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Psychometric Performance of the Fear of COVID-19 Scale (FCV-19S) and Its Validation in Czechia

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Abstract: The COVID-19 pandemic has brought significant changes to people's lives, causing high levels of anxiety, distress, and fear. In response, the "Fear of COVID-19" scale (FCV-19S) was developed in 2020 to measure the severity of fears related to COVID-19. This study assessed the psychometric properties of the Czech version of the FCV-19S, which was administered to a representative sample of 1372 participants, and confirmatory factor analysis (CFA) was conducted. The sample reflects the structure of a theoretical population aged 15–74 years and is composed of 50% males and 50% females. Moreover, univariate statistics were calculated, internal consistency was tested, and uni-dimensionality based on principal component analysis was performed. In addition, univariate statistical analyses were performed, internal consistency was tested, and univariate consistency was also assessed using principal component analysis. CFA indicated that the scale demonstrated very good standard indices; FCV-19S showed a high level of internal consistency, and it adequately differentiated the levels of fear among diverse subpopulations. The findings suggest that the Czech version of the FCV-19S is a valid and reliable instrument that has robust psychometric properties and can, therefore, be recommended for use in research. The availability of the Czech version of the FCV-19S will contribute to assessments of the impact of the COVID-19 pandemic on the Czech population, providing valuable information in guiding interventions aimed at reducing the negative psychological impacts of the pandemic.

Keywords: COVID-19; FCV-19S; psychometric validation; fear; cross-sectional survey

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1. Introduction

According to Worldometers [1], COVID-19 is present in at least 230 countries worldwide, with more than 688 million confirmed cases and approximately 6.9 million deaths associated with the disease. Several preventive measures have been introduced in Czechia since March 2020, when the first patients with COVID-19 were diagnosed. One of the most widely implemented strategies to reduce social interactions and prevent the spread of the disease has been the imposition of various measures such as curfews, quarantines, and bans on large gatherings. These measures aimed to limit the human-to-human transmission of the virus, which is crucial in slowing down an outbreak. In addition to these measures, it has been widely recognized that wearing masks or respirators can reduce the spread of the virus. The use of face masks has been required in many countries as a protective measure against the virus. Regular and frequent hand sanitation has also been recommended as another essential measure to prevent the virus from spreading. The introduction of appropriate interventions has been accompanied by extensive information campaigns aimed at raising awareness about these measures and strengthening compliance. Since the spring of 2020, in many countries, including Czechia, COVID-19, its spread, and its impact on society have dominated the media [2,3].

The COVID-19 pandemic has intensified people's uncertainty in terms of their outlook on life, increased any perceived vulnerability, and strengthened concerns about the health or even life of loved ones. The sudden onset of the pandemic brought about a new

situation with unexpected impacts, such as a pervasive feeling of lacking control or altered mental health [4]. Some researchers pointed out that one of the negative side effects of the implemented interventions and their publicity might be an increased risk of mental disorders in the general population and especially within vulnerable sub-populations [5]. The disease itself, the consequent anti-epidemic interventions, and media coverage of the issues related to the spread of COVID-19 have created a growing fear in many people's lives. COVID-19 thus represents a considerable stress factor that deserves significant research attention [6].

Examining the level of fear is particularly important, as high levels of fear might carry increased risks of maladaptive and negative behaviors or other forms of inappropriate psychological responses; it may also contribute to the development of depression, anxiety, or nervousness [7–9]. For decision-makers, it is important to adequately understand the nature of the population's fear when planning and implementing effective interventions aimed at reducing the transmission of the disease [10].

In response to this challenge, Ahorsu et al. [11] developed the "Fear of COVID-19" scale (FCV-19S). Over a short period of time, it has been used and validated by many researchers throughout the world, appearing in several translations (e.g., Italian, Romanian, Arabic, Spanish, Turkish, and many others). The proposed scale has already been tested in varying socio-cultural settings including Israel [12], Turkey [13], Japan [14], Cuba [15], and India [16]. The FCV-19S has also been tested on different populations, especially the medical workforce [17] and university students [18,19]. Many published studies have been conducted within populations that were (relatively) easy to access—residents of a single city (e.g., Lima, Peru, as reported by Huarcaya-Vichoria [20]) or a sample gathered via convenience sampling techniques [21–23]. Such a research design is appropriate for validating the scale psychometric characteristics; however, the authors of these studies admit that such findings can hardly be extrapolated to the general public or to the whole population of the given countries, i.e., the theoretical population.

As a response to these limitations, the presented research is based on a robust nation-wide representative sample of the entire population. Moreover, the FCV-19S has not been used in Czechia before; therefore, the presented research is the very first use of the newly developed scale within the adult Czech population. The data from Czechia serve as an important case study since the country not only experienced rigid measures imposed on the population (lockdown) during the so-called "first wave" of the outbreak during the spring of 2020 but also demonstrated a high degree of individual solidarity and a strong adherence to restrictions among the population. The impact of the disease, measured by the number of infected people and deaths, was at that time significantly lower than in other countries [24]. The level of fear embedded in the context of the time, therefore, provides useful knowledge about the scale. Furthermore, the study expands the current knowledge via a concurrent validity assessment, which used the health consciousness scale (HCS) introduced by Gould [25] as a reference. Validation of the FCV-19S, conducted with the use of health consciousness, represents a novel approach as the constructs of fear and consciousness have not previously been used for such a purpose. Meanwhile, the constructs of the fear of COVID-19 and health consciousness are interrelated for several other reasons:

(a) The fear of COVID-19 can lead to increased health consciousness. When people are afraid of contracting the virus, they may become more aware of their health, they might have a greater understanding of the importance of maintaining good health practices, and they can be more willing to adopt healthy habits [25]. From another perspective, health consciousness can also lead to a fear of COVID-19, as people who are health-conscious may be more concerned about their susceptibility to the virus and its potential impact on their health. Such concerns can result in fear and anxiety [26].
(b) The fear of COVID-19 and health consciousness both involve an awareness of the risks associated with the virus and the importance of taking measures to mitigate those risks. People who are health-conscious may be more likely to perceive the risks

associated with COVID-19 and take the appropriate precautions to protect themselves and others [27].

(c) The fear of COVID-19 and health consciousness can impact an individual's sense of self-efficacy, i.e., a belief in their own ability to accomplish a task or act in a given situation [25]. Fear can make people feel helpless and overwhelmed, while health consciousness can give them a sense of control over their health and their ability to protect themselves from the virus [28].

The main objective of this study is to validate the FCV-19S using Czech data, i.e., to test the internal consistency of the scale, confirm its unidimensional structure, analyze its psychometric characteristics, and compare the achieved results with the original scale that was introduced and initially validated by Ahorsu et al. [11]. The research objectives are aimed at proving the normal distribution of the scale, its internal consistency, and its uni-dimensional structure. Moreover, the aim is to confirm whether the Czech data support the proposed single-factor model, if the seven items purport to reflect a construct of fear, if the scale shows concurrent validity, based on the correlation with HCS, and if the scale discriminates among the levels of fear between males and females and among different age groups. Finally, an additional aim of the study is to analyze the levels of fear within the different sub-populations, i.e., to analyze the mean difference in FCV-19S scores according to selected sociodemographic characteristics (especially gender and age).

2. Materials and Methods

2.1. Participants and Procedure

The general population of Czechia who are aged 15–74 and are permanent residents of the country constituted the theoretical population for this study. The research was carried in Czechia (51°03′20″–48°33′06″; 12°05′26″–18°51′33″) in central Europe. The country is divided into 14 regions, which are further divided into districts. In addition to the regions and districts, there are also municipalities, which are the basic unit of local government. There are 6254 municipalities in Czechia, ranging in size from very small villages with around a dozen inhabitants (the smallest village has 16 inhabitants) to large cities with hundreds of thousands of inhabitants. Participants were selected by a multistage random sampling procedure employing address-based sampling. Since there was no available sampling frame or register of residents, primary sampling units were selected, and addresses within each unit were identified. The selection of households was then based on ensuring the appropriate number of addresses within each unit. Potential respondents were identified by interviewers during a visit to pre-selected addresses, using a Kish table [29] to randomly select participants. The Kish table is a simple tool that helps to select participants in a controlled manner irrespective of the interviewers' arbitrariness. Each member of the household is assigned a number, then the person whose number is identified by the Kish table is selected and invited to participate in the interview.

A total of 174 primary sampling units were selected across Czechia, with a maximum of 20 addresses identified for each unit. Sampling units were selected in all regions of the country in such a way as to represent the regional distribution of the theoretical population. Contact was made with 2657 households and interviews were conducted with 1423 participants, resulting in a response rate of 53.2 percent. Informed consent was obtained from each participant before each interview. For adolescent participants aged 15–18, informed consent was also obtained from at least one parent or a guardian, who was present throughout the whole interview.

To protect the anonymity of respondents and prevent direct or indirect identification, all responses are presented in aggregated form. The fieldwork was carried out in June 2020, after the "first wave" of the COVID-19 outbreak. The average duration of an interview was approximately 20 min.

Out of the 1423 interviews that were conducted, 35% were subject to check-back supervision to ensure adherence to ethical and quality standards. The data file used for the analysis consisted of only 1372 cases, due to incomplete interviews where the

respondents refused to provide certain socio-demographic data or instances of insincerity in responses (e.g., acquiescence, excessive non-response, or extremity bias). This sample size of 1372 cases is considered sufficient for scale validation [30,31]. Table 1 provides information on the sample's composition, in terms of gender, age, and the population size of the participants' places of residence.

Table 1. Socio-demographic characteristics of the sample.

Variables			
		Theoretical Population *	**Sample**
Gender	Male	50.0%	50.0%
	Female	50.0%	50.0%
	Total	100.0%	100.0%
Age	15–24 years	11.5%	11.5%
	25–34 years	17.1%	17.1%
	35–44 years	21.2%	21.2%
	45–54 years	18.2%	18.2%
	55–64 years	16.3%	16.3%
	65–74 years	15.7%	15.7%
	Total	100.0%	100.0%
Size of settlement	Fewer than 1000 inhabitants	16.8%	16.8%
	1000 to 4999 inhabitants	22.6%	22.1%
	5000 to 19,999 inhabitants	18.2%	18.7%
	20,000 to 99,999 inhabitants	20.0%	20.3%
	100,000 inhabitants and more	22.3%	22.1%
	Total	100.0%	100.0%
Region	Prague, the Capital City	12.5%	12.5%
	Středočeský Region	13.1%	13.1%
	Jihočeský Region	6.0%	6.1%
	Plzeňský Region	5.5%	5.5%
	Karlovarský Region	2.7%	2.7%
	Ústecký Region	7.6%	7.6%
	Liberecký Region	4.1%	4.2%
	Královéhradecký Region	5.1%	5.1%
	Pardubický Region	4.9%	4.8%
	Vysočina Region	4.8%	4.9%
	Jihomoravský Region	11.2%	11.2%
	Olomoucký Region	5.9%	5.8%
	Zlínský Region	5.4%	5.4%
	Moravskoslezský Region	11.1%	11.2%
	Total	100.0%	100.0%

* Data about the theoretical population comes from the Czech Statistical Office.

Before data collection, the research instruments (the FCV-19S and HCS) were translated into the Czech language, and the other variables were operationalized. The process of translating both scales followed the recommendations made by Sousa and Rojjanasrirat [32] and Yu et al. [33]. Therefore, two parallel translations of each scale were performed by two independent translators, who translated the English version of both scales into the Czech language. Then, the two translations of all items were compared, and the differences were resolved. In this way, an integrated form of the Czech translation of both scales was created. After that, a third translator performed a back-translation to confirm the equivalence of the English and Czech versions. The alternatives (i.e., agreement with statements) have also been taken from the original scales. The translated scales were then pilot-tested on a sample of 27 respondents, who were recruited from the target population. However, only minor changes to the wording of 2 items in FCV-19S and 1 item in HCS were

made as there were no issues concerning understandability or vagueness. Think-aloud techniques were used for this purpose [34]. In Appendix A, the original English version of FCV-19S and its translation into Czech are compared.

2.2. Measures

2.2.1. Fear of COVID-19 Scale (FCV-19S)

The FCV-19S is a seven-item scale developed by Ahorsu et al. [11] to measure self-reported emotional fear related to COVID-19. Participants can complete the scale themselves using self-administered questionnaires (SAQ) or via computer-assisted web interviewing (CAWI), or they can respond to interviewers using face-to-face interviews, computer-assisted personal interviewing (CAPI), or computer-assisted telephone interviewing (CATI). Respondents rate each item on a five-point Likert scale, ranging from strongly agree (5) to strongly disagree (1). The total score ranges from 7 to 35, with higher scores indicating greater fear. In my research in Czechia, the mean score was 18.29 (SD = 7.278, median = 18, skewness = 0.354, and kurtosis = −0.759).

Most validation studies propose a one-factor solution: in addition to Ahorsu et al. [11], this also applies to Stanculescu [35], Tsipropoulou et al. [36], Alyami et al. [37], and many others. However, other studies [38] resulted in a two-factor solution, in which two factors distinguish the physical (somatic) response to fear (clammy hands, inability to fall asleep, heart palpitations, etc.) from fearful thinking (feeling nervous, being afraid, etc.).

2.2.2. Health Consciousness Scale (HCS)

The HCS was used in this study to test the concurrent validity of the FCV-19S, in which a positive correlation between fear and health consciousness was hypothesized. Greater fears are expected to lead to an increased consumption of information about the source of those fears [36]. Moreover, monitoring the current status might decrease the level of fear, while an increased amount of information might serve as a fear-relieving intervention [39,40].

The HCS was developed by Gould [25] to track respondents' perceptions of and attitudes toward their own health. The validity of the HCS has been repeatedly proven by many studies [27,41,42]. HCS is a nine-item scale designed for self-reporting the degree of identification with presented statements, with responses measured on a five-point Likert-type scale ranging from 1 = "not at all reflecting my situation" to 5 = "fully reflecting my situation". The total score ranges from 9 to 45, in which a higher score equals higher health consciousness. It is composed of four domains, namely, health self-consciousness (HSC), health involvement (HI), health alertness (HA), and health self-monitoring (HSM). Health self-consciousness comprises an individual's ability to reflect on his/her own health status; health involvement is made up of statements expressing the degree of active involvement that an individual has in assessing his/her health status; health alertness describes the degree of vigilance in relation to health; health self-monitoring focuses on the self-monitoring of health status as a daily routine. In this study, the HCS has a mean of 24.52, standard deviation = 8.169; the median is 25, skewness = 0.008, and kurtosis = −0.686.

2.2.3. Direct Stimuli

In addition to the FCV-19S and HCS instruments, four direct attitudinal questions were included to assess the individuals' responses to the pandemic. Table 2 presents these items, along with their corresponding descriptive statistics.

Table 2. Descriptive statistics of the direct stimuli.

		4	3	2	1	0	N	Mean	SD
1	I am sad.	3.4%	13.2%	28.4%	26.2%	28.8%	1354	1.36	1.130
2	I feel under increased pressure.	7.1%	17.5%	31.3%	22.0%	22.1%	1354	1.66	1.202
3	I worry about how other family members are coping with this situation.	10.1%	24.0%	34.4%	13.4%	18.0%	1341	1.95	1.225
4	I am worried about the impact the outbreak will have on the other members of my family.	6.4%	21.6%	34.5%	20.2%	17.3%	1339	1.80	1.151

Note: 4 = fully reflecting my situation, 0 = not at all reflecting my situation; as the direct stimuli are treated as stand-alone variables, N differs due to an uneven number of missing cases.

2.3. Data Analysis

Various descriptive statistics, including the mean (M), standard deviation (SD), skewness, and kurtosis, were calculated to describe the sample and the characteristics of the respondents in this study. Pearson correlation analyses and analyses of variance (ANOVA) were used to explore and test differences among relevant measures and indicators. The internal consistency of the scale was assessed by calculating Cronbach's alpha [43,44]. Scale validation was performed by using exploratory factor analysis with principal component estimation, followed by a confirmatory factor analysis (CFA) that was conducted in AMOS 24 using the maximum likelihood estimation method. All other analyses were performed in IBM SPSS ver. 27 (IBM Corp., Armonk, NY, USA). All statistical tests were conducted at a 0.05 level of significance. Listwise deletion of the missing cases was used for the analyses of the FCV-19S; however, other variables such as the direct stimuli may differ in a number of valid cases.

3. Results

The present study utilizes classical test theory (CTT) to examine the psychometric properties of the Fear of COVID-19 scale (FCV-19S). Specifically, we investigated the internal consistency of the FCV-19S, as well as its construct, concurrent, and discriminant validities. To assess internal consistency, we employed Cronbach's alpha. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were utilized to evaluate the construct validity of the scale. EFA was used to identify the potential subscales and explore the underlying structure of the scale, while CFA confirmed the hypothesized factor structure of the scale. Concurrent validity was assessed by examining the correlation between the FCV-19S and other measures of related constructs, which can provide evidence for the extent to which the scale measures what it purports to measure. Discriminant validity, on the other hand, was used to assess the extent to which the FCV-19S is distinct from other measures that are unrelated to the fear of COVID-19, providing evidence that the scale measures a unique construct and is not simply a measure of general anxiety [45].

3.1. Univariate Statistics

Table 3 shows a similar pattern of the standard deviations for all individual items; no item has a standard deviation that is significantly different from the others. The scale produces a skewness of 0.354; kurtosis equals −0.759. Table 3 also shows both statistics for all items.

Since both the skewness and kurtosis of the data fall within the acceptable range of −1.5 to +1.5, the distribution of the scale can be considered to be normal [46]. The distribution of values is presented visually in the violin chart in Figure 1.

Table 3. FCV-19S—Descriptive statistics of the scale and its items.

		N	Mean	SD	Skewness	Kurtosis	Item-Total Correlation
1	I am most afraid of coronavirus.	1357	3.07	1.273	−0.071	−1.032	0.726
2	It makes me uncomfortable to think about coronavirus.	1357	3.29	1.261	−0.285	−0.937	0.597
3	My hands become clammy when I think about coronavirus.	1357	2.18	1.215	0.737	−0.463	0.769
4	I am afraid of losing my life because of coronavirus.	1357	2.39	1.269	0.503	−0.820	0.820
5	When watching news and stories about coronavirus on social media, I become nervous or anxious.	1357	2.71	1.272	0.211	−0.995	0.807
6	I cannot sleep because I am worrying about getting coronavirus.	1357	2.25	1.199	0.589	−0.663	0.792
7	My heart races or palpitates when I think about getting coronavirus.	1357	2.39	1.281	0.474	−0.897	0.836
	FCV-19S (the whole scale)	1357	18.29	7.278	0.354	−0.759	

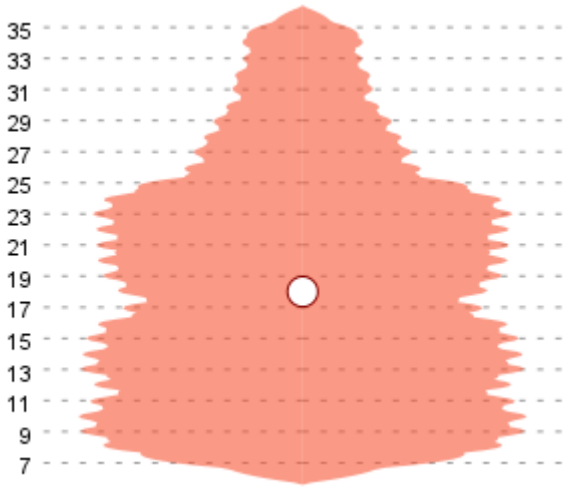

Figure 1. Distribution of the FCV-19S scores. Note: n = 1357; the dot represents the median.

The floor effect is 8.5% and the ceiling effect is 2.2%; these values are acceptable according to Strober et al. [47], who recommend that they should not exceed 50%.

3.2. Uni-Dimensionality of the Scale

The uni-dimensionality of the scale was demonstrated through the results of exploratory factor analysis, in which only one factor was extracted through principal component analysis. The factor explained 69.3% of the total variance, assuming the eigenvalue of >1. A good contribution of individual items to the explanation of the whole factor was indicated by those factor scores higher than 0.8, according to Floyd and Widaman [48]. As shown in Table 4, this threshold was exceeded by five items, while the remaining two were 0.792 and 0.679. A greater contribution of the item to the explanation of the whole factor was indicated by a higher score.

Table 4. Exploratory factor analysis.

		F1	Communalities
1	I am most afraid of coronavirus.	0.792	0.627
2	It makes me uncomfortable to think about coronavirus.	0.679	0.461
3	My hands become clammy when I think about coronavirus.	0.841	0.707
4	I am afraid of losing my life because of coronavirus.	0.880	0.774
5	When watching news and stories about coronavirus on social media, I become nervous or anxious.	0.863	0.745
6	I cannot sleep because I am worrying about getting coronavirus.	0.860	0.740
7	My heart races or palpitates when I think about getting coronavirus.	0.893	0.797

In the given case, the values support the hypothesis about the unidimensional structure of fear measured by the proposed FCV-19S. It is also useful to add that the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy is 0.917 and Bartlett's test of sphericity is χ^2 = 7194.665 (df = 21, p = 0,000). The value for KMO suggests that the data are highly suitable for factor analysis; the result of Bartlett's test of sphericity indicates that the variables are related to each other through the underlying factor(s); therefore, the data are suitable for factor analysis [48].

To test the internal consistency of the FCV-19S, Cronbach's alpha was calculated, resulting in a value of 0.925. This value indicates a high level of internal consistency, exceeding the original scale's reported value of 0.82 in the study by Ahorsu et al. [11]. Therefore, it seems that the scale is inherently stable. In addition to Cronbach's alpha, we assessed the internal consistency using item-total correlations, which are considered acceptable when they exceed 0.4 [49]. In our study, the item-total correlation ranged from 0.597 to 0.836, meeting this recommendation. These values indicate a high level of internal consistency and provide further support for the hypothesis that the items on the FCV-19S accurately reflect the construct being measured.

3.3. Psychometric Performance of the Scale

The psychometric performance of the scale was evaluated by confirmatory factor analysis (CFA). First, construct validity using the maximum likelihood estimation method was conducted. The chi-square test value is significant (χ^2 = 13.856, df = 1, p = 0.000); however, such a result is common when the analysis is performed on a large sample, as Pituch and Stevens [50] have explained. The tested model is presented in Figure 2.

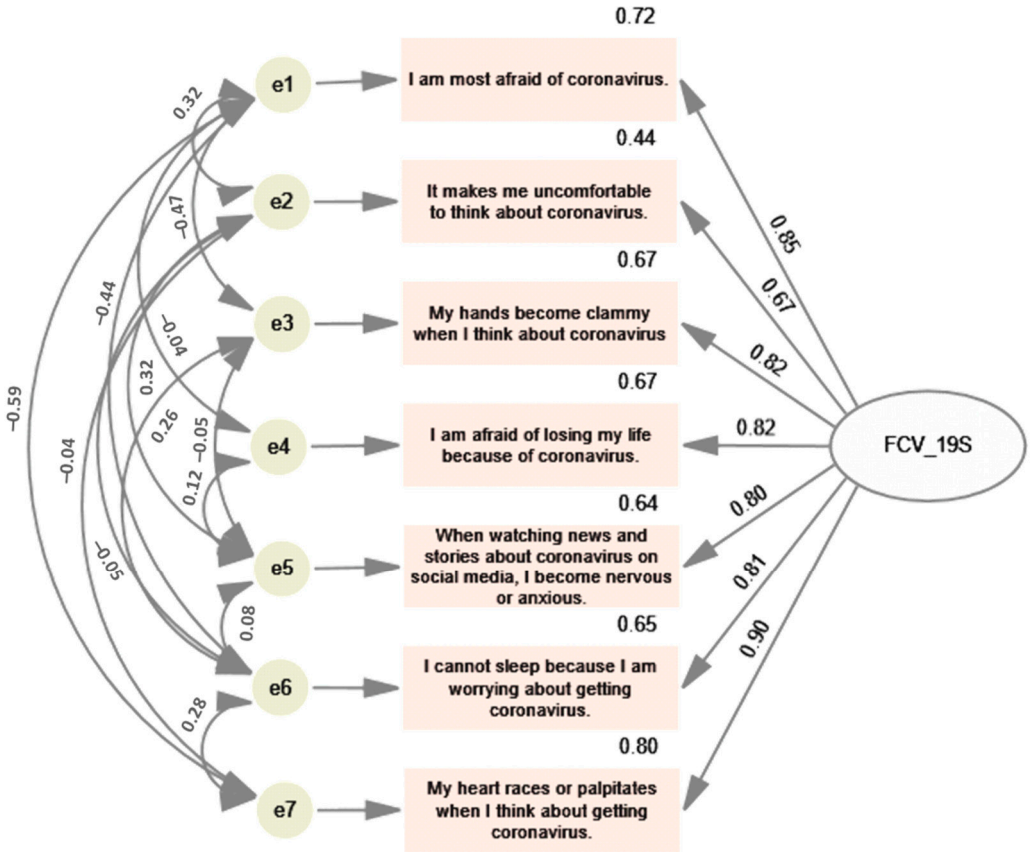

Figure 2. Confirmatory factor analysis. Note: n = 1357.

In the presented CFA model, the errors are displayed as well. These represent the unobserved variables capturing the variance that is not accounted for by the latent construct.

The error variances and error correlations suggest the possible measurement error or decreased measurement reliability for the given items. To assess the model fit, the whole range of absolute and incremental indices was calculated. Their values are shown in Table 5, together with the recommended thresholds.

Table 5. Absolute and incremental indices.

Indices	Thresholds	Value in the Study
RMSEA (Root mean square error of approximation)	<0.07 [51]	0.047
SRMR (Standardized root mean square residual)	<0.08 [52]	0.0044
GFI (Goodness-of-fit index); adjusted GFI	>0.95 [53]	0.999
CFI (Comparative fit index)	>0.90 [54]	1.000
TLI (Tucker–Lewis index)	>0.95 [55]	0.0991
NFI (Normed fit index)	>0.95 [55]	1.000

The study findings support the original model proposed by Ahorsu et al. [11] as a single-factor structure, which fits the Czech data well. The psychometric properties of the FCV-19S are further supported by the key fit indices, including RMSEA, SRMR, GFI, CFI, TLI, and NFI. The RMSEA value of 0.047 suggests a good fit between the hypothesized model and the data, as the value is below the recommended level [50]. The SRMR value of 0.0044 indicates a very good fit, as lower values imply a better model fit [52]. The GFI value of 0.999 indicates that the model accounts for a high proportion of variance in the observed covariance matrix [53]. The CFI value of 1.000 suggests an excellent fit between the model and the data, as it compares the fit of the hypothesized model with that of a baseline model assuming no relationships among the variables [54]. The TLI and NFI values also support the fit of the hypothesized model with the data [55]. Overall, these findings confirm the robust psychometric properties of the FCV-19S in the Czech context.

3.4. Convergent Validity

Establishing convergent validity is an important step in the validation process of any measure or instrument used in research, as it helps to provide evidence that the instrument is accurately measuring the construct that it is intended to assess. Convergent validity is a type of construct validity that assesses whether the items of a construct that are expected to be related are, in fact, related. It might be understood as the extent to which the items indicate a single underlying construct [56], i.e., each item on the scale purports to reflect the given construct. It is assumed that all items reflect the idea of fear, or, in other words, that the different items of the given construct are correlated with each other, as predicted. Therefore, convergent validity is demonstrated by the correlation matrix in Table 6, which shows the statistically significant associations among all items.

Table 6. Correlational matrix.

		1	2	3	4	5	6	7
1	I am most afraid of coronavirus.	1.000						
2	It makes me uncomfortable to think about coronavirus.	0.643 **	1.000					
3	My hands become clammy when I think about coronavirus.	0.537 **	0.410 **	1.000				
4	I am afraid of losing my life because of coronavirus.	0.605 **	0.463 **	0.740 **	1.000			
5	When watching news and stories about coronavirus on social media, I become nervous or anxious.	0.672 **	0.585 **	0.643 **	0.700 **	1.000		
6	I cannot sleep because I am worrying about getting coronavirus.	0.555 **	0.404 **	0.741 **	0.754 **	0.692 **	1.000	
7	My heart races or palpitates when I think about getting coronavirus.	0.604 **	0.472 **	0.745 **	0.799 **	0.713 **	0.790 **	1.000

Note: $n = 1357$; ** = $p < 0.01$.

Table 6 shows that the item intercorrelations are high. Furthermore, convergent validity might also be indicated by the average variance extracted (AVE) and composite reliability (CR). The value of AVE which represents the average amount of variance captured by the indicators associated with the latent variable is recommended to be higher than 0.5 [57]. The Czech version of the FCV-19S instrument tested in this study showed an AVE = 0.70, which indicates that, on average, 70% of the variance in the indicators is explained by the latent variable. This suggests that the latent variable is a good representation of the constructs that it is intended to measure. Moreover, the CR represents the degree to which the indicators of a latent variable are related to each other; this value should be above 0.7 [44]. The CR value for the Czech data is 0.94, indicating that the items of the latent variable are highly correlated with each other.

3.5. Concurrent Validity

Concurrent validity involves assessing the extent to which a measure relates to an established measure of the same construct or a related construct that is administered at the same time [30]. When concurrent validity is used to evaluate the degree to which a new measure is related to an already validated measure that is used as a reference criterion, the measure's result for the FCV-19S might be supported by the significant positive correlation with the health consciousness scale (HCS). Spearman's coefficient rho is 0.543 ($p < 0.001$). In this respect, the FCV-19S shows good concurrent validity when it is positively associated with the health consciousness scale (HCS). Respondents with higher levels of health consciousness suffer from a higher fear of COVID-19.

3.6. Discriminant Validity

Discriminant validity refers to the degree to which a measure distinguishes between two or more different constructs that are theoretically distinct from one another, i.e., the ability of a measure to differentiate between the constructs being measured [51]. In this respect, appropriate ANOVA tests were conducted to identify those population groups in which the level of fear differs from that of the remaining part of the population. A one-way ANOVA was computed to test the mean differences for categorical variables such as gender and age. Fear is an emotional response to external stimuli, and females show a higher response in this respect.

The results are as follows: gender F (1, 1356) = 16.781, $p = 0.000$; age F (5, 1356) = 16.140, $p = 0.000$; therefore, it is obvious that the proposed scale provides significantly different values among dissimilar sub-populations. The actual differences are displayed in Figure 3, where the distribution of responses within the different age groups is obvious, together with the differences between males and females.

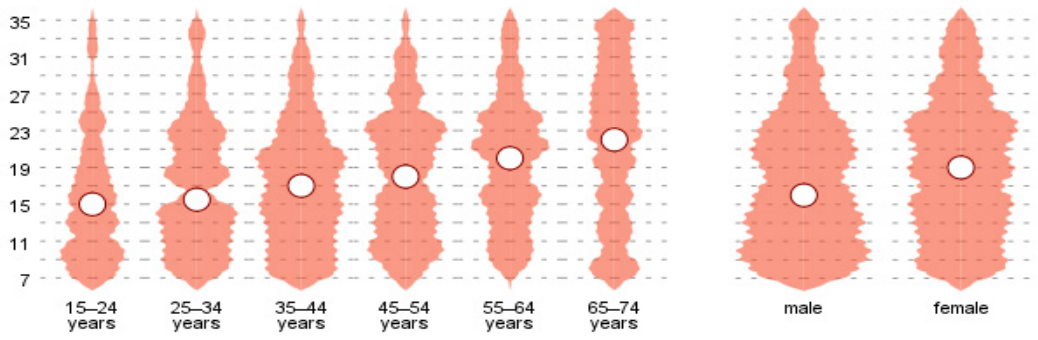

Figure 3. Values of FCV-19S in different sub-populations. Note: n = 1357; the dots represent the median. Age: mean (SD) = 15.83 (6.86)/17.06 (6.91)/17.29 (6.64)/18.25 (6.93)/19.71 (6.89)/21.37 (8.29); median = 15.0/15.5/17.0/18.0/20.0/22.0. Gender: mean (SD) = 17.49 (7.21)/19.10 (7.26); median = 16.0/19.0.

Based on the results presented above, it seems that the FCV-19S presents a significant correlation with some direct measures that reflect the attitudes and experiences of respondents with COVID-19. In this respect, it was observed that the analysis of variance (one-way ANOVA) resulted in F (4, 1343) = 107.424 and $p = 0.000$ for the statement "I am sad". Similarly, "I feel under increased pressure" resulted in F (4, 1344) = 112.497 and $p = 0.000$; "I worry about how other family members are coping with this situation" achieved F.(4; 1330) = 104.829 and $p = 0.000$; "I am worried about the impact the outbreak will have on the other members of my family" resulted in F (4, 1330) = 98.935 and $p = 0.000$. Correlations with the respondents' declared behavior and declared experience with COVID-19 are also significant.

4. Discussion

The current study aimed to translate and validate the FCV-19S in Czechia. In this respect, the whole range of relevant tests was performed, especially the univariate statistics test, the uni-dimensionality of the scale, and its psychometric performance when the EFA and CFA confirmed the one-factor structure of the scale. A series of validation attempts, including convergent validity, concurrent validity, and discriminant validity, indicates that the scale measured the intended construct, i.e., fears regarding COVID-19.

The following descriptive statistics are based on a sample of 1357 cases; the grand mean of the scale is 18.29, and the standard deviation is 7.278. For comparison, in India, the score reached 18.00; SD = 5.68 [16], in Romania 14.11, SD = 5.62 [35], in Russia 17.4, SD = 4.7 [58], in Belarus 16.6, SD = 4.5 [58], in Iran 27.39 [11], or in Japan 16.67, SD = 4.85 [59].

Previous research has indicated a significant correlation between fear and the various aspects of psychological well-being, such as anxiety and despair [12,19,60,61]. Fear is typically defined as a negative emotional response to a perceived threat or stressful situation [4], which involves both a subjective emotional response and an actual experience. The available studies suggest that fear is a complex emotional response that can impact an individual's psychological health in various ways. Some researchers suggest that fear is associated with an overestimation of the probability of experiencing a dangerous, life-threatening event [62].

Additionally, several studies have evaluated the internal consistency of the Fear of COVID-19 scale (FCV-19S), with researchers reporting high levels of reliability. For example, Alyami et al. [34] reported an internal consistency coefficient of 0.88, while Satici et al. [13] reported a coefficient of 0.85. Reznik et al. [58] reported 0.81, while Midorikawa et al. [59] reported 0.83, Sakib et al. [9] reported 0.871, and Ping et al. [63] reported 0.893. Moreover, Perz [19] conducted a factor analysis and reported that the scale demonstrated 66% unidimensionality.

Sakib et al. [9] reported $\chi^2 = 554.75$; Midorikawa et al. [59] reported $\chi^2 = 386.25$; $p < 0.001$; Perz et al. [19] reported a KMO = 0.88. For comparison, the CR in the original scale reported by Ahorsu et al. [11] was 0.88 and the AVE was 0.51. Sakib et al. declared values of CR = 0.89 and AVE = 0.58 [9], whereas Ping et al. achieved a CR = 0.799 and AVE = 0.411 [63].Based on the high intercorrelations of AVE and CR, the Czech version of the FCV-19S might be considered to have items that are interrelated and are converging into a common construct.

Statistically significant differences in the FSC-19S scores between females and males were identified in this study, similar to some other studies, e.g., Stanculescu [35]. As Broche-Pérez et al. [15] reported, in Cuba, the subsample of males reached 17.9 (SD = 8.05), whereas female scores reached 21.9 (SD = 6.90); similarly, Sakib et al. [9] found that males reached 22.75 (SD = 5.65) and females 20.29 (SD = 5.90). Such a finding is not unique, as many other studies have already mentioned that females are more sensitive to external stressors, and a higher level of fear is a typical reaction [12,60,64].

A verbal report on experiences with COVID-19 may not be accurate, as there may be a risk of social desirability bias, especially in the case of males, who are avoidant of expressing their fear. All indicators were self-reported, with no cross-checks.

Some studies indicate that the two-factorial model performs better than a single-factor model (e.g., in China [38]). However, this is not the case in Czechia, where the results are comparable with findings that confirm the single-factor model.

The cross-sectional design of the study precludes the determination of causality between the FCV-19S and HCS. It is not clear whether heightened health consciousness leads to a greater fear of COVID-19 or whether the increased fear of COVID-19 motivates greater health consciousness. Both explanations are plausible, but further research is needed to establish a causal relationship. A longitudinal study, such as a panel survey, would enable the monitoring of changes in the level of fear over time as the pandemic evolves or in response to specific interventions. Such a design would allow for repeated interviews with the same participants and provide an opportunity to analyze changes in their attitudes and fear. This would provide valuable insights into the dynamics of fear and health consciousness and help establish causality.

Sharing the results of this research supplements the body of resources on the performance of the FCV-19S in different parts of the world. It might also help other researchers in the future to perform a meta-analysis that is either focused on the findings as such or on the methodologies used.

5. Conclusions

The primary goal of the presented paper was to evaluate the key psychometric characteristics of the FCV-19S instrument. To reach this goal, several methods and indices were used, especially Cronbach's alpha, EFA, and CFA. The very first data from Czechia show that the FCV-19S, as it was translated into the Czech language, performs well; the results indicate that the scale has a unidimensional structure, satisfactory concurrent validity, and good discriminant validity (see its correlations with direct stimuli, gender, and age). The scale also has high internal consistency and acceptable construct validity, based on the fit indices between the data and the proposed model. Concurrent validity is supported by the significant correlation with the HCS (the study showed that the FCS is highly correlated with the HCS). Similar findings were reported by other studies that tested the association of the scale with other relevant constructs. These studies claim that FCV-19S scores well with: GAD-7 [19]; PHQ-9 [9]; HADS [11]; DASS-21 [12]; SCS-SP [38]; PVDS [65]. The FCV-19S might, therefore, be considered a sound scale with robust psychometric properties.

Based on the findings, it can be concluded that the Fear of COVID-19 scale (FCV-19S) is a reliable tool for measuring the fear of COVID-19 among the general population. Furthermore, this study contributes to the growing body of research on the impact of the pandemic on various subgroups by identifying vulnerable populations at risk of experiencing high levels of fear. Specifically, the results of the ANOVA analysis indicate that females and the elderly are more likely to experience high levels of fear related to COVID-19. While the FCV-19S may also be capable of identifying other vulnerable subgroups, further research is needed to explore this possibility.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki of 1975 (https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/) and follows the Ethical code of AAPOR (https://www.aapor.org/Standards-Ethics/AAPOR-Code-of-Ethics.aspx, accessed on 1 December 2022). The research design, as well as the research instrument (the questionnaire), were approved in INESAN by the Research Ethics Board (IREBA/2020/536). The institute holds an HRS4R HR Excellence in Research award (https://inesan.eu/en/hrs4r-2/), which acknowledges the high standard of ethics applied by researchers at this institute (https://www.euraxess.cz/jobs/hrs4r). All links were accessed on 21 March 2023.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. This study involved data collected from anonymous respondents. All subjects gave their informed consent for inclusion before their participation in the survey.

Data Availability Statement: The data used to support the findings of this study will be available from the corresponding author upon reasonable request.

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Appendix A

Table A1 in Appendix A compares the original English version of the FCV-19S and its translation into Czech.

Table A1. Comparison of the English and Czech versions of the FCV-19S.

	English	Czech
1	I am most afraid of coronavirus.	Z koronaviru mám opravdový starch.
2	It makes me uncomfortable to think about coronavirus.	Z myšlenek na koronavirus mám nepříjemný pocit.
3	My hands become clammy when I think about coronavirus.	Když si vzpomenu na koronavirus, zvlhnou mi ruce.
4	I am afraid of losing my life because of coronavirus.	Bojím se, že kvůli koronaviru přijdu o život.
5	When watching news and stories about coronavirus on social media, I become nervous or anxious.	Při sledování zpráv o počtech nakažených a zemřelých znervózním.
6	I cannot sleep because I am worrying about getting coronavirus.	Kvůli obavám z koronaviru nemohu spát.
7	My heart races or palpitates when I think about getting coronavirus.	Když si uvědomím, že bych se mohl/a nakazit koronavirem, rozbuší se mi srdce.

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