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Adaptation and Validation of a Monkeypox Concern Instrument in Peruvian Adults

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Abstract: Monkeypox is causing great concern in society because of its great infective power and the possibility that it could become a new pandemic. This study aimed to adapt and validate the monkeypox concern scale in the Peruvian adult population (EP-VIR-MONK). An instrumental cross-sectional study was carried out under a non-probabilistic convenience sampling with 779 adults from the three regions of Peru (coast, highlands, and jungle). The instrument was adapted based on an instrument previously validated related to the concern caused by COVID-19 in Peru. Content-based validity was calculated with Aiken's V coefficient, internal structure with confirmatory factor analysis, and reliability with the omega coefficient. The first evidence of validity of EP-VIR-MONK based on its content, internal structure, and reliability in a sample of Peruvian adults is presented here. Accordingly, it can be helpful for the management of the prevention of mental health alterations resulting from the proliferation of monkeypox in Peru.

Keywords: validation study; monkeypox virus; Peru; monkey; smallpox; pandemic

1. Introduction

Monkeypox virus (MPXV) is a zoonotic double-stranded DNA virus with a 197 kb genome, a member of the genus Orthopoxvirus (OPV) and the family Poxviridae, which also includes the smallpox virus that causes the disease of the same name [1]. Monkeypox has recently begun to spread from central and western Africa [2], becoming a major threat with a high probability of worldwide expansion [3,4]. Given recent experiences with the COVID-19 pandemic, the population is again uncertain regarding this new public health threat [5]. Several studies have reported that monkeypox poses unique challenges, which is why prospective studies of antiviral drugs for this disease are being carried out [6,7]. Because of the announcement of the COVID-19 health emergency declared in March 2020, most of the population has already been showing concern about the progress of monkeypox and its impact on physical health [8] since the World Health Organization declared monkeypox a global health emergency after a significant increase in cases around the world [9,10].

Peru officially declared the fourth wave of COVID-19 in August 2022 [11], which coincided with 224 confirmed cases of monkeypox in eight regions of the country [12].

Because of the number of confirmed monkeypox cases, Peru is the country, after Brazil, with the second-highest increase in confirmed cases in the Latin American region [13]. Against this, psychological concerns are growing in the population since there are still no drugs or a specific vaccine against monkeypox infection [14–17]. Because of the 2017 monkeypox outbreak in Nigeria, fear and widespread panic may be on the rise because of the stigmatization and social exclusion of affected patients, survivors, and family members [18]. The reported mental health disorders in infected patients and vulnerable populations [19] is a continuous concern with emerging infectious diseases (EIDs) outbreaks, including the current COVID-19 pandemic [20–22].

The main physical manifestations caused by monkeypox are fever, headache, myalgia, skin rashes and superimposed infections, sepsis, encephalitis, and bronchopneumonia [23]. However, psychological manifestations such as fear and uncertainty have also been reported [23]. Given this, healthcare policymakers and clinicians in all professions must become aware of how the concern of the population may affect responses to viral epidemics, including the responses currently being taken to monkeypox. This could help to reduce the risk of mental health disorders with adequate recommendations for the early phases of the global outbreak.

Considering this scenario, it is essential to have valid and reliable measurement instruments that allow for an accurate assessment of the magnitude of the problem. However, there are still no proper instruments designed to measure the concern related to monkeypox. The instrument described in the current study was adapted based on an instrument previously validated for the concern caused by COVID-19 in Peru, which has shown good psychometric performance and been utilized in other studies [24]. Given the gap in the scientific literature and the importance of assessing monkeypox concerns, this report aims to adapt and validate the monkeypox concern scale in the Peruvian adult population (EP-VIR-MONK).

2. Methodology

2.1. Design and Population

The study is an instrumental-type cross-sectional study [25] under a non-probabilistic sampling for convenience. A total of 779 adults (56.2% women) between 18 and 58 years of age participated (23.62 ± 7.04 years), recruited in the three regions of Peru (42.1% mountains, 32.0% jungle, and 25.9% coast). The marital status of the respondents was single (47.5%), married (32.2%), cohabiting (19.6%), and widowed and separated (0.7%). Regarding the occupation, the majority of respondents work independently (54.4%; commerce, small and medium-sized companies) and, to a lesser extent, work as dependents (31.3%; employees, appointed, contracted). The inclusion criteria applied were being of legal age (over 18 years), providing informed consent, and completing the entire form.

2.2. Instrument

The instrument is shown in its original version (Spanish) and the translated version (English) in Appendix A. The instrument-adaptation process was carried out in stages. First, the items were adapted in time and context, based on the reagents of a scale previously validated in Peru [24]. Second, scrutiny was requested through the criteria of expert judges. For this, six healthcare professionals participated (two doctors, three psychologists, and one psychiatrist). They evaluated the items' clarity, relevance, and representativeness based on the proposed construct. Third, a focus group was carried out, in which 18 people with similar characteristics to the study population participated, to evaluate the instrument's relevance and possible errors in the understanding of the items. As a result, minor observations were collected, which were corrected. Fourth, the pilot test was applied.

2.3. Procedure

The investigation was carried out in July 2022, when the first cases of monkeypox infection began to be reported in Peru. Due to health security measures and other restrictions

due to the fourth wave of COVID-19 infections, it was decided to transfer the items from the EP-VIR-MONK, and the demographic questionnaire to Google Forms, which was sent to the participants through social networks and virtual platforms. Before answering the questions, an informed consent form was presented, informing them of the purpose of the study and emphasizing that participation was voluntary and anonymous.

2.4. Data Analysis

The data analysis was performed with the free access R program in version 4.2.0; specifically, the RStudio environment in version 02.3. In this case, the libraries used were «psych» to calculate the response rates, “lavaan” for confirmatory factor analysis (CFA), and “semTools” for reliability estimation. Due to the ordinal nature of the variables, the items were first examined by the response rate of each of the choice alternatives. The scale’s internal structure was then analyzed through confirmatory factor analysis, using the robust maximum likelihood estimation method (RML), which has proven to be adequate for ordinal variables. In this case, the goodness-of-fit measures were chi-square (χ^2), comparative fit index (CFI > 0.95), Tucker–Lewis index (TLI > 0.95), root mean square error of approximation (RMSEA < 0.08), and standardized root mean square residual (SRMR < 0.06). Additionally, the weighted root mean square residual (WRMR < 1) designed for ordinal variables is incorporated. Ultimately, reliability was calculated using the omega coefficient (ω).

2.5. Ethical Considerations

The ethics committee approved the research of the Universidad Peruana Unión (N° 2022-CEUPeU-0089). Authorization was obtained by email from the author of the scale that was used as the basis for the adaptation.

3. Results

Table 1 shows the items adapted in time and context, the product of the scrutiny of the six expert judges, and the evaluation received in the focus group.

Table 1. Adaptation of the EP-VIR-MONK items.

Items from the Original Version	Adaptation of EP-VIR-MONK
During the last week, how often have you thought about your chances of being infected with coronavirus?	How often have you thought about your chances of being infected with monkeypox in the last week?
During the last week, has thinking about the possibility of being infected with coronavirus affected your mood?	During the past week, has thinking about the possibility of being infected with monkeypox affected your mood?
During the last week, has thinking about the possibility of being infected with coronavirus affected your ability to carry out your “day-to-day” activities?	During the past week, has thinking about the possibility of being infected with monkeypox affected your ability to carry out your “day-to-day” activities?
To what extent are you worried about the possibility of being infected with coronavirus one day?	How concerned are you about being infected with monkeypox?
How often do you worry about the possibility of being infected with coronavirus?	How often do you worry about being infected with monkeypox?
Is being worried about being infected with coronavirus an important problem for you?	Is worrying about being infected with monkeypox a major problem for you?

Table 2 shows the evaluation results of the six experts who analyzed the relevance, representativeness, and clarity of the items of the EP-VIR-MONK. All the items received a favorable evaluation ($V > 0.70$). Regarding relevance, it is evident that Item 3 is the most relevant ($V = 1.00$; 95% CI: 0.89–1.00), Item 6 is the most representative ($V = 1.00$; 95% CI: 0.89–1.00), and items 2 and 6 are the clearest ($V = 1.00$; 95% CI: 0.89–1.00). Likewise, all the values of the lower limit (Li) of the 95% CI are appropriate, and all the values of the V coefficient were statistically significant.

Table 3 shows that the factorial weights of each indicator are more significant than 0.70, which is appropriate. Regarding the percentage of the response rate, a tendency to mark the options “Never or rarely” and “Sometimes” is observed, which guides us

to understand that for the participants it is not yet common to be concerned about the possibility of contagion with monkeypox.

Table 2. Aiken’s V to test the relevance, representativeness, and clarity of the items of the EP-VIR-MONK.

Items	Relevance (n = 6)				Representativeness (n = 6)				Clarity (n = 6)			
	M	SD	V	CI 95%	M	SD	V	CI 95%	M	SD	V	CI 95%
Item 1	2.90	0.32	0.97	0.83–0.99	2.80	0.42	0.93	0.79–0.98	2.90	0.32	0.97	0.83–0.99
Item 2	2.90	0.32	0.97	0.83–0.99	2.60	0.52	0.87	0.70–0.95	3.00	0.00	1.00	0.89–1.00
Item 3	3.00	0.00	1.00	0.89–1.00	2.60	0.52	0.87	0.70–0.95	2.90	0.32	0.97	0.83–0.99
Item 4	2.90	0.32	0.97	0.83–0.99	2.60	0.52	0.87	0.70–0.95	2.90	0.32	0.97	0.83–0.99
Item 5	2.90	0.32	0.97	0.83–0.99	2.60	0.52	0.87	0.70–0.95	2.80	0.42	0.93	0.79–0.98
Item 6	2.80	0.42	0.93	0.79–0.98	2.90	0.32	0.97	0.83–0.99	3.00	0.00	1.00	0.89–1.00

Note: M = mean, SD = standard deviation, V = Aiken’s V coefficient, 95% CI = Aiken’s V confidence interval.

Table 3. Descriptive statistics and internal consistency of the EP-VIR-MONK.

Items	% Response Rate				F1
	Never or Rarely	Sometimes	Often	Almost All the Time	
Item 1	59	33	5	3	0.81
Item 2	63	27	8	2	0.83
Item 3	68	22	8	2	0.81
Item 4	44	40	11	5	0.81
Item 5	49	36	12	3	0.84
Item 6	45	34	16	5	0.74
Ω					0.89

Confirmatory factor analysis found a good fit for the model, as shown by the goodness-of-fit indices (chi-square = 55.64, df = 9, p-value = 0.000, CFI = 0.96, TLI = 0.94, RMSEA = 0.08 CI95% [0.067–0.097], and finally the SRMR = 0.03, less than 0.05). With these results, the internal structure of six items distributed in a single factor is confirmed (Figure 1), which corroborates the factorial structure of the scale taken as a base.

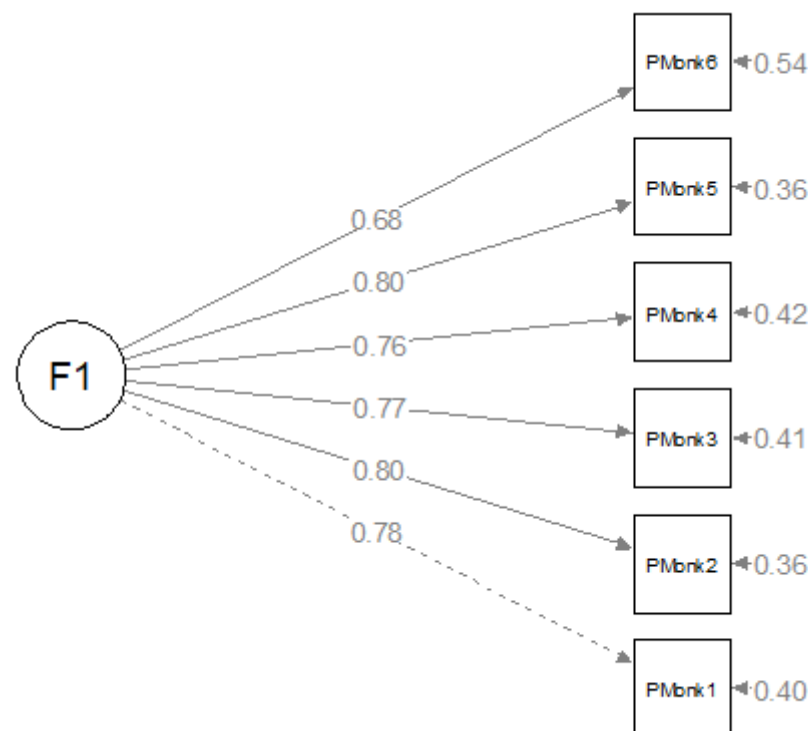


Figure 1. Factor structure of the Monkeypox Concern Scale (EP-VIR-MONK).

Finally, regarding reliability, internal consistency was analyzed using the omega coefficient, obtaining a result of 0.89, which indicates an acceptable level as it is higher than the 0.80 cut-off.

4. Discussion

The state of alert caused by the rapid contagion of monkeypox, coupled with the lack of a vaccine to deal with it and the physical manifestations of the virus, have generated uncertainty and fear in the Peruvian population. Given this, the purpose of the study was to adapt and validate the monkeypox concern scale in a sample of Peruvian adults (EP-VIR-MONK).

Based on the results, the main findings point to the recognition that the EP-VIR-MONK confirms the internal structure of the previously validated concern scale in Peru; such is the case for the version used as the basis of this adaptation [24]. In this sense, the scientific value of this study lies in reporting the psychometric properties of one of the first measures to assess concern about the spread of monkeypox in the Peruvian context. Thus, the EP-VIR-MONK should be interpreted as a short measure made up of six items that obey a single factor, the product of the implementation of factorial models, scrutiny of items by six health professionals, and a reliability analysis using internal-consistency-calculation procedures that support this as an appropriate instrument for measuring concern about the possibility of becoming ill with monkeypox. In contrast to other similar studies, the evidence of validity and reliability found in this study was related to the reports of other investigations, mainly with the concern scale adapted and validated by Ruiz et al. [24]. This study reported a good fit of the model for an internal structure of six items distributed in a single factor with reliability indicators ($\omega = 0.89$) where the performance in terms of internal consistency was acceptable [24].

4.1. Practical Implications

The practical implications of these results, given the impact of the rapid spread of monkeypox [26], directly indicate the need to have an accurate situational diagnosis, which requires reliable assessments to measure the level of uncertainty and concern before public health problems and emergencies, as happened with the COVID-19 pandemic [27]. In this sense, having the EP-VIR-MONK offers the possibility of generating scientific evidence with which health strategies can be proposed to control concern and other alterations in mental health, a product of both misinformation [28] and a lack of precise information, so that the population can take precautionary measures in favor of their mental health [29]. On the other hand, having this instrument can help health and mental health professionals properly manage risk factors that could trigger fear and panic [30].

4.2. Limitations

Although important implications emerge from this study, certain limitations should be reported. Among the most important is that a convenience sample was used, which does not allow generalizations of the results to the population of Peruvian adults. Additionally, the application of virtual surveys may have generated some bias in the selection of participants, a fact that may be better managed in future studies by including face-to-face surveys. Finally, it is still necessary to carry out more research to explore other types of validity, such as that based on the relationship with other variables and other psychometric perspectives such as the Item Response Theory.

5. Conclusions

The first evidence of validity of EP-VIR-MONK based on its content, internal structure, and reliability in a sample of Peruvian adults is presented here. Accordingly, it can be helpful for the management and the prevention of mental health alterations resulting from the proliferation of monkeypox in Peru.

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Informed Consent Statement: All the survey participants were well versed on the study intentions and were required to consent before enrollment.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Appendix A.1. Spanish Version

Para la aplicación del cuestionario se recomienda que a cada respuesta se le asigne un código/valor, siendo: Nunca o raras ocasiones = 1, Algunas veces = 2, A menudo = 3 y Casi todo el tiempo = 4. Siendo así posible que se obtengan puntajes en un rango desde 6 hasta 24 puntos (según las respuestas de cada persona). Para el análisis estadístico se puede categorizar usando los terciles, por ejemplo, si desea conocer quienes son los más preocupados ante la posible infección por viruela del mono se deberá categorizar de la siguiente forma: tercil superior de las notas serán los más preocupados, tercil medio y tercil inferior de las notas se sumarán para hacer la categoría de comparación.

Preguntas	Nunca o Raras Ocasiones	Algunas Veces	A Menudo	Casi Todo el Tiempo
Durante la última semana ¿Con qué frecuencia ha pensado usted sobre sus probabilidades de ser infectado con la viruela del mono (Monkeypox)?				
Durante la última semana, el pensar sobre la posibilidad de ser infectado con la viruela del mono (Monkeypox), ¿Ha afectado su estado de ánimo?				
Durante la última semana, el pensar sobre la posibilidad de ser infectado con la viruela del mono (Monkeypox) ¿Ha afectado su capacidad para realizar sus actividades del «día a día»?				
¿Hasta qué punto le preocupa la posibilidad de ser infectado con la viruela del mono (Monkeypox)?				
¿Con qué frecuencia se preocupa usted sobre la posibilidad de ser infectado con la viruela del mono (Monkeypox)?				
El estar preocupado por ser infectado con la viruela del mono (Monkeypox), ¿Es un problema importante para usted?				

Appendix A.2. English Version

For the application of the questionnaire, it is recommended that each response be assigned a code/value, being: Never or rarely = 1, Sometimes = 2, Often = 3, and Almost all the time = 4. Thus, it is possible that obtain scores in a range from 6 to 24 points

(depending on the answers of each person). For statistical analysis, this can be categorized using tertiles; for example, if you want to know who is most concerned about possible monkeypox infection, it should be categorized as follows: the top tertile of the notes will be the most concerned; the middle tertile and lower tertile of the grades will be added to make the comparison category.

Questions	Never or Rarely	Sometimes	Often	Almost All the Time
During the last week, how often have you thought about your chances of being infected with monkeypox?				
During the past week, has thinking about the possibility of being infected with monkeypox affected your mood?				
During the past week, has thinking about the possibility of being infected with monkeypox affected your ability to carry out your “day-to-day” activities?				
How concerned are you about being infected with monkeypox?				
How often do you worry about being infected with monkeypox?				
Is being worried about being infected with monkeypox a major problem for you?				

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