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COVID-19 CAUSAL FACTORS PERCEPTION QUESTIONNAIRE (COVID-19-CFPQ)

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Abstract

The article details the validation procedure for a questionnaire that analyzes the perception of the causal factors of the COVID-19 pandemic, the COVID-19-CFPQ. A pilot test was carried out with 55 subjects, its content and comprehension validity was analyzed through the judgment of 8 experts, and its construct validity through an exploratory factor analysis. In addition, a confirmatory factorial analysis was carried out with a sample of 427 people, the convergent validity was calculated, and a descriptive and internal consistency analysis of the factors of the final questionnaire was performed. The COVID-19-CFPQ finally comprised 20 items and four dimensions: Social distancing and Protection (SDP), Perceived psychological impact (PPI), Skepticism (S) and Credibility of perceived information (CPI). The results demonstrated the validity of the questionnaire and high reliability rates, which allows us to determine the perceptions of the population about the causal factors of COVID-19.
KEY WORDS: *COVID-19, causes, perception, questionnaire, mask.*

Resumen

En el artículo se detalla el procedimiento de validación de un cuestionario que analiza la percepción de los factores causales de la pandemia de la COVID-19, el CPFC-COVID-19. Se realizó una prueba piloto con 55 sujetos, se analizó la validez de contenido y de comprensión a través del juicio de 8 expertos y la validez de constructo a través de un análisis factorial exploratorio. Además, se realizó un análisis factorial confirmatorio con una muestra de 427 personas, se calculó la validez convergente y se hizo un análisis descriptivo y de consistencia interna de los factores del cuestionario final. El CPFC-COVID-19 quedó constituido por 20 ítems y cuatro dimensiones: Distanciamiento social y Protección (DSP), Impacto psicológico percibido (IPP), Escepticismo (E) y Credibilidad de la información percibida (CIP). Los resultados demuestran la validez del cuestionario y unos altos índices de fiabilidad, lo que permite conocer las percepciones de la población acerca de los factores causales de la COVID-19.
PALABRAS CLAVE: *COVID-19, causas, percepción, cuestionario, mascarilla*.

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Introduction

The Corpus Hippocraticum, a great work attributed to Hippocrates, considered by many to be the father of medicine, shaped Western medicine for centuries. The disciples of Hippocrates always asked the three famous questions: what happens to him?, since when does it happen?, and to what does he attribute it?, currently being the common thread for obtaining an adequate clinical history. With the vast amount of information on medicine, the last question may be overlooked, however, the lack of knowledge in the current pandemic situation makes the last question imperative. The COVID-19 pandemic registers more than 59 million infected and more than 1 million deaths, putting health organizations and institutions around the world on alert. The Panel Independiente (2021) assures that the advance of the virus would depend on the extent to which the correct information reaches the population, being able to influence and transcend the possible economic or political ideological manipulation that is perceived. Leventhal's common sense model (Leventhal, 2003) emphasizes the importance of the beliefs and perceptions that the population has about the disease, therefore, all possible information is necessary about the perceptions and judgments of the population about the possible causes of contagion by COVID-19, not only to determine the attribution of the population to the causality of COVID-19 based on their experiences own or nearby, but also to find out their perception of the causes of spread.

As a consequence of the above, different instruments have been developed to assess perception. Following Conway et al. (2020), in their questionnaire, they analyzed information contamination (mistrust of the information received) and reactance or support for restrictions or measures. On the other hand, Olapegba, et al. (2020) considered reflecting in their questionnaire a section on fomites and contact surfaces as points of contagion. Other articles such as the one by Akwa et al. (2020) decided to include items such as "eating properly cooked food prevents contagion" or items related to the use of masks to avoid contagion risks. On the other hand, Zhong et al. (2020) considered reflecting in their questionnaire dimensions such as personal knowledge, trust in science, trust in government, personal experience and social amplification of risk (through friends or relatives).

On the one hand, the pandemic has also been related to its psychological impact on society. According to Ding, Xu et al. (2020), the perception of an upcoming public health crisis is negatively associated with depression among people, with depression being greater the closer the perceived distance to said crisis. Likewise, Ding, et al. (2020) highlighted that support for prevention and control policies is associated with depression in public health crises, assuming that the higher the support for prevention and control policies, the lower the depression. On the other hand, following Choi, Lee & Ok (2013), the attitude towards an epidemic is a significant mediator between risk perception and behavioral intention. According to Choi et al. (2013) a high level of risk perception influences attitude, which, in turn, impacts the behavioral intention of individuals. According to these authors, daily social distancing influences people's day-to-day movements,

suggesting the modulating effect of perceived behavioral control between risk perceptions and behavioral intention. Along the same lines, Ahmad et al. (2020) also raised in their questionnaire the dimension of "perceived behavioral control", in addition to risk aversion, knowledge about the epidemic and the perceived feasibility of adopting epidemic prevention.

On the other hand, however, there is little baggage of scales aimed at assessing the social factors related to the COVID-19 disease from a multiple perspective, in which the importance of the population attributed to the aspects analyzed in the validated questionnaire is analyzed in this article: Social Distancing and Protection (SDP), Perceived Psychological Impact (PPI), Skepticism (S) and Credibility of Perceived Information (CPI). In the absence of a questionnaire that analyzes these variables in the social context, it is considered important to assess the perception of the population to promote popular understanding of the perception of causal factors of the COVID-19 pandemic. The objective of this article is to validate the Perception Questionnaire on the Causal Factors of COVID-19 (COVID-19-CFPQ), analyzing the validity and reliability of the items, answering the following questions: does it measure what it purports to measure? (validity) and, with what precision are these measurements obtained? (reliability). The article highlights the need to specify the essential terms of the measurement (validity and reliability), since they constitute the quality indices of the questionnaires, proposing a confirmatory factorial analysis to evaluate the validity and reliability of each item, the validity to determine if Theoretically, the questionnaire is valid to measure what is intended, and the reliability to assess the performance of the measurements made. Quantitative validity assessment is indicated using exploratory factor analysis (EFA) and reliability assessment using Chronbach's alpha. If an instrument is valid, it is because it does not have systematic errors. Among the different types of validity, construct validity is ideal for the evaluation of questionnaires, since it incorporates aspect, concurrent, criterion and content validity. When there is sufficient scientific contribution to formulate specific hypotheses about the relationship between indicators and latent dimensions, the interest of the scientific community should be focused on contrasting these hypotheses, for example, it is known which items should measure which dimensions in some translation or adaptation of a document. developed questionnaire. confirmatory factor analysis (CFA) leads to a greater specification of the hypotheses that must be contrasted, although in the current pandemic scenario there is still not enough scientific contribution since these indicators and dimensions are not exactly known. On the other hand, EFA seeks to discover unobservable latent variables, whose existence is assumed, which remain hidden waiting to be found, and which have logic within the framework of a theory or in the way of understanding the variables. relationships between variables, with EFA being a type of multivariate analysis of interdependence for dimension reduction that seeks to discover latent factors in a set of quantitative variables (López-Aguado & Gutiérrez-Provecho, 2019). Therefore, an EFA of the correlation matrix can generate latent dimensions, using its results as an indication of convergent and discriminant validity. Regarding reliability, it is related to the degree of random error, that is, the fewer

random fluctuations there are in the responses, the higher the reliability. The measurement of constructs is based on the correlation, understood as the internal consistency of the items measured by Chronbach's alpha, based on the average of the correlations.

Method

This research has been based on the description of the process of construction and validation of a questionnaire developed *ad hoc* to find out the perceptions of the population about the causes attributed to COVID-19. It is intended, on the one hand, to analyze the construct validity, and, on the other hand, to examine the reliability of the questionnaire. An *ad hoc* information collection questionnaire has been developed as it is an easily applicable tool (Thomas & Nelson, 2007). It is a methodological investigation based on the survey technique, which aims to objectively analyze facts and characteristics of a population.

Participants

A sample of 55 subjects was used in the pilot test and the second sample was made up of 427 people (73.6% men and 26.4% women), 9.9% between 16-24 years old, 38.7% between 25 -34 years old, 35.2% between 35-44 years old, 12.7% between 45-54 years old and 3.5% over 55 years old. The experience of 53.5% of those surveyed is as an employee, 16.2% civil servants, 14.8% self-employed, 5.6% corresponds to the health sector and 1.4% to restaurants. Of the total number of participants, 70.4% have university education, 20.4% vocational training, 4.9% high school, 2.8% secondary education and 1.4% basic studies.

On the other hand, to evaluate the validity of content, 8 expert judges from the field of social sciences with PhD, with a professional background of more than 5 years on average and with extensive knowledge about the scientific method were selected. , taking into account their reputation and availability. McGartland et al. (2003) suggest a range of between 2 and 20 experts, so 20 experts were invited, with 8 finally participating in the revision of the instrument.

Instruments

To assess the perception of the population, the present study has designed and validated the Perception Questionnaire on the Causal Factors of COVID-19 (COVID-19-CFPQ) (Appendix), whose psychometric properties are described in the procedure. The necessary explanations for its proper completion were specified in the questionnaire, being confidential and anonymous. The questionnaire consists of 20 items with a Likert-type scale whose answers range between 1 (*totally disagree*) and 4 (*totally in agreement*), with items 3, 5, 7, 9, 11, 18 and 20 being inverted. The items were presented with sequential numbering to give the instrument a simpler appearance, following a coherent logical order and facilitating the

completion process. The COVID-19-CFPQ has 4 dimensions: 1) Social Distancing and Protection (SDP) with 6 items (3, 5, 7, 11, 18 and 20); 2) Perceived Psychological Impact (PPI) with 5 items (2, 4, 6, 9 and 17), 3) Skepticism (S) with 4 items (1, 13, 14 and 15) and 4) Credibility of Perceived Information (CPI) with 5 items (8, 10, 12, 16 and 19). For its interpretation, the results obtained in the sum of each construct imply the perception that the participant has in each one of them as a causal factor of COVID-19.

Procedure

In the first place, in order to provide the questionnaire with internal coherence, the existing literature on the main causal agents of Covid-19 and on similar questionnaires previously prepared with common characteristics or because they are related to the subject in question was reviewed. (Ahmad et al., 2020; Akwa et al., 2020; Conway et al., 2020; Ding et al., 2020; Geldsetzer, 2020; Olapegba et al., 2020; Simione,y Gnagnarella, 2020; Zhong et al., 2020).

In the second place, and after reviewing the literature, a bank of possible questions formulated in 42 items and in four dimensions was created, originating an initial version that would allow knowing the perceptions of the population about the causes attributed to the spread of the COVID-19. The questions were formulated in a clear, brief and understandable way, prioritizing that they did not lead to an answer and that they were referred to a single aspect in a logical way. Within the design of the ad hoc questionnaire, a section on categorized sociodemographic variables (age, gender, education, work experience and autonomous community) has been inserted, as well as closed questions with dichotomous answers (yes/no) related to having been positive, having had some symptom or if a relative or close friend was positive in the last 6 months, questions added to the items that the instrument consists of, in which each item has a Likert-type scale whose answers range between 1 (*totally disagree*) and 4 (*totally in agreement*).

Thirdly, to address the validation of the instrument, the Q-initial 42-item questionnaire was provided to a group of 8 social science experts along with a dossier explaining each of the constructs to be evaluated along with a cover letter. via email, requesting the return of their evaluations by the same means. Once the degree of adequacy and relevance of each item had been analyzed, the items that best analyzed the contents in each of the constructs were selected and those that the judges deemed appropriate were eliminated.

Fourth, a pilot test was carried out with 55 subjects to analyze the validity of comprehension, eliminating items after analyzing the response frequency and the elevated response frequency, resulting in a Pre-Q version (pilot test) composed of 35 items.

In fifth and last place, construct validity was analyzed through an EFA and CFA with a sample of 427 people, giving rise to a final Q composed of 20 items.

Data analysis

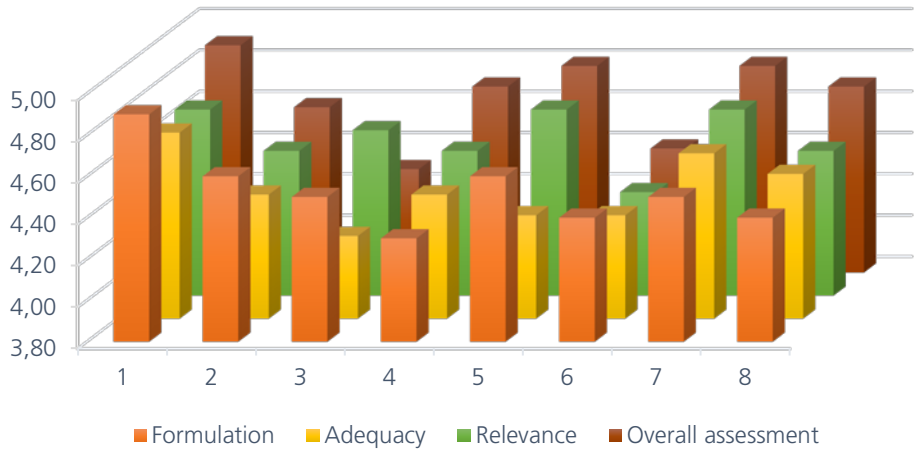
For the statistical analysis of the psychometric properties of the COVID-19-CFPQ, the statistical package SPSS in its version 25.0 and the AMOS program were used, considering the statistical analyzes with a significance level of $p< .05$. An EFA was performed by principal components and varimax orthogonal rotation to establish uncorrelated linear combinations of the observed variables. The Kaiser-Meyer-Oldin (KMO) sample adequacy index and the Bartlett Method were used, a choice that, in combination with the varimax rotation, can give rise to correlated scores. Subsequently, following the guidelines of Merenda (2007) for the validation of instruments, a CFA was used with the maximum likelihood extraction method to provide the estimates of the parameters that the correlation matrix has most likely produced. observed. This data extraction method was chosen because it allows the fit of the model to the data to be contrasted with an indicator associated with a χ^2 distribution, which makes it one of the best options (López-Aguado & Gutiérrez-Provecho, 2019). For the evaluation of the fit of the model, the following indices were used: root mean square error of approximation (RMSEA), and the comparative fit index (CFI), Tuker-Lewis index (TLI) and normed fit index (NFI) On the other hand, it was verified that the matrix was not affected by the common variance bias through Harman's single factor test. On the other hand, normality was calculated (obtaining a multivariate normal distribution) and the internal consistency of each factor using Cronbach's alpha.

Results

Content and comprehension validity

For the evaluation rubric of the questionnaire by the expert judges, it was decided to develop a Likert-type scale with 5 response options, and to dispense with open questions, since they make the evaluation and control of the answers very difficult. Once the scale was built, and in order to define the degree to which the elaborated questionnaire adequately represents what has been done (content validity), the content was validated by the 8 expert judges, indicating the degree of precision in its formulation and its adequacy due to its definition and wording (1= not at all appropriate; 5= totally appropriate) and the degree of relevance to the content under study (1= not at all relevant; 5= totally relevant). Figure 1 shows the averages of the assessment of the expert judges in each of these aspects. Once the feedback from the judges was obtained, certain items raised in the 42-item Q-initial were modified and/or eliminated, specifically, those items in which 3 or more experts agreed to point out some inconvenience in the design of the question that could give rise to confusion, and the items that presented a global assessment of less than 3 or an adequacy and relevance equal to or less than 3, coincident by more than 3 experts.

Figure 1
Quantitative results of the validation by (8) expert judgment of the questionnaire



Assuming that the three variables (formulation, adequacy and relevance) have equal weight in the validation of the content of the questionnaire, the assessments generated the following measures of central tendency: x= 4.3, between quite adequate and relevant (4) and totally adequate and pertinent (5), with S*(x)*= 0,5253; M_e= 4 (fairly adequate and relevant) y M_d= 4 (fairly adequate and relevant). It is evident that at least 89% of the evaluations were found between the categories of quite and totally adequate and pertinent. On the other hand, at least 25% (f= 2) of them suggested deletions and/or modifications in the formulation of 9 of the pre-questionnaire items, with the following suggested modifications:

-Item 3: "I think that stress or worry decreases the immune system and influences the risk of contagion by COVID-19". Reformulated, referring only to stress.

-Item 6: "It is vital that the government punish citizens with social distancing measures as it would stop the spread of the virus." It must be reformulated so that extremist responses are not given.

-Item 9: "I distrust the information received from the government about COVID-19". Reformulated, eliminating the government and referring to government information channels without a negative character.

-Item 15: "Because I and my family members have a good lifestyle, I think we have little chance of being infected by COVID-19." Reformulated in infinitive and impersonal.

-Item 16: "I think that fumigation or chemical trails in the sky can influence having a certain risk of contagion to the virus." Removed due to lack of relevance to the content.

-Item 19: "I think that the electrical networks can influence having a certain risk of contagion to the virus." Removed due to lack of relevance to the content.

-Item 22: "I prefer to wash my hands or use hand sanitizer after shaking someone's hand to avoid contagion." Reformulated, modifying the wording more directly.

-Item 26: "Receiving and opening a package from China increases the risk of contagion by the coronavirus". Reformulated with a different statement in which no country is indicated.

-Item 27: "I am sure that if I am careful I will not get infected if I go with a large group of people." Reformulated, adjusting it to the dominant category of the construct: social distancing and no psychological impact and perceived behavioral control.

For the validity of comprehension, a pilot study was carried out in which the degree of understanding of 55 subjects, belonging to the university community, who were intentionally administered the questionnaire via Google Forms (for accessibility to the sample) was assessed, in the last section of the final questionnaire there was an open question in which they had to record questions or doubts related to its completion. It was decided to eliminate items 5 and 21 because they presented the same response in more than 90% of the sample (High Response Frequency, HRF), and to eliminate items 37, 39 and 41 because the response percentage was It was situated between the answers "disagree" and "agree", that is, "neither agree nor disagree", since it was higher than 22% (Response Frequency Analysis, RFA).

Table 1 shows, on the one hand, the magnitude of the changes made to the pre-questionnaire by comparing the items and constructs between its Pre-Q and Q-final version, reflecting the causes of elimination of those that have been rejected or modified. On the other hand, the final Q shows the average (1-5) of the experts' assessment of each of the items resulting from the questionnaire.

Reliability

In the pilot study, the initial-Q consisting of 42 items was given to 55 subjects to assess their degree of understanding. Subsequently, the Pre-Q was administered to the 427 participants, consisting of 35 items (eliminating items 5, 16, 19, 21, 37, 39 and 41 from the initial-Q), following the elimination criteria that can be seen in the Figure 3, obtaining a Cronbach's alpha coefficient of .571 for the 35 items. Table 2 shows the item-test correlation and the Cronbach's alpha of each item if it is deleted.

Table 1

Evaluation of the experts and comparison of the modifications made between the pre-questionnaire and the final questionnaire

Items within each factor of the pre version of the questionnaire (35 ítems)				Items (M) within each factor of the final questionnaire (20 ítems)			
MI	SD	IP	EP	MI	SD	IP	EP
1	2	3[a]	4	**1** (4.3)	2 (3.9)	3 (4.2)	4 (4.3)
5[b]	6[a]	7	8	**9** (4.3)	**6** (3.5)	7 (3.8)	**8** (4.8)
9[a]	10	11	12	13 (4.3)	10 (4.1)	11 (4.4)	12 (5)
13	14	15[a]	16[c]	17 (4.7)	**14** (4.4)	15 (4.5)	**23** (4.3)
17	18	22[a]	19[c]	20 (4.1)	18 (4.8)	**22** (4.3)	**26** (3.6)
20	21[b]	30	23	24 (4.4)	25 (4.7)	**30** (4.7)	**31** (4.7)
24	25	34	26[a]	28 (4.8)	27 (3.5)	34 (4.6)	**35** (4.7)
28	27 [a]		31	**32** (4.6)	**29** (4.5)		40 (4.6)
32	29		35	38 (4.7)	**33**(3.5)		**42** (4.3)
37[d]	33		40		36 (3.9)		
38	36		42				
	39[d]						
	41[d]						
9 items	10 items	7 items	9 items	6 items	6 items	5 items	3 items

Notas: MI= Measurements and Information; SD= Social Distancing; PI= Psychological Impact and less perceived behavioral control; EP= Exposure and Protection. [a]Item eliminated due to response frequency analysis; item removed for high response frequency; [b]item removed for high response frequency; [c]item eliminated due to global evaluation of experts less than an average of 3; [d]item modified due to relevance, adequacy due to its definition or precision in its formulation. In bold those items that were suppressed because they did not fit the existing literature and because of their reduced size reliability after applying Cronbach's alpha coefficient.

Table 2 shows that the scores for items 1, 5, 7, 8, 13, 18, 19, 22, 25, 26, 27, 28, 29, 31 and 35 are not strongly related to the total score. of the test, so it was decided to remove these elements below an item-test correlation of less than 0.165 to achieve an appropriate Cronbach's alpha, obtaining a Cronbach's alpha coefficient of .861 for the 20 items of the Q-final, assuming unidimensionality. Some authors (George & Mallery, 2003; Gliem & Gliem, 2003) consider that values greater than .700 are adequate. On the other hand, item/test correlations were established for each dimension, with items 1, 5, 7, 8, 13, 18, 19, 22, 25, 26, 27, 28, 29, 31 and 35 below item-test correlation less than 0.165, as in the test in which unidimensionality was assumed. Table 3 shows the total score of the test and the item-test correlation of the 20 items of the Q-final.

Table 2
Test score and its item/test correlation with the 35 Pre-Q items

Item	Scale mean if suppressed	Scale variance if suppressed	Total element correlation corrected	Cronbach's alpha if deleted
1	78.4085	82.562	-.291	.608
2	79.0000	73.073	.198	.557
3	79.1901	70.653	.374	.538
4	79.1268	73.819	.166	.561
5	78.3052	82.302	-.274	.608
6	78.9343	68.814	.451	.526
7	78.3521	78.323	-.063	.585
8	78.2183	74.468	.157	.562
9	79.1526	71.010	.317	.543
10	79.0141	66.574	.614	.508
11	79.5469	71.886	.310	.545
12	79.1643	72.599	.253	.551
13	79.0305	79.103	-.107	.589
14	78.8310	72.051	.271	.549
15	78.0305	73.959	.215	.557
16	79.6408	73.600	.230	.555
17	78.8052	72.811	.283	.549
18	78.0962	78.322	-.062	.584
19	79.3451	74.269	.191	.559
20	79.3638	73.136	.284	.550
21	79.3498	72.162	.342	.544
22	79.5352	76.955	.030	.574
23	79.7113	74.022	.229	.556
24	79.1526	72.257	.254	.551
25	77.7277	80.476	-.209	.592
26	77.8028	79.552	-.139	.587
27	79.5587	77.278	.015	.575
28	79.1268	80.309	-.169	.598
29	78.9883	76.200	.034	.577
30	79.2113	69.395	.469	.528
31	79.5962	74.444	.195	.559
32	78.6808	71.865	.256	.550
33	78.6033	73.054	.204	.556
34	79.7230	73.749	.226	.555
35	78.2160	80.334	-.175	.596

As for the reliability analysis of each dimension, a Cronbach's alpha of .829 was obtained for the Social Distancing and Protection (SDP) dimension, .780 for the Perceived Psychological Impact (PPI) dimension, and .714 for the dimension Skepticism (S), and .707 for the Credibility of Information Perceived (CIP) dimension. Therefore, with a Cronbach's alpha coefficient of .861 for the 20 items, the dimensions oscillating between .707 and .829. As this coefficient is close to 1, it can

be determined that the questionnaire developed has a high reliability, so the measurement is reproducible. On the other hand, the method of the two halves was applied, obtaining appropriate scores, a value of .762 in the first and a value of .775 in the second.

Table 3

Total test score and its item/test correlation with the 20 items of the Q-Final

	Scale mean if suppressed	Scale variance if suppressed	Total element correlation corrected	Cronbach's alpha if deleted
1	40.5399	105.402	.367	.858
2	40.7300	107.703	.302	.861
3	40.6667	102.660	.506	.853
4	40.4742	105.389	.385	.858
5	40.6925	99.908	.632	.847
6	40.5540	103.932	.476	.854
7	41.0869	101.609	.621	.848
8	40.7042	102.501	.550	.851
9	40.3709	104.992	.409	.857
10	39.5704	110.641	.194	.864
11	41.1808	104.694	.502	.853
12	40.3451	108.655	.293	.860
13	40.9038	109.697	.257	.861
14	40.8897	105.816	.465	.854
15	41.2512	105.953	.477	.854
16	40.6925	99.592	.659	.846
17	40.7512	106.512	.374	.858
18	40.2207	101.862	.518	.852
19	40.1432	104.128	.433	.856
20	41.2629	103.446	.580	.850

Construct validity

First, an EFA was performed with 55 subjects, by extracting principal components with Varimax orthogonal rotation, to minimize the number of variables that have high loads on each factor, simplifying the interpretation of the factors by themselves. correlations are null or small. The Kaiser-Meyer-Oldin (KMO) sample adequacy index reaches a value of .838 and the Bartlett sphericity test is 3171.472 (*df*=900, *p*= 0,000), which indicates the adequacy of the data. The Kolmogorov-Smirnov normality test was performed, obtaining adequate values in all cases (*p*> .05). These data reject the null hypothesis that the inter-item correlation matrix is the identity (the intercorrelations between the variables are zero), considering the relationships between the responses.

On the other hand, following the abscissa axis of the sedimentation graph, and taking into account the drop contrast criterion, four factors were selected, since the rest of the variance factors tend to stabilize. Likewise, using the Kaiser rule, the eigenvalues greater than 1 also turned out to be four. On the other hand, the Harman Single Factor Test was carried out to check if the matrix is affected by the common variance bias, since it is not, Since the total variance for a single factor is less than 50%, all the variables analyzed were not grouped into a single factor. Once the main components have been analyzed, and after the varimax rotation, including the 20 items that make up the questionnaire, the convergence in four factors explains 53.05% of the variance, showing appropriate values of the items that range between .303 and .859, as can be seen in Table 4.

Table 4

Total explained variance of the questionnaire and goodness-of-fit test

	Initial eigenvalues			Sums of the squared saturations of the extraction		
Factor	Total	Variance %	Cumulative variance %	Total	Variance %	Cumulative variance %
1	5.823	29.115	29.115	5.823	29.115	29.115
2	2.433	12.163	41.278	2.433	12.163	41.278
3	1.414	7.069	48.347	1.414	7.069	48.347
4	1.272	6.360	54.707	1.272	6.360	54.707

Following the percentages of variance that explain each factor, the factors manage to explain 54.70% of the variability of the construct, being an appropriate percentage. The first factor explains 29.11% of the variance of the information collected, the second factor 12.16%, the third factor 7.06%, and the fourth factor 6.36%.

The analysis detects the four latent factors that had been pointed out by the literature and that explain 54.70% of the common variance, describing the goodness of fit of this four-factor structure calculated through a hypothesis test with a χ^2 distribution.

On the other hand, for the interpretation of the factors, we started from the initial matrix of rotated components. As can be seen in Table 4, these components determined different factor saturations for the selection of the items included in each of the 4 factors. To interpret the extracted factors, Table 5 presents the rotated component matrix with the factor saturations that express the magnitude of the correlation between the item and the factors, ordered by size and suppressing small coefficients, with a low absolute value of .30.

Table 5
Variables of each factor in the matrix of rotated components

Items	1	2	3	4	C
11. Pienso que la pandemia solamente afecta si se mantiene contacto con personas mayores o con personas con enfermedades crónicas.	.748				60%
3. Pienso que si voy por la calle sin mascarilla no pongo a nadie en riesgo de contagio.	.732				55%
18. No me importaría ir a zonas rurales poco transitadas sin mascarilla ya que no supone ningún riesgo de contagio.	.671				50%
16. Pienso que el gobierno y los medios hablan de demasiadas medidas de contención que no son necesarias para evitar contagios.	.646		.303	.652	62%
7. El uso de mascarillas no sirve como medida para evitar contagios.	.615		.469		62%
8. Pienso que el desconocimiento genera una psicosis colectiva que induce al miedo que puede maximizar innecesariamente el riesgo de contagio.	.613	.308		.647	51%
20. La posibilidad de infectarte por otra persona sin o con mascarilla es la misma.	.581		.465		67%
19. Intento deliberadamente no ver las noticias ya que pienso que la información sobre la propagación de la COVID-19 puede ser contradictoria.	.569			.645	56%
5. Pienso que la obligación de quedarse en casa no evita la propagación de la COVID-19.	.552		.314		61%
4. Pienso que la depresión por la situación pandémica puede influir en el riesgo de contagio por COVID-19.		.859			74%
6. Pienso que el impacto psicológico negativo producido por la COVID-19 puede aumentar el riesgo de contagio.		.848			78%
2. Pienso que el estrés influye en el riesgo de contagio por COVID-19.		.821			70%
9. Tener un estilo de vida saludable disminuye las posibilidades de contagio por COVID-19.	.460	.590			48%
17. La pandemia del COVID-19 me ha hecho sentir peor de lo que estaba antes y creo que ha influido en mi sistema inmune, aumentando mi riesgo de contagio.	.309	.575			44%
13. He leído artículos de revistas científicas con respecto a la COVID-19 y no sé si el riesgo de contagio es alto o bajo.			.718		62%
15. Estoy seguro de que no me voy a contagiar si me voy con mi grupo de amistades.			.678		65%
14. Pienso que son inútiles las acciones personales que está tomando la población para intentar limitar la propagación del coronavirus.			.605		52%
10. Pienso que la población no está bien informada sobre la situación política y social relacionada con frenar la COVID-19.				.642	60%

Items	1	2	3	4	C
12. He escuchado charlas en internet de expertos en la materia y existe controversia sobre las causas de riesgo de contagio.			.618	.620	51%
1. Pienso que es innecesaria la restricción de movimiento de ciudadanos para frenar la propagación de la COVID-19.			.615		67%

Notes: Q-final items sorted by correlation size between item/factor. C= Communalities (principal components analysis).

Regarding the communalities, the model can fully reproduce the variability of most of the items in appropriate proportions in each case, with the exception of items 9 (48%) and 17 (44%), the rest of the items have an average of 60.15%,

Considering the similarity of the items that correlate with each factor, in Table 5 we see that the items that correlate the highest with factor 1 are, in descending order, items 11, 3, 18, 7, 20 and 5, with a factor loading between .552 and .748; with factor 2 items 4, 6, 2, 9 and 17 with a factorial load between .575 and .859; with factor 3 items 13, 15, 14 and 1 with a factorial load between .615 and .718; and with factor 4, items 16, 8, 19, 10 and 12 with a factorial load between .620 and .652. Therefore, it is interpreted that the items that have been extracted for each factor have acceptable loads and that the four factors can be constituted as 4 one-dimensional scales that represent more than 54% of the variance.

The denomination of the factors found has been determined from the elements that constitute it, these being the following:

FACTOR 1: SOCIAL DISTANCING AND PROTECTION (SDP). Elements related to the safety distance and the use of masks. It describes the factors of influence that the population perceives related to maintaining a safe distance and the use or not of a mask as a protective element.

FACTOR 2: PERCEIVED PSYCHOLOGICAL IMPACT (PPI). It describes the stress and depression that the pandemic has generated and how the population relates this negative psychological impact as a causal risk factor for contagion.

FACTOR 3: SKEPTICISM (S). Elements related to the perception of self-control and security of the population regarding the risks of contagion. It describes the skepticism and risk perception assumed by the population in situations involving restrictions, personal actions or social distancing as contagion risk prevention measures.

FACTOR 4: CREDIBILITY OF PERCEIVED INFORMATION (CPI). It describes the insecurity and the credibility of the population towards the content related to COVID-19 transmitted by the government and by the media.

Second, a Confirmatory Factor Analysis (CFA) was carried out with 427 subjects, in order to know the resulting factorial structure in the EFA, to check if said previous theoretical structure fits the data through hypothesis contrasts. It was verified that the matrix was not affected by the common variance bias through Harman's Single Factor Test. However, 3 models were tested to check the factorial validity of the questionnaire.

In the first model, the factorial structure of the model was analyzed with a single latent factor, introducing the 20 items of the questionnaire as reagents, with a single first-order global factor, showing the factorial structure regression weights between .34 and .75.

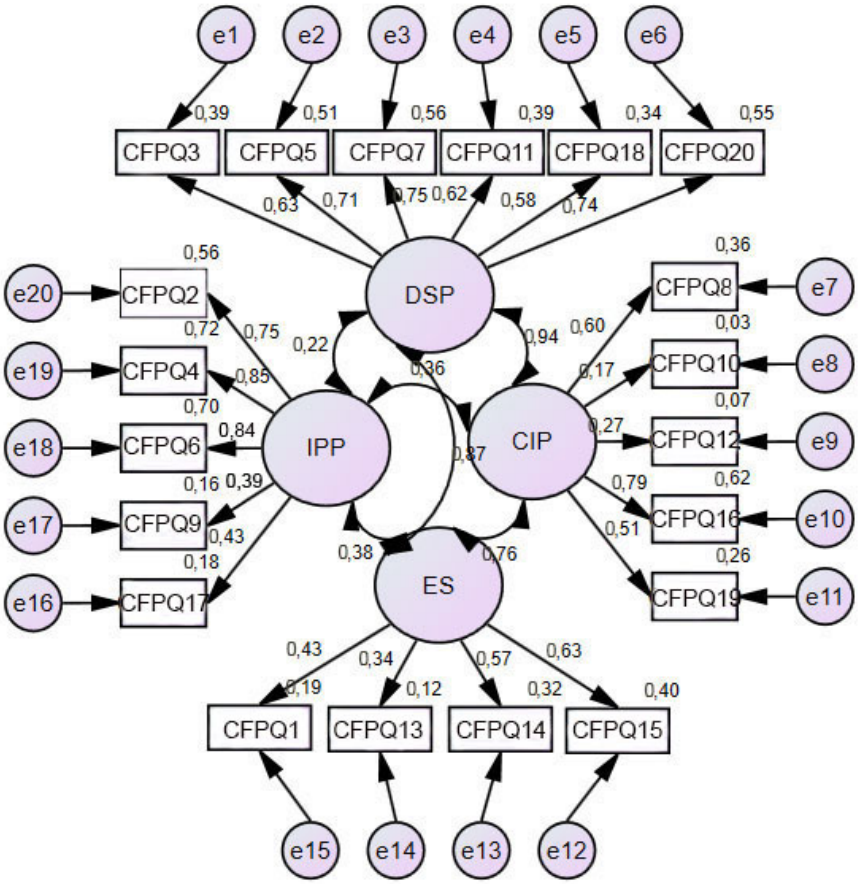
In the second model, the factorial structure of a model with five correlated latent factors was analyzed, grouping the 20 items into 1 first-order factor and 4 correlated second-order factors, with the regression weights ranging between .52 and .94 between the 4 second-order factors and the first-order factor, the correlations between the second-order factors between .27 and .88, and between the 4 second-order factors and their items between .17 and .87 (between .50 and .79 for the SDP factor, between .44 and .87 for the IPP factor, between .34 and .62 for the S factor, and between .17 and .82 for the CPI factor).

Finally, in the third model, the 20 items were grouped into 4 correlated first-order factors, with the regression weights oscillating between the first-order factors between .22 and .94 and the correlations between the four factors and their items between .17 and .85 (between .58 and .75 for the DSP factor, between .39 and .85 for the IPP factor, between .34 and .63 for the ES factor, and between .17 and .79 for the CIP factor) (Figure 2).

After the analysis of the correlations between the items and the factors, there is evidence that the proposed factorial models could be rejected. To confirm this, Table 6 evaluates the quality measures of the fit of said model to see if fit the data. For the evaluation of the fit of the model, the following indices were used: on the one hand, the RMSEA was used, considering the model with a good fit if the RMSEA is less than .06 (Hu and Bentler, 1999); on the other hand, χ^2/df was used, considering values lower than 5 as acceptable, and the CFI, TLI and NFI considered by Hu and Bentler (1999) as acceptable values above .90, and excellent if they exceed .95.

Table 6 shows the fit indices obtained in the 3 proposed models, observing how adequate fit indices were obtained in the 4-factor model. Table 6 shows that after the results of the maximum likelihood method and the eigenvalue criterion >1, with 0 being the significance associated with Chi-square (354,652), it is possible to verify the adjustment of the data to the 4-factor model, presenting an NFI and PNFI greater than .90, obtaining values that ranged between 0.83 and 0.91 in all indices, being considered acceptable.

Figure 2
Factorial structure of the model with four correlated latent factors



Note: CFPQ= COVID-19 Causal Factors Perception Questionnaire; SDP= Social Distancing and Protection; PPI= Perceived Psychological Impact; S= Skepticism; CPI= Credibility of Perceived Information.

Table 6
Quality of fit measures in three models

Models	Absolute fit measurements		Incremental adjustment measures			Parsimony adjustment measures			
	χ^2	RMSEA	CFI	TLI	NFI	PRATIO	PCFI	PNFI	AIC
1 Factor	0	0,079	0,884	0,846	0,765	0,895	0,831	0,876	585,880
5 Factors	0	0,086	0,785	0,754	0,746	0,889	0,683	0,649	947,830
4 Factors	0	0,057	0,893	0,880	0,914	0,893	0,837	0,911	426,389

Note: RMSEA= root mean square error of approximation; CFI= comparative fit index; TLI= Tuker-Lewis index; NFI= normed fit index, PRATIO= parsimony ratio; PCFI= comparative parsimony fit index; PNFI= parsimony normed fit index; AIC= Akaike´s criterion of information.

Convergent validity

Construct validity is divided into convergent, discriminant, and nomological. Convergent validity refers to the fact that the measures of the same concept must be more closely related than the measures of different concepts, which in turn constitutes discriminant validity (Campbell & Russo, 2001). Table 7 shows the bilateral bivariate correlations between the 4 factors of the Q-final and its items through the Pearson correlation coefficient.

Table 7 shows appropriate correlation coefficients, between .71 and .78 for the SDP dimension, between .60 and .84 for the IPP dimension, between .58 and .72 for the S dimension, and between .47 and .73 for the CPI dimension, the latter being the lowest correlation between items/factor.

Table 7

Correlations between the factors of the Q-final and its items

Factors	Items of each factor					
SDP	Item 7	Item 3	Item 20	Item 11	Item 18	Item 5
	.788	.750	.745	.718	.713	.712
PPI	Item 6	Item 4	Item 2	Item 9	Item 17	
	.849	.823	.770	.601	.601	
S	Item 15	Item 14	Item 1	Item 13		
	.729	.674	.611	.580		
CPI	Item 16	Item 19	Item 8	Item 12	Item 10	
	.733	.705	.656	.520	.473	

Note: SDP= Social Distancing and Protection; PPI= Perceived Psychological Impact; S= Skepticism; CPI= Credibility of Perceived Information.

Descriptive analysis, internal consistency and normality

In Table 8, a descriptive analysis was carried out, showing descriptive statistics such as normality and internal consistency in relation to the 4 Pre-Q constructs and the factors of the 4-factor model of the Q-final after its validation of construct through the AFE and AFC.

Following the means of the variables, the Social Distancing and Protection (SDP) construct of the Q-final obtained a mean with higher scores (.82), the PI constructs of the Pre-Q and IPP of the Q-final obtained means significantly lower, although the protection construct of the Pre-Q and CPI of the Q-final obtained a lower mean. Regarding normality, according to Curran, West and Finch (1996), all the variables complied with univariate normality, since the asymmetry and kurtosis values were below 2 and 7, respectively. On the other hand, an acceptable internal consistency was obtained, since all the factors obtained a Cronbach's alpha coefficient greater than .70 with the exception of the CPI construct with .68.

Table 8
Descriptive statistics, normality and internal consistency

Factors	*M*	*DT*	kurtosis	Asymmetry	α
Pre-Q Factors					
Measurements & Information (MI)	14.39	3.46	-.16	.35	.71
Social Distancing (SD)	11.97	3.97	-.45	.56	.72
Psychological Impact (PI)	11.08	3.83	-.43	.33	.78
Exposition & Protection (EP)	8.92	2.94	.57	.92	.74
Q-final Factors					
Social Distancing & Protection (SDP)	11.63	4.60	-.30	.79	.82
Perceived Psychological Impact (PPI)	11.07	3.83	-.43	.33	.78
Skepticism (S)	6.93	2.39	1.03	1.05	.71
Credibility of Perceived Information (CPI)	12.50	3.19	-.33	.35	.70

Discussion

This research has focused on the description of the process of construction, design and validation of a questionnaire developed ad hoc to find out the perceptions of the population about the causes attributed to COVID-19. The objective of this article was to analyze the validity and reliability of the items, answering the following questions: do they measure what they intend to measure? (validity) and, with what precision are these measurements obtained? (reliability).

The results demonstrate the validity of the questionnaire, so, on the one hand, the items of each factor measure what they are intended to measure, the convergence in 4 factors explains 54.70% of the variance, showing appropriate values of the items ranging between .303 and .859. On the other, it has high reliability indices, the results yielded a Cronbach's alpha coefficient of .861 for the 20 items, with a confidence level of 95%, the Cronbach's coefficient oscillating between .707 and .829, obtaining very high scores. appropriate through the method of the two halves, with a value of .762 in the first and a value of .775 in the second, for which the reliability index obtained via internal consistency analysis is considered to be high. Since said coefficient is close to 1, it can be determined that the developed questionnaire has a high reliability, so the measurement is reproducible, so that the measurements are precise since the instrument does pass the reliability test, which allows knowing the population's perceptions about the causal factors of COVID-19 in a satisfactory way, in the sense that if we apply the instrument to the same subject or population it would produce similar results.

Most of the expert judges pointed out that the questions formulated were correct, being adequate and pertinent, and their contributions were mainly linked to improving the degree of understanding of the items for the subjects. Despite obtaining low ratings from the expert judges on some items, it was decided to maintain and slightly modify some items, due to the low rating. Once the intervention of the expert Thursdays is over, the important need to carry out pilot

studies to strengthen the information that the questionnaire is intended to obtain is highlighted. On the other hand, after the EFA and CFA, the items that constituted the 4 dimensions of the Pre-Q were modified, combining the Exposition and Protection factor (EP) with the Social Distancing factor (SD), generating the Social Distancing and Protection (SDP) dimension; the Measures and Information (MI) factor was modified in the Q-final including items related to insecurity and the credibility of the population towards the content related to COVID-19 transmitted by the government and by the media, generating the dimension Credibility of Perceived Information (CPI). Likewise, in the Q-final, a dimension called Skepticism (S) was established with elements related to the perception of self-control and security of the population regarding the risks of contagion. The correlation between the CPI and S dimensions is .76, high scores in the CIP and ES dimensions could determine the level of denialism of the population about their perception of the effectiveness of the restrictions or the use of a mask to stop the spread of the Covid-19; Finally, the items of the Pre-Q Psychological Impact dimension were significantly modified in the Perceived Psychological Impact dimension of the Q-final, describing, specifically, the perception of stress and depression that the pandemic has generated and how the population relates said negative psychological impact as a causal risk factor for contagion.

Regarding the relationships between the factors of the questionnaire, it is convenient to point out the high correlation coefficient found for factor 1 of Social Distancing and Protection (SDP) in the 4-factor model (between .58 and .75) and in the model of 5 factors (between .50 and .79). Factor 1 describes the influencing factors perceived by the population related to maintaining a safe distance and the use or not of a mask as a protective element. In this sense, Conway et al. (2020) analyzed the reaction or support towards restrictions or social distancing measures, and in the study by Akwa et al. (2020) they decided to include items related to the use of masks to avoid contagion risks. On the other hand, Choi et al. (2013) state that attitude towards an epidemic can be a significant mediator between risk perception and behavioral intention. According to Choi et al. (2013) a high level of risk perception influences attitude, which, in turn, impacts the behavioral intention of individuals. According to these authors, daily social distancing causes a modulating effect of perceived behavioral control between risk perceptions and behavioral intention. In this sense, the dimension "Perceived Psychological Impact" (PPI) also had an appropriate correlation coefficient in the 5-factor model (between .44 and .87) and in the 4-factor model (between .39 and .85). These findings are in line with previous studies (Ahmad et al., 2020; Akwa et al., 2020; Conway et al., 2020; Ding, et al., 2020; Zhong et al., 2020), verifying how these variables belonged to the same theoretical network of relationships. Therefore, these results indicate an adequate factorial validity of the instrument, as stated by different authors in relation to the criteria to follow to check the validity of a questionnaire (Jackson et al*.,* 2009; Merenda, 2007). It can be concluded that the developed questionnaire has appropriate content validity, comprehension, construct and reliability data, so the instrument allows knowing the population's perceptions about the causal

factors of COVID-19 and their perception of the effectiveness of restrictions or the use of a mask to stop the spread of Covid-19, and can be used in various research.

Regarding the limitations and future lines of research, the responses to the questionnaire items may have different systematic effects of various natures that may compromise validity. The cause may lie in the questionnaire (response modalities) or in the *on-line* method of collecting information. On the other hand, having tested this questionnaire on a sample of Internet users and having calculated some correlations and published their results does not guarantee that it has been validated, since the questionnaire validation process involves a set of decisions based on contrasts of hypotheses correctly formulated and that has been applied in a different population in a broader way, so that in future research the reliability and validity should be checked with different samples. On the other hand, it is proposed that future research analyze whether there are differences between men and women regarding their perception of causal factors, since they can enhance the results obtained, as indicated by Froment et al. (2020). Regarding the factorial models, Caballo et al. (2010) recommend the use of exploratory structural equation models (ESEM) as an alternative to exploratory factor models to test which model has the best fit to the data. In future research that uses the questionnaire, it is suggested to pay special attention to the relationships found between the four factors of the questionnaire, so that, if high correlation coefficients are found, assess the possibility of using the four separate factors and respecify the factorial model. proposed to seek to improve the fit of a future model by suppressing those less significant relationships.

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Appendix
COVID-19 Causal Factors Perception Questionnaire (COVID-19-CFPQ)

Select the answer with which you feel most identified. Place a cross ["X"] on the number that best reflects you based on the scale below. We remind you that there are no right or wrong answers, just express your opinion about the statements presented below *(the original questionnaire is published in Spanish if you want to consult it)*

Totally disagree	Disagree	Agree	Totally agree
1	2	3	4

1. I think it is unnecessary to restrict the movement of citizens to stop the spread of COVID-19.	1	2	3	4
2. I think that stress influences the risk of contagion by COVID-19.	1	2	3	4
3. I think that if I go down the street without a mask, I don't put anyone at risk of contagion.	1	2	3	4
4. I think that depression due to the pandemic situation can influence the risk of contagion by COVID-19.	1	2	3	4
5. I think that the obligation to stay at home does not prevent the spread of COVID-19.	1	2	3	4
6. I think that the negative psychological impact produced by COVID-19 can increase the risk of contagion.	1	2	3	4
7. The use of masks does not serve as a measure to avoid infections.	1	2	3	4
8. I think that ignorance generates a collective psychosis that induces fear that can unnecessarily maximize the risk of contagion.	1	2	3	4
9. Having a healthy lifestyle decreases the chances of contagion by COVID-19.	1	2	3	4
10. I think that the population is not well informed about the political and social situation related to curbing COVID-19.	1	2	3	4
11. I think that the pandemic only affects if you maintain contact with older people or with people with chronic diseases.	1	2	3	4
12. I have listened to talks on the internet by experts on the subject and there is controversy about the causes of risk of contagion.	1	2	3	4
13. I have read articles in scientific journals regarding COVID-19 and I do not know if the risk of contagion is high or low.	1	2	3	4
14. I think that the personal actions that the population is taking to try to limit the spread of COVID-19 are useless.	1	2	3	4
15. I am sure that I will not get infected if I go with my group of friends.	1	2	3	4
16. I think that the government and the media talk about too many containment measures that are not necessary to avoid contagion.	1	2	3	4
17. The COVID-19 pandemic has made me feel worse than I was before and I think it has influenced my immune system, increasing my risk of contagion.	1	2	3	4
18. I would not mind going to rural areas with little traffic without a mask since it does not pose any risk of contagion.	1	2	3	4
19. I deliberately try not to watch the news as I think the information about the spread of COVID-19 may be contradictory.	1	2	3	4
20. The possibility of being infected by another person without or with a mask is the same.	1	2	3	4