



Validation of Fear of COVID-19 Scale in India: Classical Test Theory and Item Response Theory Approach

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Accepted: 24 February 2021/ Published online: 17 June 2021

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Abstract

COVID-19 has become one of the significant sources of stress, fear, and anxiety throughout the world. Though the global effect on the psychological health of university settings is still unclear, the effect is highly significant (Lima et al., 2020). Therefore, assessing students' anxiety regarding this pandemic is the need of the hour. The Fear of COVID-19 scale developed by Ahorsu et al. (2020) is a unidimensional scale with seven items that assess the intensity of fear of COVID-19. Given the rapid increase of COVID-19 cases and fear of uncertainty among college students in India, we aim to analyze the psychometric properties and validate this scale in the Indian context. A cross-sectional survey was conducted among college students (n= 572). In confirmatory factor analysis, the loadings ranged between .54 and .78. To further validate this, we have performed item response theory analysis. The unidimensional IRT estimates shown in Table 5 reveals that item difficulties ranged between $-.33$ and 1.28 . The item characteristics curve for the COVID-19 scale is given at the end of the results section.

Keywords Fear of COVID-19 · COVID-19 · Psychometric analysis · Uncertainty · Item response theory

COVID-19 has turned a situation of alarm into a crisis with peculiar consequences all over the world. For almost 8 pandemic months, most countries worldwide have briefly closed educational institutions to control the spread of the COVID-19 pandemic and reduce infections (UNESCO, 2020). This closure has affected more than 1.2 billion learners worldwide, with more than 320 million learners in India (UNESCO, 2020). Responses like community lockdown and community quarantine of several countries have led students and teachers to study and work from home. Face-to-face lectures have been changed to an online platform to avoid interaction. Many students have been negatively affected by this pandemic; for some

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students, the access towards health care was reduced or unavailable because of the shutdown of student health care centers (Perz et al., 2020).

The Government of India introduced social distancing as a precautionary measure to prevent the large-scale spread of the COVID-19. Measures like 14-h voluntary curfew by the public, a nationwide lockdown starting from 22nd March 2020, have been taken to contain the spread of the virus. Despite having no vaccine, social distancing has been one of the most widely used control and prevention strategy (Ferguson et al., 2020). These initiatives have restricted social interaction in colleges, schools, workplaces, and other public places. As a consequence, the situation has created unprecedented emotional turmoil on college students and the overall population, with vital signs of anxiety and fear (Wang et al., 2020). According to a study (Raj & Fatima, 2020), 51.4% of the Indian students feel threatened due to the current situation, and 69.8% show symptoms of stress and anxiety. Though the global effect on the psychological health of university settings is still unclear, the effect is highly significant (Lima et al., 2020; Sahu et al., 2020).

Unlike armed battles that have borders, contagious diseases are not restricted with borders, and these outbursts are among the most stressful forms of catastrophes to deal with psychologically due to the degree of uncertainty caused. From past studies, contagious disease leaves people feeling vulnerable and fearful (Kouznetsova et al., 2012).

Fear is one of the multi-faceted factors, which is one of the substantial elements that may vandalize the mental health and wellbeing of people in general (Kumar & Nayar, 2020). Summing up the protruding effect of COVID-19, Ahorsu et al. (2020) have developed a scale for measuring Fear of COVID-19. The Fear of COVID-19 scale (FCV-19S) is a seven-item unidimensional scale.

Given the degree to which the spread of COVID-19 has hit India, the current study tests the scale among Indian college students. The paper contributes in two ways: first, by examining the psychometric properties of Fear of COVID-19 scale developed by Ahorsu et al. (2020), and second, by assessing fear of COVID-19 in Indian sample using English version of Fear of COVID-19 scale.

Methods

Participants and Procedure

The cross-sectional study was carried out during the initial weeks of May 2020. An online survey was developed, SurveyMonkey platform, and administered to sample participants. Online survey link was circulated among the students in India through different social media platforms (Huang, 2020). Participation in this study was voluntary, and consent was obtained from every participant before collecting the responses. The procedure performed in this study adheres to the 1975 Helsinki Declaration. All the respondents were guaranteed anonymity and confidentiality of the data. Information regarding the need and implications of the present study were intimated and also their right to withdraw their participation at any time.

The sample population comprises of college students studying Indian universities. The criteria of selection were (i) being an Indian, (ii) studying in a college, and (iii) being able to read and write English. Participants were selected through social media. Of the total sample, 33% of the students were perusing under graduation, 62% post-graduation, and 19% were perusing a Ph. D. The final sample consists of 572 respondents, which exceeds the suggested 1:5 ratio of a number of items to the number of respondents (Floyd & Widaman, 1995).

Measures

The descriptive statistics and Cronbach's alpha values are presented in Table 2.

Fear of COVID-19 To understand the fear of the current pandemic, the Fear of COVID-19 scale developed by Ahorsu et al. (2020) is used. It is a unidimensional 7-item, 5-point Likert scale. The scale consists of items like “I am most afraid of COVID-19” and “It makes me uncomfortable to think about COVID-19,” on a 5-point Likert scale ranging from strongly disagree to strongly agree. A higher score indicates a greater fear due to COVID-19.

Intolerance Towards Uncertainty The Intolerance towards Uncertainty Scale (IUS) is a shortened version of the original IUS scale with 12 items (Carleton et al., 2007). The scale assesses individuals' reactions towards uncertainty, future events, and ambiguous situations. Every item on the IUS-12 is a 5-point Likert scale ranging from “not at all” to “entirely.” The higher the score, the more intolerance towards uncertainty.

Table 1 Demographic characteristics of the sample

	Frequency	Percent
Gender		
Male	235	41.1
Female	336	58.7
Total	571	99.8
Missing values	1	0.2
Total	572	100.0
Educational qualification		
UG	192	33.6
PG	359	62.8
Ph.D.	19	3.3
Total	570	99.7
Missing values	2	0.3
Total	572	100.0
Course discipline		
Others	35	6.1
Management	343	60.0
Engineering	44	7.7
Arts course	93	16.3
Science course	55	9.6
Total	570	99.7
Missing values	2	0.3
Total	572	100.0
Family structure		
Others	15	2.6
Lives with parents	489	85.5
Lives with a partner	20	3.5
Lives with single parent	25	4.4
Lives in a hostel	22	3.8
Total	571	99.8
Missing Values	1	0.2
Total	572	100.0

Table 2 Descriptive statistics, Cronbach's alpha values and correlations

Variables	Minimum	Maximum	Mean	Std. Deviation	α	1	2	3
1. Age	18	43	22.70	3.37	–	1		
2. FCOVID-19	1	5	2.79	0.88	.87	–.15**	1	
3. Intolerance to uncertainty	1	5	3.49	0.56	.56	–0.03	.36**	1

Note: N=572, ** $p < .01$, *S.E.* standard error, α Cronbach's alpha

Data Analysis

We have used confirmatory factor analysis (CFA) to validate the Fear of COVID-19 scale. CFA analysis was carried out using IBM AMOS v21. In the CFA analysis, we have used maximum likelihood estimation method to validate the scale items. The fit of the CFA model is evaluated using the following fit indices: Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Akaike information criterion (AIC). After examining the factorial structure of the fear of the COVID-19 scale, we have performed item response theory (IRT) analysis using BlueSky Statistics software. This software is an open source software, and this IRT analysis is based on Test Analysis Modules package developed for R environment (Robitzsch & Steinfeld, 2018). The Samejima's (1997) graded response model (GRM) is used to determine the item difficulty and rater category parameter of the COVID-19 scale. This approach can yield more detailed and reliable information than the classical test theory approach (Robitzsch et al., 2020). Bock and Aitkin (1981) estimation method is used in the 2PL GRM analysis. GRM is most suitable for analyzing the Likert scale response data.

Results

The demographic characteristics of the sample are described in Table 1.

Table 2 shows the descriptive statistics, correlations, and Cronbach's alpha values for the study variables.

The correlation between Fear of COVID-19 and intolerance to uncertainty is significant ($r=.36$, $p < .01$). Similarly, age is negatively correlated to Fear of COVID-19 ($r = -.15$, $p < .01$). In Table 3, the item-wise descriptives, item-total correlations, and CFA analysis based loadings are presented. We have performed two different CFA analyses. In the first CFA model, all of the Fear of COVID-19 items were considered as a single factor. In the second run, we did the two factor model where fear of COVID-19 and intolerance to uncertainty were included in the analysis. The fit of the

Table 3 Item-wise descriptives, item-total correlation, and factor loadings

Items	Mean	S.D	Skewness	Kurtosis	Item-total correlation	CFA factor loadings
Item 1.	3.24	1.17	–.26	–.85	.56	.54
Item 2.	3.29	1.14	–.33	–.91	.61	.59
Item 3.	2.73	1.13	.27	–.81	.62	.66
Item 4.	2.68	1.25	.28	–1.04	.69	.77
Item 5.	3.00	1.22	–.12	–1.07	.66	.73
Item 6.	2.19	1.04	.83	.16	.69	.74
Item 7.	2.41	1.18	.55	–.70	.74	.78

Note: *S.D* standard deviation, *CFA* confirmatory factor analysis

Table 4 Fit indices for confirmatory factor analysis models

Models	χ^2 (df)	χ^2/df	GFI	CFI	RMSEA	AIC
Single factor model	314.86 (61)	5.16	.93	.91	.09	374.86
Correlated factor model	131.84 (60)	2.19	.96	.97	.04	193.84

different model results is presented in Table 4. The average variance extracted value for the Fear of COVID-19 scale is .50. The composite reliability value is .83. All of the AVE and CR values are there within the cut off limit (Hair et al., 2009).

The results of the IRT are shown in Table 5 and Fig. 1.

The unidimensional IRT estimates shown in Table 5 reveals that the item difficulties were ranged between $-.33$ and 1.28 . Item 1 and item 2 are considered as low difficult items. In the classical test theory-based CFA analysis, items 1 and 2 had produced marginal loading values of .54 and .59. Similarly, in IRT-based analysis, also items 1 and 2 have produced low difficulty parameter value. In Fig. 1, the item characteristics curve is plotted with observed data and estimated parameter values. Finally, we conclude that the seven item Fear of COVID-19 scale is producing adequate validity evidences.

Discussion

The present study presents the validation of Fear of COVID-19 scale (Ahorsu et al., 2020) with Indian college students' population. The result indicates that the scale has a good internal consistency and good construct validity. Overall, our findings were similar to previous research using the FCV-19S. Internal consistency of the FCV-19S in the present study is 0.88, which is in line with the reported the original scale ($\alpha = .82$) (Ahorsu et al., 2020), Bangla ($\alpha = .87$) (Sakib et al., 2020), Italian ($\alpha = .87$) (Soraci et al., 2020), and Turkish ($\alpha = .85$) versions (Satici et al., 2020).

Understanding the fear of COVID-19 among the student population helps to assess the overall perception of learning during the pandemic. Analyzing such information may help provide insights into preventive COVID-19 behaviors that reduce the levels of fear (Pakpour & Griffiths, 2020). Worldwide, efforts are rendering towards ways to battle with COVID-19. Comprehending and mitigating fear linked to mental health is the foremost concern and critical for intervention (Smith et al., 2006).

Table 5 Unidimensional model item response theory estimates for the Fear of COVID 19 scale

Items	α	b_1	b_2	b_3	b_4
Item 1. I am most afraid of COVID-19	-.33	-2.41	-2.83	-3.17	-1.33
Item 2. It makes me uncomfortable to think about COVID-19	-.41	-2.49	-2.98	-3.40	-1.64
Item 3. My hands become clammy when I think about coronavirus-19	.42	-1.66	-1.33	-.92	1.68
Item 4. I am afraid of losing my life because of coronavirus-19	.49	-1.59	-1.19	-.71	1.96
Item 5. When watching news and stories about coronavirus-19 on social media, I become nervous or anxious	.03	-2.05	-2.11	-2.09	.11
Item 6. I cannot sleep because I'm worrying about getting coronavirus-19	1.28	-.80	.39	1.65	5.10
Item 7. My heart races or palpitates when I think about getting coronavirus-19	.91	-1.17	-.34	.56	3.65

Note: α – Item difficulty, b_1, b_2, b_3, b_4 are rater category parameters which assess the aspects of severity/leniency or centrality/extremity behavior of the raters

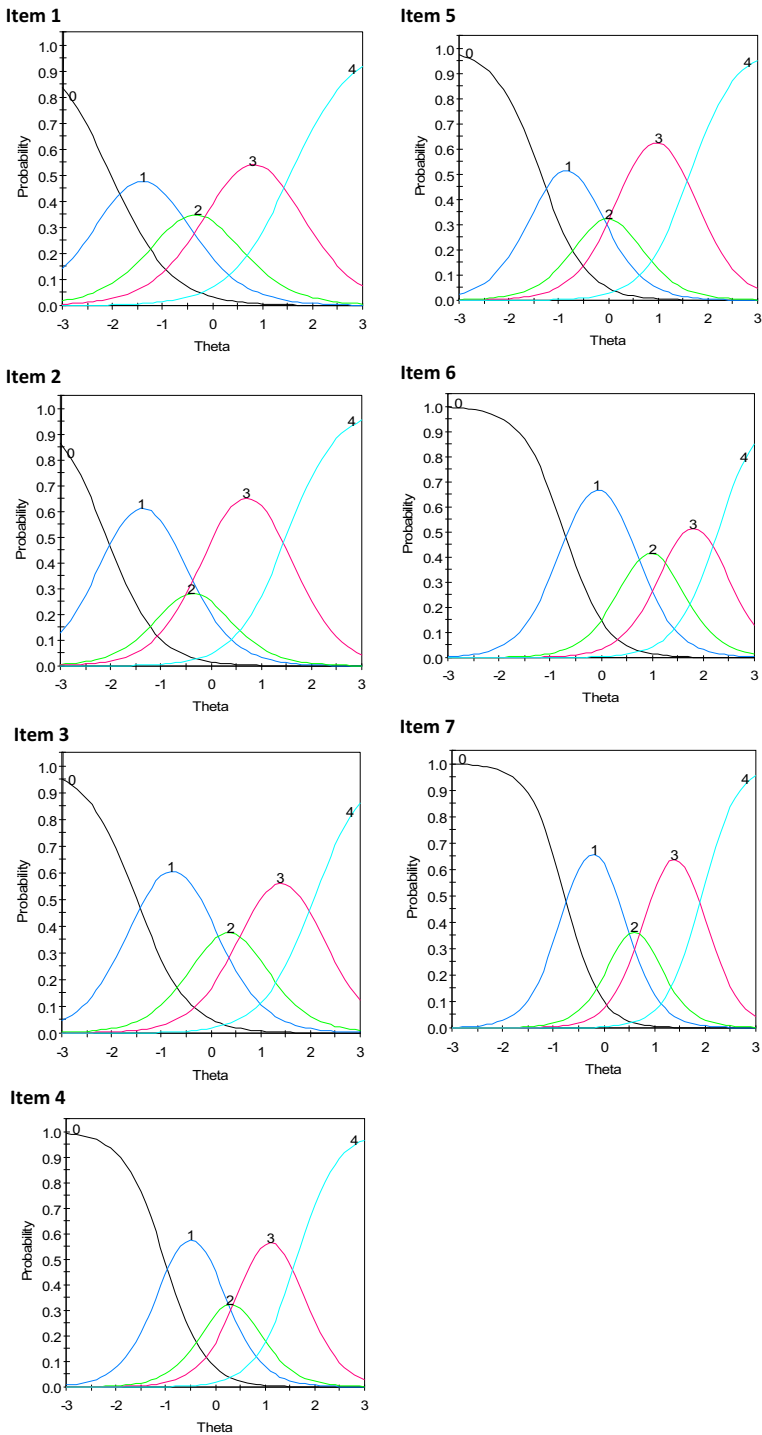


Fig. 1 Item characteristics curve for the Fear of COVID-19 scale

Intolerance of uncertainty is the tendency of an individual to refuse to admit that something negative, though unlikely, might occur (Dugas et al., 2012). Given the situation, intolerance of uncertainty may be very challenging for individuals. The results show a significant correlation with intolerance towards uncertainty which is also consistent with previous finding (Bakioğlu et al., 2020)

A significant contribution of the present study is that this study validates the Fear of COVID-19 scale in the Indian context. This present study complements the scales that have been validated in other contexts—Persian (original version; Ahorsu et al., 2020), English (Ahorsu et al., 2020), Greek (Tsipropoulou et al. 2020), Italian (Soraci et al., 2020), Arabic (Alyami et al., 2020), Bangla (Sakib et al., 2020), and Turkish (Satici et al., 2020). This study facilitates comparative research on the Fear of COVID-19 across the national boundaries.

Considering students from varied backgrounds and utilizing classical test theory and item response theory to validate the Fear of COVID are some of the strengths of the study. The final and foremost contribution of the present study is based on the classical test theory approach and item response theory approach; we found that the two of the items are having poor loadings and low difficulty level. Further studies are required to investigate this issue in other contexts. In most of the validation studies, the authors have used 7-item scale to measure fear of COVID. Based on our results also, we say that the same 7-item scale is useful to capture the entire domain of fear of COVID-19 construct.

The study also has several limitations. First, the present study's findings were built on self-reported data, which has the risk of common method bias. A longitudinal study to understand fear using Fear of COVID-19 may deliver critical information on how COVID-19-related stress and anxiety keeps changing with the change in overall infections globally. Second, convenience sampling weakens the generalizability of the results. Only those students who had received the link to participate in the survey had the chance to participate in the study. We have retained 9 items to measure fear of COVID. Past studies have recommended 7-item scale. Future studies are required to re-validate this scale to further expand the proposed dimensions (emotional anxiety and somatic) in this study.

In conclusion, the results of the present study have validated the English version of the Fear of COVID-19 scale in the student sample of India. The study was found to exhibit a high internal consistency and good construct validity in Indian.

Declarations

Ethics Approval All procedures performed in this study involving human participation are conducted according to the ethical standards of 1975 Helsinki Declaration.

Informed Consent Consent was obtained from all participants, and participation was completely voluntary.

Conflict of Interest The authors declare no competing interests.

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