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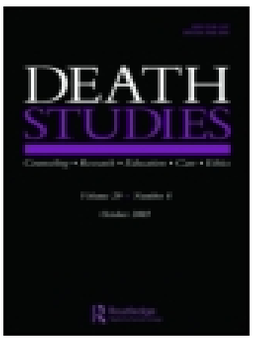

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Replication analysis of the COVID-19 Worry Scale

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ABSTRACT

Efforts and focus regarding the COVID-19 pandemic have largely been centered around physical health. However, mental health is equally as critical—as such, psychological impacts can resonate adversely during and following the pandemic. This study examined a sample of 729 Bangladeshi people and aimed to assess the psychological impact of the pandemic. Through this replication analysis, the results supported the validation and reliability of the COVID-19 Worry Scale on a Bangladeshi population. The validation of another COVID-19 mental health measure can help determine who is mentally affected by the pandemic and the extent of COVID-19's psychological impact.

In this era of globalization, people are typically connecting on such a large and quick scale, though, COVID-19 has stunted this, forcing a more freestanding and separated world—to decrease the fast, viral spreading in which globalization incurs. The COVID-19 virus, first detected in December of 2019 in China, shows primarily the health effects of globalization (Bostan et al., 2020). After the first report of SARS-CoV-2 in Wuhan, China, it took less than a month for it to spread to different countries around the world and become a devastating and deadly pandemic (Washington Post, 2020; Worldometer, 2020). As the COVID-19 pandemic spreads around the world, several groups including the aged population, tourists, immigrants, professionals in health care, patients, and their families have become targets (Bostan et al., 2020). The world is counting the number of those infected as well as watching death tolls rising practically every day. Nations are working to flatten the curve of infections and are sharing resources like knowledge, tests, and personal protective equipment with other countries for the sake of saving humanity. There is much variation in terms of trying to predict when the pandemic will end and when the world population will return somewhat back to normal. This uncertainty is increasing with time—especially when spikes in more cases keep fluctuating.

Because of the pandemic, life has changed dramatically for most, as there have been alarming rates of job loss, loneliness, as well as COVID-19 associated deaths along with continued increases in positive infection cases (Lee et al., 2020). Such changes have changed normality and created distress, which has threatened both people's physical and mental health. In addition, it is likely that the pandemic will have an adverse effect on the global economy—like it has on a smaller scale with individual countries' economies, like the U.S. (Wall Street Journal, 2020). These economic hardships, like from job losses, can lead to financial insecurity and uncertainty over whether one is able to fulfill their basic needs—such as eating (Mazzella, 2020; Power et al., 2020). Moreover, this pandemic uncertainty, daily life changes, and staying home for a long time may impose threats to mental health.

Today, the pandemic is not only a personal, biological issue, but is also a political, economic, social, and technological issue (Aytaç & Kurtdaş, 2016). Various infectious diseases that have spread in recent years contribute to society's fear over diseases and have made it so countries are prepared with various health protections (Bostan et al., 2020). However, apart from what is in our control, like taking precautionary and spatial distancing measures to reduce the virus' spread, there are some things that are out of our control—despite having the best statistical prediction equipment—such as knowing how long the pandemic will be and the extent of its spread. The virus has become more unpredictable and harder to control

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than originally thought—like how it could spread to three people from one infected person and that there were many asymptomatic people who tested positive with the virus.

The virus has impacted all aspects of daily life and understanding people's behavior and feelings about the pandemic are worth understanding to better help those mentally affected as well as guide government policies on the psychology of the viral spread. In addition, understanding feelings about the pandemic, now, on mental health can also be helpful for comparative measures when studying the pandemic's longitudinal effects and its potential aftermath on society. Stress, worry, fear, anxiety, and depression are just some of the reported mental health illness manifesting from the COVID-19 pandemic (Dubey et al., 2020; Mertens et al., 2020). Meanwhile, social stigmatization is also becoming a threat for mental health for infected individuals and their family. Both infected and non-infected people, though, are suffering the consequences from the various forms that mental health illness can take, stemming from the pandemic. Moreover, medical testing is commonly taking place to screen for infected people, but screening for mental health support are as common. Researchers around the world are trying to develop screening tools for measuring the adverse effects of the recent pandemic on mental health for different worldly populations; and some tools have been adapted and contextualized for respective nations.

Researchers in Bangladesh, too, are trying to develop and adapt various mental health screening tools for identifying associated psychological problems relating to the COVID-19 pandemic. The COVD-19 Worry Scale is one of these measures (Ahmed, Ahmed et al., 2020), developed to assess worry about the pandemic among the Bangladeshi population. The 7-item scale has a 4-point Likert-type response option. In addition, this instrument has shown strong psychometric and diagnostic effects, though, for the present study the authors have decided to replicate and test the scale on an independent sample. This replication analysis will be conducted using the classical test theory (item analysis and EFA) and modern test theory (rating scale model). Following that, analyses will be run to check whether the COVID-19 Worry Scale is a reliable and valid measure.

Method

Participants

Data were collected via an online survey using a Google Form that was shared over social media, like WhatsApp and Facebook. To participate in this study respondents had to have been at least 18 years old and currently living in Bangladesh. There was a total of 729 respondents. The participants' age ranged from 18 to 99 years ($M = 26.55$ years, $SD = 7.17$ years). The majority of the participants were male (60.6%), had an undergraduate level education level (46.5%), and resided in urban areas (64.5%). The profession demographics consisted of mostly of students (60.4%) followed by full-time employees (29.9%), business or self-employed professionals (4.4%), other jobs (3.3%), and unemployed individuals (2.4%).

Measures

The questionnaire contained the COVID-19 Worry Scale (Ahmed, Ahmed et al., 2020), the Coronavirus Anxiety Scale (CAS; Lee, 2020; Ahmed, Faisal et al., 2020 [Bangla version]), the short form of the Depression Anxiety Stress Scale (DASS-21; Antony et al., 1998; Alim et al., 2017 [Bangla version]), the Warwick Edinburgh Mental Well-being Scale (WEMWBS; Rahman & Imran, 2013; Tennant et al., 2007 [Bangla version]), and demographic information questions (age, gender, profession, and education level, and residential type—urban, rural, semi-urban).

COVID-19 Worry Scale

The COVID-19 Worry Scale (Ahmed, Ahmed et al., 2020) consists of 7-items on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much*). This measure is a valid unidimensional tool for assessed participants' worry about the COVID-19 infection as well as concerns about themselves, their family and friends being affected by COVID-19. Total scores can range from 7 to 28. Those who score above 22 are considered highly worried. For this study, the COVID-19 Worry Scale showed good internal consistency reliability ($\alpha = .875$).

Coronavirus Anxiety Scale

The CAS (Lee, 2020) is a unidimensional valid tool for assessing the psychological reactions of coronavirus anxiety and fear (e.g., "I had trouble falling or staying asleep because I was thinking about the coronavirus"). The scale consists of 5-items ranging from 0 (*not at all*) to 4 (*nearly every day over the last two weeks*). The scale has excellent internal consistency, construct, and concurrent validity (Lee, 2020). The cutoff score for the scale is ≥ 9, with 85% specificity and 90% sensitivity. The validated Bangla version of

Table 1. Descriptive statistics of the COVID-19 Worry Scale.

Items	*M*	*SD*	Skewness	Kurtosis
1) How concerned are you about yourself being affected by Coronavirus?	2.63	.854	.169	−.795
2) How concerned are you about your family members being affected by Coronavirus?	3.20	.819	−.616	−.622
3) How concerned are you about your close relatives being affected by Coronavirus?	2.95	.819	−.129	−1.055
4) How concerned are you about your friends being affected by Coronavirus?	2.87	.837	−.055	−1.003
5) How concerned are you about getting hospitalized due to Coronavirus infection?	3.02	.992	−.524	−.969
6) How concerned are you about dying from Coronavirus?	2.60	1.08	.016	−1.315
7) How concerned are you about death of close others from Coronavirus?	3.24	.902	−.835	−.468

Note. M: mean; *SD*: standard deviation.

the scale (Ahmed, Faisal et al., 2020) also showed good reliability in this study ($\alpha = .872$).

Short Form of the Depression Anxiety Stress Scale-21. The DASS-21 (Antony et al., 1998) was developed from its longer version the DASS-42 (Lovibond & Lovibond, 1995). The shorter version of the scale was found to have similar psychometric properties has the original (Antony et al., 1998). The scale is used to assess depression, anxiety, and stress levels of the participants. Each of those three facets is devised into a 7-item subscale ranging from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much or most of the time*). Participants rated items based off how each statement applied to them based on the past week. For each subscale, the scores are multiplied by two—total could range from 0 to 42 per subscale. For this study the Bangla version of the short form of the DASS-21 was used, which has been found to have good psychometric properties for assessing the stress, anxiety, and depression for the people of Bangladesh (Alim et al., 2017). However, for this study, only the anxiety and depression subscales were used; they were also found to have good internal consistency reliabilities ($\alpha = .799$ and .872, respectively).

Warwick Edinburgh Mental Well-being Scale

The WEMWBS (Tennant et al., 2007) assesses the positive aspects of mental health in a 7-item Likert scale ranging from 1 (*None of the time*) to 5 (*All the time*) where participants rate their feelings from the previous week. Total scores range from 7 to 35. Both the English and Bangla versions of the scale have been found to have good reliabilities (Rahman & Imran, 2013; Tennant et al., 2007 [Bangla version]). For this study, the WEMWBS Bangla version had high internal consistency reliability ($\alpha = .874$).

Statistical analysis

Psychometric properties of the COVID-19 Worry Scale were assessed using both the classical test theory (CTT) and the item response theory (IRT). Using CTT, corrected item-total correlations, internal consistency reliabilities, average variance extracted (AVE), composite reliability, standard error of measurement (*SEM*), discriminatory power with Ferguson's delta, and exploratory factor analysis (EFA) were calculated and run. For IRT, item validity (i.e., infit mean square and outfit mean square), item and person reliability, separation index, and item characteristic curves were conducted. Finally, correlations were run between the COVID-19 Worry Scale and other measures.

Ethics

This study is in accordance with the Declaration of Helsinki and its later amendments or comparable ethical standards; it is also approved by the ethics committee at the Noakhali Science and Technology University, Bangladesh (reference number: 21/2020). To participate in the study, respondents had to read the informed consent from which briefed them on the study's purposes, its nature, and the risks and benefits. In addition, participants were informed that their responses would be kept confidential and only used for research purposes. To consent, participants chose to either click "Yes" (I agree) or "No" (I disagree) prior to viewing the survey's contents. If participants chose "No" the survey would end, and they were not permitted to view or continue to the questionnaire.

Results

Table 1 shows the descriptive statistics of the COVID-19 Worry Scale. Skewness values (ranging between −.835 and .169) and kurtosis values (ranging between −1.315 and −.468) were between ± 3 (suggested cut-off per Kim, 2013) that suggested the normality of the data. Table 2 presents the item-level psychometric properties of the COVID-19 Worry Scale. The scale had higher corrected item-total correlations (ranging between .598 and .724). These values suggested that all the items had good item discrimination index. The determinant value (.028), *Kaiser-Meyer-Olkin (KMO)* measure of sampling adequacy (.843), and the

Table 2. Psychometric properties of the COVID-19 Worry Scale at item-level.

		EFA statistics		Rating scale model	
Item	Corrected item-total correlation	Communality	Factor loadings	Infit MnSq	Outfit MnSq
Item 1	.668	.577	.759	.71	.68
Item 2	.724	.682	.826	.64	.57
Item 3	.710	.669	.818	.64	.63
Item 4	.682	.635	.797	.71	.67
Item 5	.598	.480	.693	1.18	1.13
Item 6	.610	.494	.703	1.27	1.18
Item 7	.643	.545	.738	.95	.87

Note. EFA: exploratory factor analysis.

Bartlett's test of sphericity ($\chi^2(21) = 2597.531$, $p < .001$) suggested the suitability of the data for the EFA. All correlation coefficients in the EFA ranged from .387 to .762 (Supplementary Table 1) that suggested the absence of a multicollinearity problem. Among extracted components in the EFA, there was only one component with an eigen value higher than 1 (4.082) and comprised all items. This extracted factor explained 58.32% of the total variance. The communality values (ranging from .480 to .682) and factor loadings (ranging between .693 and .826) in Table 2 reconfirmed the construct validity of the COVID-19 Worry Scale. Table 2 also shows the item fit indices of the COVID-19 Worry Scale explored via using the rating scale model. The infit mean square values (ranging between .64 and 1.27) and outfit mean square values (ranging between .57 and 1.18) suggested the item validity of the scale. The item characteristics curves (Figure 1) of the scale suggested that the thresholds advanced monotonically with categories. The test information curve (Supplementary Figure 1) demonstrated that this scale provides the most information and assess COVID-19 related worry well for indivduals with low to moderately high levels of COVID-19 worry.

Table 3 presents the scale level psychometric properteis of the COVID-19 Worry Scale. The floor (1.1) and ceiling effects (7.7) of the scale were below the cutoff values (15% or less). The COVID-19 Worry Scale had good internal consistency (ranging between .875 and .924) and composite reliabilities (.907) as well as an acceptable average variance extracted (.583) and a standard error of meaasurement (1.69). In addition, this scale also had good discrimination power (Ferguson's delta = .983).

Table 4 presents the convergent validity information for the COVID-19 Worry Scale. The COVID-19 Worry Scale scores have significant positive correlations to the Coronavirus Anxiety Scale's score ($r = .390$, $p < .001$, 95% CI [.327, .450]), as well as the anxiety ($r = .296$, $p < .001$, 95% CI [.228, .361]) and depression scores ($r = .270$, $p < .001$, 95% CI [.201, .336]) of the DASS-21. Moreover, the COVID-19 Worry Scale's scores have a significant but negative correlation to the mental well-being scores ($r = -.145$, $p < .001$, 95% CI [–.215, –.073]).

Discussion

The pandemic effects continue to be discovered—whether it is new cases or mental health constructs that have found to be related to COVID-19. Nonetheless, it is clear that COVID-19 not only affects physical health but has adversely affected mental health in various capacities (Dubey et al., 2020). The COVID-19 Worry Scale is one of handfuls of mental health COVID-19 related assessment tools to screen and determine who has been significantly affected by the pandemic. The COVID-19 Worry Scale was developed to specifically assess concern and worry about COVID-19 infection in oneself and loved ones. After analyzing a sample of 729 Bangladeshi people, the study's purpose was to determine whether the COVID-19 Worry Scale is as valid and reliable as originally claimed.

The findings from the original study concluded that the unidimensional 7-item scale has good psychometric properties for assessing COVID-19 worry among Bangladeshi people (Ahmed, Ahmed et al., 2020). In addition, it demonstrated acceptable item-total correlations, strong factor loadings, acceptable floor and ceiling effects on scale level, and good reliabilities—such as Cronbach's alpha, split-half, and composite as well as a good AVE and Ferguson's delta (Ahmed, Ahmed et al., 2020). Similarly, the current study found that the scale had good psychometric scale level properties, such as acceptable ceiling and floor effects, good internal consistency, split-half reliability, and AVE as well as discriminatory power found with Ferguson's delta. Moreover, the EFAs for both studies all fit within the .30 and .90 range—showing no multicollinearity issues; both studies also showed that the item characteristic curves for the scale advanced monotonically with categories. Overall, these

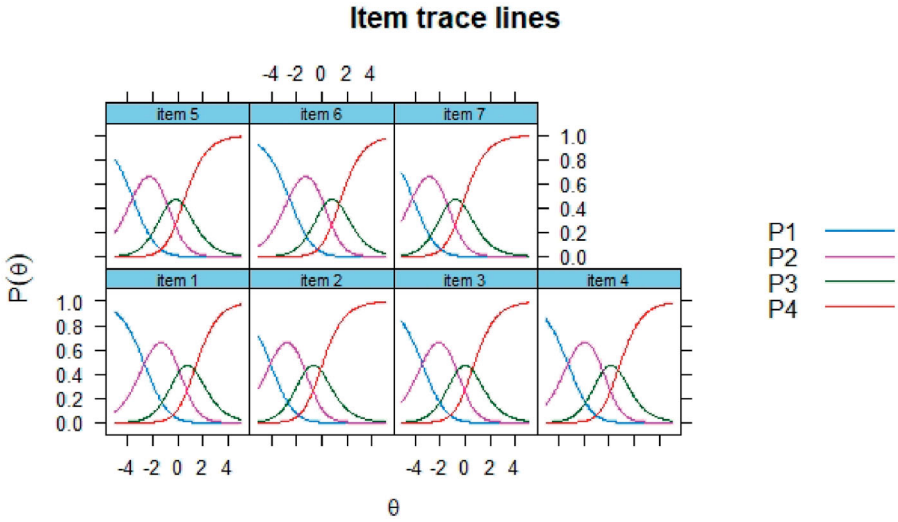

Figure 1. Item characteristic curves of the COVID-19 Worry Scale.

Table 3. Psychometric properties of the COVID-19 Worry Scale at scale level.

Psychometric properties	Value	Suggested cutoff
Floor effect	1.1	<15%
Ceiling effect	7.7	<15%
Cronbach's alpha	.875	≥.7
McDonald's omega	.881	≥.7
Split-half reliability though Spearman-Brown formula	.924	≥.7
Average variance extracted (AVE)	.583	≥.5
Composite reliability (CR)	.907	≥.7
Standard error of measurement (*SEM*)	1.69	Smaller than *SD*/2
Ferguson's delta	.983	≥.90

Note. SD: standard deviation.

Table 4. Correlation of the COVID-19 Worry Scale to coronavirus anxiety, anxiety, depression, and mental well-being.

	COVID-19 Worry	
Measure	Correlation (*r*)	Confidence interval (CI)
Coronavirus Anxiety	.390*	95% CI [.327, .450]
Anxiety	.296*	95% CI [.228, .361]
Depression	.270*	95% CI [.201, .336]
Mental Well-being	−.145*	95% CI [−.215, −.073]

Note. $^{*}p < .001$.

results demonstrate closely related findings with little to no significant variation between the two studies. Thus, showing that the COVID-19 Worry Scale is a psychometrically sound, unidimensional valid, and reliable tool for assessing its construct on the Bangladeshi people.

The original results also showed that COVID-19 worry has significant positive predictors with depression, anxiety, and stress, and was a negative predictor for mental well-being (Ahmed, Ahmed et al., 2020). These findings coincide with the correlational results conducted in the present study. For this study, anxiety and depression were significantly correlated positively—along with coronavirus anxiety, which was not assessed in the initial study, but does show a stronger correlation than general anxiety has with COVID-19 worry; therefore showing that anxiety is associated with COVID-19 worry as predicted in the first study, but as seen with this study, coronavirus anxiety—due to its specificity—does have a stronger correlation with the worry construct. This could also likely be because of the COVID-19 commonalities centered around both constructs. Finally, the original study assessed stress, which was not used a measure in this study, however, mental well-being was analyzed in both studies. For it, both were found to have negative statistics, one being a correlation and the other a predictor of COVID-19 worry. This demonstrates that COVID-19 worry may negatively impact the mental health of an individual, or as the first study found, predict a negative mental well-being state. These correlational findings are not only consistent in terms of the initial study, but they are also consistent with previous research on the psychosocial impacts of COVID-19 (Ahmed, Ahmed et al., 2020; Dubey et al., 2020).

Although the study did reach individuals from different backgrounds, areas in Bangladesh, and professions, the sample did largely consist of students and those living in urban areas—both of which are groups that have easy accessibility to the internet. Therefore,

it may be possible that these results are not entirely representative to the general Bangladeshi population as they are for those specific groups. However, because of COVID-19 and spatial distancing orders still in place, online survey research is the most practical and safest way to conduct studies. Another limitation for this study is that the measures were composed of self-reporting assessments. Thus, it could be possible that the data were subjected to the social desirability bias.

Future research should examine the COVID-19 Worry Scale on populations outside of Bangladesh as well as create other translated versions of this scale. However, such translated versions of this scale should first assess the scale's psychometric properties prior to assure that it is sufficient for potential scholarly or clinical uses. Additionally, researchers should validate such adaptations of this scale on general and clinically diverse and representative samples. Such adaptations, translations, and validations of this scale can bring insight to what the psychological extent of COVID-19 is for worldly populations.

Overall, this replication analysis examined the newly developed COVID-19 Worry Scale, with results similar to the initial study's findings, indicating that the scale is both a reliable and valid tool for assessing worry related to COVID-19, for the Bangladeshi people. Future research should include translating and validating the COVID-19 Worry Scale across different populations to help give a better understanding to how COVID-19 is impacting the globe psychologically.

Disclosure statement

There is no conflict to be reported.

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