



Psychometric properties of the positive mental health scale in Arequipa (Peru)

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Título: Propiedades psicométricas de la escala de salud mental positiva en Arequipa (Perú).

Resumen: La salud mental positiva es un constructo complejo que está relacionado con el funcionamiento óptimo de la persona. Comprende un conjunto de cualidades orientadas al desarrollo del potencial del individuo. La Escala de Salud Mental Positiva es uno de los instrumentos más utilizados para evaluarlo, sin embargo, los antecedentes señalan inconsistencias respecto a su estructura interna. El objetivo del presente estudio fue analizar las propiedades psicométricas de la Escala de Salud Mental Positiva en Arequipa-Perú. Participaron 3933 personas, 50.3% fueron mujeres y 49.7% fueron varones, incluyendo desde adolescentes hasta adultos mayores. La evaluación mediante AFC de la estructura original evidenció índices de ajuste pobres, por lo que se tuvo que evaluar la dimensionalidad y proponer una nueva estructura. Para lo cual, se dividió a la muestra ($n_1 = 1966$ y $n_2 = 1967$). En la primera, se aplicó un AFE y en la segunda se valida mediante un AFC. Se hallaron tres factores y se concluye que tiene un buen ajuste ($\chi^2(431) = 2473.378$; $CFI = .959$; $TLI = .956$, $RMSEA = .049$; $SRMR = .051$). La consistencia interna mostró valores mayores a .81. Finalmente, se evaluó la equivalencia de la medición según el sexo, hallando que el instrumento presenta invarianza de la medición.

Palabras clave: Salud Mental Positiva. Validación. Evidencia basada en la estructura interna. Invarianza de la medición. Confiabilidad.

Abstract: Positive mental health is a complex construct that is related to the optimal functioning of the person. It comprises a set of qualities aimed at the development of the individual's potential. The Positive Mental Health Scale is one of the most used instruments to evaluate it, however, the antecedents indicate inconsistencies regarding its internal structure. The objective of this study was to analyze the psychometric properties of the Positive Mental Health Scale in Arequipa-Peru. 3,933 people participated, 50.3% were women and 49.7% were men, including from adolescents to the elderly. The evaluation by CFA of the original structure showed poor fit indices, so the dimensionality had to be evaluated and a new structure had to be proposed. For which the sample is divided ($n_1 = 1,966$ and $n_2 = 1,967$). In the first, an EFA was applied and in the second, it is validated by means of a CFA. Three factors were found and it is concluded that it has a good fit ($\chi^2(431) = 2,473.378$; $CFI = .959$; $TLI = .956$, $RMSEA = .049$; $SRMR = .051$). The internal consistency showed values greater than .81. Finally, the equivalence of the measurement according to sex was evaluated, finding that the instrument presents measurement invariance.

Key words: Positive Mental Health. Validation. Evidence based on the internal structure. Invariance of the measurement. Reliability.

Introduction

From the biomedical model, mental health has historically been associated with mental illness (Macaya et al., 2018). In recent years, mental health has been conceptualized from a broader point of view, trying to understand how the person interacts with the community, what are their expectations, desires, needs, and what values they practice facing the demands of the community life in a specific historical, social and cultural context (Gómez-Acosta, 2018; Fernández, 2012). Therefore, we now understand that mental illness is associated with indicators of well-being, quality of life, and prevention or health promotion (Muñoz et al., 2016), and it is not only about the presence or absence of symptoms and signs (Mebarak et al., 2009; Rodríguez, 2005).

In Peru, a significant increase in neuropsychiatric disorders has been observed (National Institute of Mental Health Honorio Delgado - Hideyo Noguchi, 2018), which emphasizes the need to have a community look at mental health problems (Cárcamo et al., 2019), focused above all in a pre-

ventive promotional approach. Along these lines, we see a significant increase in community health centers in Peru (Pan American Health Organization, 2020), but these are insufficient given the high demand for care and lack of personnel. Likewise, these centers maintain an optics associated with the pathological view, affecting the development of a more community and positive vision of mental health, where factors such as well-being, quality of life, and health promotion (Muñoz et al., 2016), are key to understanding.

In this sense, Lluch (1999; 2002) based on the works of Jahoda (1958) hypothesizes about the aspects that positive mental health comprises, starting from a theoretical model with 16 sub-factors comprised of six general factors, which are: Attitudes towards the same, Growth and self-actualization, Integration, Autonomy, Perception of Reality and Environmental mastery. When evaluating this model in an instrumental study, Lluch (1999) concludes that it is necessary to make changes in the content and the denomination of the factors, proposing a new model of positive mental health, with the following structure: Personal satisfaction, prosocial attitude, self-control, autonomy, self, problem-solving and self-actualization, and interpersonal relationship skills.

This new structure proposed by Lluch (1999) has been previously evaluated, showing important indicators of validi-

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ty and reliability, both in Europe and in Latin America. In Spain, Hurtado-Pardos et al. (2018) studied the validity of the instrument in university nursing professors, finding a high internal consistency with an alpha of .885 and, reporting evidence on its convergent and discriminant validity through the relationship with the General Health Questionnaire. In Portugal, Sequeira et al. (2014) analyzed the psychometric properties of the instrument in young higher education students. The instrument presented a factorial structure similar to the original version, in addition, a high internal consistency was found (alpha of .920). In Mexico, Martínez Aparicio et al. (2015) applied the instrument to health workers, evaluating the factorial structure with the principal component's method and varimax rotation. The six factors were reported to maximize the explained variance (43.4%), with alpha coefficients of .862.

González and Valdez (2016) conducted an instrumental study with children from the city of Toluca, State of Mexico, finding that four of the six original dimensions were maintained, and regarding internal consistency, alpha coefficients of .50 to .81 were found, for the dimensions and .807 for the full scale. Gómez-Acosta et al. (2020) evaluated the internal structure of the instrument in Colombian youth through exploratory factor analysis, obtaining six factors with an alpha value of .81. Cabarcas and Mendoza (2016) studied the psychometric properties of the instrument in a sample of young Colombian students. The analysis showed a unifactorial structure with internal consistency values (alpha) higher than .90. Lastly in Peru, Aguilar (2018) analyzed the psychometric properties of the instrument in pre-professional psychology practitioners from universities in the Trujillo region. Confirmatory factor analysis was applied, finding results consistent with the initial structure of the scale. The fit indices ranged from good to very good (.860 to .992), and with internal consistency, the alpha value was found to be .922.

From what has been described, we can see the need to have validated instruments for measuring mental health from a more community perspective. Health measurements imply not only the presence or absence of symptoms associated with pathologies but also include the positive characteristics that individuals present, such as personal satisfaction, autonomy, social skills, self-control, among others. The valid and precise measurement of these characteristics constitutes an improvement in the understanding of true public health and that they favor developing more suitable strategies, pertinent to the context and the territorial reality, of health promotion and evaluation, design and development of interventions more focused on improving the quality of life of the individual and their community. The Positive Mental Health Scale has been little studied in Peru and considering the importance of measuring positive constructs of the human being and that the reviewed antecedents have shown inconsistencies regarding its structure, we set out to analyze the psychometric properties of the Positive Mental health scale, in addition to evaluating the equivalence of the measurement according to sex.

Method

Participants

A non-probabilistic sample made up of 3,933 participants from the city of Arequipa was used. The inclusion criteria considered were: being over 12 years old, being literate person, and not having severe sensory problems. The sample consisted of 50.3% women and 49.7% men. According to the stage of development, the sample was distributed as follows: 22.9% were adolescents, 40.7% were young adults, 31.2% were intermediate adults, and 5.19% were older adults. Most of those evaluated were students (48.3%), followed by dependent workers (21.0%), independent workers (15.9%), unemployed (8.19%), and housewife (6.61%). 64.6% report being single, 18.1% are married, 12.4% are cohabiting, 2.85% are divorced and 2.14% are widowers. Regarding the degree of instruction, 30.7% have incomplete regular basic studies, 14.4% have complete regular basic studies, 9.2% have incomplete technical higher studies, 12.8% have complete technical higher studies, 20.2% have incomplete university studies and 12.7% have university studies complete.

Instrument

The Positive Mental Health Scale. It is a questionnaire prepared by Lluch (1999). The instrument consists of 39 Likert-type response items. The response alternatives and respective scores for the positive items are: always / almost always = 4, quite often = 3, sometimes = 2, never / almost never = 1. The scale is made up of 6 factors: Factor 1 is called Personal Satisfaction, composed of items 4, 6, 7, 12, 14, 31, 38, and 39; Factor 2 is called Prosocial Attitude, made up of items 1, 3, 23, 25 and 37; Factor 3, called Self-control, made up of items 2, 5, 21, 22 and 26; Factor 4, called Autonomy, made up of items 10, 13, 19, 33 and 34; Factor 5, called Problem Solving and Updating, made up of items 15, 16, 17, 27, 28, 29, 32, 35 and 36; and Factor 6, called interpersonal relationship skills, made up of items 8, 9, 11, 18, 20, 24 and 30. The directionality of the items is presented in Table 1. There is incipient evidence on the application of the instrument in the general population, however, studies have focused on specific populations, such as children (González and Valdez, 2016), adolescents (Cabarcas and Mendoza, 2016), young university students (Sequeira et al., 2014; Aguilar, 2018), university professors (Hurtado-Pardos et al., 2018) and health workers (Martínez Aparicio et al., 2015), finding adequate psychometric properties. However, the antecedents show inconsistencies in the internal structure. Likewise, sociodemographic characteristics such as age, sex, marital status, occupation, and degree of education were added to the instrument; In the same way, the data of the informed consent were recorded.

Procedure

For the application of the instrument, the following steps were followed: in the case of adolescents, the authorization of their educational centers was requested, explaining in detail the purpose of the research, who informed the students and relatives accepting to participate voluntarily; and for people of legal age, each one of them was contacted in different public spaces, the purpose of the study was also explained to them, for which they accepted and signed the informed consent. The administration of the instrument was done individually, with a pen and paper, and always with the presence of an applicator to solve doubts or attend to any incident.

This study is part of the Multicenter and Multidimensional Study of Mental Health of the Population of Barranquilla and Arequipa, Colombia-Peru, which was reviewed and approved by the Ethics Committee of the Universidad de la Costa. Participation was voluntary and the responses were kept completely confidential.

Statistical and psychometric analysis

The data were digitized in a file with the sav extension of the SPSS version 25 software. For the data analysis, the programming language R version 4.0.2 (R Core Team, 2020) and its development environment RStudio version 1.3.959 were used. (RStudio Team, 2020). The packages were used: haven (Wickham & Miller, 2020) for data import; For the manipulation and cleaning of these, the tidyverse package (Wickham et al., 2019) was used, for the descriptive analysis of the psych package (Revelle, 2020) was used and to export tables to Microsoft Excel, the openxlsx package (Schauberger et al., 2020). The elaboration of the correlogram required the ggcorrplot package (Kassambara, 2019). The lavaan (Rosseel, 2012) and semPlot (Epskamp et al., 2019) packages were used for the confirmatory factor analysis, the polychoric correlation matrices were calculated and robust weighted least squares (WLSMV) were used as an estimation method. The original structure of the Scale (six factors) was analyzed. For the evaluation of the fit indices, the following criteria were considered: values $\geq .90$ and $\geq .95$ in the *CFI* and *TLI* as adequate fit and good fit respectively, values $\leq .08$ and $\leq .05$ in the *RMSEA* as adequate fit and good fit respectively and for the *SRMR*, the values $\leq .08$ and $\leq .06$ were considered as a good fit and ideal respectively (Keith, 2015).

Because the original model obtained poor fit indices, it was decided to analyze the factorial structure employing an Exploratory Factor Analysis in one half of the sample data, and later a Confirmatory Factor Analysis in another half, for the validation of the structure. The following GPA rotation packages (Bernaards & Jennrich, 2005), nFactors (Raiche & Magis, 2020), and semTools (Jorgensen et al., 2020) were used. For the elaboration of the factorial loads' figure, the indications of Vallejo (2020) are followed. The reliability evaluation was calculated using the internal consistency

method with the Omega coefficient and its confidence intervals, which was obtained with the MBESS package (Kelley, 2020)

For the invariance of the measurement, the procedure developed by Wu & Estabrook (2016) was used, following the recommendations of Svetina et al. (2019). As criteria to evaluate invariance, the sample size (> 300) is considered, and the possibility of no invariance is established when $\Delta CFI \geq .010$, $\Delta TLI \geq .010$, $\Delta SRMR \geq .030$, and $\Delta RMSEA \geq .015$ (Chen, 2007; Svetina et al., 2019).

Results

The results are presented in the following order: first, the descriptive analyzes of the items are presented. Second, a correlogram is presented that represents the correlations between the items of the instrument. Third, the internal structure is evaluated by confirmatory factor analysis. As a model with adequate fit indices was not achieved, it was decided to perform an analysis in two phases dividing the sample into halves, with the data from the first, the Exploratory Factor Analysis was applied and once the factors with their respective items had been extracted, it is validated by applying a Confirmatory Factor Analysis with the data of the other half. Subsequently, the measurement invariance of the scale is evaluated according to sex for the total sample. Finally, the reliability evaluation is presented using the internal consistency method with the Omega coefficient.

Descriptive analysis of items

In Table 1, the descriptive statistics of the 39 items are shown. Items 4 (1 case) and item 22 (2 cases) presented missing values, which were removed from the analysis. Regarding the descriptive analysis, the means ranged between 1.79 (item 17) and 3.19 (item 39), the skewness for all items was less than 1, and in the kurtosis values less than 2 were found, where item 31 presented the highest kurtosis value - 1.43.

Correlogram between the items of the Instrument

Figure 1 shows a correlogram that contains the matrix of polychoric correlations between the items. To facilitate interpretation, the items have been ordered according to previously reported factors: personal satisfaction, prosocial attitude, self-control, autonomy, problem solving and self-actualization, and interpersonal relationship skills. A letter D has been added, to identify the direct items and a letter I to identify the inverse items.

It is observed that in the personal satisfaction dimension, items 4 and 39 presented very low correlations with the rest of the items, which could indicate that they do not correspond to their original factor. For the prosocial attitude dimension, they show low correlations between items, specifically items 1 and 3. In the self-control dimension, item 2

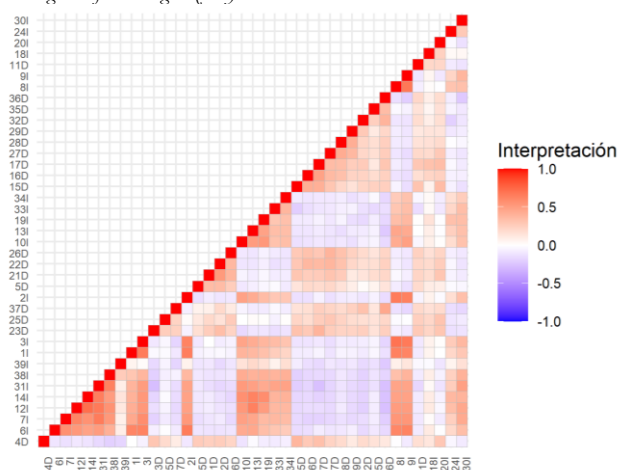
shows low values in the correlations with other items. For the autonomy and problem-solving and self-updating dimension, the items are shown related to each other in their respective dimensions. Finally, in the interpersonal relationship skills dimension, it has been identified that the items are correlated with low average levels.

Table 1
Descriptive statistics of the items

Item	M	SD	Skewness	Kurtosis	Item	M	SD	Skewness	Kurtosis
It1	2.72	0.94	-0.34	-0.76	It21	2.22	0.93	0.18	-0.94
It2	2.73	0.94	-0.33	-0.78	It22	2.13	0.87	0.20	-0.84
It3	2.85	1.11	-0.40	-1.24	It23	1.88	0.90	0.65	-0.58
It4	1.86	0.94	0.75	-0.52	It24	2.68	0.95	-0.25	-0.86
It5	2.34	0.90	-0.06	-0.92	It25	2.23	0.89	0.11	-0.86
It6	2.72	0.99	-0.29	-0.94	It26	2.18	0.87	0.08	-0.95
It7	2.63	1.12	-0.15	-1.35	It27	2.04	0.87	0.39	-0.70
It8	2.80	1.00	-0.34	-0.98	It28	2.16	0.89	0.28	-0.76
It9	2.76	0.96	-0.27	-0.92	It29	2.35	0.91	0.09	-0.81
It10	2.71	1.06	-0.29	-1.15	It30	2.63	1.04	-0.18	-1.14
It11	2.38	0.95	-0.02	-0.99	It31	2.83	1.22	-0.44	-1.43
It12	2.83	1.15	-0.43	-1.29	It32	2.17	0.97	0.35	-0.89
It13	2.73	1.00	-0.28	-0.99	It33	2.72	0.98	-0.25	-0.96
It14	2.87	1.15	-0.50	-1.23	It34	2.66	0.99	-0.19	-1.00
It15	1.91	0.94	0.64	-0.70	It35	2.12	1.00	0.37	-1.04
It16	2.04	0.91	0.39	-0.84	It36	1.92	0.88	0.55	-0.64
It17	1.79	0.87	0.81	-0.28	It37	1.95	0.90	0.55	-0.65
It18	2.41	0.99	-0.04	-1.07	It38	2.63	1.14	-0.17	-1.39
It19	2.74	1.06	-0.30	-1.15	It39	3.19	0.95	-0.98	-0.06
It20	2.16	0.95	0.26	-0.97					

The correlations between the items suggest that possibly the original 6-dimensional structure might not fit the data. It should be noted the case of item 39, which did not show correlations with the rest of the items, was only correlated with two items of the entire scale (<.30). These results will be considered for the re-specifications.

Figure 1
Correlogram of items organized by dimensions.



Confirmatory Factor Analysis

The confirmatory factor analysis for the original structure composed of six dimensions shows an inadequate fit ($\chi^2(687) = 26,365.429$; $CFI = .766$; $TLI = .748$; $RMSEA = .098$; $SRMR = .103$). Considering that the evaluated structure had a poor fit and low correlations were found between the items within the factors of the original structure, it was decided to carry out an analysis in two phases: first, the sample was randomly divided into two halves, in the first half ($n = 1,966$) an exploratory factor analysis is applied to know the structure suggested by the analysis, and in the second half ($n = 1,967$) a confirmatory factor analysis is applied to evaluate the adequacy of the structure found in the exploratory factor analysis.

According to the results obtained in Table 1 and the correlogram based on the correlation matrix in Figure 1, it has been decided to withdraw item 39 from the analyzes, due to its low correlations with the rest of the items.

Exploratory Factor Analysis

An exploratory factor analysis was applied with the 38 items with oblique rotation (oblimin). The Kaiser-Meyer-Olkin coefficient showed the adequacy of the data for the $KMO = .93$ analyzes and all the KMO values for the individual items were greater than .83, which is satisfactory for the analysis. The Bartlett sphericity test $\chi^2(703) = 23449.31$, $p < .001$, indicating that the correlations between the items were high enough for the EFA. Unweighted Least Squares (ULS) is used as a factor estimation method. The recommendations of Izquierdo et al. (2014), considering the following criteria for factor extraction: that the factors have a minimum number of items of 3, saturation sizes greater than .40, and that the meaning of the items is related to the factor. Three factors are extracted that explain 37% of the variance. The factor loadings are presented in Table 2.

The items that did not reach the minimum value of .40 were item 5 ("I am able to control myself when I experience negative emotions"), item 24 ("It is difficult for me to understand the feelings of others"), item 29 ("The changes that occur in my usual routine stimulate me"), item 30 ("I have difficulties relating to my teachers /bosses"), item 35 ("I am able to say no when I want to say no") and item 37 ("I like to help the others"), it was decided to remove them from the internal structure of the instrument.

In reviewing the content of the Factor 1 items, it has been identified that most of the items are related to three characteristics: adaptability, personal appreciation, and empathy, which is why we decide to call it the ability to adapt. In Factor 2, items related to the factors of personal satisfaction and autonomy of the original structure have been included, for which reason he decides to call it personal satisfaction and autonomy. Factor 3, contains more varied information, oriented with tolerance towards others, skills to relate, and emotional control, which is called tolerance to frustration.

Table 2
EFA factorial loads with 3 factors

Nro Item	F1	F2	F3
17 I try to better myself as a person.	.66		
22 I'm capable of maintaining a good level of autocontrol in the conflicting situations of my life.	.59		
27 When faced with changes I try to adapt.	.58		
21 I'm capable of controlling myself when having negative thoughts.	.56		
16 I try to look on the positive side of bad occurrences.	.56		
20 I believe I'm a sociable person.	.54		
28 When faced with a problem I'm able to ask for help.	.53		
15 I'm capable of making decisions for myself.	.52		
23 I believe I'm trust worthy.	.52		
26 When pressured I'm capable of keeping calm.	.5		
25 I think about other people's necessities.	.46		
4 I like myself.	.44		
36 When faced with a problem I try to think of possible solutions.	.44		
18 people come to me when in trouble.	.43		
11 I believe I'm a very empathic person.	.42		
32 I try to develop my good qualities and abilities.	.4		
14 I consider myself less important than the people I surround myself with.		.8	
31 I believe I'm useless.		.78	
38 I feel unsatisfied with myself.		.74	
12 I look at my future with pessimism.		.71	
19 I'm worried I will be criticized.		.68	
13 Other people's opinions influence my ability to take decisions.		.61	
34 When taking important decisions, I feel insecure.		.56	
10 I'm worried about what others may think of me.		.52	
33 I find it hard to find my own opinions.		.47	
7 For me life is boring and monotone.		.46	
1 It is especially hard for me to accept others who have different attitudes towards me.			.84
8 For me it is especially hard to give emotional support.			.83
2 Problems block me easily.			.79
9 I have difficulties when establishing profound and satisfactory interpersonal relationships with some people.			.75
3 For me it is especially hard to listen to other people's problems			.75
6 I feel I'm about to explode.			.69

Model validation with 3 dimensions

A CFA is applied in the 3-factor structure using WLSMV as an estimator. The results show an adequate fit ($\chi^2(461) = 2,964.226$; $CFI = .951$; $TLI = .947$, $RMSEA = .053$; $SRMR = .056$). The localized analysis using the modification indices indicates that item 18 ("I consider myself "a good psycholo-

gist", people come to me when in trouble.") presents errors correlated with Factors 2 and 3. When reviewing the content of the item, this is not concordant with the rest of the items and dimensions, so it is decided to remove it from the model. Table 3 shows the goodness of fit indices of the model, removing item 18.

Table 3
Goodness-of-fit indices of the model with 3 factors.

Models	χ^2	df	CFI	TLI	RMSEA	SRMR
Model with 3 factors	2,964.226*	461	.951	.947	.053	.056
Model with 3 factors without item 18	2,473.378*	431	.959	.956	.049	.051

Note: CFI = Comparative adjustment index, TLI = Tucker Lewis index, RMSEA = Root Mean Square Error of Approximation, SRMR = standardized root mean square residual

* $p < .001$.

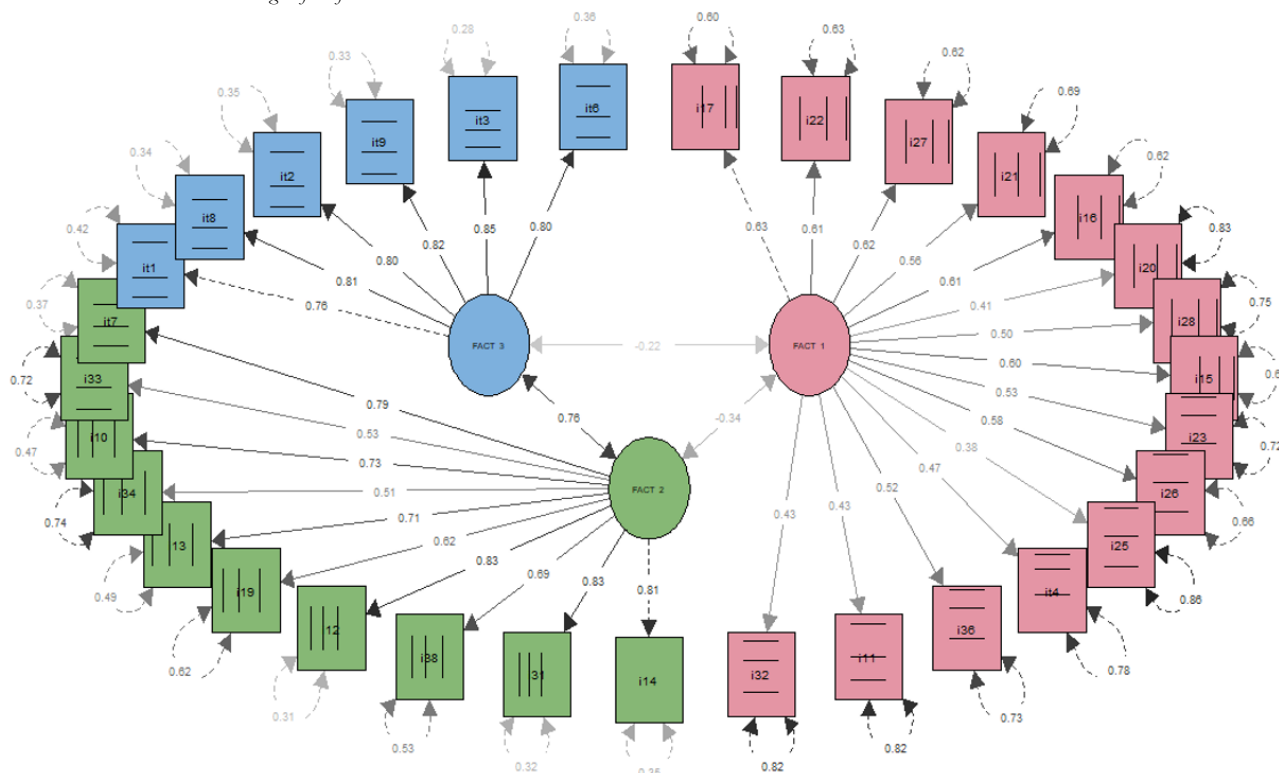
Overall, the model is identified as having a good fit. Factor loadings ranged from .429 to .809. In Figure 2, the information of the 3-Factor Model is shown without item 18.

Internal consistency of the instrument

The result of the internal consistency analysis with the Omega coefficient for the final model shows the following

coefficients: for Factor 1, a coefficient of .81 was obtained (95% CI: .80 - .83); for Factor 2, a coefficient of .88 was obtained (95% CI: .88 - .89), and for Factor 3, a coefficient of .89 (95% CI: .88 - .90) was obtained.

Figure 2
Factorial charges of the final model.



Measurement invariance according to sex

To evaluate the measurement invariance, we worked with the total sample and the 3-dimensional model was tested with item 18 removed. The equivalence of the factorial structure of the scale measures according to sex is evaluated. The results are presented in Table 4. It is observed that the facto-

rial structure of the scale according to sex obtained good fit indices in the configure, threshold (Threshold), metric, scalar, and strict levels. Furthermore, the differences between the adjustment indices were less than the value established in the data analysis section, which indicates that the factorial structure of the instrument presents measurement invariance and is equivalent for both groups (men and women).

Table 4
Invariance of the measurement according to sex.

Model	X ²	df	CFI	TLI	RMSEA	SRMR	ΔCFI	ΔTLI	ΔRMSEA	ΔSRMR
Configural	4969.42	862	.958	.954	.049	.052				
Threshold	5060.61	893	.957	.955	.049	.052	-.001	.001	-.001	.000
Metric	5081.15	921	.957	.957	.048	.052	.000	.001	-.001	.000
Scale	5152.36	949	.957	.957	.047	.052	.000	.001	.000	.000
Strict	5082.00	980	.958	.960	.046	.053	.001	.002	-.001	.001

Discussion and Conclusions

The objective of this study was to analyze the psychometric properties of the Positive Mental Health Scale, developed by Lluich (1999). The results showed a structure different from the one originally proposed for six factors. The structure found comprises 3 factors, which have been called: F1 - Ability to adapt, F2 - Personal satisfaction and autonomy, and F3 - Tolerance to frustration.

In the evaluation by Confirmatory Factor Analysis of the original structure (6 factors), the adjustment indices obtained showed values below what is considered adequate. This re-

sult presents differences with previous studies (Aguilar, 2018; Cabarcas & Mendoza, 2016; Gómez-Acosta et al., 2020; González & Valdez, 2016; Hurtado-Pardos et al., 2018; Martínez Aparicio et al., 2015; Sequeira et al., 2014). In the background check, the dimensionality of the instrument is not stable, but varies from models that comprise six dimensions, such as the original, to one-dimensional models. This great variability of the structure is possible due to the differences in the procedures applied in Factor Analysis, for example: in the studies by Sequeira et al. (2014), Martínez Aparicio et al. (2015), González and Valdez (2016) and Gómez-Acosta et al. (2020) evaluated the internal structure using the Principal Components Analysis Method, which is a proce-

ture that involves ignoring the measurement error, so it can inflate factor loadings, explained variance percentages and overestimation of dimensionality. (Lloret-Segura et al., 2014), in addition to being a non-recommended factor extraction method (Izquierdo et al., 2014). The use of different extraction methods can explain, at least partially, the differences in the number of dimensions reported in the present study.

In the background of the instrument, a common characteristic of the reviewed works was found, they do not report the type of correlation and the estimator that has been used. Considering that the responses to the items are ordinal variables, it is very likely that approximately normal distributions are not fulfilled, so it was necessary to use the polychoric correlations between the items and later use this matrix for factor analyzes (Lloret-Segura et al., 2014). As most of the studies reviewed have used software such as SPSS, they may not have given greater importance to the factor estimation method, using the default method, which is the maximum likelihood method, which is more appropriate in Pearson correlation matrices, which they have approximately normal distributions (Harrington, 2009). According to the aforementioned, the most appropriate is to use robust estimators, such as the ULS (Unweighted Least Squares) estimator, which is more robust to the violation of the normality assumption (Ferrando & Lorenzo-Seva, 2014; Izquierdo et al., 2014; Li, 2016; Lloret-Segura et al., 2014). It is important to mention that no studies were found that report on the use of the ULS estimator in the analysis of validity based on the structure of the Positive Mental Health Scale.

Another aspect to take into account when comparing the results of the factorial analyzes is to consider the rotation used, either orthogonal or oblique since your choice will show different factorial solutions as a result. In the reviewed studies, it was identified that Aguilar (2018) applies a confirmatory factor analysis with orthogonal rotation, Martínez Aparicio et al. (2015) applied a principal component analysis with orthogonal rotation and Gómez-Acosta et al. (2020) applied a principal component analysis with orthogonal rotation. The choice of the rotation method implies important consequences in the factorial solution, since the orthogonal rotations assume the independence of the factors, while the oblique rotation method allows the correlation between them. The current recommendation is to use oblique rotation regardless of the known theoretical model of the construct (Izquierdo et al., 2014; Lloret-Segura et al., 2014).

The removal of items has also been an important aspect to understand the reason for the differences in the structure of the instrument. In the instrumental study by González and Valdez (2016), two criteria were used to remove items from the analysis. Regarding the first criterion, the authors affirm that “in the case of items 1, 5, 11, 17, 23, 24, 29, 35 and 36, it was decided to eliminate them since they presented values greater than the total alpha” (p. 2373), and concerning the second criterion, it consisted in only including items with factor loadings greater than .50. While in the study by Martínez Aparicio et al. (2015) was taken as a criterion to include

the item in the factorial solution, which has values greater than .40 in its factorial load, which led to the removal of items. In the study by Cabarcas and Mendoza (2016), 14 items were removed (according to the value of communalities) to establish a one-dimensional structure. As can be seen, the threshold assigned to factor loadings has an impact on the dimensionality of the scale.

Another factor that could influence the differences in factor structures between previous psychometric studies with the present one could be the size of the sample and the characteristics of the participants. The sizes of the samples used in the reviewed antecedents ranged from 194 to 942 evaluated. Information on how much is the minimum required to study structure-based evidence using factor analysis is inconclusive and difficult to determine. Mundfrom et al. (2005) carried out a simulation study on how much is the minimum necessary to carry out these analyzes, concluding that the lower the commonality, the greater the sample size should be. Harrington (2009) explains that the larger the sample, the better for factor analysis, however, there is no universal agreement on how large it should be.

Izquierdo et al. (2014) recommend that the decision of the sample size should consider the complexity of the model (referring to the number of factors) and the communalities of the items, but under no circumstances should samples be used below the 200 evaluated. Also, it should be noted that studies have used different populations to analyze the structure of the Scale, for example, Hurtado-Pardos et al. (2018) evaluated university nursing professors, Sequeira et al. (2014) worked with higher education students, Martínez Aparicio et al. (2015) studied health sector workers, González and Valdez (2016) analyzed children, Gómez-Acosta et al. (2020) evaluated adolescents and young adults, Cabarcas Soleno & Mendoza Bolaño (2016) worked with schoolchildren and Aguilar (2018) analyzed pre-professional psychology practitioners. The diversity of the populations has contributed to the differences in the reported structures. Based on what has been described, the present study has a much larger sample, compared to the aforementioned research, in addition to taking into account a more heterogeneous sample, considering variables such as the stage of development (from adolescence to late adulthood), occupation (students, dependent workers, independent workers and unemployed), different degrees of education, among other characteristics. When working with a larger and more heterogeneous sample, it is possible that the results found in the present study can be generalized to the Peruvian population and even possibly to Latin America, however, more studies are required to know if these results can be applied generalize.

The original version of the Scale has 39 items, between direct and inverse. In methodological studies, it has been found that the presence of inverse items can cause bias in the response, which implies adding a greater measurement error to the instrument. Therefore, it is advisable to use only direct items. Vigil-Colet et al. (2020) explain that the use of reversed items without the application of a method that con-

trols biases is highly discouraged. According to what has been described, it is recommended that researchers on the Positive Mental Health construct can modify the instrument so that it only has direct items, reducing the response bias caused by the reversed items.

The reliability of the scale was evaluated using the internal consistency method with the Omega coefficient, finding values greater than .81 in the three factors, which suggests that the scale presents high levels of reliability. Previous studies have also evaluated the internal consistency of the scale, but using the Alpha coefficient, finding values that range from .34 to .98. Although it is important to mention that none of the reviewed studies have reported confidence intervals, which is currently a good practice, since it improves the presentation in the empirical literature (Domínguez-Lara & Merino-Soto, 2015). Regarding the Alpha coefficient, it has been seen that it is a coefficient with severe limitations since it is susceptible to the number of items, the number of response alternatives, and the proportion of variance of the test, so the use of the coefficient is suggested Omega, which is a more precise coefficient when measuring reliability (Ventura-León & Caycho-Rodríguez, 2017).

The results of the measurement invariance show that there is an equivalence in the factorial structure of the scale according to Sex. The fit indices obtained are good. The differences between the adjustment indices were lower than those established (see statistical and psychometric analysis), so it can be said that the 3-dimensional model is equivalent between the groups (men and women).

Regarding the limits of the study, it is necessary to mention the use of a non-probabilistic sampling that can affect the ability to generalize the results to the population, however, considering the larger sample size compared to previous studies, it is considered that the results provide important evidence on the psychometric properties in the Peruvian population. Another limitation could be the lack of inclusion of

children in the study. Future research is recommended to include this group to test the external population validity of these results. Finally, another limitation that can be mentioned is the lack of proportionality in the participants according to the stage of development, the majority being adults (young and intermediate) and a smaller number of adolescents and older adults, which could bias the results.

It is suggested that future studies can evaluate samples that consider the proportionality of the groups according to the stage of development and thus be able to apply the measurement invariance establishing whether the internal structure is equivalent for all age groups. This would help us to delve into the role of the life cycle in the positive mental health of individuals.

In summary, the results found in the present work indicate good psychometric properties of the Positive Mental Health Scale for its application in the Peruvian population. The original six-factor structure had a poor fit to the data, so with the analysis carried out, a structure based on 3 factors is proposed, which has good fit indices. The Omega coefficient was higher than .81, which indicates that the instrument has a high internal consistency. Finally, in the invariance analysis, it was found that there are no differences between the structure of the instrument for men and women.

Finally, with the present study, it is hoped to motivate future investigations of psychological phenomena that address positive aspects of the human being, such as the Positive Mental Health Construct. Advances in this area of knowledge will favor the timely attention of cases through prevention and health promotion strategies in the general population. Understanding that health is not only the absence of disease should be a pillar that guides our actions as professionals, since it does not focus only on solving a problem, but anticipating it and improving people's living conditions, strengthening protective factors to the individual level, as well as, for society in general.

References

- Aguilar, H. M. (2018). Propiedades psicométricas del cuestionario de salud mental positiva en practicantes preprofesionales de psicología [Psychometric properties of the positive mental health questionnaire in pre-professional psychology practitioners]. *Revista de Psicología UCV*, 20(1), 64-84. <https://doi.org/10.18050/revpsi.v20i1.2208>
- Bernaards, C. A., & Jennrich, R. I. (2005). Gradient Projection Algorithms and Software for Arbitrary Rotation Criteria in Factor Analysis. *Educational and Psychological Measurement*, 65(5), 676-696. <https://doi.org/10.1177/0013164404272507>
- Cabarcas, J., & Mendoza, L. M. (2016). *Validación del cuestionario salud mental positiva de Llach en jóvenes estudiantes en el municipio del Carmen de Bolívar [Validation of Llach's positive mental health questionnaire in young students in the municipality of Carmen de Bolívar]* (Tesis de pregrado). Universidad Tecnológica de Bolívar, Bolívar, Colombia. <https://repositorio.utb.edu.co/handle/20.500.12585/1654>
- Cárcamo, K., Cofré, I., Flores, G., Lagos, D., Oñate, N., & Grandón, P. (2019). Atención en salud mental de las personas con diagnóstico psiquiátrico grave y su recuperación [Mental health care for people with a severe psychiatric diagnosis and their recovery]. *Psicoperspectivas. Individuo y Sociedad*, 18(2). <https://doi.org/10.5027/psicoperspectivas-Vol18-Issue2-fulltext-1582>
- Chen, F. F. (2007). Sensitivity of Goodness of Fit Indexes to Lack of Measurement Invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(3), 464-504. <https://doi.org/10.1080/10705510701301834>
- Domínguez-Lara, S. A., & Merino-Soto, C. (2015). ¿Por qué es importante reportar los intervalos de confianza del coeficiente alfa de Cronbach? [Why is it important to report the confidence intervals of Cronbach's alpha coefficient?]. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud*, 13(2), 1326-1328. <http://revistaumanizales.cinde.org.co/rclsnj/index.php/Revista-Latinoamericana/article/view/2030>
- Epskamp, S., Stuber, S., Nak, J., Veenman, M., & Jorgensen, T. D. (2019). *semPlot: Path Diagrams and Visual Analysis of Various SEM Packages' Output* (1.1.2) [Computer software]. <https://CRAN.R-project.org/package=semPlot>
- Fernández, B. (2012). Salud Mental: Un concepto polisémico [Mental Health: A Polysemic Concept]. *Revista Uruguaya de Enfermería*, 7(2), 1-10. <http://rue.fenf.edu.uy/index.php/rue/article/view/65/63>
- Ferrando, P. J., & Lorenzo-Seva, U. (2014). El análisis factorial exploratorio de los ítems: Algunas consideraciones adicionales [The exploratory factor analysis of the items: Some additional considerations]. *Anales de Psicología*, 30(3), 1170-1175. <https://doi.org/10.6018/analesps.30.3.199991>
- Gómez-Acosta, A., Alpi, S. V., & Sierra-Barón, W. (2020). Propiedades psicométricas de la escala de salud mental positiva en jóvenes colombianos: Un estudio exploratorio [Psychometric properties of the positive mental health

- scale in Colombian youth: An exploratory study]. *CES Psicología*, 13(2), 102-112. <https://revistas.ces.edu.co/index.php/psicologia/articulo/view/5026>
- Gómez-Acosta, C. A. (2018). Factores psicológicos predictores de estilos de vida saludable [Psychological predictors of healthy lifestyles]. *Revista de Salud Pública*, 20(2), 155-162. <https://doi.org/10.15446/rsap.v20n2.50676>
- González, N. I., & Valdez, J. L. (2016). Validez de la Escala de Salud Mental Positiva en Niños Mexicanos [Validity of the Positive Mental Health Scale in Mexican Children]. *Acta de Investigación Psicológica*, 6(1), 2368-2383. [https://doi.org/10.1016/s2007-4719\(16\)30056-4](https://doi.org/10.1016/s2007-4719(16)30056-4)
- Harrington, D. (2009). *Confirmatory factor analysis*. New York: Oxford University Press.
- Hurtado-Pardos, B., Lluch-Canut, T., Casas García, I., Sequeira, C., Puig-Llobet, M., & Roldán-Merino, J. (2018). Evaluación de la fiabilidad y validez del Cuestionario de Salud Mental Positiva en profesores universitarios de Enfermería en Cataluña [Evaluation of the reliability and validity of the Positive Mental Health Questionnaire in university nursing professors in Catalonia]. *Revista de Enfermería y Salud Mental*, 9, 5-17. <https://doi.org/10.5538/2385-703X.2018.9.5>
- Instituto Nacional de Salud Mental Honorio Delgado - Hideyo Noguchi [National Institute of Mental Health Honorio Delgado - Hideyo Noguchi]. (2018). *Compendio Estadístico* [Statistical Compendium]. <http://www.insm.gob.pe/oficinas/estadistica/compendio.html>
- Izquierdo, I., Olea, J., & Abad, F. J. (2014). Exploratory factor analysis in validation studies: Uses and recommendations. *Psicothema*, 26(3), 395-400. <https://doi.org/10.7334/psicothema2013.349>
- Jahoda, M. (1958). *Current concepts of positive mental health*. Basic Books. <https://doi.org/10.1037/11258-000>
- Jorgensen, T. D., Pornprasertmanit, S., Schoemann, A. M., Rosseel, Y., Miller, P., Quick, C., Garnier-Villarreal, M., Selig, J., Boulton, A., Preacher, K., Coffman, D., Rhemtulla, M., Robitzsch, A., Enders, C., Arslan, R., Clinton, B., Panko, P., Merkle, E., Chesnut, S., ... Ben-Shachar, M. S. (2020). *semTools: Useful Tools for Structural Equation Modeling* (0.5-3) [Computer software]. <https://CRAN.R-project.org/package=semTools>
- Kassambara, A. (2019). *ggcorrplot: Visualization of a Correlation Matrix using ggplot2* (0.1.3) [Computer software]. <https://CRAN.R-project.org/package=ggcorrplot>
- Keith, T. Z. (2015). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling* (2a. ed.). Routledge/Taylor & Francis Group.
- Kelley, K. (2020). *MBESS: The MBESS R Package* (4.8.0) [Computer software]. <https://CRAN.R-project.org/package=MBESS>
- Li, C. H. (2016). The performance of ML, DWLS, and ULS estimation with robust corrections in structural equation models with ordinal variables. *Psychological Methods*, 21(3), 369-387. <https://doi.org/10.1037/met0000093>
- Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A., & Tomás-Marco, I. (2014). El análisis factorial exploratorio de los ítems: Una guía práctica, revisada y actualizada [The exploratory factor analysis of the items: A practical guide, revised and updated]. *Anales de Psicología*, 30(3), 1151-1169. <http://dx.doi.org/10.6018/analesps.30.3.199361>
- Lluch, M. T. (1999). *Construcción de una escala para evaluar la salud mental positiva* [Construction of a scale to assess positive mental health] (Tesis Doctoral). Universidad de Barcelona, Barcelona, España. http://diposit.ub.edu/dspace/bitstream/2445/42359/1/E_TESIS.pdf
- Lluch, M. T. (2002). Evaluación empírica de un modelo conceptual de salud mental positiva [Empirical evaluation of a conceptual model of positive mental health]. *Salud Mental*, 25(4), 42-55. <https://www.redalyc.org/pdf/582/58242505.pdf>
- Macaya, X. C., Pihan, R., & Vicente, B. V. (2018). Evolución del constructo de Salud mental desde lo multidisciplinario [Evolution of the mental health construct from the multidisciplinary point of view]. *Revista Humanidades Médicas*, 18(2), 338-355. <http://scielo.sld.cu/pdf/hmc/v18n2/1727-8120-hmc-18-02-338.pdf>
- Martínez Aparicio, R., Pando Moreno, M., León Cortés, S. G., González Baltazar, R., Aldrete Rodríguez, M. G., & López Rodríguez, L. F. (2015). Validez y Confiabilidad de la Escala de Salud Mental Positiva [Validity and Reliability of the Positive Mental Health Scale]. *Psicogente*, 18(33), 78-88. <https://doi.org/10.17081/psico.18.33.57>
- Mebarak, M., De Castro, A., Salamanca, M. & Quintero, M. (2009). Salud mental: un abordaje desde la perspectiva actual de la psicología de la salud [Mental health: an approach from the current perspective of health psychology]. *Revista Psicología desde el Caribe*, 23, 83-112. <http://www.scielo.org.co/pdf/psdc/n23/n23a06.pdf>
- Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum Sample Size Recommendations for Conducting Factor Analyses. *International Journal of Testing*, 5(2), 159-168. https://doi.org/10.1207/s15327574ijt0502_4
- Muñoz, C. O., Restrepo, D., & Cardona, D. (2016). Construcción del concepto de salud mental positiva: Revisión sistemática [Construction of the concept of positive mental health: Systematic review]. *Revista Panamericana de Salud Pública*, 39(3), 166-173. <https://www.scielosp.org/pdf/rtpsp/2016.v39n3/166-173>
- Organización Panamericana de la Salud. [Pan American Health Organization]. (2020). *Perú continúa con la implementación de centros de salud mental comunitarios* [Peru continues with the implementation of community mental health centers]. https://www.paho.org/per/index.php?option=com_content&view=article&id=4454;peru-continua-con-la-implementacion-de-centros-de-salud-mental-comunitarios&Itemid=1062
- R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>
- Raiche, G., & Magis, D. (2020). *NFactors: Parallel Analysis and Other Non Graphical Solutions to the Cattell Scree Test* (2.4.1) [Computer software]. <https://CRAN.R-project.org/package=nFactors>
- Revelle, W. (2020). *Psych: Procedures for Psychological, Psychometric, and Personality Research* (2.0.8) [Computer software]. <https://CRAN.R-project.org/package=psych>
- Rodríguez, R. (2005). El hombre como ser social y la conceptualización de la salud mental positiva [Man as a social being and the conceptualization of positive mental health]. *Revista Investigación en Salud*, 7(2), 105-111. <https://www.redalyc.org/articulo.oa?id=14270205>
- Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, 48(1), 1-36. <https://doi.org/10.18637/jss.v048.i02>
- RStudio Team. (2020). *RStudio: Integrated Development Environment for R*. RStudio, PBC, Boston, MA. <https://rstudio.com/>
- Schauberger, P., Walker, A., Braglia, L., & Sturm, J. (2020). *openxlsx: Read, Write and Edit xlsx Files* (4.2.2) [Computer software]. <https://CRAN.R-project.org/package=openxlsx>
- Sequeira, C., Carvalho, J. C., Sampaio, F., Sá, L., Lluch-Canut, T., & Roldán-Merino, J. (2014). Avaliação das propriedades psicométricas do Questionário de Saúde Mental Positiva em estudantes portugueses do ensino superior [Evaluation of the psychometric properties of the Positive Mental Health Questionnaire in Portuguese higher education students]. *Revista Portuguesa de Enfermagem de Saúde Mental*, 11, 45-53. <http://www.scielo.mec.pt/pdf/rpesm/n11/n11a07.pdf>
- Svetina, D., Rutkowski, L., & Rutkowski, D. (2019). Multiple-Group Invariance with Categorical Outcomes Using Updated Guidelines: An Illustration Using M plus and the lavaan/semTools Packages. *Structural Equation Modeling: A Multidisciplinary Journal*, 27(1), 111-130. <https://doi.org/10.1080/10705511.2019.1602776>
- Vallejo, P. (2020, May 7). *Análisis Factorial Confirmatorio (AFC) en R y RStudio* [video] [Factorial Confirmatory Analysis (AFC) in R and RStudio]. Youtube. https://www.youtube.com/watch?v=ZnHY07TKMj4&ab_channel=PabloVallejoMedina
- Ventura-León, J. L., & Caycho-Rodríguez, T. (2017). El coeficiente Omega: Un método alternativo para la estimación de la confiabilidad [The Omega coefficient: An alternative method for the estimation of reliability]. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud*, 15(1), 625-627. <https://www.redalyc.org/pdf/773/77349627039.pdf>
- Vigil-Colet, A., Navarro-González, D., & Morales-Vives, F. (2020). To reverse or to not reverse Likert-type items: That is the question. *Psicothema*, 32(1), 108-114. <https://doi.org/10.7334/psicothema2019.286>
- Wickham, H., & Miller, E. (2020). *haven: Import and Export SPSS, Stata and SAS Files* (2.3.1) [Computer software]. <https://CRAN.R-project.org/package=haven>
- Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., ... Yutani, H. (2019). Welcome to the Tidyverse. *Journal of Open Source Software*, 4(43), 1686. <https://doi.org/10.21105/joss.01686>
- Wu, H., & Estabrook, R. (2016). Identification of Confirmatory Factor Analysis Models of Different Levels of Invariance for Ordered Categorical Outcomes. *Psychometrika*, 81(4), 1014-1045. <https://doi.org/10.1007/s11336-016-9506-0>