ORIGINAL RESEARCH

Psychometric Network Analysis of the Problematic Pornography Use Scale (PPUS) in Peruvian Adults

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Objective: The aim of this research was to analyze the psychometric properties of the Problematic Pornography Use Scale (PPUS).
Methods: A sample of 704 Peruvian youth and adults aged 18 to 62 years (M = 26, SD = 6.0) was considered, of which 56% were female and 43% male. The participants were from various cities in Peru: Lima (84%), Trujillo (2.6%), Arequipa (1.8%), and Huancayo (1.6%). The validity of the theoretical structure of the PPUS was carried out by means of two techniques: Confirmatory factor analysis (CFA) and Exploratory Graphical Analysis (EGA), a new effective and efficient dimension evaluation technique, whose measure consists of verifying the fit of the dimension structure.
Results: Using the bifactor model, the hypothesis that PPUS has a unifactorial behavior was corroborated. These approximations of unidimensionality are also corroborated by the EGA method, where the centrality parameters and network loadings are found to have acceptable estimates.
Conclusion: The results demonstrate the validity of the PPUS, contrasting with the factor model and verifying the unidimensionality of the construct, which provide useful directions for future studies on the instrumentalization of problematic pornography use scale.
Keywords: pornography, pornography scale, problematic pornography use, psychometrics, Peru

Introduction

Currently, the use of pornography has become very recurrent among teenagers and young adults. In fact, it has become an important part of contemporary culture and is growing exponentially due to the easy access to digital platforms.[1,2] This could be partly due to the fact that in the context of human psychosexual development, adolescents enter biological maturity with little or no knowledge about sexuality.[3] This represents a challenge because knowledge of sexuality helps people to be more fulfilled and face sexual life with some preparation, avoiding complications and related addictions.[4]

It is also important to mention that aspects related to sexual development and education in juvenile populations are an area of little approach and relevance, despite the fact that there is evidence of negative repercussions on the emotional development of individuals.[5] This has led many young people to seek information of a sexual nature on the web, finding pornographic materials for the sake of pleasure without measuring the results and the consequences that this entails. It is then, where a cycle of constancy - repetitive behavior for self-satisfaction through the use of pornography- based on visual and physical self-satisfaction through the use of pornography begins.[5,6]

Pornography is intended to be titillated to the viewer and is created for the sole and exclusive purpose of generating an acting genital activation that proposes to excite through the demonstration of the same.[7] However, there is a lack of consensus on the definitions of pornography, categorizing it as sexually explicit materials intended to excite.[8] In any case, regardless of the conceptual definitions of pornography, it is worth noting that it has become stigmatized and controversial.[7]

Likewise, pornography is given a modern connotation, significantly differentiating it from conventional and stigmatized pornography to pornography with greater access and openness.[9] At the same time, profiles depending on the search

content are evident: (a) recreational (they show higher sexual satisfaction), (b) compulsive (they show lower sexual satisfaction and sexual dysfunction), and (c) very distressed (they show sexual dissatisfaction and avoidance).[7,9–11]

Along the same lines, pornography presents different classifications by genre, which can be *snuff, soft-care, hard-core, alt porn, big-boogs*, among others. In that sense, the research will focus on the *hard-core* type of pornography, which consists of showing a variety of scenes of explicit sexual acts.[7] In this context, it is evident that the use of pornography worldwide has increased exponentially through the web, having a high consumption and social acceptance not only among young people but also among adults.[12]

Worldwide, according to data from the PornHub website, which broadcasts pornographic videos, it has registered an average of 81 million daily visits in 2017. On the other hand, in March 2020, at the beginning of the restrictions due to the pandemic, the number of views rose between 38 and 61% worldwide, this was possible due to the free access to premium content that Pornhub offered to countries affected by the pandemic.[13,14] Thus, it appears that social isolation has increased the search for alternative pleasures, with pornography being one of the most commonly used pleasurable distractions to mitigate the loneliness, stress, and distress associated with the pandemic.[15]

It is also important to mention that the constant use of pornography for prolonged periods of time can generate two possible effects in the viewer: 1) increased aggressive behavior of men towards women due to the excessive content of sexual violence in pornographic scenes and 2) distorted perceptions of sexual reality.[16] However, currently, there is no evidence of a relationship between constant exposure to pornography and the development of maladaptive behaviors.[6,17] Therefore, it is not a determinant in psychosocial development as it may cause premature development of more intimate knowledge of the sexual sphere.[6,7]

Seen from the psychosexual approach, there is evidence that people experience excitation visually, which initiates a sexual response; therefore, pornography is shown as a primary excitatory element, allowing us to understand that the use of visual elements is presented as predisposing factors to a consumption problem.[18]

Likewise, neurosciences indicate that the excessive use of pornographic material produces neurobiological mechanisms such as dopamine that provokes pleasurable feelings with the repetitive use of psychoactive substances or other behavioral addictions.[2,19] In relation to the above, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) does not include excessive pornography consumption as an addictive behavior. However, being exposed to the constant use of pornography for personal satisfaction can have negative mental health consequences, causing increased levels of stress, depression, and anxiety, due to the unrealistic and exaggerated nature of the content, generating confusion in the discernment between reality and fiction.[20–23]

In previous studies,[12] the PPUS was designed based on three studies which concluded that the instrument presents adequate validity and satisfactory internal consistency in the structure of four factors and 21 items, and it was shown that the frequency of pornography use is influenced by the marital status of the subjects, thus, it could be inferred that single individuals resort to pornography to satisfy their sexual needs. Another study[24] used PPUS on 105 hypersexual men ranging in age from 18 to 73 years, demonstrating evidence of discriminant and construct validity with a total alpha for the overall scale of ($\alpha = 0.83$) indicating that there is a predisposition of pornography consumption in hypersexual men. In a recent survey[25] in which they adapted the PPUS-J by means of confirmatory factor analysis, based on the four factors of the original scale, it was found that the results are consistent. With respect to internal consistency, adequate values were obtained in a general and dimensional manner, and in terms of validity with other variables, a significant convergence with the sexual compulsivity scale was demonstrated. Therefore, it can be indicated that the PPUS-J presents adequate psychometric evidence to measure the variable problematic pornography use in the Japanese population. In the national context,[26] the adaptation of the PPUS based on a sample of 358 participants of both sexes aged between 18 and 62 years, results were obtained that disagree with the original scale, which consists of 4 dimensions and 12 items. In the adaptation, a reduction of dimensions was made, leaving only 3 and 12 items, the scale showed evidence of reliability ($\alpha=0.89$) and it was concluded that its adaptation presents adequate psychometric measures for the national context.

In this sense, the present research focused on demonstrating the validity and reliability of the psychometric analysis of the PPUS, in order to provide a practical contribution to mental health professionals, especially psychologists, educational and social agents.

Materials and Methods
Study Design and Participants
A cross-sectional and instrumental observational design was used. All participants were selected through a non-probabilistic convenience sampling method. The sample was composed of 704 Peruvian adults aged 18 to 62 years (M = 26, SD = 6.0), of whom 56% were women and 43% men. The participants were from various cities in Peru: Lima (84%), Trujillo (2.6%), Arequipa (1.8%), and Huancayo (1.6%).

Instruments
Problematic Pornography Use Scale (PPUS): This scale was developed in 2014,[12] which was adapted to Spanish for the Peruvian population, taking into account the linguistic realities of the country.[26] This instrument consists of 12 items based on a Likert-type measurement scale ranging from 0 to 5, where 0 = never true, 1 = rarely true, 2 = sometimes true, 3 = often true, 4 = very often true, and 5 = almost always true. Scores range from 0 to 60. A high score shows a problem with pornography for the participant, the adaptation of the scale evidenced a Cronbach's alpha of (α =0.79 to 92) and an internal consistency of (α=0.93) evidencing adequate validity. Therefore, we can break down the variable into its 4 factors to observe the phenomenon in greater detail.[27]

Data Analysis
A Gaussian plot considering multivariate variables was analyzed to determine the UPPS variable. In these network models, the relationships between variables are based on the partial correlations of each pair of variables after all other variables in the network have been controlled. In a network, the strength of a connection can be visualized as the strength representing the unique relationship between two variables. To assess the underlying dimensionality of the UPPS, we applied the EGA, a new effective and efficient dimension evaluation technique, whose measure consists of verifying the fit of the dimension structure. The "EGAnet" package was used,[28] which is available in R environment.[29] The network method considers the LASSO procedure that includes the use of extended Bayes information criterion (EBIC) considering an adjustment parameter to control the dispersion of the estimated network of 0.05 used as default option in the "EGAnet" package. Subsequently, the estimation of the graphical model and the weights of the edges was carried out. Moreover, we used the "dimStability" function to explore the structural consistency of the previously mentioned network model and the stability of the elements in the extracted dimensions. The "bootEGA" function was then used to obtain the calculated network structure based on the bootstrap method. In addition, through the "net.loads" function, the factor loadings were determined. Through the centrality metric of node strength, the identification of the most important nodes in the network was performed using the centralityPlot function of the R package qgraph. The EGA can be used as a parallel method to the other methods in variables that have highly correlated dimensions such as the UPPS.[28,30]

On the other hand, to evaluate the factorial model of the EGA, structural equation modeling was used. We considered fit indicators such as the comparative fit index (CFI), and the Root Mean Squared Error of Approximation (RMSEA) expecting a value >0.95 and <0.05, respectively;[31] The chi-square ratio over degrees of freedom was also used, considering good fit to estimated values below or equal to five, using the WLSMV estimator due to the ordinal nature of the data.

Additionally, a Bifactor model was examined given the persistence of high interfactor correlations in the three-factor structure.[32] In this model, the covariance between items can be explained by a general common factor (g) and a domain-specific factor (SF), as well as by the measurement error.[32] This allows for further exploration of the dimensions of UPPS and to assess the extent to which differences in UPPS are explained by common factors or specific components,[33] as referred to in previous UPPS studies.[12,25,26]

Procedure
Initially, the instrument was applied to 110 participants who met the inclusion and exclusion criteria for this study. This is part of a pilot test in order to confirm whether the items of the instrument were being fully understood and to make certain adjustments involving the validity and reliability of the instrument before its final application. The instrument was then administered to 704 participants who met the inclusion and exclusion criteria.

Likewise, informed consent was obtained from all participants. The applications of the instruments were given in a collective non-face-to-face manner, by means of a digital questionnaire available on the "Google Forms" platform and shared through social networks such as Facebook, WhatsApp, Instagram, and Email. Finally, the corresponding statistical analysis was performed. All the procedures that contributed to the development of the project were carried out taking into account the ethical and deontological criteria of the Peruvian College of Psychologists and those established in the 1975 Declaration of Helsinki and its subsequent modifications. This study was approved by the ethics committee of the César Vallejo University.

Results

The EGA results show that the PPUS network only supports unidimensionality, ie, the 12 items are interconnected to represent the network dynamics of the construct, without the need to identify three dimensions (Figure 1).

The assignment of the items as a one-dimensional structure and the network loads are given in Table 1. The item-level network centrality estimates (Figure 2) indicated that items 2 ("Veo pornografía cuando me siento deprimido(a)"/"I watch pornographic materials when am feeling despondent)", 3 ("Veo pornografía para escapar de sentimientos de tristeza o para aliviar sentimientos negativos"/"I use pornographic materials to escape my grief or to free myself from negative feelings)", 4 ("Continúo mirando pornográfico pese a que intento dejar de hacerlo"/ "I keep on watching pornographic materials even though I intend to stop)", and 11 ("Empleo más tiempo de lo debido planeando ver pornografía"/ "I spend too much time planning to and using pornography)" were more central in the network, which correspond to different theoretical scales of the PPUS, these measures would be exerting more influence on other variables of the network. On the other hand, items 5 ("Arriesgo o pongo en peligro algo importante para mí [como una relación sentimental, un empleo o mis estudios] debido al consumo de la pornográfica"/"I risked or put in jeopardy a significant relationship, place of employment, educational or career opportunity because of the use of pornographic materials)", 7 ("Mi uso de pornografía ha causado algunos problemas en mis relaciones con otras personas"/"Using pornography has created
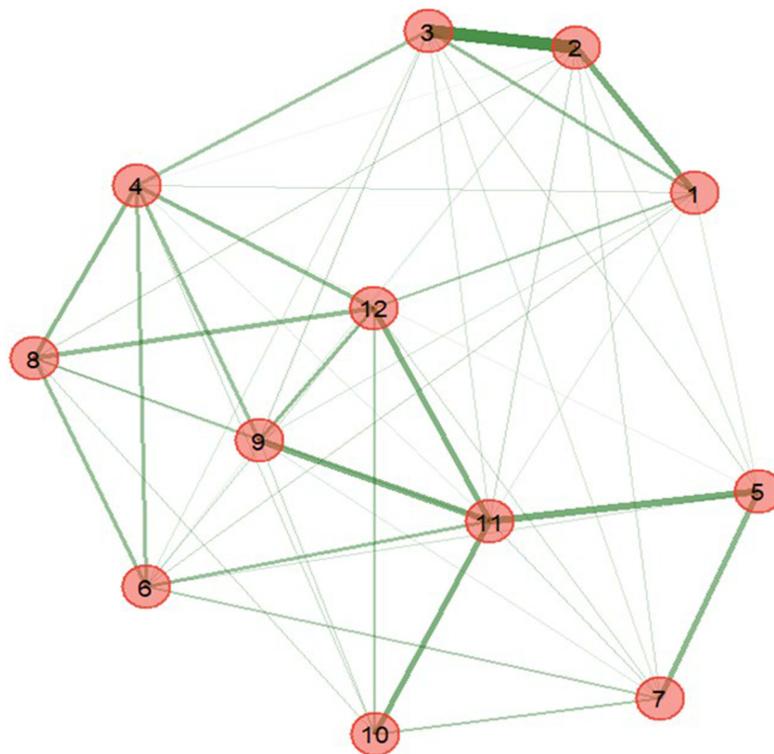

Figure 1 Network structure of the UPPS items.
Note: All partial correlations are positive.

Table 1 Network Loads of the UPPS Items Identified Unidimensionally by the EGA

Items	Factor
p1: Veo pornografía cuando he estado de mal humor./*I watch pornography when I have been in a bad mood.*	0.232
p2: Veo pornografía cuando me siento deprimido (a)./*I watch pornographic materials when am feeling despondent.*	0.311
p3: Veo pornografía para escapar de sentimientos de tristeza o para aliviar sentimientos negativos./*I use pornographic materials to escape my grief or to free myself from negative feelings.*	0.317
p4: Continúo mirando pornográfico pese a que intento dejar de hacerlo./*I keep on watching pornographic materials even though I intend to stop.*	0.287
p5: Arriesgo o pongo en peligro algo importante para mí (como una relación sentimental, un empleo o mis estudios) debido al consumo de la pornográfica./*I risked or put in jeopardy a significant relationship, place of employment, educational or career opportunity because of the use of pornographic materials.*	0.195
p6: Veo pornografía a pesar del peligro de dañar mis capacidades físicas (como, por ejemplo, dificultad para lograr una erección o para alcanzar un orgasmo no hay pornografía de por medio)./*I continued using pornography despite the danger of harming myself physically (for example: difficulty getting an erection due to extensive use, difficulty reaching an orgasm in ways that do not include pornography).*	0.241
p7: Mi uso de pornografía ha causado algunos problemas en mis relaciones con otras personas./*Using pornography has created significant problems in my personal relationships with other people, in social situations, at work or in other important aspects of my life.*	0.198
p8: No he tenido éxito en mis esfuerzos de reducir o controlar la frecuencia con la que utilizo pornografía./*I have been unsuccessful in my efforts to reduce or control the frequency I use pornography in my life.*	0.259
p9: Pienso a menudo en la pornografía./*I often think about pornography.*	0.263
p10: Siento que pierdo tiempo pensando en pornografía./*I spend too much time being involved in thoughts about pornography.*	0.201
p11: Empleo más tiempo de lo debido planeando ver pornografía./*I spend too much time planning to and using pornography.*	0.440
p12: Me siento incapaz de dejar de ver pornografía/*I feel I cannot stop watching pornography.*	0.330

significant problems in my personal relationships with other people, in social situations, at work or in other important aspects of my life)", and 10 ("Siento que pierdo tiempo pensando en pornografía"/ "I spend too much time being involved in thoughts about pornography)" were the least central.
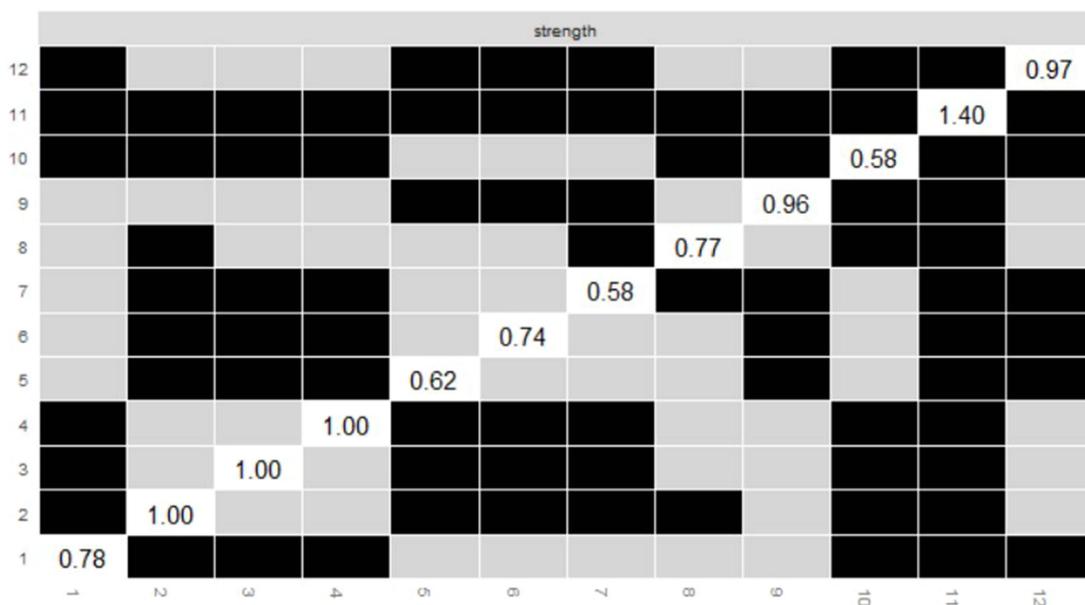

Figure 2 Centrality indexes of the EGA variables.
Note: Centrality indexes of the EGA variables.
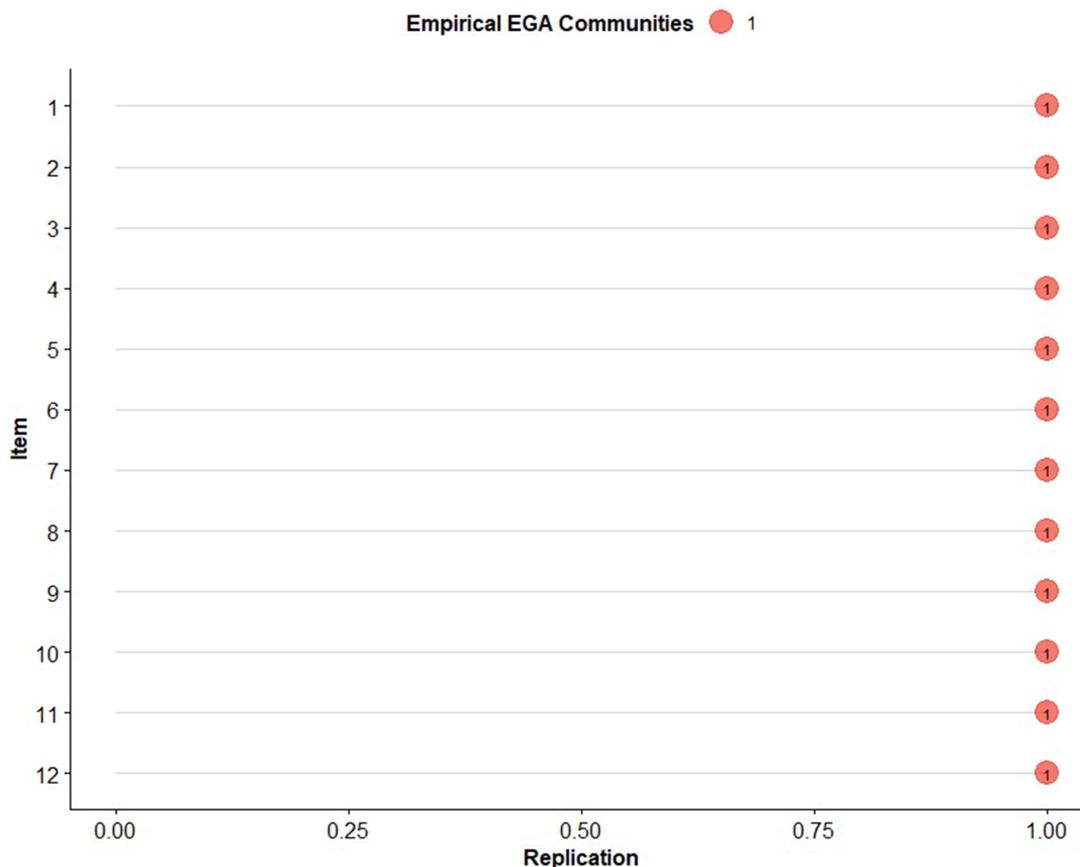
Figure 3 Stability of PPUS items.
Note: The nodes represent each replica of the item in the original dimension specified by EGA.

Figure 3 shows that all 12 items were consistent with the unidimensional model, however, some items were less consistent compared to the others. After inspection of the network loads (Table 1), items 5 ("Arriesgo o pongo en peligro algo importante para mí [como una relación sentimental, un empleo o mis estudios] debido al consumo de la pornográfica" / "I risked or put in jeopardy a significant relationship, place of employment, educational or career opportunity because of the use of pornographic materials)" and 7 ("Mi uso de pornografía ha causado algunos problemas en mis relaciones con otras personas"/ "Using pornography has created significant problems in my personal relationships with other people, in social situations, at work or in other important aspects of my life)" are the least consistent. It should be noted that network loadings tend to be lower than factor loadings,[34] therefore, low values should not be interpreted as weak loads.

Subsequently, a post hoc confirmatory factor analysis (CFA) was performed on the three-dimensional EGA of the PPUS.[35] The CFA of this trifactorial EGA structure showed an acceptable model fit, $\chi^2/df=2.359$, CFI = 0.962, TLI = 0.990, SRMR = 0.028. The interfactor correlations were above 0.80, which continues to indicate discriminant validity problems. Specifically, F1 correlated most highly with all other factors (F1-F2: ψ = 0.86; F1-F3: ψ =0.82 and F2-F3: ψ =0.95) (Table 2). These results would seem to favor the argument that the construct is represented in three dimensions. However, for greater precision it is necessary to evaluate through hierarchical models such as the bifactor.

The results of the bifactor model revealed a good fit as is the case of $\chi^2/df=2.359$, CFI = 0.996, TLI = 0.994 and SRMR = 0.020. These models avoid estimation problems and provide a clear interpretation of the general factor. In addition to the fit indices obtained by means of the CFA, there are other parameters that allow a more exhaustive analysis, such as the percentage of reliable variance in the total raw scores attributed to individual differences in the general factor (ωH) was 93%. Likewise, the explained common variance (ECV) is higher than the lower limit threshold $\geq.60$

Table 2 Factor Analysis (Oblique and Bifactor Model) and Internal Consistency

Items	Oblique Model (Zolezzi)			Bifactor			
	F1	F2	F3	SF1	SF2	SF3	OF
p1	0.852			0.384			0.743
p2	0.934			0.551			0.799
p3	0.957			0.436			0.829
p11		0.967			0.095		0.962
p5		0.719			0.656		0.704
p9		0.835			−0.077		0.841
p7		0.716			0.217		0.703
p10		0.717			0.033		0.715
p12		0.937			−0.043		0.942
p8			0.809			0.365	0.765
p4			0.868			0.287	0.824
p6			0.848			0.128	0.815
F1	–						
F2	0.862	–					
F3	0.822	0.951	–				
χ^2 /df		2359				2359	
CFI		0.992				0.996	
TLI		0.990				0.994	
SRMR		0.028				0.020	
ECV							0.851
PUC							0.682
HH.G							0.973
ωH							0.939
oh $_{H.SF1}$				0.235			
oh $_{H.SF2}$					0.03		
oh $_{H.SF3}$						0.084	
λ $_{average.}$OF							0.804
λ $_{average.SF1}$				0.457			
λ $_{average.SF2}$					0.147		
λ $_{average.SF3}$						0.26	
λ $_{average.SF}$					0.288		
Ord. α							0.958

(*Continued*)

Table 2 (Continued).

Items	Oblique Model (Zolezzi)			Bifactor			
	F1	**F2**	**F3**	**SF1**	**SF2**	**SF3**	**OF**
oh							0.935
Ave							0.676

Notes: λaverage: value and the fuzzy; SF1, SF2, SF3, OF: Bifactor model with three factors with the general factors correlated with the 12 items; F1,F2,F3: Three-factor oblique model.
Abbreviations: X^2, Chi-square; df, degree of freedom; CFI, comparative fit index; TLI, Taker Lewis index; SRMR, Standardized Root Mean Square Residual; ECV, explained common variance; PUC, percentage of uncontaminated correlations; ωH, Omega Hierarchical; ord α, ordinal α.

(ECV=0.851), while the percentage of uncontaminated correlations (PUC) is at the acceptable limit (PUC=0.682). Similarly, the H coefficient, which describes how well a latent variable is represented by a set of items (H=0.973). Finally, the average factor loadings of the general factor (OF=0.804) is higher compared to the average factor-specific factor loadings (SF=0.288). These results indicate that the reliabilities of the subscales were inflated by the general factor (Table 2 and Figure 4). The specific factors did not contribute strongly to the PPUS measurement beyond the general factor and did not appear to be significant subconstructs. Therefore, the PPUS is best conceptualized as a primarily unidimensional instrument, despite the presence of three specific facets.
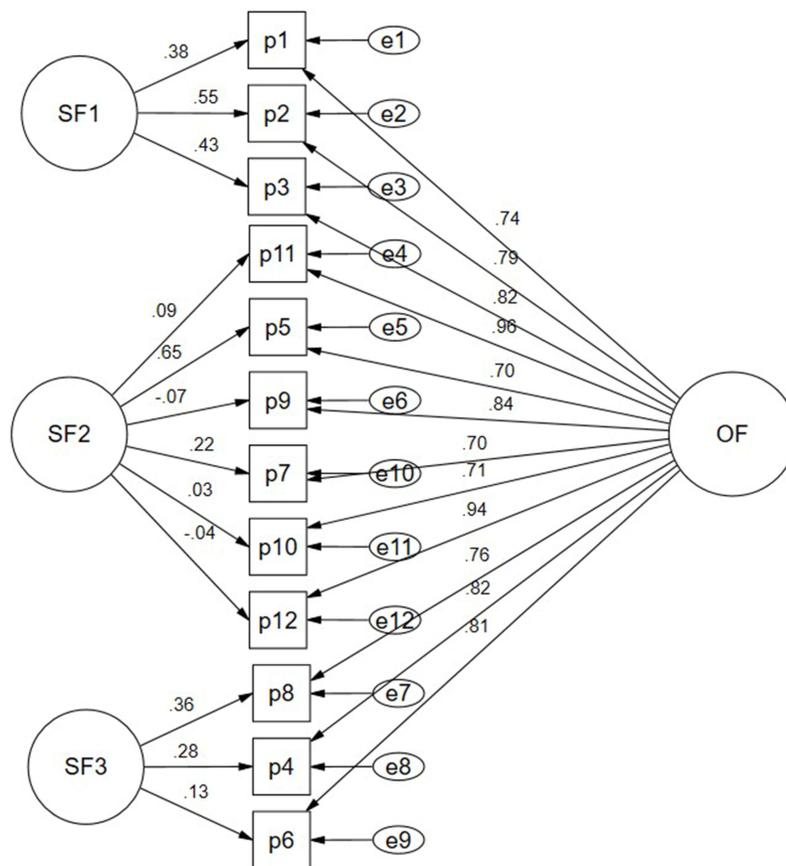

Figure 4 Bifactor analysis of the PPUS.
Note: Bifactor model.

Discussion

This research was the first to evaluate the validity of the theoretical structure of the PPUS, by means of two techniques such as factorial and EGA. Two models (latent model and network) were compared to evaluate whether the scale structure really has multidimensional or unidimensional behavior. It should also be noted that this is the first work to employ the EGA as part of obtaining the psychometric properties of this instrument. Consequently, the properties identified by EGA and ratified by the bifactor model would corroborate the hypothesis that PPUS would have unifactorial behavior. On the other hand, through the factorial technique it was verified that the interfactor correlations scored high values (≥.82) and their interpretation is closer to the presence of collinearity. This result with high estimates was also reported in other studies,[25] where they obtained interfactor correlations above 0.85. Furthermore, it is necessary to point out that the studies that preceded this research did not employ more robust techniques such as the bifactor model, with the purpose of evaluating the incidence of the general factor as well as the specific factor on the common variance of the item;[12,25,26] ie, the objective of the bifactor model is to evaluate that the common variance of the items is not only attributed to the specific factor, but to the general factor.[36]

As for the validity based on the internal structure of the construct, it is justified by the evaluation of two models using the factorial technique, where the bifactor model is the one that would be representing the most appropriate fit index values compared to the four-factor oblique model.[37,38] These approximations of unidimensionality are also corroborated by the EGA method, where the centrality parameters and network loadings are found to have acceptable estimates.[34] The items that most evidenced the measurement of network centrality were items 2 ("Veo pornografía cuando me siento deprimido (a)"/ "I watch pornographic materials when am feeling despondent), 3 ("Veo pornografía para escapar de sentimientos de tristeza o para aliviar sentimientos negativos"/"I use pornographic materials to escape my grief or to free myself from negative feelings)", 4 ("Continúo mirando pornográfico pese a que intento dejar de hacerlo/I keep on watching pornographic materials even though I intend to stop), and 11 (Empleo más tiempo de lo debido planeando ver pornografía"/"I spend too much time planning to and using pornography"). Therefore, the interaction of affect and planning would be functions of PPUS, and the constancy of this behavior would seem to be associated with a distorted view of reality. Therefore, it can generate a subclinical addiction depending on the environment in which the individual develops socioemotionally.[39,40]

Consequently, these measures of centrality identified in these items have greater connectivity between them compared to the rest of the PPUS items. Therefore, the psychometric network approach (dynamic approach) would be a contributing and complementing the interpretation of the factorial technique (static approach), which objectively describes the phenomena observed in the variable. As a consequence, this study provided the psychometric properties of the PPUS scale in a more accurate way by contrasting the two approaches mentioned above.

Limitations and Future Perspectives

This being the first instrumental study of the PPUS scale applying the EGA and contrasting it with the factorial model, it has important limitations that will be the subject of future research. Future research should further expand the sample size, which will allow for greater precision when drawing inferences from the results obtained. It is also important to continue verifying in other contexts the possible unidimensionality of the construct, as was justified in this research in a sample of Peruvian adults. However, the findings of this research provide useful directions for future studies regarding the instrumentalization of problematic pornography use. Thus, the results provide more support for the unidimensional structure compared to the one proposed by the original author[12] and the Asian adaptation.[25] In this sense, the studies that preceded the current study did not evaluate multidimensionality, using hierarchical models such as the bifactor, where it is tested that the shared variance of each item is due to the specific factor as well as to the hierarchical factor. The research was circumscribed only by means of oblique three- and four-factor models. Consequently, this research argues that there are certain questions about the multidimensionality of the PPUS.

Contribution to the Field

The use of pornography has become a recurrent activity. The number of adolescents and young people who use pornography continues to grow at an exponential rate, due to easy access to digital platforms. In fact, it occupies an important place in contemporary culture. During the pandemic, a significant increase has been evidenced in the use of web pages destined to broadcast pornographic videos, it is possible that social isolation has increased the search for other pleasure alternatives, being

pornography one of the most used pleasure distractions to mitigate the loneliness, stress, and anguish associated with the pandemic. In this sense, there is a need for a validated instrument due to the scarcity of previous psychometric studies aimed at assessing pornography use. These findings also provide useful directions for future studies on the instrumentalization of the PPUS. In addition, having this tool will facilitate studies that will contribute to the understanding of the use of pornographic materials in Peru, which is important, since constant exposure represents a greater risk to physical and mental health.

Conclusion

This study presents the findings of the evaluation of the psychometric properties of the PPUS. Using the EGA method, approximations of the unidimensionality of the scale show that the centrality parameters and network loadings present acceptable estimates. It was concluded that the PPUS is valid by contrasting with the factor model and verifying the unidimensionality of the construct. The argument of unidimensionality does not mean a better result in the face of multidimensionality. However, in this research, the fit index parameters of the unidimensional model would be much better representing the builder's structure compared to the multidimensional three-factor model. Furthermore, considering the prevalence of pornography use in the study population, these findings provide useful directions for future studies regarding the instrumentalization of problematic pornography use.

Data Sharing Statement

Data supporting the conclusions of this research will be made available in coordination with the corresponding author.

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Disclosure

The authors declare that they have no conflicts of interest.

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