that the total score can be usefully employed as a measure of general distress in both research and clinical settings.

The associations between demographic features and the Italian DASS-21 scale scores were also analyzed. Age issues in regard to the DASS-21 have been reported in the literature. Specifically, a number of studies examining the structure of the DASS-21 among young adolescents between the ages of 11 and 18 [9,53–56] suggested that the three dimensions of the DASS-21 do not adequately fit the emotional phenomena experienced in adolescents. Rather, the application of the questionnaire appears to be suitable in individuals who are 18 and older [11]; therefore, we hypothesized low correlations between age and the DASS-21 scale scores. Consistently, analyses revealed only two small negative correlations in our community sample (one between age and the DASS-21 depression subscale and one between age and the DASS-21 stress subscale), suggesting that the questionnaire is substantially insensitive to age. The same consideration can also be extended to education, since only one small-range correlation between years of education and the DASS-21 stress subscale emerged. Different from age issues, only a few studies focused on gender differences in the DASS-21 scores in adult samples [11,25,27]. The comparison between community male and female participants in the present sample revealed no gender difference in any of the scale scores, contrary to previous findings that showed higher levels of anxiety [11], depression [25], stress [11,27], and higher DASS-21 total scores [25] in women than in men. Overall, the present findings regarding age, educational level, and gender provide evidence that demographic characteristics do not seem to affect the scores of the Italian version of the DASS-21, thus it can be administered to a wide population.

In line with our hypotheses, the DASS-21 anxiety subscale differentiated anxious patients from depressive individuals and a subgroup of community participants; similarly, the DASS-21 depression scale discriminated depressive patients from anxious ones and healthy controls, thus generally confirming the criterion-oriented validity of the questionnaire. Such differences were relatively small in size when the two clinical groups were compared to each other. Such an observation is not surprising at all since it is difficult to differentiate anxiety from depression, especially in clinical samples [2,6,57]. Interestingly, even though anxious patients showed higher scores than their depressive counterparts on the DASS-21 stress scale, the magnitude of the differences was quite low, confirming a certain degree of specificity of the DASS-21 stress scale: as a measure of tension/irritability, it is reasonable to observe higher (and almost comparable) scores in all patients than in healthy individuals. Furthermore, both clinical groups scored significantly higher compared to healthy individuals in the DASS-21 total score; despite the finding that anxious patients showed higher scores than depressive ones, the magnitude of such a difference was quite small. Thus it

suggested, also in this case, that the total score might be interpreted as a quite specific measure of general distress.

Some shortcomings of the present study must be mentioned. First of all, the small sample sizes (especially those of clinical samples) do not allow for generalizing the observed results. Furthermore, in the present study, the community individuals were recruited in northern and central Italy, whereas southern regions were under-represented; moreover, the recruitment strategy we adopted may not guarantee that such participants are effectively representative of the general Italian population.

Importantly, the findings regarding the CFA must be interpreted with caution: indeed, our community sample might differ qualitatively from clinical samples of anxious or depressive patients, meaning further analyses and testing of the invariance of the scale structure according to clinical groups are encouraged. Moreover, it should be noted that three items (5, 9, and 14) of the Italian DASS-21 did not show strong specificity to their relevant factor (depression, anxiety, and stress respectively). Interestingly, item 5 showed low factor loadings also in two previous studies [1,58], whereas no evidence regarding the low specificity of items 9 and 14 to their relevant factor has been previously observed. Item removal is a contentious issue, since it implies considering both the pros and cons of reducing the number of items on an established questionnaire. Indeed, item removal may guarantee that a measure will be more precise and reliable; on the other hand, it may also mean that the newly validated scale cannot be compared to other published and currently used versions. Notably, despite the potential weaknesses of the scale that may arise from retaining every item, the original 21-item DASS is the most frequently used across different countries [7,13,16–18] and maintaining the same version appears to be relevant for comparative purposes. Importantly, we also believe that removing items does not represent a correct solution in the case at hand because: 1) the bifactor model emerged as the most appropriate in reproducing the observed data, since all loadings associated with the general factor were significant at $p < .05$ and had a satisfactory size; 2) internal consistency values were good to excellent for all the DASS-21 scale scores, both in the community and clinical samples as a whole, and no indication of item removal emerged to be appropriate. Another limitation of the present study is that temporal stability was conducted in only one group of participants, specifically in the undergraduate student sample. With respect to patients, the main limitation is that those with comorbid Axis-I or Axis-II have also been included in the study and may have affected the results; furthermore, the clinical groups are not completely homogenous since we elected to include patients with Axis-I and Axis-II comorbidity. However, with this strategy, we thought we would enroll a potentially more severe clinical population and be able to present data on patients that are similar to those routinely seen in Italian clinical settings.

In conclusion, despite the above-mentioned limitations, findings from the present study highlight that the DASS-21 is a robust measure of anxiety, depression, and stress in its Italian version. Moreover, current results further contribute to outlining the potential utility of also using the total score of the scale as a measure of general distress, thus leading to important advantages (for example, controlling for general psychopathology, and screening purposes) in both research and clinical practice.

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Appendix A. The Italian DASS-21

Per favore, legga ogni frase e poi indichi con quale frequenza la situazione descritta si è verificata negli ultimi sette giorni. Esprima la sua valutazione facendo un segno sul numero 0, 1, 2 o 3 secondo la scala di valutazione seguente. Tenga presente che non esistono risposte giuste o sbagliate. Non impieghi troppo tempo per rispondere a ciascuna affermazione, spesso la prima risposta è la più accurata. Grazie per la sua preziosa disponibilità e collaborazione.

La scala di valutazione è la seguente

0	1	2	3
Non mi è mai accaduto	Mi è capitato qualche volta	Mi è capitato con una certa frequenza	Mi è capitato quasi sempre

1	Ho provato molta tensione e ho avuto difficoltà a recuperare uno stato di calma	0	1	2	3
2	Mi sono accorto di avere la bocca secca	0	1	2	3
3	Non riuscivo proprio a provare delle emozioni positive	0	1	2	3
4	Mi sono sentito molto in affanno con difficoltà a respirare (per es. respiro molto accelerato, sensazione di forte affanno in assenza di sforzo fisico)	0	1	2	3
5	Ho avuto un'estrema difficoltà nel cominciare quello che dovevo fare	0	1	2	3
6	Ho avuto la tendenza a reagire in maniera eccessiva alle situazioni	0	1	2	3
7	Ho avuto tremori (per es. alle mani)	0	1	2	3
8	Ho sentito che stavo impiegando molta energia nervosa	0	1	2	3
9	Ho temuto di trovarmi in situazioni in cui sarei potuto andare nel panico e rendermi ridicolo	0	1	2	3
10	Non vedevo nulla di buono nel mio futuro	0	1	2	3
11	Mi sono sentito stressato	0	1	2	3
12	Ho avuto difficoltà a rilassarmi	0	1	2	3
13	Mi sono sentito scoraggiato e depresso	0	1	2	3

14	Non riuscivo a tollerare per nulla eventi o situazioni che mi impedivano di portare avanti ciò che stavo facendo	0	1	2	3
15	Ho sentito di essere vicino ad avere un attacco di panico	0	1	2	3
16	Non c'era nulla che mi dava entusiasmo	0	1	2	3
17	Sentivo di valere poco come persona	0	1	2	3
18	Mi sono sentito piuttosto irritabile	0	1	2	3
19	Ho percepito distintamente il battito del mio cuore senza aver fatto uno sforzo fisico (per es. battito cardiaco accelerato o perdita di un battito)	0	1	2	3
20	Mi sono sentito spaventato senza ragione	0	1	2	3
21	Sentivo la vita priva di significato	0	1	2	3

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