PSYCHOMETRIC EVIDENCE OF THE 7-ITEM GENERALIZED ANXIETY DISORDER QUESTIONNAIRE IN BRAZIL

Abstract. Generalized Anxiety Disorder (GAD) is one of the most prevalent and impairing psychological disorders. GAD is defined as a persistent and excessive worry associated with physical and psychological symptoms. Despite the potentially severe nature of GAD, it has been estimated that nearly half of patients live with the symptoms for about two years before being appropriately diagnosed and treated. To allow early identification of this disorder, valid and reliable measures for the screening of GAD are essential. Therefore, the present study aimed to gather psychometric evidence of the 7-Item Generalized Anxiety Disorder Questionnaire (GAD-7) in Brazil (N = 746). The findings suggested a stable one-factor structure (CFI = .99; TLI = .99; RMSEA = .05) that is likely to be replicated (H-Latent = .92; H-Observed = .86) and have excellent reliability (ω = .91; CR = .91). Furthermore, the GAD-7 correlated positively with the DASS-21 stress (*r* = .73), depression (*r* = .53), and anxiety (*r* = .60) factors, along with the Groningen Sleep Quality Scale (*r* = .45) and the personality trait of neuroticism (*r* = .49), supporting its convergent validity. Finally, the GAD-7 is able to differentiate between participants with mild, moderate and severe level of anxiety. Taken together, the present findings indicate that the GAD-7 is a suitable psychometric measure to assess generalized anxiety disorder in Brazil.

Keywords: Generalized anxiety disorder; mental health; GAD-7; psychometrics; validity.

Introduction

Generalized Anxiety Disorder (GAD) is one of the most impairing psychological disorders and is highly prevalent among patients accessing primary health care (Baldwin et al., 2012; Plummer et al., 2015). GAD is defined as a chronic, multifocal and excessive worry that is difficult to control along with dysfunctional physical and psychological symptoms (Stein & Sareen, 2015). Anxiety disorders affect millions of people around the world, particularly those from developing countries such as Brazil, which has the highest prevalence of anxiety disorders (World Health Organization, 2017). However, most studies on GAD are limited to WEIRD (Western, Educated, Industrialised, Rich, and Developed) countries with similar cultural values (Ruscio et al., 2017). Studies on the nature and prevalence of GAD across different cultural contexts (non-WEIRD countries) are necessary. To this aim, ensuring that suitable instruments are available to measure GAD in developing countries, such as Brazil, is pivotal.

Generalized Anxiety Disorder

Although GAD is one of the most common anxiety disorders, almost half of patients live with the symptoms for around two years before being diagnosed and undertaking proper treatment (Baldwin et al., 2012) when they do finally seek help. Specifically, the prevalence of GAD varied between 0.1% (Czech Republic) and 2.1% (Hungary; Lieb et al., 2005) in Europe, whereas its prevalence is around 5.3% in China (Yu et al., 2018) and 2.6% in Canada (Watterson et al., 2017). In Brazil, epidemiological data have shown that the point prevalence of GAD is about 10.2% (Mangolini et al., 2019). However, only 22.8% of individuals with GAD seek specialised healthcare (Wang et al., 2017). These findings are concerning, especially

because GAD has been found to be a risk factor for cardiovascular conditions (Kempt et al., 2015; Santos et al., 2015). Furthermore, GAD is often comorbid with other disorders such as depression and dysthymia, such that the risk of suicide is up to six times higher among people suffering with GAD and comorbidities (Vasconcelos et al., 2015).

Despite the alarming prevalence of GAD in Brazil, most studies about this disorder are carried out in rich and industrialised countries (Ruscio et al., 2017). Given the low socioeconomic conditions and precarious healthcare systems in developing countries, examining conditions such as GAD in these countries is essential. To do this, reliable assessment instruments to measure GAD are necessary, which would enable its early identification (Ahn et al., 2019) as well as assessment of the effectiveness of both psychotherapeutic and pharmacological interventions for GAD (García-Campayo et al., 2010).

7-Item Generalized Anxiety Disorder Questionnaire

Among the instruments available in the literature to assess GAD, the 7-item Generalized Anxiety Disorder Questionnaire (GAD-7) is widely used and sensitive to the detection and changes that occur during the treatment of GAD (Toussaint et al., 2020), having been recommended for clinical use in comparison to other instruments (Dear et al., 2011). The GAD-7 was proposed by Spitzer et al. (2006) from a set of 13 initial items, of which nine reflected the diagnostic criteria for GAD as listed in the DSM-IV and four items were selected from a review of existing instruments to assess anxiety. The final version of the GAD-7 encompassed seven items that loaded on one single factor. These items were selected due to their high correlations with the initial 13-item general factor.

Because the GAD-7 is a short instrument, easily administered and useful for epidemiological studies, particularly in situations in which time for data collection is

limited (García-Campayo et al., 2010), the GAD-7 has been adapted to different populations and contexts. For example, this instrument is suitable for measuring GAD in cancer patients (Esser et al., 2018), patients with epilepsy (Seo et al., 2014) and in patients of primary care centres (Munõz-Navarro et al., 2017). The GAD-7 has also been employed to assess GAD in different age groups, from adolescents (Mossman et al., 2017) to elderly individuals (Vasiliadis et al., 2015). Moreover, the popularity of the GAD-7 is confirmed by studies that gather evidence of its psychometric suitability in several countries, such as Germany (Hinz et al., 2017), South Korea (Ahn et al., 2019), Spain (García-Campayo et al., 2010), and Portugal (Sousa et al., 2015).

The present study

Although the GAD-7 has been used globally, few studies have explored its psychometric properties in Brazil. For example, Bergerot et al. (2014) demonstrated the convergent and discriminant validity, and the reliability of the GAD-7 in Brazil, recommending its use for the screening of GAD among cancer patients. In turn, Moreno et al. (2016) found support for the one-factor structure of the GAD-7 in Brazil, demonstrated its measurement invariance across genders, and explored the parameters of the individual items via Item Response Theory. Notwithstanding the promising initial findings, new studies are desirable as the validation of instruments should be understood as a periodic and continuous process, aiming at accumulating evidence from multiple sources (Ambiel & Carvalho, 2017), especially when the instrument holds clinical applicability (e.g. screening, testing the effectiveness of psychotherapy).

Therefore, the present study aims to expand the evidence of validity and reliability of the GAD-7 in Brazil. Specifically, we aimed to gather evidence of validity based on the GAD-7 internal structure (Exploratory Factory Analysis – EFA), its association with external variables (e.g. neuroticism, depression, sleep quality) and

reliability (McDonald's omega and composite reliability). We also explored whether the items of the GAD-7 are able to differentiate between individuals with mild, moderate, and severe level of anxiety.

Method

Participants and procedure

A total of 746 respondents participated in this study, with an age range from 18 to 72 years (M_{age} = 23.75; DP_{age} = 8.21; 70.2% were women). Most respondents reported to be undergraduates (53.8%), single (80.3%), and from middle-class backgrounds (46.8%). Out of the total number of respondents, 252 completed the Depression Anxiety Stress Scale-21, the Ten-Item Personality Inventory, and the Groningen Sleep Quality Questionnaire. Data collection was done online and the link of the questionnaire was shared on social media (e.g. WhatsApp, Instagram, Facebook), using the snowball sampling method. Prior to participating in the study, all respondents were required to read and electronically agree to the Participant Consent Form. Participants were also previously informed of the aims and the voluntary and anonymous nature of their participation as well as the low risk involved in the study.

Measures

7-Item Generalized Anxiety Disorder Questionnaire (Spitzer et al., 2006). This instrument has been translated to Portuguese by Pfizer (Copyright © 2005 Pfizer Inc., New York, NY), with evidence of validity in Brazil gathered by the Mapi Research Institute (2006). Participants are instructed to indicate to what extent (0 – *Not at all*; 3 – *Nearly every day*), in the past two weeks, they were bothered by symptoms of anxiety, such as "Feeling afraid as if something awful might happen" and "Being so restless that it's hard to sit still".

Depression Anxiety and Stress Scale – Short Form (DASS-21; Lovibond & Lovibond, 1995). This instrument consists of 21 items that assess symptoms of anxiety, depression, and stress in clinical and non-clinical populations, and it was adapted to Brazil by Vignola and Tucci (2014). Participants are instructed to indicate the frequency with which each symptom happened in the past week (0 – *It did not happen to me this week*; 3 – *It happened to me most of the time this week*), such as "I was aware of the dryness in my mouth" (anxiety; $\omega = .87$), "I couldn't seem to experience any positive feelings at all" (depression; $\omega = .89$), and "I found it difficult to relax" (stress; $\omega = .88$).

Groningen Sleep Quality Questionnaire (Mulder-Hajonides et al., 1984). This is a 15-item questionnaire that evaluates sleep quality in the past night. Participants are instructed to use a dichotomous scale of response (yes or no) to answer items such as "I woke up several times last night" and "I got up in the middle of the night". This measure has yet to be adapted to Brazil. For the purposes of the current study, the items were translated to Portuguese through the backtranslation procedure. The one-factor structure was also tested, which showed acceptable indexes (DWLS; CFI = .95; TLI = .94; RMSEA = .095; SRMR = .087) and an adequate reliability index ($\omega = .89$).

Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann Jr., 2003). This instrument measures the Big-Five personality dimensions. In this research, we used the validated Brazilian version (Pimentel et al., 2014). To complete the items, participants need to consider the following sentence 'I see myself as someone…" to indicate their level of agreement (1- *Completely disagree*; 7- *Completely agree*) with items such as "extroverted, enthusiastic" (extraversion, inter-item correlations $r = .32$, $p < .01$), "sympathetic, warm" (agreeableness, inter-item correlation $r = .11$, $p < .05$), "dependable, self-disciplined" (conscientiousness, inter-item correlation $r = .27$, $p < .01$), "anxious, easily upset" (neuroticism, inter-item correlation $r = .34$, $p < .01$), and

"open to new experiences, complex" (openness to experience, inter-item correlation r = .10, p < .05).

Data Analysis

The data analysis was carried out on Factor (Lorenzo-Seva & Ferrando, 2006) and SPSS. With the former, Exploratory Factor Analysis was carried out to determine the dimensionality of the GAD-7. Due to the ordinal nature of this measure, the analysis used a polychoric correlations matrix, adopting the method of extraction *Robust Diagonally Weighted Least Squares* (RDWLS; Asparouhov & Muthen, 2010). The decision regarding the number of factors to be extracted was based on the Hull method (Lorenzo-Seva, Timmerman, & Kiers, 2011). The goodness of fit of the model to the data was evaluated considering the following indicators (acceptable parameters are provided in brackets; Brown, 2006; Kline, 2015): *Root Mean Square Error of Approximation* (RMSEA < .08), *Comparative Fit Index* (CFI > .95) and *Tucker-Lewis Index* (TLI > .95). To reinforce the structure of the instrument, we referred to the following criteria of unidimensionality (values that support unidimensionality are provided in brackets; Ferrando & Lorenzo-Seva, 2018): *Unidimensional Congruence* (UniCo > .95), *Explained Common Variance* (ECV > .85) and *Mean of Item Residual Absolute Loadings* (MIREAL < .30). Finally, the stability of the factor structure was evaluated considering the H-index, such that values above .80 suggest a well-defined latent variable and likely replication of the factor structure in future studies (Ferrando & Lorenzo-Seva, 2018). SPSS was employed to calculate descriptive statistics (e.g., mean, standard deviation), and correlation analysis to test convergent validity of the GAD-7 (Spearman's rho) and mean comparison analysis to examine the discrimination power of the items (Mann-Whitney U test).

Results

Validity evidence based on internal structure

The result of Bartlett's Test of Sphericity (2988.4, $df = 21$, $p < .001$) and Kaiser-Meyer-Olkin = .92, verified that the polychoric matrix of the items was factorable. The Hull method indicated that the one-factor solution best fits the data (RMSEA = .05; TLI = .99, and CFI = .99). This decision was endorsed by the following unidimensionality indexes (Ferrando & Lorenzo-Seva, 2018): *Unidimensional Congruence* (UniCo = .99), *Explained Common Variance* (ECV = .93) and *Mean of Item Residual Absolute Loadings* (MIREAL = .16). Table 1 displays the factor loadings for the items, the replicability indices of the factor solution (H-index; Ferrando & Lorenzo-Seva, 2018), and coefficients of internal consistency for the GAD-7.

[TABLE 1 AROUND HERE]

The general factor yielded an eigenvalue of 4.11, explaining 64% of total variance. All items were satisfactorily associated with the general factor (factor loadings > |.30|) with factors loadings ranging from .66 [Item 5. Being so restless that it's hard to sit still] to .83 (Item 2. Not being able to stop or control worrying; Item 4. Trouble relaxing). The index of composite reliability (.91) and the McDonald's omega were appropriate ($\omega = .91$), suggesting that the factor solution is well-defined and likely to be replicated in new studies (H-latent = .92 e H-Observed = .86).

Validity evidence based on associations with external variables

Additional evidence of validity was gathered by correlating the GAD-7 with external variables. The total score of the GAD-7 correlated with stress ($r = .73$; $p < .001$), depression ($r = .53$; $p < .001$), anxiety ($r = .60$; $p < .001$) and low sleep quality ($r = .45$; $p < .001$) in the expected direction. Regarding the associations with the Big-Five, the most consistent association was with neuroticism ($r = .49$; $p < .001$). The findings are summarised in Table 2.

[TABLE 2 AROUND HERE]

Discriminative power of the GAD-7 items

Given that the general score of the GAD-7 ranges from 0 to 21; 0 to 9 mild anxiety and 10 to 21 moderate and severe (Bergerot et al., 2014), we created two criterion groups (inferior and superior), that had the median of each item compared through the Mann-Whitney U test (Table 3). Specifically, all items were able to discriminate participants between groups, such that item 3 was the most discriminative item (U =16178.5; z = -18.882), whereas item 5 was the least discriminative one (U =27394.0; z = -15.482).

[TABLE 3 AROUND HERE]

Discussion

The present study sought to provide new psychometric evidence for the GAD-7 (Spitzer et al., 2006) in Brazil, gathering evidence of validity based on internal structure and associations with other variables (e.g. sleep quality, neuroticism), along with evidence of its reliability and discriminant ability. In the present study, we confirmed the one-factor solution of the GAD-7 in Brazil, with adjustment indexes that attest to the quality of this model (Brown, 2006; Kline, 2015), its likely replicability in future studies, and items with excellent factor loadings (Pasquali, 2012). The current findings on the one-factor structure of the GAD-7 confirmed previous studies across different countries (e.g., Germany, Spain, Portugal), and indicated that the seven items of the GAD-7 satisfactorily represent the latent construct of generalized anxiety disorder (García-Campayo et al., 2010; Hinz et al., 2017; Sousa et al., 2015).

It is important to highlight that the one-factor structure of the GAD-7 has been tested in Brazil previously through Confirmatory Factory Analysis (Moreno et al., 2016). In the current study, however, we applied Exploratory Factor Analysis (EFA),

which is a basic requirement for the validation of an instrument, particularly when there is sparse psychometric evidence on the instrument in the new context (Damásio, 2012), such as in Brazil. This is even more important when alternative factor structures have been proposed in the literature (Beard & Björgvinsson, 2014; Doi, Ito, Takebayashi, Muramatsu, & Horikoshi, 2018). Furthermore, the indexes of internal consistency (McDonald's omega and composite reliability) confirm that the GAD-7 provides an accurate measure of the latent trait (Valentini & Damásio, 2016).

We also observed correlations between the GAD-7 and external variables in the expected direction, confirming its convergent validity. The GAD-7 correlated with the anxiety and stress factors of the DASS-21 in line with previous studies. For instance, considering a psychiatric sample, Kertz et al. (2013) found relations between the total score of GAD-7 and those factors of DASS above .70. In turn, in a South Korean undergraduate sample, Lee and Kim (2019) found correlations above .60 between those variables. In turn, the comorbidity between GAD and depression has consistently been observed in the literature (Schoevers, Deeg, van Tilburg, & Beekman, 2005), which was confirmed in this study by the correlations found between the GAD-7 and the depression factor of the DASS-21. Individuals suffering from GAD also tend to experience sleep disturbances (American Psychiatric Association, 2013), and are two times more likely to develop sleep disturbances (Marcks et al., 2010). Moreover, GAD is the strongest predictor of insomnia among different anxiety disorders (Alvaro, Roberts, & Harris, 2014), which was corroborated by the positive association found between GAD-7 and poor sleep quality in the current study.

We also observed that the GAD-7 correlated positively with neuroticism. In previous studies, individuals high on neuroticism also showed higher scores on GAD-7 in comparison with those low on neuroticism (Koh et al., 2015). Anxiety as measured

by the GAD-7 has also been found to mediate the association between neuroticism and suicidal ideation (Duan et al., 2019). Such findings demonstrate the public health significance of neuroticism (Lahey, 2009), one of the main predictors of internalising problems (Widiger & Oltmanns, 2017), which increases the risk for the development, maintenance, and aggravation of GAD (Bourgeois & Brown, 2015; Merino et al., 2016). In turn, consistent with previous literature (Akram et al., 2019), negative but weak correlations were observed between the GAD-7 and both agreeableness and conscientiousness, suggesting that these traits may promote better coping strategies with anxiety.

The items of the GAD-7 can also discriminate between participants with mild, moderate and severe level of anxiety. Such findings add to previous evidence showing that patients with GAD symptoms reported higher scores on the GAD-7 than individuals without the diagnosis (Donker et al., 2011). Additionally, evidence from the IRT analysis suggests that this instrument is able to discriminate between participants along the evaluated latent trait (Moreno et al., 2016).

Limitations, Future Studies, and Final Considerations

Notwithstanding the results reinforcing the psychometric quality of the GAD-7, this study is not without limitations. Although we used a relatively large sample, the sample is non-probabilistic, which prevents generalisability beyond the current study. Therefore, future studies in Brazil testing the psychometric suitability of the GAD-7 should consider more diverse groups by age, educational level, and social class. Future studies testing the parameters of the GAD-7 in clinical samples with a diagnosis of GAD are required, which has not been done in Brazil yet. However, it is important to highlight that 43.2% of our sample presented scores equal to or higher than 10. In screening settings, such scores suggest that a more in-depth assessment or a referral to a

mental health care professional is necessary. A recent meta-analysis found that 83% of patients with GAD presented scores higher than 8, whereas 84% of individuals without a diagnosis presented scores lower than this cut-off point (Plummer et al., 2016).

Despite the discussed limitations, the current study provided new psychometric evidence for the GAD-7, which is a short, easily administered, valid and accurate instrument to measure generalized anxiety disorder in Brazil. Therefore, this scale is a useful alternative for screening for GAD, which despite being one of the most common anxiety disorders, is often not detected or treated (Donker et al., 2011), resulting in more suffering for patients and aggravating their clinical condition.

Compliance with Ethical Standards

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical Approval: All the procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

References

Ahn, J. K., Kim, Y., & Choi, K. H. (2019). The psychometric properties and clinical utility of the Korean version of GAD-7 and GAD-2. *Frontiers in Psychiatry, 10*, 1-8. https://doi.org/10.3389/fpsyt.2019.00127

Akram, U., Gardani, M., Akram, A., & Allen, S. (2019). Anxiety and depression mediate the relationship between insomnia symptoms and the personality traits of conscientiousness

and emotional stability. *Heliyon*, *5*, e01939. https://doi.org/10.1016/j.heliyon.2019.e01939

Alvaro, P. K., Roberts, R. M., & Harris, J. K. (2014). The independent relationships between insomnia, depression, subtypes of anxiety, and chronotype during adolescence. *Sleep Medicine, 15*, 934-941. https://doi.org/10.1016/j.sleep.2014.03.019

Ambiel, R. A. M., & Carvalho, L. F. (2017). Validade e precisão de instrumentos de avaliação psicológica. Em M. R. C. Lins & J. C. Borsa (Orgs.), *Avaliação psicológica: Aspectos teóricos e práticos* (pp. 115-125). Petrópolis, RJ: Vozes.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5®). Arlington, VA: American Psychiatric Association.

Asparouhov, T., & Muthen, B. (2010). Simple second order chi-square correction. Unpublished manuscript. Available at https://www.statmodel.com/download/WLSMV_new_chi21.pdf.

Baldwin, D. S., Allgulander, C., Bandelow, B., Ferre, F., & Pallanti, S. (2012). An international survey of reported prescribing practice in the treatment of patients with generalised anxiety disorder. *The World Journal of Biological Psychiatry, 13*, 510-516. https://doi.org/10.3109/15622975.2011.624548

Beard, C., & Björgvinsson, T. (2014). Beyond generalized anxiety disorder: Psychometric properties of the GAD-7 in a heterogeneous psychiatric sample. *Journal of Anxiety Disorders*, *28*, 547-552. https://doi.org/10.1016/j.janxdis.2014.06.002

Bergerot, C. D., Laros, J. A., & Araujo, T. C. C. F. D. (2014). Avaliação de ansiedade e depressão em pacientes oncológicos: Comparação psicométrica. *Psico-USF, 19*, 187-197. https://doi.org/10.1590/1413-82712014019002004

Bourgeois, M. L., & Brown, T. A. (2015). Perceived emotion control moderates the relationship between neuroticism and generalized anxiety disorder. Cognitive Therapy and Research, 39, 531-541. https://doi.org/10.1007/s10608-015-9677-5

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: The Guilford Press.

Damásio, B. F. (2012). Uso da análise fatorial exploratória em psicologia. *Avaliação Psicológica*, *11*, 213-228. Retrieved from http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1677-04712012000200007&lng=pt&nrm=iso&tlng=pt

Dear, B. F., Titov, N., Sunderland, M., McMillan, D., Anderson, T., Lorian, C., & Robinson, E. (2011). Psychometric comparison of the Generalized Anxiety Disorder Scale-7 and the Penn State Worry Questionnaire for measuring response during treatment of generalised anxiety disorder. *Cognitive Behaviour Therapy*, *40*, 216-227. https://doi.org/10.1080/16506073.2011.582138

Doi, S., Ito, M., Takebayashi, Y., Muramatsu, K., & Horikoshi, M. (2018). Factorial validity and invariance of the 7-item Generalized Anxiety Disorder Scale (GAD-7) among populations with and without self-reported psychiatric diagnostic status. *Frontiers in Psychology*, *9*, 1741. https://doi.org/10.3389/fpsyg.2018.01741

Donker, T., van Straten, A., Marks, I., & Cuijpers, P. (2011). Quick and easy self-rating of generalized anxiety disorder: Validity of the Dutch web-based GAD-7, GAD-2 and GAD-SI. *Psychiatry Research*, *188*, 58-64. https://doi.org/10.1016/j.psychres.2011.01.016

Duan, Z., Wang, Y., Tao, Y., Bower, J. L., Yu, R., Wang, S., ... & Huang, L. (2019). Relationship between trait neuroticism and suicidal ideation among postpartum women

in China: Testing a mediation model. *Journal of Affective Disorders, 256*, 532-535. https://doi.org/10.1016/j.jad.2019.06.030

Esser, P., Hartung, T. J., Friedrich, M., Johansen, C., Wittchen, H. U., Faller, H., ... & Wegscheider, K. (2018). The Generalized Anxiety Disorder Screener (GAD-7) and the anxiety module of the Hospital and Depression Scale (HADS-A) as screening tools for generalized anxiety disorder among cancer patients. *Psycho-oncology, 27*, 1509-1516. https://doi.org/10.1002/pon.4681

Ferrando, P. J., & Lorenzo-Seva U. (2018). Assessing the quality and appropriateness of factor solutions and factor score estimates in exploratory item factor analysis. *Educational and Psychological Measurement, 78*, 762-780. https://doi.org/10.1177/0013164417719308

García-Campayo, J., Zamorano, E., Ruiz, M. A., Pardo, A., Pérez-Páramo, M., López-Gómez, V., ... & Rejas, J. (2010). Cultural adaptation into Spanish of the Generalized Anxiety Disorder-7 (GAD-7) scale as a screening tool. *Health and Quality of Life Outcomes, 8*, 1-11. https://doi.org/10.1186/1477-7525-8-8

Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*, 504-528. https://doi.org/10.1016/S0092-6566(03)00046-1

Hinz, A., Klein, A. M., Brähler, E., Glaesmer, H., Luck, T., Riedel-Heller, S. G., ... & Hilbert, A. (2017). Psychometric evaluation of the Generalized Anxiety Disorder Screener GAD-7, based on a large German general population sample. *Journal of Affective Disorders, 210*, 338-344. https://doi.org/10.1016/j.jad.2016.12.012

Kemp, A. H., Brunoni, A. R., Nunes, M. A., Santos, I. S., Goulart, A. C., Ribeiro, A. L., ... & Lotufo, P. A. (2015). The association between mood and anxiety disorders, and coronary heart disease in Brazil: A cross-sectional analysis on the Brazilian longitudinal

study of adult health (ELSA-Brasil). *Frontiers in Psychology, 6,* 1-9. https://doi.org/10.3389/fpsyg.2015.00187

Kertz, S., Bigda-Peyton, J., & Bjorgvinsson, T. (2013). Validity of the Generalized Anxiety Disorder-7 Scale in an acute psychiatric sample. *Clinical Psychology & Psychotherapy*, *20,* 456-464. https://doi.org/10.1002/cpp.1802

Kline, R. B. (2015). *Principles and practice of structural equation modeling.* New York, NY: Guilford Publications

Koh, J. S., Ko, H. J., Wang, S. M., Cho, K. J., Kim, J. C., Lee, S. J., & Pae, C. U. (2015). The relationship between depression, anxiety, somatization, personality and symptoms of lower urinary tract symptoms suggestive of benign prostatic hyperplasia. *Psychiatry Investigation, 12,* 268-273. https://doi.org/10.4306/pi.2015.12.2.268

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist, 64,* 241-256. https://doi.org/10.1037/a0015309.

Lee, B., & Kim, Y. E. (2019). The psychometric properties of the Generalized Anxiety Disorder scale (GAD-7) among Korean university students. *Psychiatry and Clinical Psychopharmacology*, *29,* 864-871. https://doi.org/10.1080/24750573.2019.1691320

Lieb, R., Becker, E., & Altamura, C. (2005). The epidemiology of generalized anxiety disorder in Europe. *European Neuropsychopharmacology*, *15*, 445-452. https://doi.org/10.1016/j.euroneuro.2005.04.010

Lorenzo-Seva, U., & Ferrando, P. J. (2006). FACTOR: A computer program to fit the exploratory factor analysis model. *Behavior Research Methods, 38,* 88-91. https://doi.org/10.3758/BF03192753

Lorenzo-Seva, U., Timmerman, M. E., & Kiers, H. A. (2011). The Hull method for selecting the number of common factors. *Multivariate Behavioral Research, 46,* 340-364. https://doi.org/10.1080/00273171.2011.564527

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*, 335-343. https://doi.org/10.1016/0005-7967(94)00075-U

Mangolini, V. I., Andrade, L. H., & Wang, Y. P. (2019). Epidemiologia dos transtornos de ansiedade em regiões do Brasil. *Revista de Medicina, 98*, 415-422. https://doi.org/10.11606/issn.1679-9836.v98i6p415-422

Mapi Research Institute. (2006). *Certificate of linguistic validation certificate: General Anxiety Disorder-7 (GAD-7)*. Lyon, FR: Mapi Research Institute.

Marcks, B. A., Weisberg, R. B., Edelen, M. O., & Keller, M. B. (2010). The relationship between sleep disturbance and the course of anxiety disorders in primary care patients. *Psychiatry Research, 178*, 487-492. https://doi.org/10.1016/j.psychres.2009.07.004

Merino, H., Senra, C., & Ferreiro, F. (2016). Are worry and rumination specific pathways linking neuroticism and symptoms of anxiety and depression in patients with generalized anxiety disorder, major depressive disorder and mixed anxiety-depressive disorder?. *PloS One, 11*, e0156169. https://doi.org/10.1371/journal.pone.0156169

Moreno, A. L., DeSousa, D. A., Souza, A. M. F. L. P., Manfro, G. G., Salum, G. A., Koller, S. H., ... & Crippa, J. A. D. S. (2016). Factor structure, reliability, and item parameters of the Brazilian-portuguese version of the GAD-7 questionnaire. *Temas em Psicologia*, *24*, 367-376. https://doi.org/10.9788/TP2016.1-25

Mossman, S. A., Luft, M. J., Schroeder, H. K., Varney, S. T., Fleck, D. E., Barzman, D. H., ... & Strawn, J. R. (2017). The Generalized Anxiety Disorder 7-item (GAD-7) scale in adolescents with generalized anxiety disorder: Signal detection and validation. *Annals of Clinical Psychiatry: Official Journal of the American Academy of Clinical*

Psychiatrists, *29*, 227-234. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5765270/

Mulder-Hajonides van der Meulen, W. R. E. H., & Van den Hoofdakker, R. H. (1984). The Groningen Sleep Quality Scale. In *Book of Abstracts*. Florence, Italy: The 14th Collegium Internationale Neuro-Psychopharmacologicum Congress.

Muñoz-Navarro, R., Cano-Vindel, A., Moriana, J. A., Medrano, L. A., Ruiz-Rodríguez, P., Agüero-Gento, L., ... & Ramírez-Manent, J. I. (2017). Screening for generalized anxiety disorder in Spanish primary care centers with the GAD-7. *Psychiatry Research*, *256*, 312-317. https://doi.org/10.1016/j.psychres.2017.06.023

Pasquali, L. (2012). *Análise Fatorial para Pesquisadores*. Brasília, DF: LabPAM.

Pimentel, C. E., Ferreira, D. C. S., Vargas, M. M., Maynart, V. A. P., & Mendonça, D. C. (2014). Preference for movie styles and their differences in the five factors of personality. *Pesquisas e Práticas Psicossociais*, *9*, 232-244. Retrieved from http://pepsic.bvsalud.org/pdf/ppp/v9n2/09.pdf

Plummer, F., Manea, L., Trepel, D., & McMillan, D. (2016). Screening for anxiety disorders with the GAD-7 and GAD-2: A systematic review and diagnostic metaanalysis. *General Hospital Psychiatry*, *39*, 24-31. https://doi.org/10.1016/j.genhosppsych.2015.11.005

Ruscio, A. M., Hallion, L. S., Lim, C. C., Aguilar-Gaxiola, S., Al-Hamzawi, A., Alonso, J., ... & De Almeida, J. M. C. (2017). Cross-sectional comparison of the epidemiology of DSM-5 generalized anxiety disorder across the globe. *JAMA Psychiatry*, *74*, 465-475. https://doi.org/10.1001/jamapsychiatry.2017.0056

Santos, I. S., Goulart, A. C., Brunoni, A. R., Kemp, A. H., Lotufo, P. A., & Bensenor, I. M. (2015). Anxiety and depressive symptoms are associated with higher carotid intima-media thickness. Cross-sectional analysis from ELSA-Brasil baseline data. *Atherosclerosis*, *240*, 529-534. https://doi.org/10.1016/j.atherosclerosis.2015.04.800

Schoevers, R. A., Deeg, D. J. H., Van Tilburg, W., & Beekman, A. T. F. (2005). Depression and generalized anxiety disorder: co-occurrence and longitudinal patterns in elderly patients. *The American Journal of Geriatric Psychiatry*, *13*, 31-39. https://doi.org/10.1097/00019442-200501000-00006

Seo, J. G., Cho, Y. W., Lee, S. J., Lee, J. J., Kim, J. E., Moon, H. J., & Park, S. P. (2014). Validation of the Generalized Anxiety Disorder-7 in people with epilepsy: a MEPSY study. *Epilepsy & Behavior*, *35*, 59-63. https://doi.org/10.1016/j.yebeh.2014.04.005

Sousa, T. V., Viveiros, V., Chai, M. V., Vicente, F. L., Jesus, G., Carnot, M. J., ... & Ferreira, P. L. (2015). Reliability and validity of the Portuguese version of the Generalized Anxiety Disorder (GAD-7) scale. *Health and Quality of Life Outcomes*, *13*, 50-58. https://doi.org/10.1186/s12955-015-0244-2

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing Generalized Anxiety Disorder: the GAD-7. *Archives of Internal Medicine*, *166*, 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Stein, M. B., & Sareen, J. (2015). Generalized anxiety disorder. *New England Journal of Medicine*, *373*, 2059-2068. https://doi.org/10.1056/NEJMcp1502514

Toussaint, A., Hüsing, P., Gumz, A., Wingenfeld, K., Härter, M., Schramm, E., & Löwe, B. (2020). Sensitivity to change and minimal clinically important difference of the 7-item Generalized Anxiety Disorder Questionnaire (GAD-7). *Journal of Affective Disorders*, *265*, 395-401. https://doi.org/10.1016/j.jad.2020.01.032

Wang, Y. P., Chiavegatto Filho, A. D. P., Campanha, A. M., Malik, A. M., Mogadouro, M. D. A., Cambraia, M., ... & Andrade, L. H. (2017). Patterns and predictors of health service use among people with mental disorders in São Paulo metropolitan area, Brazil. *Epidemiology and Psychiatric Sciences*, *26*, 89-101. https://doi.org/10.1017/S2045796016000202

Watterson, R. A., Williams, J. V., Lavorato, D. H., & Patten, S. B. (2017). Descriptive epidemiology of generalized anxiety disorder in Canada. *The Canadian Journal of Psychiatry*, *62*, 24-29. https://doi.org/10.1177/0706743716645304

Widiger, T. A., & Oltmanns, J. R. (2017). Neuroticism is a fundamental domain of personality with enormous public health implications. *World Psychiatry, 16,* 144-145. https://doi.org/10.1002/wps.20411

World Health Organization. (2017). *Depression and other common mental disorders: global health estimates* (No. WHO/MSD/MER/2017.2). World Health Organization.

Valentini, F., & Damásio, B. F. (2016). Variância média extraída e confiabilidade composta: Indicadores de precisão. *Psicologia: Teoria e Pesquisa, 32, 1-7*. https://doi.org/10.1590/0102-3772e322225

Vasconcelos, J. R. D. O., Lôbo, A. P. D. S., & Melo Neto, V. L. D. (2015). Risco de suicídio e comorbidades psiquiátricas no transtorno de ansiedade generalizada. *Jornal Brasileiro de Psiquiatria, 64,* 259-265. https://doi.org/10.1590/0047-2085000000087

Vasiliadis, H. M., Chudzinski, V., Gontijo-Guerra, S., & Préville, M. (2015). Screening instruments for a population of older adults: The 10-item Kessler Psychological Distress Scale (K10) and the 7-item Generalized Anxiety Disorder Scale (GAD-7). *Psychiatry Research, 228,* 89-94. https://doi.org/10.1016/j.psychres.2015.04.019

Vignola, R. C. B., & Tucci, A. M. (2014). Adaptation and validation of the Depression, Anxiety and Stress Scale (DASS) to Brazilian Portuguese. *Journal of Affective Disorders, 155*, 104-109. https://doi.org/10.1016/j.jad.2013.10.031

Yu, W., Singh, S. S., Calhoun, S., Zhang, H., Zhao, X., & Yang, F. (2018). Generalized anxiety disorder in urban China: Prevalence, awareness, and disease burden. *Journal of Affective Disorders*, *234*, 89-96. https://doi.org/10.1016/j.jad.2018.02.012

Appendix. Items in Brazilian-Portuguese and *English*.

1. Sentir-se nervoso(a), ansioso(a) ou muito tenso(a). (*Feeling nervous, anxious or on edge*).
2. Não ser capaz de impedir ou de controlar as preocupações. (*Not being able to stop or control worrying*).
3. Preocupar-se muito com diversas coisas. (*Worrying too much about different things*).
4. Dificuldade para relaxar. (*Trouble relaxing*).
5. Ficar tão agitado(a) que se torna difícil permanecer sentado(a). (*Being so restless that it is hard to sit still*).
6. Ficar facilmente aborrecido(a) ou irritado(a). (*Becoming easily annoyed or irritable*).
7. Sentir medo como se algo horrível fosse acontecer. (*Feeling afraid as if something awful might happen*).

Table 1.

Factor structure of the GAD-7

Items	Factor Loadings
Feeling nervous, anxious, or on edge	.81
Not being able to stop or control worrying	.82
Worrying too much about different things	.81
Trouble relaxing	.82
Being so restless that it's hard to sit still	.65
Becoming easily annoyed or irritable	.72
Feeling afraid as if something awful might happen	.71
Ordinal McDonald’s omega	.91
Composite reliability	.91
H-Latent	.92
H-Observed	.86

Table 2.
Correlations of the GAD-7 with the DASS-21, the Groningen Sleep Quality Scale and the TIPI

	1	2	3	4	5	6	7	8	9
1. GAD-7									
2. S-DASS	.73**								
3. D-DASS	.53**	.65**							
4. A-DASS	.60**	.68**	.60**						
5. SQ	.45**	.44**	.41**	.49**					
6. EX	-.01	.02	-.12*	-.11*	-.06				
7. AG	-.12*	-.15**	-.07	-.03	-.03	.03			
8. CO	-.14*	-.22**	-.32**	-.18**	-.15**	-.08	.004		
9. NE	.49**	.55**	.38**	.42**	.34**	.03	-.31**	-.23**	
10. OP	-.04	-.10	-.16**	-.09	-.07	.38**	.11*	.11*	-.12*

Note: * $p < .05$, ** $p < .01$. GAD-7 = Total score of the GAD-7; S-DASS = Total score of the DASS-21 stress factor; D-DASS = Total score of the DASS-21 depression factor; A-DASS = Total score of the DASS-21 anxiety factor; SQ = Total score of the Groningen Sleep Quality Scale; EX = Extroversion; AM = Agreeableness; CO = Conscientiousness; NE = Neuroticism; OP = Openness.

Table 3.

Discriminant power of the GAD-7 items

Items	Criterion groups		Mann-Whitney U test		
	Inferior	Superior			
	Md	Md		Z	p
Item 1	253.85	529.34	17871.0	-18.510	<.001
Item 2	258.40	523.41	19793.0	-17.559	<.001
Item 3	249.84	534.57	16178.5	-18.882	<.001
Item 4	250.64	533.52	16516.5	-18.660	<.001
Item 5	276.41	499.95	27394.0	-15.482	<.001
Item 6	260.46	520.73	20661.5	-17.122	<.001
Item 7	264.56	515.39	22390.5	-16.670	<.001