Psychometric Properties of the COVID-19 Protective Motivation Scale in Peruvians During the Health Emergency

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Abstract

Objective: The COVID-19 protective motivation scale (EMP-COVID-19) has been developed for the assessment of protective motivation. This study aims to examine the psychometric properties of the EMP-COVID-19 for its application in the Peruvian community.

Methods: This is an observational, cross-sectional, instrumental design study, 483 adults (≥18 years) participated in the study, in 2 samples of 81 and 402 participants from the different macro-regions of Peru through an online survey using non-probabilistic sampling. Content validation was performed through expert judgment. Exploratory factor analysis (EFA) to evaluate the factor model of the EMP-COVID-19 was performed with the first sample. The confirmatory factor analysis (CFA) to verify the goodness of fit of the analysis found in the EFA was performed with the second sample. The examination of convergent and discriminant validity included peer evaluations of each EMP-COVID-19 dimension. Finally, the reliability of the instrument was evaluated using Cronbach’s Alpha coefficient.

Results: The 3-factor related model presents better fit indices (CFI = 0.99; TLI = 0.99; RMSEA = 0.077 [90% CI 0.069-0.085]) versus a unidimensional model (CFI = 0.91; TLI = 0.90; RMSEA = 0.206 [90% CI 0.199-0.213]). The scale present convergent and discriminant validity in all the dimensions Threat Appraisal (AVE = .57), Coping Appraisal (AVE = .81), and Response Costs (AVE = .67). The Coping Appraisal (α = .97; ω = .97), Threat Appraisal (α = .88; ω = .74), and Response Costs (α = .80; ω = .76) dimensions were also found to have adequate reliability indices.

Conclusions: The EMP-COVID-19 scale demonstrated adequate reliability and validity based on internal structure in the study sample.

Keywords

protective motivation, psychometric properties, health emergency, COVID-19, Peru

Introduction

The COVID-19 pandemic is one of the most recent public health problems with great political, economic, social, and sanitary impact around the world.¹,² According to the Coronavirus Resources Center at Johns Hopkins University, more than 192.7 million cases have been confirmed, while the number of deaths has risen to more than 4.139 million.³ It figures that indicate a deadly threat to humanity, which have changed the perception of the severity of infectious-contagious diseases and the way we deal with them.⁴

Peru, one of the countries with the highest mortality rate per million inhabitants due to COVID-19,⁵ declared a state of national emergency in order to efficiently protect the life and health of the population in March 2020. However, despite the efforts made to control the pandemic, these grew exponentially until reaching its peak of the first wave on August 22 with 8538 confirmed cases and 387 deaths.⁶ In September, the health crisis was announced and emergency policies were adopted, such as increased hiring of health personnel and curfew, restriction of private vehicles on Sundays, mandatory use of protective measures in public transport and establishments, among others.⁷

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In 2021, the second wave was even more aggressive, currently, although it is true that the number of deaths and infections has greatly been reduced, there is concern about the imminent arrival of the third wave, similar to the cases documented in European countries. Mandatory social distancing has been described as a strong predictor of reduction of new cases per day of COVID-19, however, a large percentage of citizens do not comply with these measures due to physical, social, emotional, and economic problems caused by confinement. Despite the fact that 19% of Peruvian population has already been immunized, the prevention of COVID-19 is the cornerstone for reducing future peaks of contagion.

Human motivation is influenced by different cognitive theories, which once applied help to prevent diseases and promote health. One of them is the protective motivation theory introduced by Rogers in 1975, which is defined as the current protective behaviors and attitudes that an individual has in the face of a threat, which can act as protective or risk factors for their health. The theory consists of 3 dimensions: (1) threat appraisal which in turn is influenced by perceived vulnerability (possibility of harm from a threat) and perceived severity (degree of harm generated by a threat), (2) coping appraisal comprised of response efficacy (an individual’s perception of the effectiveness of a recommended preventive behavior) and self-efficacy (an individual’s ability to execute a given behavior), and (3) response costs (economic, physical, or psychological consequences of a behavior).

There are some instruments based on protective motivation theory, one of them was applied to predict the preventive behaviors of healthcare workers in Iran. Furthermore, another study evaluated the factors affecting the perceived effectiveness of COVID-19 prevention measures in the Philippine community. Both instruments do not present their psychometric properties. Likewise, these instruments consider behavior and personal protective equipment according to the socio-cultural characteristics of each country. Currently, no standardized instruments have been found that present items appropriate to the Latin American culture, specifically to the Peruvian community, through which different projects on self-care and protection can be carried out, generating changes in health-related behaviors. The objective of this study is to examine the psychometric properties of the COVID-19 Protection Motivation Scale (EMP-COVID-19) in a Peruvian population during the health emergency.

**Methods**

This cross-sectional study was conducted in adult Peruvians from the different macro-regions of Peru: North, Central, South, East, Lima-Callao, and Peruvian overseas. Data were collected using the non-probabilistic convenience sampling method between September and October 2020 during the COVID-19 health emergency. Inclusion criteria were: (1) Be willing to participate in the present study, (2) Be older than 18 years of age, and (3) Be a Peruvian citizen.

The study was approved by the Ethics Committee of the Universidad Peruana Unión (reference number was 2020-CEUUPeU-00040). Participants were informed in writing about the objective of the research study in the first section of the virtual survey; likewise, it was explained that their participation was anonymous and voluntary.

The study was divided into 2 stages: construction and validation of the EMP-COVID-19 scale. The initial scale considered 18 items adapted from the instrument to predict prevention behaviors toward COVID-19 in health care workers in Iran, and 5 items from the instrument to assess the perceived effectiveness of COVID-19 prevention measures in the Filipino community. For the development and initial adaptation of the scale, authorization was obtained from the aforementioned authors and contact was maintained during the construction and validation process.

The initial EMP-COVID-19 scale has a total of 23 items assesses the 3 dimensions of protection motivation: (1) threat appraisal (EAm) with its subdimensions perceived vulnerability and perceived severity, (2) coping appraisal (Eaf) with its subdimensions response efficacy, self-efficacy and intention to follow, and (3) response costs (CR). It was evaluated with a 5-point Likert scale (1. strongly disagree; 2. disagree; 3. neither agree nor disagree; 4. agree; 5. strongly agree). The formula (Eam + Eaf − CR), was used to evaluate protection motivation, meaning that the higher the score, the higher the participant’s protection motivation.

The instrument was submitted to content validation, for which the content evaluation format, the scale (EMP-COVID-19), the conceptual definition of the construct and the operationalization of the construct were sent to several expert judges (psychologists, physicians with degrees in public health and infectious diseases), of whom responded and sent their suggestions and observations. After reformulating the items of the instrument, we proceeded to collect the sample for the analysis of the psychometric properties.

For pilot and field test, data were obtained through a virtual survey using the Google Forms platform and the instrument was the COVID-19 Protective Motivation Scale (EMP-COVID-19). In the pilot and confirmatory sample, 81 and 402 adults participated, respectively. For the confirmatory study, Soper’s online calculator was used, taking into account the following criteria: eighteen observed variables, 2 latent variables, anticipated effect size of .30 (minimum lambda value for factorial models), desired probability of .05, and a power level statistic of .95. The minimum size required was 200 cases. Therefore, the present study collected a sample of participants that far exceeds the minimum required.
Table 1. Sociodemographic Characteristics.

| Demographics       | Pilot sample (n=81) | Confirmatory sample (n=402) |
|--------------------|---------------------|----------------------------|
|                    | n (%)               | n (%)                      |
| **Sex**            |                     |                            |
| Woman              | 57 (70.4)           | 247 (61.4)                 |
| Man                | 24 (29.6)           | 155 (38.6)                 |
| **Age (years old)**|                     |                            |
| 18-29              | 66 (81.5)           | 154 (38.3)                 |
| 30-39              | 1 (1.2)             | 77 (19.1)                  |
| 40-49              | 6 (7.4)             | 19 (4.7)                   |
| 50-59              | 5 (6.2)             | 69 (17.2)                  |
| ≥60                | 3 (3.7)             | 43 (10.7)                  |
| **Educational level** |                 |                            |
| Secondary and below| 19 (23.5)           | 43 (10.6)                  |
| Technical superior  | 2 (2.5)             | 47 (11.7)                  |
| University (superior) | 55 (67.9)      | 272 (67.7)                 |
| Postgraduate       | 5 (6.2)             | 40 (10.0)                  |
| **Monthly income (PEN)** |                 |                            |
| ≤999               | 55 (67.9)           | 175 (43.5)                 |
| 1000-1999          | 11 (13.6)           | 82 (20.4)                  |
| 2000-2999          | 8 (9.9)             | 63 (15.7)                  |
| ≥3000              | 7 (8.6)             | 82 (20.4)                  |
| **Residence**      |                     |                            |
| Lima and Callao   | 52 (64.2)           | 232 (57.7)                 |
| Northern region    | 8 (9.9)             | 55 (13.7)                  |
| Central region     | 3 (3.7)             | 17 (4.2)                   |
| Southern region    | 14 (17.3)           | 73 (18.2)                  |
| Eastern region     | 3 (3.7)             | 19 (4.7)                   |
| Peruvian overseas  | 1 (1.2)             | 6 (1.5)                    |

Results

Table 1 shows the sociodemographic data of the study samples. In the Pilot sample, 81 participants were surveyed, including 24 males (29.6%) and 57 females (70.4%). The majority had an age range between 18 and 29 years old (81.5%). About 67.9% had a university (superior) level of education. The monthly income of the majority was less than S/.1000 (67.9%). In addition, all macro-regions were represented, with Lima and Callao being the most represented region (64.2%). On the other hand, in the Confirmatory sample, 402 participants were surveyed, among them 155 men (38.6%) and 247 women (61.4%). The majority had an age range of 18 to 39 years old. In this group, 67.7% had a university (superior) level of education. There were more participants residing in Lima and Callao (57.7%) than in the other macro-regions (42.3%). The average monthly income with the highest representation in the Confirmatory sample was less than S/.2000 (63.9%).

The content validity carried out by a panel of experts evaluated the items of the scale in terms of clarity, congruence, context, and domain of the construct. All the items received a favorable evaluation from the experts with a recommendation to modify some personal protection accessories such as “the use of gloves” for “the use of alcohol,” which is more commonly used in the Peruvian community and it is part of the protection plan established by the country’s health policies. With respect to the clarity of the items of the threat assessment factor, the term “contracting” was modified to “infecting” (Table 2).

An exploratory factor analysis of the items was performed with data from a pilot sample, where the parallel analysis (PA) showed the existence of 3 factors that explained 62.3% of the variance of the construct. In addition, most of the items evidenced a high factorial weight (λ >.60) in their own factor. However, item 1 presented a very low factorial weight (λ <.30) and did not enter the factor that it corresponded to theoretically. Also, items 6 (.52), 8 (.38), and 22 (.34) presented a considerable factorial weight in another factor. These items were revised and their wording was improved, for example, item 1 (It is unlikely that I will get COVID-19), which was originally worded negatively, was changed to positive (It is likely that I will get COVID-19), which was originally worded negatively, was changed to positive (It is likely that I will get COVID-19) for the CFA.

In the exploratory factor analysis with the data from the larger sample, items 7, 8, 22, and 23 were eliminated because they presented a high factorial weight in a factor to which they theoretically did not belong. In this new exploratory factor analysis, the parallel analysis (PA) showed the existence of 3 factors. Table 3 shows that the remaining 19 items have high factor loadings (λ >.50) in their corresponding factor. In addition, the 3 factors explain 71.3% of the variance of the construct.

After confirmatory factor analysis the model with 3 related factors (Table 4) presents adequate fit indices...
Despite this, the presence of other plausible models was ruled out, this unidimensional model does not present adequate fit indices to the data (CFI = 0.92; TLI = 0.90; RMSEA = 0.206 [90% CI 0.199-0.213]). The Figure 1 shows the factor loadings of the items with each of their specific factors are significant and high for the most part.

In addition, the study showed that the scale has convergent validity since dimensions: Threat Appraisal (AVE = .57), Coping Appraisal (AVE = .81), and Response Costs (AVE = .67) present an adequate level of Average Variance Extracted (AVE > .50). Also, it can be seen in Table 5 that the 3 dimensions present an AVE coefficient greater than the correlation coefficients of the dimensions. Therefore, all dimensions have discriminant validity.

Finally, was evidenced that the Coping Appraisal (α = .97; ω = .97), Threat Appraisal (α = .88; ω = .74), and Response Costs (α = .80; ω = .76) dimensions present adequate reliability indices. The final scale is shown in Supplemental Appendix 1.

**Discussion**

The EMP-COVID-19 scale is one of the first instruments in Latin America that assesses the motivation to protect against COVID-19, an international health problem that has led to the death and contagion of a large part of the world’s population. There are studies that assess the motivation to protect against COVID-19, but their psychometric properties are not presented. The omega and Cronbach’s alpha coefficients for the factors of the EMP-COVID-19 were .74 to .97, which showed an appropriate reliability for the internal consistency of the study. These results are similar to studies applied to hospital staff in Iran and the Philippine community.16,17

### Table 2. Content Validity of the Scale.

| Items                                                                 | $V_{Cl}$ | $V_{Cong}$ | $V_{Con}$ | $V_{Dom}$ |
|----------------------------------------------------------------------|----------|------------|-----------|-----------|
| 1. Es probable que me contagie de COVID-19                           | 1.00     | 1.00       | 1.00      | 1.00      |
| 2. Existe la posibilidad de que mi familia se contagie de COVID-19   | 1.00     | 1.00       | 1.00      | 1.00      |
| 3. Es probable que en mi vecindario alguien se contagie de COVID-19  | 0.83     | 1.00       | 1.00      | 1.00      |
| 4. Existe la posibilidad de que las personas de cualquier edad se contagien de COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |
| 5. El COVID-19 puede afectar a muchas personas de mi comunidad en un corto periodo de tiempo | 1.00     | 1.00       | 1.00      | 1.00      |
| 6. El COVID-19 puede provocar la muerte                             | 1.00     | 1.00       | 1.00      | 1.00      |
| 7. Me preocupo cuando pienso en el COVID-19                         | 1.00     | 1.00       | 1.00      | 1.00      |
| 8. El brote de COVID-19 en mi país es más severo que en otros países | 1.00     | 1.00       | 1.00      | 1.00      |
| 9. Usar medidas de protección cuando tengo contacto con personas fuera de casa previene el COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |
| 10. Lavarse las manos frecuentemente con agua y jabón previene el COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |
| 11. La desinfección de superficies y equipos previene el COVID-19    | 1.00     | 1.00       | 1.00      | 1.00      |
| 12. Usar guantes fuera de casa puede prevenir el COVID-19            | 1.00     | 1.00       | 1.00      | 1.00      |
| 13. Usar una mascarilla fuera de casa ayuda a prevenir el COVID-19   | 1.00     | 1.00       | 1.00      | 1.00      |
| 14. Puedo evitar el dar la mano a las personas fuera de casa        | 1.00     | 1.00       | 1.00      | 1.00      |
| 15. Puedo evitar tocarme los ojos, nariz o boca después de haber tenido contacto con personas fuera de casa | 1.00     | 1.00       | 1.00      | 1.00      |
| 16. Puedo usar la mascarilla continuamente fuera de casa           | 1.00     | 1.00       | 1.00      | 1.00      |
| 17. Puedo usar guantes constantemente fuera de casa                | 1.00     | 1.00       | 1.00      | 1.00      |
| 18. Puedo lavarme las manos con agua y jabón después de tener contacto con personas fuera de casa | 1.00     | 1.00       | 1.00      | 1.00      |
| 19. Siento que es difícil protegerme del COVID-19                   | 1.00     | 1.00       | 1.00      | 1.00      |
| 20. Siento que usar las medidas de protección para protegerme del COVID-19 requieren de mucho tiempo | 1.00     | 1.00       | 1.00      | 1.00      |
| 21. Planeo seguir las precauciones recomendadas (lavado de manos, uso de mascarilla, etc.) hasta el final de la pandemia de COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |
| 22. Estoy dispuesto a quedarme en casa durante el brote de COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |
| 23. Estoy dispuesto a seguir cada regla hecha por mi gobierno durante el brote de COVID-19 | 1.00     | 1.00       | 1.00      | 1.00      |

Abbreviations: $V_{Cl}$, clarity; $V_{Cong}$, congruence; $V_{Con}$, context; $V_{Dom}$, domain.
Additionally, the results of the parallel analysis from the Pilot sample show that the EMP-COVID-19 can be represented by 3 factors: threat assessment (items 2-5), coping assessment (items 9-18, 21-23), and response costs (items 19, 20). In the EFA, it was observed that item 1 presented a very low factorial weight (λ < .30) and did not enter the factor that corresponded to it theoretically, this can be explained by the fact that item 1 was written in a negative sense, affecting the understanding of the question; in addition, it is important to mention that the contagion curve had decreased rapidly after the maximum peak, which could condition the attitude of the participants toward the pandemic, creating a feeling of collective immunity. It should be considered that the time of data collection influences the perception of threat assessment in each individual, so it is recommended that the time of data collection be considered in subsequent studies and be applied to larger sample sizes.

In the CFA, items 6 to 8, 22, and 23 were removed from the study because they did not fit their factor well. In addition, it was observed that when these items were removed there was a marked improvement in the RMSEA for the three-factor model. All the items that remained in the scale had factor loadings between .49 and .97 on their factor, demonstrating the adequate homogeneity of the items. All items explained 61.9% of the variance, which was above the minimum required standard (50%), indicating that it had adequate structural validity.

There are studies to evaluate COVID-19 preventive health behaviors, however, they consider multivariate models of several factors, evaluating each factor independently.

### Table 3. Exploratory Factor Analysis Using Confirmatory Sample.

| EMP-COVID-19 items | Factor loadings |
|--------------------|-----------------|
|                    | Factor 1 | Factor 2 | Factor 3 |
| PV1                | 0.71     |          |          |
| PV2                | 0.85     |          |          |
| PV3                | 0.85     |          |          |
| PV4                | 0.65     |          |          |
| PS5                | 0.59     |          |          |
| PS6                | 0.58     | 0.32     |          |
| RE9                | 0.81     |          |          |
| RE10               | 0.88     |          |          |
| RE11               | 0.96     |          |          |
| RE12               | 0.95     |          |          |
| RE13               | 0.94     |          |          |
| SE14               | 0.90     |          |          |
| SE15               | 0.83     |          |          |
| SE16               | 0.84     |          |          |
| SE17               | 0.96     |          |          |
| SE18               | 0.88     |          |          |
| IF21               | 0.86     |          |          |
| RC19               |          |          | 0.77     |
| RC20               |          |          | 0.85     |
| % Of variance explained | 0.487 | 0.153 | 0.073 |
| Cumulative % of variance | 0.487 | 0.64 | 0.713 |
| Overall MSA        | 0.950    |          |          |
| Bartlett’s test of sphericity | χ² = 41684 | df = 18 | P < .01 |

**Abbreviations:** MSA, measurement statistical analysis; PV, perceived vulnerability; PS, perceived severity; RE, response efficacy; SE, self-efficacy; IF, intention to follow; RC, response costs.

### Table 4. Model Fit Indices.

| Models | χ² | df  | P       | TLI | CFI  | RMSEA (90% CI) | SRMR |
|--------|----|-----|---------|-----|------|----------------|------|
| Model 1| 435.44 | 129 | .000   | 0.99 | 0.99 | 0.077 (0.069-0.085) | 0.040 |
| Model 2| 2364.38 | 132 | .000   | 0.92 | 0.09 | 0.206 (0.199-0.213) | 0.105 |

**Abbreviations:** Model 1, model with 3 related factors; model 2, unidimensional model; χ², Chi square; df, degrees of freedom; SRMR, standardized root mean square residual; TLI, Tucker-Lewis Index; CFI, Comparative Fit Index; RMSEA, root mean square error of approximation.
Figure 1. Flow chart for the 3-factor model of the EMP-COVID-19 using the confirmatory sample, showing standardized loadings and correlations between factors.
However, although these studies were based on protective motivation, they only consider some dimensions and subdimensions of Rogers’ theory and add others to develop their study.

The instrument used by Farooq et al.²⁹ to assess the impact of online information on self-isolation intention during the COVID-19 pandemic considers a bifactor model, threat assessment, and coping assessment, including response costs in the coping assessment factor. This model is used by some studies. However, the three-factor model used in the scale could provide a complete understanding of the perception of protection motivation and be applied to different age groups due to its simple form of interpretation and the number of its items, in future cross-sectional research it would indirectly indicate where we should develop awareness projects on the importance of the use of preventive measures.

The study had the following limitations: (1) data collection was carried out through digital means due to the current health situation and the provisions proposed by the Peruvian government, (2) there is an over-representation of younger individuals (<30 years) and women, (3) the invariance of the scale according to age or sex was not evaluated, because in the sample the most of the participants were young people and women, (4) as well as the stability of the instrument over time through a test-retest, and (5) finally, the same sample was used to perform the EFA and CFA in the confirmatory study, which could produce overfitting of the model. Because of this, following the recommendations given in the scientific literature in the interpretation of the model, not only the fit indices were taken into account, but also the factor loadings, factorial covariances, standard errors and P-values.³⁰,³¹

### Table 5. Convergent and Discriminant Validity.

|               | Threat appraisal | Coping appraisal | Respond cost |
|---------------|------------------|------------------|--------------|
| Threat appraisal | 0.57⁹           |                  |              |
| Coping appraisal  | 0.41ᵇ           | 0.81ᵃ            |              |
| Respond cost     | 0.12ᵇ           | 0.01ᵇ            | 0.67ᵃ        |

³⁰Average variance extracted.
³¹Square root of the correlation coefficients of the dimensions.

### Conclusion

In conclusion, the EMP-COVID-19 demonstrated high and adequate internal consistency and validity based on internal structure. Additionally, the 3-factor model was considered as the model of choice compared to the unidimensional model. In view of the imminent arrival of a third wave of contagion in Latin America, this instrument will make it possible to evaluate the motivation to protect in the different Peruvian communities and age groups in order to carry out projects to raise awareness of the importance of using preventive measures and applying them to the most vulnerable groups, thus indirectly avoiding the collapse of health services and high rates of contagion and mortality.

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### Supplemental Material

Supplemental material for this article is available online.

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