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Measuring anxiety related to COVID-19: A Turkish validation study of the Coronavirus Anxiety Scale

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ABSTRACT

The aim of the current study is to validate the Turkish version of the Coronavirus Anxiety Scale (CAS). Participants were assessed across the CAS, Obsession with COVID-19 Scale (OCS) and Fear of COVID-19 Scale. We surveyed 1023 Turkish native speakers who participated online. Confirmatory factor analysis showed that the factor structure of the CAS was satisfactory. The scale was internally consistent with a Cronbach's alpha of 0.80. Positive correlations of the CAS with the OCS and the Fear of COVID-19 Scale demonstrated adequate convergent validity. These findings suggest that the CAS is a valid and reliable measure to assess the severity of dysfunctional coronavirus related anxiety.

The World Health Organization (WHO) announced a new viral pneumonia, which originated in Wuhan, China on December 2019 (Lee, 2020a). It did not take long for the world to realize that COVID-19 is dangerous. The virus spread quickly across the globe, causing an outbreak that escalated rapidly in North America and Europe in March 2020. Now, nearly 5 months after the first outbreak, more than 5 million people worldwide have been infected with the virus, 6.52% (321,000) of whom have died (Covidvisualizer, 2020). The first case in Turkey was reported on March 11, 2020. The total number of infected people in our country is 150,000 and the number of losses is reported as more than 4,000 (Covidvisualizer, 2020). After the WHO declared the new coronavirus a pandemic on March 11, 2020, many governments had to take measures that radically changed social and/or work life. Thus, while infection rates continue to increase, life has gotten worse for most people, with increasing deaths, job losses, and social isolation associated with COVID-19 (Lee, 2020a). During an infectious disease outbreak, a significant proportion of people tend to experience clinically significant levels of fear and anxiety (Taylor, 2019). Consistent with this, high infection and mortality rates related to COVID-19 caused widespread fear and anxiety (Ahorsu et al., 2020; Lin, 2020). Studies conducted in

China demonstrate this, reporting that between 50% (Wang et al., 2020) and 70% (Tian et al., 2020) of the participants showed moderate to high psychological symptoms (Tian et al., 2020; Wang et al., 2020). Consistent with this, Wang et al. (2020) found that approximately one third of the participants reported moderate to severe anxiety, while for Tian et al. (2020) the participants reported high scores for obsessive compulsion, interpersonal sensitivity, phobic anxiety and psychoticism.

Identifying high-risk groups for psychological symptoms is as important as recognizing the presence of these symptoms, as they will be the target populations for evaluation and perhaps treatment. The study conducted in China showed that those who are at the highest risk for mental illness are young people, health workers, and people who spend a lot of time thinking about pandemics (Huang & Zhao, 2020). Consistent with this, high depression (50.7%), post-traumatic stress (73.4%), generalized anxiety (44.7%) and insomnia (36.1%) rates were determined among COVID-19 infected patients (Bo et al., 2020) and healthcare workers (Lai et al., 2020; Xiang et al., 2020) in China, but to what extent these psychological conditions can be attributed to coronavirus anxiety has not been established (Lee, 2020a).

Paying reasonable attention to information related to COVID-19 may be beneficial for people to stay safe during the crisis, but excessive attention may be mentally disruptive and unhealthy (Taylor, 2019). People's personal negative experiences and/or exposure to issues in media about this growing health crisis may also increase their fear and anxiety (Kumar & Somani, 2020; Lee, 2020b; Shuja et al., 2020). This is because individuals may not think clearly and rationally when reacting to COVID-19 with high levels of anxiety (Ahorsu et al., 2020; Lee, 2020a). It has been reported that psychological reactions such as hypochondriasis and anxiety negatively affect the health and well-being of individuals during an infectious disease outbreak (Pappas et al., 2009). In a recent study among 775 adults residing in the U.S., individuals who were functionally affected by coronavirus fear and anxiety showed more despair, suicidal ideation, religious crisis, and alcohol/substance coping than those who were anxious but not functionally affected (Lee, 2020a). Therefore, in order to help those with higher coronavirus anxiety, it is very important for healthcare professionals to realize their psychological functionality (Asmundson & Taylor, 2020; Lee, 2020a, 2020b, 2020c). However, the determination of the mental health needs of people affected by the pandemic has been neglected, especially in the early stages of the pandemic (Xiang et al., 2020). In fact, although healthcare professionals are aware of the growing fear and anxiety of those around them, they need an assessment tool to evaluate it (Lee, 2020a). Developing this measure may help healthcare professionals, researchers and policy makers to gain information about the clinical signs and consequences of this anxiety related to the COVID-19 crisis and how to deal with it (Asmundson & Taylor, 2020; Lee, 2020a, 2020b, 2020c). In this regard, Lee (2020a) developed the Coronavirus Anxiety Scale (CAS), which has strong psychometric properties. Results for this pandemic-related mental health screener were also replicated by further analyses (Lee, 2020c; Lee et al. 2020). However, there is no available measuring instrument to evaluate the dysfunctional anxiety related to COVID-19 in Turkey. Such a measure may help clinicians recognize the psychological impacts of COVID-19 and develop psychological interventions to help people with dysfunctional anxiety caused by this pandemic. Thus, the aim of the present study is to adapt the CAS (Lee, 2020a) into Turkish (see Appendix section).

Method

Participants and procedure

A cross-sectional online survey was conducted to test the psychometric properties of the CAS in Turkish.

Table 1. Sociodemographic and clinical variables ($n = 1,023$).

	<i>n</i>	%
Age years; (Mean \pm SD)	43.32	13.66
Gender		
Male	387	37.8
Female	631	61.7
Other	5	0.5
Romantic relationship	583	57.0
Living ...		
alone	152	14.9
with partner	427	41.7
with roommate	16	1.6
with family	426	41.6
in dorm	2	.2
Duration of education (Mean \pm SD)	16.93	4.04
Employment		
Working	660	64.5
Part-time worker	43	4.2
Unemployed	56	5.5
Student	58	5.7
Other	206	20.1
Positive COVID-19 diagnosis	19	1.9
History of anxiety disorder	163	15.9
Relative or acquaintance with COVID-19 diagnosis		
No	873	85.3
Yes, but not living together	133	13
Yes, living together	17	1.7
Health professional (HP)		
Not HP	736	71.9
HP not working with COVID-19 positive patients	234	22.9
HP working with COVID-19 positive patients	53	5.2

The target population was the general Turkish population. An online survey link was distributed across social media, e-mail and WhatsApp groups.

Participation in the study was anonymous and confidential. Participants were given the Plain Language Information Statement and informed consent was recorded online. The data were collected via Qualtrics, from May 14, 2020 to May 17, 2020. There were 1,413 potential participants who initiated the survey online. However, participants ($n = 390$) with systematically missing data were excluded from the study. Therefore, a total of 1,023 participants, who completed the survey without missing data, were included in the study. Among these, 387 were male (37.8%), 631 were female (61.7%), and 5 were other (0.5%). The mean age of the sample was 43.32 years ($SD = 13.66$). Sociodemographic information of the sample is summarized on Table 1.

Measures

Background information

Questions related to the background information asked participants' age, gender, duration of their education, whom they live with, employment and relationship status, coronavirus diagnosis, history of anxiety, if they are health professionals and working with a COVID-19 positive patients, and if they have a relative or acquaintance with COVID-19 diagnosis.

The Coronavirus Anxiety Scale (CAS)

The CAS is a 5-item scale with robust reliability ($\alpha = .93$) and validity based on a study conducted with 775 adults (Lee, 2020a). The CAS distinguishes those with dysfunctional anxiety and non-anxiety while using an optimized cutoff score of 9 (90% sensitivity and 85% specificity). The results support the CAS as an effective and valid tool for clinical research and practice (Lee, 2020a), and was replicated by a further study (Lee et al., 2020). Lee (2020c) also conducted another replication analysis for the CAS. The results of this latest study demonstrated that the CAS is a highly reliable ($\alpha = .92$) and factorially valid measure that meets conventional standards for model fit. However, the cutoff score had to be lowered to ≥ 5 in order for the sensitivity and specificity rates to be acceptable at 71% and 74% respectively, while the diagnostic values were still within acceptable ranges for mental health screening. The results of that latest study which evaluated psychometric characteristics of the CAS was reported to be largely consistent with the results of the first CAS investigation and support the validity of the CAS (Lee, 2020c).

After receiving the consent of the original scale's author, the CAS was translated from English to Turkish by two independent translators, and this translated version was agreed upon by these specialists. In order to establish their comparability, the Turkish version of the CAS was then translated from Turkish to English by a separate translator.

The Obsession with COVID-19 Scale (OCS)

The OCS is a 4-item scale with robust reliability and validity (Lee, 2020b). Lee (2020b) conducted statistical analyses in two large samples of adults independently from each other; those who reported some level of anxiety about the coronavirus and those who were not restricted to any level of anxiety. High OCS scores were correlated with coronavirus anxiety ($r = .72-.81$), religious crisis ($r = .53-.64$), alcohol/substance coping effort ($r = .42-.50$), extreme hopelessness ($r = .66-.70$) and suicidal ideation ($r = .45-.56$). Using an optimized cutoff score ≥ 9 , the OCS discriminates the nonfunctional COVID-19 thinking patterns (81% sensitivity and 93% specificity) from those without such pattern (73% sensitivity and 76% specificity). The results support the OCS as an effective and valid tool for clinical research and practice (Lee, 2020b). In the present study, the unidimensional 4-item OCS indicated a good fit to the data ($\chi^2/df = 1.40$, RMSEA = .020 [CI

90% (.000, .068)], CFI = .999, GFI = .999) and had good internal consistency ($\alpha = .71$).

The fear of COVID-19 scale

The Fear of COVID-19 Scale, which is a self-rated 7-item scale, has robust psychometric properties (Ahorsu et al., 2020). Item-total correlations ranged from .47 to .56, and factor loadings ranged from .66 to .74. Internal consistency is high ($\alpha = .80$), whereas test-retest reliability is acceptable ($r = .72$). The Fear of COVID-19 Scale was positively correlated with perceived vulnerability, hospital anxiety, and depression (Ahorsu et al., 2020), thus showed validity. The Turkish version of the Fear of COVID-19 Scale also had strong psychometric properties (Satici et al., 2020). In the present study, the Cronbach's alpha was .87.

Statistical analysis

AMOS was used for Confirmatory Factor Analysis (CFA), whereas IBM SPSS Statistics Version 20 was used for the remaining statistical analyses. Data were cleaned through the inspection of cases with severe missing values across the measures beforehand. The distribution of all items across all psychometric tests utilized in the present study was examined to assess univariate normality. As a result, no item of the GDT and the other psychometric tests had absolute values of skewness >3.0 and kurtosis >8.0 (Kline, 2011). Frequencies and percentages were given for sociodemographic variables, whereas means and standard deviations were given for age, duration of education and CAS score. We used analysis of variance (ANOVA) and independent samples Students t-tests for mean differences analyses.

The psychometric properties of the Turkish CAS were consecutively investigated. CFA was used to examine the scale's factorial structure. Secondly, convergent validity was determined by estimating Pearson product-moment correlation coefficients between the total scores of the CAS, OCS, and the Fear of COVID-19 Scale. Finally, Cronbach's alpha was used to assess internal consistency.

Results

Factor structure

Bartlett's Test of Sphericity and the Keiser-Meyer-Olkin measurement of sampling adequacy (KMO) were checked to be sure about the sample size sufficiency beforehand so CFA analyses were run in order

Table 2. Summary of the results from the CFA on the Coronavirus Anxiety Scale (CAS), Cronbach's alpha, item-total and inter-item correlations obtained from the five items of the CAS.

Item	Mean \pm SD	Factor loadings	Item-total correlation	Inter-item correlations			
				2	3	4	5
1. I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus.	1.32 \pm 0.72	0.762	0.777	0.52	0.55	0.35	0.48
2. I had trouble falling or staying asleep because I was thinking about the coronavirus.	1.61 \pm 0.95	0.694	0.811		0.49	0.38	0.48
3. I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.	1.22 \pm 0.58	0.712	0.742			0.42	0.42
4. I lost interest in eating when I thought about or was exposed to information about the coronavirus.	1.22 \pm 0.58	0.566	0.662				0.47
5. I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus.	1.30 \pm 0.68	0.632	0.751				
Mean \pm SD	6.66 \pm 2.65	AVE	0.57				
Cronbach's alpha	0.80	CR	0.87				

All factor loadings and item-item Pearson correlations were statistically significant ($p < .001$). CFA: Confirmatory factor analysis, SD: Standard deviation, AVE: Average Variance Extracted, CR: Composite reliability.

to examine the factor structure and its dimensionality of the CAS. The Bartlett's Test of Sphericity was significant ($\chi^2 = 1514.637$, $df = 10$, $p < .001$) for the CAS, and the KMO was acceptable at .819.

The unidimensionality of the Turkish CAS was then assessed via CFA with maximum likelihood. In order to evaluate the quality of the model estimated in the CFA, several fit indices were used and the following thresholds adopted: $\chi^2/df \leq 5$, Goodness of Fit Index (GFI), Tucker-Lewis Fit Index (TLI) and Comparative Fit Index (CFI) $> .90$, and Root Mean Square Error of Approximation (RMSEA) $< .05$ (Ferguson & Cox, 1993; Kaiser, 1960; Lin et al., 2013; Wu et al., 2015). However, Browne and Cudeck (1992) suggested that RMSEA values up to .08 represent reasonable error fit of approximation. The estimation of a unidimensional model produced a good fit ($\chi^2/df = 12.819/3 = 4.273$; GFI = .995, TLI = .978, CFI = .993, and RMSEA = .057). As seen in Table 2, all item-component loadings were statistically significant (ranged from .57 to .76) and within the conventional acceptable threshold of $> .50$. Thus, results from the CFA suggest that the CAS assesses a unidimensional construct.

Convergent validity

The literature defines convergent validity as the extent to which items of a psychometric test appear to be indicators of a single underlying construct (Lee et al., 2015). Convergent validity is deemed adequate when the Average Variance Extracted (AVE) of the latent variable is $\geq .50$ and composite reliability (CR) is $\geq .70$ (Fornell & Larcker, 1981; Wu et al., 2015). As shown in Table 2, the AVE value for the GDT was adequate

(.57), and the composite reliability coefficient was beyond the desired threshold (.87).

Convergent validity was also assessed by correlating the CAS scores with the scores of two related scales (i.e., the OCS and Fear of COVID-19 Scale). The correlations between the CAS and the OCS ($r = .57$, $p < .001$) and the Fear of COVID-19 Scale ($r = .54$, $p < .001$) were statistically significant. Overall, these results demonstrate positive correlations among the variables of interest in the expected direction according to the underlying theory, thus supporting the validity of the CAS.

Internal consistency reliability

The Cronbach's alpha coefficient of the Turkish CAS was high ($\alpha = .80$), which showed the reliability of the scale (Table 2). Moreover, the Cronbach's alpha did not increase by deleting any of the five items of the scale. Furthermore, item-total correlations for the CAS were equally robust, ranging between .662 (item 4) and .811 (item 2) (Table 2). Finally, inter-item correlations for the CAS ranged between .354 (between item 1 and 4) and .554 (between item 1 and 3) (Table 2).

Mean differences analyses

An analysis of variance (ANOVA) showed that CAS scores were higher among health professionals working with COVID-19 positive patients ($M = 7.94$; $SD = 3.92$) than health professionals not working with these patients ($M = 6.62$; $SD = 2.69$) and those who are not health professionals ($M = 6.58$; $SD = 2.50$) ($F[91,811] = 6.626$, $p = .001$). Another ANOVA indicated that those who have a relative or acquaintance

with a COVID-19 diagnosis and living together had higher CAS scores ($M=7.77$; $SD=2.95$) than those who have a relative or acquaintance with this diagnosis but not living together ($M=7.04$; $SD=3.15$) and who do not know anyone diagnosed positive ($M=6.59$; $SD=2.55$) ($F[44,561]=3.195$, $p=.041$).

Independent samples t-tests revealed that those who had a history of anxiety ($M=7.53$; $SD=3.36$) had higher CAS scores than those who did not ($M=6.50$; $SD=2.46$) ($t[196.23]=-3.725$, $p<.001$), while women ($M=7.14$; $SD=2.94$) had higher CAS scores compared to men ($M=5.88$; $SD=1.83$) ($t[1015.78]=8.395$, $p<.001$).

Discussion

The current study mainly aimed to adapt the CAS and assess its psychometric properties in a sample recruited from the general population in Turkey. Results revealed a statistical support to the validity of the CAS across several levels. A single-factor solution for the CAS was found in the CFA, further supporting the unidimensional factor structure of the CAS found in the previous study (Lee, 2020a). The results of the CFA yielded statistically significant and relatively high factor loadings, further demonstrating that all items were adequate indicators of the construct (dysfunctional anxiety related to the coronavirus) and that the scale has adequate psychometric properties, alongside a solid factor structure. In previous studies, the CAS showed adequate reliability (Cronbach's alphas of .92 [Lee, 2020c] and .93 [Lee, 2020a; Lee et al., 2020]) among USA participants. Consistent with these results, the Cronbach's alpha obtained for the Turkish version was satisfactory ($\alpha=.80$). In addition to this result, convergent validity was supported by the expected positive pattern of correlations that have emerged between the CAS and the related measures. The convergent validity of the scale was indicated by the significant correlations of the CAS with the OCS and the Fear of COVID-19 Scale. Comparing the CAS scores also showed health professionals working with COVID-19 positive patients, those who have a relative or acquaintance with COVID-19 diagnosis and living together with them, those who had a history of anxiety, and women had higher scores. The Turkish version of the CAS provided a valid and reliable measure of dysfunctional anxiety that can be used for research and diagnostic purposes among male and female general population.

The current study has some limitations that must be mentioned. Firstly, this study was conducted

online. Therefore, those without Internet access could not be involved in the study. Secondly, the results of this study heavily rely on participants' self-reports. Self-reports may yield limitations due to biases such as social desirability and short-term recall. Thirdly, there was no common attention check item (instructed response item) embedded within the online survey. Thus, careless responses may have affected the validity of the CAS. Lastly, the cutoff point, which was found to be ≥ 9 (Lee, 2020a; Lee et al., 2020) and ≥ 5 (Lee, 2020b) in previous studies, was not evaluated in the present study. Therefore, it can be concluded that current study has limitations regarding sensitivity and specificity of the Turkish CAS in detecting dysfunctional coronavirus anxiety. These potential shortcomings within this research should be taken into consideration.

Despite mentioned possible limitations, results of the current study revealed that the CAS is a measure with a unidimensional construct. It is a valid and reliable screening tool in examining the dysfunctional anxiety related to coronavirus among Turkish speaking populations. Findings of this study determined that the CAS could be used for diagnosis in clinical practice and in developing prevention programs. The CAS can also be administered quickly because it includes only five items, possibly assisting clinicians in crowded clinical environments.

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Appendix

Koronavirüs Anksiyete Ölçeği

CAS

Son 2 hafta boyunca aşağıdaki durumları ne sıklıkta yaşadınız?	Hiç	Nadir, bir veya iki günden az	Birkaç gün	7 günden fazla	Son 2 haftada neredeyse her gün
1. Koronavirüs ile ilgili haberleri okuduğumda veya dinlediğimde başım döndü, sersemlemiş veya baygın hissettim.	0	1	2	3	4
2. Koronavirüs hakkında düşündüğüm için uykuya dalma veya uykuda kalma konusunda sorun yaşadım.	0	1	2	3	4
3. Koronavirüs hakkında düşündüğümde veya bilgiye maruz kaldığımda felç olmuş veya donmuş gibi hissettim.	0	1	2	3	4
4. Koronavirüs hakkında düşündüğümde veya bilgiye maruz kaldığımda yemek yemeye ilgimi kaybettim.	0	1	2	3	4
5. Koronavirüs hakkında düşündüğümde veya bilgiye maruz kaldığımda mide bulantısı hissettim veya mide problemleri yaşadım.	0	1	2	3	4
Sütun Toplamları	_____ +	_____ +	_____ +	_____ +	_____ +
			Toplam Puan _____		

Katılımcılar, beş maddeli Likert tipi bir ölçek kullanarak ifadelerdeki durumları son 2 haftadır ne sıklıkta yaşadıklarını belirtirler. Cevaplar "Hiç", "Nadir, bir veya iki günden az", "Birkaç gün", "7 günden fazla" ve "Son 2 haftada neredeyse her gün" şeklindedir. Her soru için mümkün olan minimum puan 0 iken, maksimum puan 4'tür. Her madde puanı toplanarak (0 ile 20 arasında değişen) bir toplam puan hesaplanır. Puan ne kadar yüksek olursa, koronavirüs-19 ile ilişkili anksiyete o kadar büyük anlamına gelir.