https://doi.org/10.1590/1982-0275202239e200121

The Fear of COVID-19 Scale adaptation and validation

Adaptação e validação da Escala de Medo da COVID-19

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Abstract

This study aimed to adapt and raise evidences of validity based on the internal structure, on the relationship with other variables, and on the content of the Fear of COVID-19 Scale (FCV-19S) in Brazilian Portuguese. We performed the Confirmatory Factor Analysis of the scale, its invariance analysis by gender, and established norms for interpreting the instrument's scores. Participants were 1,000 adults of both genders. The findings showed all fit indices as satisfactory, confirming the scale's one-dimensionality and its invariance. Results also demonstrated convergent validity between the FCV-19S and the stress of the subjects. Moreover, the stratification of the intensity of fear (mild, moderate and severe) was determined based on the standardization of scores. We concluded that FCV-19S presents sufficient evidence to support its use to assess the fear of Covid-19S in Brazil.

Keywords: Confirmatory factor analysis; Coronavírus; Health psychology; Norm.

Resumo

*Este estudo objetivou adaptar e levantar evidências de validade com base na estrutura interna, na relação com outras variáveis e de conteúdo da Escala de Medo da COVID-19 (*EMC-19, Fear of COVID-19 Scale*) para português brasileiro. Para tanto, realizou-se a Análise Fatorial Confirmatória da medida e sua análise de invariância por sexo; ademais, estabeleceu-se normas para interpretação dos escores do instrumento. Fizeram parte da pesquisa 1.000 adultos, de ambos os sexos. Os resultados evidenciaram que todos os índices de ajuste foram satisfatórios, confirmando a unidimensionalidade da escala, bem como sua invariância. Constatou-se, ainda, que houve validade convergente entre a EMC-19 e o estresse dos participantes. Além disso, foram propostos estratos de classificação da intensidade do medo (leve, moderado e severo) com base na normatização dos escores. Por fim, concluiu-se que a EMC-19 apresenta evidências suficientes que recomendam a sua utilização para medida do medo da COVID-19 no Brasil.*

Palavras-chave: *Análise fatorial confirmatória; Coronavírus; Psicologia da saúde; Norma.*

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How to cite this article

Faro, A., Silva, L. S., Santos, D. N., & Feitosa, A. L. B. (2022). The Fear of COVID-19 Scale adaptation and validation. *Estudos de Psicologia* (Campinas), *39*, e200121. https://doi.org/10.1590/1982-0275202239e200121

The coronavirus pandemic, just six months after its emergence, reached the mark of 7.3 million confirmed cases and has already caused more than 400 thousand deaths globally. In June 2020, Brazil stood out as the second country most affected by the pandemic in the world, coming behind only after the United States (Coronavirus Resource Center, 2020). In the first half of that month, Brazil counted more than 38 thousand deaths and about 740 thousand accumulated cases of COVID-19 (Brasil, 2020). With an upward curve of confirmed cases, during that month Brazil was the only country in the world that maintained a progressive evolution of the disease, even after the first 100 days of the pandemic had been elapsed (Coronavirus Resource Center, 2020).

The low national rate of adherence to the policy of social distancing and quarantine gave prominence to the problem of combating COVID-19 in Brazil. The records showed that quarantine adherence was lower than 40% by June, despite the official recommendation that 70% would be desirable for controlling the spreading of the virus (Inloco, 2020). Additionally, in the second half of June, even before stabilization or reduction in the number of new cases, the reopening of business and the resumption of other social activities in some cities, especially capitals, that was already taking place, raised concerns about the time extension of the first infection wave in the country. These facts enhanced the expectations of a worsening of the scenario of this public health problem, since Brazil, according to estimates of the World Health Organization, had not yet reached the peak of the disease in that period (World Health Organization, 2020).

In the face of an epidemic outbreak, the efforts by governments, health teams and the media usually focus on the physical and biological aspects of the disease, neglecting and underestimating psychological implications. However, previous experiences of health crises had already shown that the repercussions on mental health can last longer and be more prevalent than the disease itself (Ornell et al., 2020), indicating the importance of mental health care throughout the epidemic and, especially, after the most acute period of the crisis.

Fear is a central emotion to be considered when trying to understand the psychological effects experienced in a threatening scenario (Ornell et al., 2020), like in the case of COVID-19. Fear is defined as an unpleasant emotional state that is triggered by the perception of threatening stimuli, but that becomes maladaptive when it overlaps actual adversity (Harper et al., 2020). It is an adaptive emotion that is expressed through levels of emotional avoidance in relation to specific stimuli, aiming to mobilize energies to deal with a potential threat (Perin et al., 2015). In the event of widespread public fear caused by pandemic viral infections, it is possible that significant levels of mental suffering will be triggered in the general population, adding to the epidemic situation itself (Harper et al., 2020). In addition to this initial aspect of acute reaction to the stressful event, the perception of fear is an important indicator of adherence to health behaviors; not complying with those health behaviors in a situation of real threat can result in negligent attitudes and cause individual and/or collective harm (Mertens et al., 2020).

In health crisis contexts, such as in the COVID-19 pandemic, fear can raise stress levels (Ornell et al., 2020) and evidence has shown that the greater the fear of the new coronavirus, the greater the stress rates (Bitan et al., 2020; Satici, Gocet-Tekin et al., 2020). Stress is a mental and physical repercussion resulting from evaluations of stimuli that are perceived as stressors (social, biological and/or psychological), which demand an adaptive response aimed at restoring the state of well-being or minimization of perceived discomfort (Faro & Pereira, 2013). In a situation like the COVID-19 pandemic, a number of stressors have been experienced by the population, especially due to an invisible threat difficult to deal with, which caused abrupt and unexpected changes in the individual routine, family organization and work of practically the entire world population (Ornell et al., 2020).

The Fear of COVID-19 Scale (FCV-19S) was developed with the aim of making available a brief measure to investigate the fear of COVID-19 (Ahorsu et al., 2020). The scale has already been adapted and validated

in more than eight countries, like Greece (Tsipropoulou et al., 2020), Israel (Bitan et al., 2020), Italy (Soraci et al., 2020), Bangladesh (Sakib et al., 2020), Turkey (Satici, Gocet-Tekin et al., 2020) and Saudi Arabia (Alyami et al., 2020), and other countries. The instrument has shown good psychometric quality, proving to be a robust measure and with the potential for comparisons of findings among countries. There are also recommendations that future studies with FCV-19S use the Confirmatory Factor Analysis to the detriment of Exploratory Factorial Analysis, since the one-dimensional model of FCV-19S has already been supported in a significant number of studies (Pakpour et al., 2020).

Findings already obtained with the application of the FCV-19S in other countries have already shown that living with chronic illness, being a woman, being married and a health professional were features associated with higher levels of fear (Bakioğlu et al., 2020; Doshi et al., 2020; Tsipropoulou et al., 2020). On the other hand, age, educational level and having a relative diagnosed with the disease did not seem to affect the individuals' perception of fear (Ahorsu et al., 2020; Bakioğu et al., 2020; Sakib et al., 2020). Furthermore, in relation to the repercussions of this fear, people who reported greater fear of coronavirus showed less satisfaction with life, mental well-being and positivity (Bakioğu et al., 2020; Satici, Saricali et al., 2020; Satici, Gocet-Tekin et al., 2020).

It is acknowledged that having available a COVID-19 fear measure validated for use in a Brazilian context is relevant, since the lack of appropriate psychometric instruments makes it impossible to achieve a comprehensive view of the care needed for the current situation. In addition, it must be considered that the effects of the pandemic, whether direct or indirect, are affecting the population's mental health at this time and possibly will continue affecting for some time (Faro et al., 2020; Holmes et al., 2020). Therefore, a measurement instrument for one-off, seasonal and longitudinal monitoring of how people perceive and deal with the fear of COVID-19 is relevant. Given the above, this study aimed to: (1) adapt the FCV-19S to Brazilian Portuguese, (2) gather evidence of its validity based on the content, the internal structure and the relationship with the external variable, (3) analyze its invariance by gender and (4) establish norms for the interpretation of the scale scores.

Method

Participants

The sample consisted of 1,000 adults, with an average age of 30.9 years (*SD* = 12.06; (*SD* = 12.06; Minimum [Min.] = 18 and Maximum [Max.] = 70), mostly made up of women (79.9%), with a higher education level (78.5%). The Northeast region was predominant (58.1%), followed by the Southeast (26.5%), South (8, 5%), Center-West (4.2%) and North (2.7%). The research design was non-probabilistic and for convenience, and the data were collected through an online questionnaire between June 3 and June 4, 2020.

Instruments

FCV-19S (Ahorsu et al., 2020) consists of one-dimensional measure, containing seven items (for example, "I am afraid of dying because of COVID-19." – Item 4), with Likert-type scale answers ranging from 1 (I strongly disagree) to 5 (I totally agree). The total score is obtained from the sum of the items, ranging from 7 to 35 points (range: 28 points), in which the higher the score, the greater the feeling of fear of the disease. In the original scale development study, Cronbach's alpha was 0.82, considered good (George & Mallery, 2003). In other measurement validation studies, the lowest value ($\alpha = 0.80$) was found in the study

of Reznik et al. (2020) and the highest value (α = 0.88) in Alyami et al. (2020). The Brazilian Portuguese version of the FCV-19S is available in the Table 1.

Table 1
Brazilian Portuguese version of the Fear of COVID-19 Scale (FCV-19S)

Instruções: Abaixo são apresentadas algumas frases a respeito da COVID-19. Leia cada uma delas e assinale um X no número que melhor descreve você, conforme o esquema de respostas abaixo:									
Discordo fortemente		*Discordo*	*Nem concordo nem discordo*		*Concordo*		*Concordo fortemente*		
1		2	3		4		5		
1	*Eu tenho muito medo da COVID-19*					1	2	3	4	5
2	*Pensar sobre a COVID-19 me deixa desconfortável*					1	2	3	4	5
3	*Minhas mãos ficam úmidas/frias quando penso na COVID -19*					1	2	3	4	5
4	*Eu tenho medo de morrer por causa da COVID-19*					1	2	3	4	5
5	*Eu fico nervoso ou ansioso quando vejo notícias nos jornais e nas redes sociais sobre a COVID-19*					1	2	3	4	5
6	*Não consigo dormir porque estou preocupado em ser infectado pela COVID-19*					1	2	3	4	5
7	*Meu coração dispara ou palpita quando penso em ser infectado pela COVID-19*					1	2	3	4	5

To analyze the evidence of validity based on the relationship with other variables, the Perceived Stress Scale (PSS-10) was used, arranged on a scale of 1 (never) to 5 (always) points. The participant was asked how often (in the last month) he/she "Got sad because of something that happened unexpectedly" (Item 1) or "Had to control life irritations" (Item 7). The higher the score, the higher the stress level perceived. In the scale validation study, Cronbach's alpha was 0.88 (Faro, 2013). In this study, it was 0.90 and was considered excellent (George & Mallery, 2003).

Finally, a sociodemographic questionnaire containing information was used to characterize the sample, including age (in years), gender (female or male), education (up to elementary school, high school and higher education) and participants' geographic region (North, Northeast, Midwest, Southeast and South).

Procedures

The process of translating and adapting the FCV-19S to Brazilian Portuguese followed the recommended technical guidelines (Borsa et al., 2012). The scale was translated by two translators and the two versions being merged into a single translation. Theoretical and structural compatibility was attested by three expert judges, who considered the items and response scale adequate, with no suggestion to introduce significant changes in terms of content or wording. Then, the scale was evaluated by a group of university students, in a pilot collection procedure (n = 40); the students also considered all items and response modalities clear, with no suggestions for adjusting the instrument.

This study was approved by the National Research Ethics Committee (*Comissão Nacional de Ética em Pesquisa*, registration nº 30485420.6.0000.0008). Participants were approached through invitations on digital media, using the snowball method, and only participants over the age of 18 were included. The Free and Informed Consent Form was provided as the first page of the form and only after consent confirmation, did the individual have access to the research questionnaire.

Data Analysis

The Confirmatory Factor Analysis (CFA) was conducted using JASP (version 0.12.2), adopting Robust Diagonally Weighted Least Squares (DWLS) as an estimation method. The model adequacy adjustment indexes

used were the Comparative Fit Index (CFI: desirable > 0.950); the (GFI: desirable > 0.950); the Tucker Lewis Index (TLI; desirable > 0.950) (Hair et al., 2009); the Root Mean Square Error of Approximation (RMSEA: desirable < 0.080) and the Standardized Root Mean Square Residual (SRMR: desirable < 0.080) (Hu & Bentler, 1998). The model invariance was evaluated at the configural, metric, scalar and strict levels, using Delta CFI (ΔCFI: expected ≤ 0.01) and Delta RMSEA (ΔRMSEA: expected ≤ 0.015) as a parameter for rejection of invariance (Chen, 2007; Hair et al., 2014). The relationship between the fear score and its categories in relation to the stress score (Pearson's correlations and ANOVA), Cronbach's alpha (α: expected > 0.60) and the standardization of the FCV-19S items were calculated in the SPSS (v. 25). Standardization was carried out based on the general classification in percentiles (5% intervals) and calculation of the T score [(Z score of the score * 10) + 50].

Results

The CFA confirmed the one-dimensionality of the FCV-19S, exhibiting all fit indexes with satisfactory values [CFI (0.986), GFI (0.992), TLI (0.980), RMSEA (0.066) and SRMR (0.060)]. The factorial loads of the items varied between 0.570 (item 2) and 0.814 (item 7) (*M* = 0.686; *SD* = 0.08), thus maintaining the same structure as the original FCV-19S. Cronbach's alpha was 0.864 (Table 2). As for the analysis of invariance, the model obtained was invariant by gender (female or male) at all levels of measurement (configural, metric, scalar and strict). The average of the total score of the sample in the FCV-19S was 22.2 (*SD* = 5.78), with a minimum score of 7 points and a maximum score of 35 points. The stratification of the scores occurred in 3 strata (approximately 33.3% each), namely: from 7 to 19 points the stratum was classified as "mild fear"; 20 to 26 points as "moderate fear" and from 27 points as "severe fear". Most participants had "moderate fear" of COVID-19 (38.8%), followed by "mild fear" (31.8%) and "severe fear" (29.4%). In the PSS-10, the mean score was 31.8 points (*SD* = 3.25).

The correlation between the FCV-19S and PSS-10 scores was statistically significant, of moderate and positive strength (r = 0.451; $p < 0.001$). ANOVA attested to the existence of a relationship between stress and fear levels of COVID-19 [F (2, 997) = 94.72; $p < 0.001$]. The average scores per stratum were 32.0 (*SD* = 7.70) in the "mild fear" group, 36.3 (*SD* = 6.47) in the "moderate fear" and 39.6 (*SD* = 5,76) in "severe fear" (post-hoc Games-Howell at $p < 0.001$ for all comparisons). The standardization of the FCV-19S

Table 2
Psychometric properties of the Fear of COVID-19 Scale (FCV-19S)

Fear of COVID-19 Scale (FCV-19S) items		General		Mild (31.8%)		Moderate (38.8%)		Severe (29.4%)		λ
		M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	
1	I am very afraid of COVID-19	3.9	(0.98)	3.0	(0.10)	4.0	(0.64)	4.6	(0.54)	0.655
2	Thinking about COVID-19 makes me uncomfortable	3.8	(0.97)	3.1	(1.05)	4.0	(0.70)	4.5	(0.56)	0.570
3	My hands get cold when I think of COVID-19	2.2	(1.08)	1.3	(0.56)	2.0	(0.68)	3.3	(0.10)	0.714
4	I am afraid of dying because of COVID-19	3.4	(1.23)	2.3	(1.10)	3.5	(0.84)	4.5	(0.67)	0.680
5	I get nervous or anxious when I see news in the newspapers and on social media about COVID-19	3.8	(1.11)	3.0	(1.18)	4.0	(0.71)	4.6	(0.58)	0.624
6	I cannot sleep because I am concerned about being infected with COVID-19	2.2	(1.10)	1.3	(0.50)	2.0	(0.74)	3.3	(0.93)	0.746
7	My heart beats faster or flutters when I think of being infected with COVID-19	2.8	(1.27)	1.6	(0.77)	2.7	(0.87)	4.1	(0.73)	0.814

Note: λ: factorial load. Minimum = 1; Maximum = 5; 2. CFI = 0.986; GFI = 0.992; TLI = 0.980; RMSEA = 0.066 (IC95% = 0.052 – 0.080); SRMR (0.060). Cronbach's alpha = 0.864.

indexes was carried out according to the distribution of the total sample. The 5th and 95th percentiles had, in the total population, T scores of 34 (13 points) and 67 (32 points), respectively. The average T score (50th percentile) was 22 points, which was basically the same (22.2) as the average of the sample's gross score (Table 3).

Table 3
Standardization of FCV-19S according to total distribution

Percentage	Gross score	T score
5	13	34
10	15	37
15	16	39
20	17	41
25	18	43
30	19	44
33	*20*	*46*
35	20	46
40	21	48
45	21	48
50	22	49
55	23	51
60	24	53
65	25	55
66	*25*	*55*
70	25	55
75	26	56
80	28	60
85	29	62
90	30	63
95	32	67

Note: Possible minimum and maximum score: 7 and 35. Average population score: 22.2 (*SD* = 5.78). Average score per stratum: Mild fear = 15.6 (*SD* = 2.83), Moderate fear = 22.4 (*SD* = 1.67), Severe fear = 29.2 (*SD* = 2.49). Values in italics indicate the tertiles used in cut-off scores.

Discussion

The present study aimed to adapt the FCV-19S and the results indicated satisfactory evidence of the scale's validity confirming the pertinence of using the version adapted for Brazilian Portuguese. Parameters for the interpretation of the FCV-19S scores were also established by standardizing the distribution of the phenomenon in the total population, providing cut-off points for the scale in terms of population's fear severity (mild, moderate and severe).

The data indicated one-dimensionality of the FCV-19S and this finding corroborates the results of the original study of the measure (Ahorsu et al., 2020) and other investigations that sought to provide evidence of the scale's validity (Sakib et al., 2020; Satici, Gocet-Tekin et al., 2020; Soraci et al., 2020; Tsipropoulou et al., 2020). Only two studies were identified in the literature in which the internal structure of the measure indicated the presence of two factors (Bitan et al., 2020; Reznik et al., 2020). The study by Bitan et al. (2020) was severely criticized by the authors of the original version of the scale since the factorial structure had been forced without theoretical justifications. In the study by Reznik et al. (2020), the internal structure was obtained from the Principal Component Analysis, a technique considered outdated for factor retention (Damásio, 2012). Therefore, the one-dimensional structure of FCV-19S, obtained in this study, proved to be stable in different cultures.

The FCV-19S showed variability compatible with the PSS-10, a scale considered to be the gold standard and mostly used to assess stress (Taylor, 2015). The analysis of evidence based on the relationship with other variables indicated a statistically significant association between the fear and stress scores. Fear and stress are phenomena that tend to be concomitant, that is, the fear emotion tends to be associated with stress responses and these stress responses directly influence the coping capacity of individuals (Faro & Pereira, 2013; Raio & Phelps, 2015). In the context of a pandemic, the perception of fear can increase the stress levels of healthy people and enhance symptoms in those with some psychiatric disorder, being an important predictor of health behaviors (Shigemura et al., 2020), a fact that was highlighted in this investigation.

Another objective of the present study was to assess the invariance of the FCV-19S model by gender. It was concluded that the model was invariant in the configural (equivalence in the model configuration), metric (equivalence of factorial loads), scalar (equivalence in the intercept levels of the items) and strict (equivalence of the measurement errors) (Damásio, 2013; Milfont & Fisher, 2010). This means that the factorial structure of the measure and the factorial loads of the items are the same for the groups of men and women. In addition, the items show similar measurement error between the two groups, allowing the comparison of scores to be psychometrically valid (Damásio, 2013). Similar findings were also observed in studies that assessed the FCV-19S psychometric properties in Iran (Ahorsu et al., 2020) and Bangladesh (Sakib et al., 2020). Therefore, for future scale applications, the findings of the present investigation support that the FCV-19S scores can be validly and reliably compared between genders.

It was observed that, in general, the participants experienced a moderate level of fear, with an average of 22 points. The current epidemic context, which is marked by routine disruption, the imposition of social distancing, economic insecurity and the characteristics of COVID-19 (highly contagious and high level of mortality), help to explain the wide feeling of fear experienced at this time (Harper et al., 2020). Therefore, establishing cutoff points for the scale in terms of fear severity (mild, moderate and severe) seems to be beneficial, as it allows classification into groups of higher and lower risk, as well as fluctuations over time.

From the findings of this study, it is understood that individuals in the severe fear category should be given priority in mental health care, even though those at a moderate level of fear should also be included in the assistance focus. Common mental disorders, such as anxiety and depression, have been found to be associated with fear at significant levels (moderate and high) in serious public health crises such as the current one, which demonstrates the importance of paying attention to this emotion (Shigemura et al., 2020). In addition, people with severe fear may have an erroneous perception of the threat, which can lead to undesirable behaviors and even increased exposure to the threatening stimulus (Van Bavel et al., 2020). Regarding the group of individuals who were mildly afraid, it is important to highlight that this does not reflect a greater capacity for protection in connection with the crisis, since excessively reduced fear, when in an actual threatening situation, can cause a false sense of security and greater exposure to risk factors (Van Bavel et al., 2020).

Conclusion

In summary, the adaptation of FCV-19S to Brazilian Portuguese allows future research in Brazil using an instrument with adequate psychometric properties to assess the fear of COVID-19 in the population. The establishment of the cutoff points and the determination of the T score performed in this work favor the parameterization of this scale scores distribution in other contexts. It also allows comparison of different research scenarios. In addition, this findings standardization allows monitoring the scores at different points in time in the COVID-19 crisis in the country. For Brazil, this appears to be important, as some sites are in the pre-crisis phase (few cases of COVID-19 but growing) and others in the intra-crisis phase (significant increase

of cases, hospitalizations and deaths), but there are municipalities that still do not record deaths related to coronavirus or have rare cases recorded, even in mid-June 2020.

As limitations of this work, it is worth noting that the data were collected at the time when Brazil was in the period of intra-crisis, that is, the reading of findings should be made based on this period of the pandemic. Another limitation is that the sample, although large, is not randomized, which does not allow to infer that it represents the entire Brazilian population, especially in the South, North and Center-West regions, which participation was quite small. Finally, it is worth noting that this research presented a short instrument, easy to use and to apply by health professionals and managers. Consequently, it is hoped that mapping the fear of COVID-19, in different locations over the country, will allow a better understanding in the future of how people are dealing with the pandemic. Thus, the FCV-19S is intended to contribute to the development of interventions in mental health and to the implementation of more appropriate health behaviors to cope with the pandemic.

Contributors

A. FARO participated in the conception and design of the research, acquisition, analysis and interpretation of data, writing of the manuscript, critical review of the article and approval of the final version. L. S. SILVA, D. N. SANTOS, and A. L. B. FEITOSA participated in data acquisition, text writing and approval of the final version.

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Received: June 18, 2020
Final version: March 10, 2021
Approved: Mayo 27, 2021