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Measuring anxiety: reliability and validity of the Turkish version of the Generalized Anxiety Disorder Scale and its relationship with academic and mental health outcomes

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ABSTRACT

Previous studies investigating psychometric properties of the Generalized Anxiety Disorder Scale (GAD-7) provided contradictory results for different populations. The purpose of this study is to investigate the reliability and validity of the GAD-7 with a sample of Turkish college students. Two hundred thirty-five Turkish university students completed the Turkish version of the GAD-7, the Perceived Stress Scale, the Satisfaction with Life Scale, and the Inventory of Common Problems. Factor analyses did not support one general factor solution of the T-GAD-7. However, a respecified model, after correlating error terms, met the adequate criteria for model fit. Additionally, significant moderate correlations were found for the anxiety scores with perceived stress, academic problems, physical problems, and life satisfaction. The results indicated that college health professionals could benefit from the T-GAD-7 to assess anxiety levels of Turkish college students. Further discussions and implications were provided.

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Anxiety disorders are a frequently seen mental health problem in society (Katzman et al., 2014; Kehoe, 2017). Although anxiety disorders have a lifetime prevalence of up 31% (Katzman et al., 2014; Kehoe, 2017), the actual rates could be higher than that. Anxiety disorders are underdiagnosed, as people with anxiety disorders may not disclose their symptoms or may not attribute somatic symptoms to anxiety (Kehoe, 2017). In addition, less than one-third of people with anxiety disorders receive treatment, and if not treated, anxiety disorders might have dire consequences and negatively impact functioning and quality of life (Kehoe, 2017).

Although college life provides unique opportunities for students' growth and development, it may also present various stressors for developing psychological problems, including anxiety disorders (lunes et al., 2017). Leaving a known environment, dealing with financial problems and academic expectations, and adjusting to a new social circle may trigger the development of anxiety disorders among college students (lunes et al., 2017). Consequently, anxiety disorders are currently seen at a high rate among college students. It is one of the top presenting concerns (i.e., 41%) among American college

students (American Psychological Association, 2013) and a high proportion of Turkish college students (i.e., 47.1%) experience moderate to severe anxiety (Bayram & Bilgel, 2008). With COVID-19, anxiety problems deepened among college students. Recent research showed that approximately 70% of college students reported that COVID-19 increased anxiety rates among college students (Son et al., 2020).

The research shows that anxiety is negatively associated with the mental well-being and academic lives of college students. It is known that anxiety negatively impacts academic performance, as anxiety causes a lack of interest in learning; students with anxiety problems find it harder to avoid distractions and show poor performance on assignments (Afolayan et al., 2013; Vitasari et al., 2010). Additionally, anxiety is significantly positively associated with perceived stress and depression for college students (Beard & Björgvinsson, 2014; Kertz et al., 2012; Khan & Khan, 2017; Lee & Kim, 2019; Rathnayake & Ekanayaka, 2016), and students with anxiety disorders tend to have low levels of life satisfaction and psychological well-being (Ghazwin et al., 2016; Serin et al., 2010).

Given the high rates of anxiety problems, the first step for assessment and interventions is to have a reliable and valid tool for measuring anxiety among college students. Spitzer et al. (2006) developed a brief clinical measurement tool to assess general anxiety disorder with a sample of American patients. It is composed of seven items that are created based on the DSM IV criteria for GAD and using the review of the other existing anxiety scales. Receiving GAD-7 scores between 0–4 reflects minimal, 5–9 mild, 10–14 moderate, and 15–21 severe anxiety issues. The original validation study indicated that the GAD Scale has good reliability and criterion, construct, factorial and procedural validity. Also, receiving higher scores on the GAD-7 was strongly associated with higher levels of functional limitations (Spitzer et al., 2006).

Previous research investigated the factorial and cross-cultural validity of the GAD-7 with various samples from different countries, including German (Löwe et al., 2008), Peruvian (Zhong et al., 2015), Spanish (García-Campayo et al., 2010), Japanese (Doi et al., 2018) and Korean (Lee & Kim, 2019) populations. However, the results of these studies provided contradictory results (Doi et al., 2018). Although some of the research studies confirmed one factorial structure (e.g., a Korean study conducted with a sample of college students) (Lee & Kim, 2019), there have been other studies that indicated that the one-factor structure did not fit the data (e.g., two American studies conducted with samples of psychiatric patients) (Kertz et al., 2012; Beard & Bjorgvinsson, 2014). The researchers indicated that several pairs of items of the GAD-7 (i.e., items #4 and #5, #5 and #6 and #4 and #6) had to be correlated to improve the model fit (Johnson et al., 2019; Kertz et al., 2012; Lee & Kim, 2019).

However, to the best of our knowledge, no study has investigated the psychometric properties of the GAD-7 for Turkish college students. Only one study investigated the psychometric properties of the GAD-7 with a sample of Turkish psychiatric patients with anxiety disorders and found a one-factor structure (Konkan et al., 2013). However, Turkish psychiatric patients and college students show different demographic and psychological characteristics. Structural equation modeling researchers indicated that factor analysis performed on samples from different populations (i.e., students versus patients with anxiety disorders) might yield different numbers of factors and factor structures (Gaskin et al., 2017). Therefore, more research is needed to understand whether the proposed one-factorial structure fits the data for Turkish college students.

Consequently, the purpose of this study is to investigate the reliability and validity of the Turkish version of the GAD-7 and its relationship with perceived stress, life satisfaction, and academic, emotional, physical, and substance abuse problems for Turkish college students. The results of this study may help college professionals and practitioners understand Turkish college students' responses to a general anxiety measurement tool.

Method

Participants and procedures

This study included 235 Turkish college students recruited from two universities located in the midst and south sides of Turkey. The participants had a mean age of 20.22 ($SD = 1.88$), ranging from 17 to 34 years old. Twenty-four percent of the participants ($N = 57$) were the first year, 34% were the second year ($N = 79$), 21% were the third year ($N = 49$) and 21% were the fourth year ($N = 50$) college students.

Ethical approvals from Institutional Review Boards from the affiliated universities (i.e., Karadeniz Teknik University, Eskisehir Osman Gazi University and University of Wisconsin–Madison with protocol numbers 2012–2 and SE-2012-0319) were obtained. The participants were recruited with the help of class instructors. Before participating in the study, the participants were informed that participation was totally voluntary; no personal identification information would be collected, and not participating in the study would not have any negative effect on them. The volunteer participants completed a questionnaire using a secured website (www.surveymonkey.com) in the university computer labs. The language of administration of the questionnaire was Turkish, and the participants were given as much time as needed to complete it.

Measures

General Anxiety Disorder 7-item (GAD-7) Scale

The GAD-7 is a seven-item brief clinical instrument developed by Spitzer et al. (2006) to screen for the presence of general anxiety disorders. The test items represent DSM-IV symptom criteria for GAD. Sample items of the GAD-7 include “Feeling nervous, anxious or on edge” and “Feeling afraid as if something awful might happen”. The participants are asked how often they have been bothered with the respected anxiety symptoms during the last two weeks. Each item is rated on a four-point Likert-type rating scale with response options ranging from 0 (not at all) to 3 (nearly every day). Total scores that can be obtained from the scale range from 0 to 21, with higher scores indicating higher levels of anxiety symptoms. Cut points of 5, 10, and 15 are considered to represent mild, moderate, and severe levels of anxiety, and a score of 10 is deemed to be sufficient to determine the presence of anxiety symptoms (Spitzer et al., 2006). The GAD-7 has been demonstrated to have good internal consistency reliability and construct validity in primary care settings and with the general population (Lee & Kim, 2019). The Turkish version of the GAD-7 was reported to have internal consistency reliability (Cronbach's alpha) of .85 (Konkan et al., 2013).

Inventory of Common Problems (ICP)

The ICP is a 24-item instrument developed by Hoffman and Weiss (1986) to assess common problems experienced by students in adjustment to college life. The test items represent the three broad areas of problems (i.e., situational, developmental, and those reflecting psychopathology). Sample items of the ICP include “Feeling like I’m not doing as well in school as I should?” and “Feeling lonely or isolated?”. The participants are asked to report the extent of the problem indicated in the test items. Each item is rated on a five-point Likert-type scale with response options ranging from 1 (not at all) to 5 (very much). The internal consistency reliability (Cronbach’s alpha) of the ICP has been reported. 85 (Hoffman & Weiss, 1986). The Turkish version of the ICP has been validated in Turkey by Kaya et al. (2019). The researchers reported that the ICP has a four-factor structure representing emotional, academic, substance abuse, and physical problems for Turkish college students. The internal consistency reliability (Cronbach’s alpha) of the Turkish version of the ICP for the current study were to be .90 .80 .77, and .73 for emotional, academic, substance abuse, and physical problems, respectively.

Perceived Stress Scale (PSS-10)

The PSS-10 is a 10-item instrument developed by Cohen and Williamson (1988) to assess the extent to which a person appraises his/her life as stressful. Although the original version of the PSS has 14 items, the PSS-10 has been validated in large samples (Cohen & Williamson, 1988). Sample items of the PSS include “In the last month, how often have you found that you could not cope with all the things that you had to do?” and “In the last month, how often have you felt nervous and stressed?”. Each item is rated on a five-point Likert-type scale with response options ranging from 0 (never) to 4 (very often). Total scores that can be obtained from the scale range from 0 to 40, with higher scores indicating a higher level of perceived stress. The internal consistency reliability (Cronbach’s alpha) of the PSS-10 has been reported to be .85 (Cohen et al., 1983). The Turkish version of the PSS-10 has been reported to have a two-factor structure: stress-related self-efficacy beliefs and stress-related feelings of helplessness (Kaya et al., 2019). The internal consistency reliability (Cronbach’s alpha) of the Turkish version of the PSS-10 has been reported to be .84 for a sample of Turkish college students (Örücü & Demir, 2009). The internal consistency reliability (Cronbach’s alpha) of the Turkish version of the PSS for the current study was .84.

Satisfaction with life scale (SWLS)

The SWLS is a seven-item instrument developed by Diener et al. (1985) to assess satisfaction with people’s lives as a whole. Sample items of the SWLS include “In most ways, my life is close to my ideal” and “I am satisfied with life.” Each item is rated on a seven-point Likert-type scale with response options ranging from 1 (strongly disagree) to 7 (strongly agree). Total scores that can be obtained from the scale range from 7 to 35, with higher scores indicating a higher level of satisfaction with life. The internal consistency reliability (Cronbach’s alpha) of the SWLS has been reported to be .87 (Diener et al., 1985). The Turkish version of the SWLS has been reported to have internal consistency reliability (Cronbach’s alpha) of .81 for Turkish college students (Durak et al., 2010). The internal

consistency reliability (Cronbach’s alpha) of the Turkish version of the SWLS for the current study was .87.

Results

Descriptive statistics

The results indicated that the participants had a mean total anxiety score of 5.89 ($SD = 4.79$). Twenty percent of the participants ($N = 47$) reported having moderate to severe levels of anxiety, which can be identified as cases of GAD, and 43.6% ($N = 126$) of the participants reported experiencing at least mild levels of anxiety. These findings were lower than anxiety levels reported by Bayram and Bilgel (2008) for Turkish college students; however, they were consistent with other researchers regarding anxiety rates among Turkish college students (Demirbatir, 2012). T test results indicated that there were no significant differences between the anxiety levels of male ($M = .87, SD = .84$) and female students ($M = .81, SD = .64; t(233) = .61, p = .53$). This finding was consistent with Mergen et al.’s (2012) findings indicating that no significant differences were found between anxiety levels of Turkish male and female college students. Additionally, analysis of variance results indicated that there were no significant differences between anxiety levels of first-year ($M = .73, SD = .69$), second-year ($M = .85, SD = .63$), third-year ($M = .95, SD = .75$) and fourth-year students ($M = .84, SD = .67, F(3, 231) = .92, p = 43$).

Confirmatory factor analysis

The one-factor model was tested to assess whether the T-GAD-7 has one factorial structure as specified by Spitzer et al. (2006) in the original format measuring the general state of anxiety problems among Turkish college students.

The goodness of fit of the measurement model was tested using the chi-square goodness of fit test and several fit indices, including χ^2/df , Comparative Fit Index, Tucker Lewis Index, Bayesian Information Criterion (BIC) and Root Means Square Error Approximations (RMSEA). A non-significant chi-square, relative chi-square (χ^2/df), values between 1–3; CFI and TLI values greater than .90 reflect an acceptable fit; and CFI and TLI values greater than .95 reflect an excellent fit (Byrne, 2001; Hu & Bentler, 1999; Weston et al., 2008). RMSEA values between .05 and .08 reflect an acceptable level of error approximations (Byrne, 2001). In addition, BIC was utilized to compare models, with lower BIC values reflecting a better model fit.

As shown in table 1, the results indicated that the one-factor model did not meet adequate criteria for model fit. Although the CFI and TLI values were in the acceptable range, the RMSEA and χ^2/df values were not in the expected range ($\chi^2 = 43.59, df = 14; \chi^2/df = 3.11, CFI = .96; TLI = .95; RMSEA = .09$ (90% CI = .06–.12); BIC = 3280.37). The modification indices were examined to determine areas of misfit in the model. The modification indices indicated that a pair of error terms (i.e., #item 3 = Worrying too much about

Table 1. Fit Indices across the tested models for general anxiety factor

Model	χ^2/df	CFI	TLI	RMSEA 90% CI	BIC
One factor model	3.11	.96	.95	.09 (.06-.12)	3280
One factor-model with a pair of error terms correlated	2.39	.98	.96	.07 (.04-.11)	3273

different things and #item 4 = Trouble relaxing) should be correlated. Correlated error terms indicate that there exists a cause for correlated residuals, which is not specified in the model (Hermida, 2015). After correlating the error terms, the respecified model provided an acceptable fit between the model and the data ($\chi^2 = 31.17$, $df = 13$; $\chi^2/df = 2.39$, CFI = .98; TLI = .96; RMSEA = .07 (90% CI = .04–.11); BIC = 3273.40). Additionally, BIC results supported that the respecified model provided a better fit than the first model.

Exploratory factor analysis

To test possible multidimensionality in the instrument, an exploratory factor analysis was conducted. Initial results showed that the data were appropriate to proceed to exploratory factor analysis. The Kaiser-Meyers-Olkin (KMO) criterion for sampling adequacy was equal to .91, indicating that the correlations between the test items were sufficient. The Bartlett test of sphericity was significant ($\chi^2 = 946.21$, $p < .01$), indicating that the correlation matrix was not an identity matrix.

A 7x7 correlation matrix was subjected to principal axis factoring (PAF). Principal axis factoring performs better than maximum likelihood in case normality assumption is not met and in recovering factors with low loadings (Coughlin, 2013; De Winter & Dodou, 2012). The results indicated that only one factor had an eigenvalue greater than one. The scree plot also indicated a one-factor model. All the factor loadings were significant and greater than .69. The one-factor model with an eigenvalue of 4.55 explaining 65% of the shared variance has been accepted.

Reliability

The internal consistency reliability of the T-GAD-7 was assessed using Cronbach's alpha. The Cronbach's alpha level of the T-GAD-7 was .91, indicating strong internal consistency reliability. The correlations between the items were moderate, ranging from .51 to .69 ($p < .01$). Additionally, further analyses indicated that removal of any item from the T-GAD-7 reduced Cronbach's alpha level of the T-GAD-7, indicating that all the items contributed to the strength of the reliability of the T-GAD-7.

External correlates

The participants' anxiety scores were correlated with scores of related measures, including perceived stress, life satisfaction, and academic, emotional, physical, and substance abuse problems. The results indicated that the T-GAD-7 scores were strongly correlated with emotional problems ($r = .74$, $p < .05$) and moderately correlated with academic problems ($r = .42$, $p < .05$), physical problems ($r = .51$, $p < .05$), perceived stress ($r = .50$, $p < .05$) and life satisfaction ($r = -.32$, $p < .05$). However, T-GAD-7 scores were not significantly correlated with substance abuse problems ($r = .12$, $p = .06$).

Discussion

The current study is the first to validate the T-GAD-7 with a sample of Turkish college students. The results of this study indicated that the one-factor model did not fit the data.

However, after correlating a pair of error terms, the model provided an acceptable fit for the one-factor model. These findings were contrary to Konkan et al.'s (2013) findings (2006), which supported one general factor solution for Turkish psychiatric patients.

Several reasons, including theoretical or methodological reasons, could justify correlating error terms to increase model fit (Gerbing & Anderson, 1984). The current study results indicated that residuals for items #3 and #4 of the T-GAD-7 had to be correlated. Theoretically, these two items share the inability to control anxiety-related thoughts and behaviors. However, methodological reasons, including common assessment method, reversed or similarly worded items, response tendency, reading difficulty, or social desirability, could explain why error terms for items #3 and #4 had to be correlated as well (Brown & Moore, 2012). It is possible that these two items share similar meanings in the Turkish version than in the English version. However, more research is needed to explain why error terms had to be correlated for the one-factor model of the GAD-7 for college students, as evidenced in previous studies (Bártolo et al., 2017; Lee & Kim, 2019; Rutter & Brown, 2017) common assessment methods (e.g., observer ratings, questionnaires), reversed or similarly worded test items, or differential susceptibility to other influences such as response set, demand characteristics, acquiescence, reading difficulty, or social desirability common assessment methods (e.g., observer ratings, questionnaires), reversed or similarly worded test items, or differential susceptibility to other influences such as response set, demand characteristics, acquiescence, reading difficulty, or social desirability common assessment methods (e.g., observer ratings, questionnaires), reversed or similarly worded test items, or differential susceptibility to other influences such as response set, demand characteristics, acquiescence, reading difficulty, or social desirability

The results indicated that anxiety scores were significantly moderately associated with academic problems, perceived stress, and physical problems. Anxiety problems cause concentration problems and disinterest in learning that may lead to academic problems among Turkish college students (Afolayan et al., 2013; Vitasari et al., 2010).

Previous studies have indicated that being a university student and college life itself in Turkey is a source of stress (Serin et al., 2010). Additionally, Turkish students are required to take a nationwide exam at the end of the college years to receive employment in public organizations, which is one of the most secure types of employment for Turkish college students (Dogan Altun et al., 2017). Therefore, feeling under pressure to increase academic skills and knowledge from early college years might lead to anxiety problems (Zucker et al., 2019).

The research indicated that T-GAD-7 scores had significant correlations with life satisfaction. This finding is in line with previous research indicating that there is a reciprocal relationship between mental health problems (i.e., anxiety, depression) and life satisfaction (Fergusson et al., 2015; Guney et al., 2010). Finally, the results indicated that there was no significant correlation between anxiety scores and substance abuse problems for Turkish college students. Alcohol or drug abuse is highly stigmatized among Muslim populations, which limits its usage and self-report (Arfken & Ahmed, 2016). It is possible that a low number of the participants reported substance abuse problems leading to no significant correlations between anxiety and substance abuse problems.

Implications

The world has been experiencing COVID-19, and therefore, it is expected that anxiety symptoms will arise among college students. Moreover, the long-term psychological effect of COVID-19 anxiety problems will be discovered in upcoming years. Therefore, it is important to take precautionary steps (Uysal et al., 2021). In that regard, college counselors or other health professionals can utilize the T-GAD-7 as a screening instrument for the detection of anxiety symptoms among Turkish college students.

Anxiety problems were negatively related to the life satisfaction of Turkish college students. College health professionals should use innovative interventions to improve the mental health and psychological well-being of college students. Recent studies have suggested that social communication might be an important factor in increasing well-being (Uysal et al., 2021). In addition, intervention strategies and programs that improve students' networks would be a different avenue to improve the life satisfaction of college students (Jihan et al., 2012)

The findings indicated that anxiety is an important factor impacting the health and well-being of Turkish college students. However, research also shows that Turkish college students have stigma toward seeking help for mental health problems and less accessibility to mental health services (Kaya et al., 2019). Therefore, in the COVID-19 era, necessary actions such as allocating more resources for mental health services to make it more accessible to Turkish college students is urgently needed.

Limitations

This study has several important limitations that limit the generalizability of the results. Therefore, the results should be interpreted cautiously. First, the sample of this study included students from two major universities in Turkey overrepresented with female students; therefore, the results may not represent the general body of Turkish college students. In addition, this study used self-report measures, and social desirability is a caveat of self-report measures impacting the validity of the results. Additionally, this study used correlation coefficients to determine the relationship between the students' anxiety scores and other measures; therefore, a cause-effect relationship cannot be determined.

Conclusion

Anxiety is a common problem among Turkish college students. To provide effective services, it is essential to screen and identify Turkish college students with anxiety problems. This study investigated the psychometric properties of the T-GAD-7. The results indicated that the T-GAD-7 is a reliable and valid measurement tool to measure anxiety symptoms among Turkish college students. The students' anxiety scores were also significantly associated with perceived stress and emotional, academic and physical problems and negatively associated with life satisfaction. College counselors and health professionals could utilize this tool to screen and accordingly provide mental health services for Turkish college students.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Informed consent

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

Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Yaygın Kaygı Bozukluğu-7 Ölçeğinin Türkçe Versiyonu [The Turkish version of GAD-7]

Son iki hafta içinde aşağıdaki problemler sizi ne sıklıkla rahatsız etti?

[How often have the following problems bothered you in the past two weeks?]

Kutuda cevabınızı belirtmek için “√” kullanın [Use “√” to indicate your answer in the box]	Hiç [Not at all]	Birkaç gün [Several days]	Günlerin yarısından fazlasında [More than half the days]	Hemen hemen her gün [Nearly every day]
1 Gergin, endişeli veya patlamaya hazır hissetmek [Feeling nervous, anxious, or on edge]	0	1	2	3
2 Endişelenmeyi önleyememek ve kontrol edememek [Not being able to stop or control worrying]	0	1	2	3
3 Farklı şeyler hakkında fazla endişe duymak [Worrying too much about different things]	0	1	2	3
4 Rahatlamakta zorlanmak [Trouble relaxing]	0	1	2	3
5 Sakin oturamayacak kadar huzursuz olmak [Being so restless that it is hard to sit still]	0	1	2	3
6 Kolay sinirlenmek veya rahatsız olmak [Becoming easily annoyed or irritable]	0	1	2	3
7 Çok kötü bir şey olabileceği gibi korkmak [Feeling afraid as if something awful might happen]	0	1	2	3