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A study: Semi-confirmatory factor analysis and reliability of the Symptom Assessment-45 questionnaire in Peruvian population

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ABSTRACT

The study of psychopathological variables constitutes a valuable resource in the field of mental health, but even more so when there are evaluation support tools that facilitate its exploration. In addition, when these tools are valid and reliable, they provide optimal data, which guides towards a better intervention response, which is extremely necessary in the face of the reality that exists in terms of mental health needs. Therefore, this work seeks to analyze the evidence of the construct validity of SA-45, convergent validity, and discriminant validity. In addition, to find the reliability of the Symptom Assessment-45 Questionnaire (SA-45). The SA-45, and other measures (LOT-4, DASS-21) were applied to 1637 subjects from different regions of Peru, aged 18 to 65. Then, a semi-confirmatory factor analysis was performed by means of exploratory structural equation modeling (ESEM) and an objective matrix with Procrustes rotation to identify the hypothesized dimensions. All nine dimensions hypothesized by previous studies were found to have favorable factor congruence coefficients (FCC-total >.85), adequate factor saturations (λ >.30), acceptable to high internal consistency alpha, omega, and ordinal alpha coefficients (>.70), and satisfactory goodness-of-fit (RMSEA = 0.004, RMSR = 0.021, FCC = 0.99, GFI = 1.000). Likewise, the validity in relation to other instruments such as the DASS-21 and the LOT-R reports Pearson correlation coefficients with medium and large effect sizes (r =.30 and r =.50) in their dimensions. The SA-45 is a theoretically and psychometrically supported instrument for use in young and adult populations.

Contribution/Originality: The first Peruvian version of the SA-45 was validated using the semi-confirmatory factor analysis technique from the exploratory structural equation modeling (ESEM) approach.

1. INTRODUCTION

Psychopathological variables constitute a wide range of conditions on which immediate action is required, due to the impact on people's lives and the relevance acquired in the context of the health crisis, since the spread of Sars-Cov-2 not only directly affects the physical health but also the mental health of many people in the world (Ezpeleta,

Navarro, De La Osa, Trepat, & Penelo, 2020; Ramírez-Ortiza, Castro-Quinteroa, Lerma-Córdobaa, Yela-Ceballosa, & Escobar-Córdobaa, 2020).

In this scenario, self-report instruments are basic resources for support in clinical practice (Fernández-Montalvo & Echeburúa, 2006). Therefore, it is important to explore some type of instrument that not only collects specific aspects but also allows a global assessment of the individual's psychological state, such as the Symptom Checklist 90 (SCL-90; Derogatis (1990), one of the most widely used tools in the world, both for clinical and research applications, whose base responds to statistical and clinical criteria, giving rise to a total of 9 scales: anxiety, depression, agoraphobia, obsessive-compulsion, paranoid ideation, interpersonal sensitivity, psychoticism, hostility, and somatization, all of which are prominent and highly prevalent in mental health (Bados, Balaguer, & Coronas, 2005; Ezpeleta et al., 2020).

Even though the SCL-90 is so widely used, it is important to note that it does have some problems. These include observations after factorial and discriminant validity analyses, an imbalance in the number of items that make up scales, overlapping between items, and a log length that often leads to the immersion of extraneous variables, making it hard to get a real scope in the results obtained (Gempp & Avendaño, 2008; Vassend & Skrondal, 1999). Therefore, it is advisable to search for brief tools that facilitate less time consumption by the evaluate, generating an environment of gratification when answering the questions and making possible the development of multivariate research, a situation that is difficult with extensive tests (Maruish, Bershadsky, & Goldstein, 1998).

In view of these considerations, Alvarado, Sandín, Valdez-Medina, González-Arratia, and Rivera (2012) consider that the use of the SCL-90 can still be optimal if a version that improves the presentation of its items and offers a brief proposal is available, as is the case of the Symptom Assessment-45 Questionnaire (SA-45) (Davison et al., 1997), which maintains the same number of components as SCL-90; additionally, it provides fairness in the number of items on each scale, reduces overlap between items, as well as the immersion of extraneous variables.

To find out what the SA-45 can measure, Maruish et al. (1998) looked at a clinical sample of 126 U.S. adults and found that the SA-45 can predict the Global Severity Index (GSI) and that it stays stable over time after three months. Additionally, they identified evidence of convergent validity with the SF-12 Health Survey.

Later, Sandín, Valiente, Chorot, Santed, and Lostao (2008), in a Spanish context, using a university sample, verified a 9-dimensional structure of the SA-45 as well as moderate correlations between factors. Regarding discriminant and convergent validity, the authors found that the instrument provided appropriate data in the correlations obtained. In terms of reliability, they obtained an overall alpha coefficient of 0.95 and values above 0.70 in their dimensions, except for the psychoticism scale (Sandín et al., 2008).

Alvarado et al. (2012), in a Mexican university context, also confirmed that the SA-45 maintains its structure of nine related factors. Additionally, they reported an overall alpha of 0.96 and values between 0.70 and 0.85 for the dimensions, except for the subscale of psychoticism (alpha less than 0.70). Slavin-Mulford, Perkey, Blais, Stein, and Sinclair (2015) in North America reported evidence of the validity of the SA-45 in a clinical sample; they specified that the instrument possessed divergence and convergence when correlated with the scales of the Personality Assessment Inventory (PAI).

Then, Holgado, Vila, and Barbero (2019) used exploratory factor analysis (EFA) on a non-clinical sample of Spanish people and found a nine-factor structure. However, some items had factor saturations that were different from what Sandín et al. (2008) and Maruish et al. (1998) had found. The Confirmatory Factor Analysis (CFA) of Holgado et al. confirms the structure found with favorable goodness of fit and internal consistency except for the psychoticism scale ($\alpha = 0.57$). Within their conclusions, Holgado et al. (2019) note that the studies by Maruish et al. (1998) and Sandín et al. (2008) were conducted with clinical samples, so they prefer to give support to their version since it was conducted with population with no previous psychopathological diagnoses.

Based on what has been reported, it is convenient to explore the psychometric exploration of the SA-45 in different contexts. Both the Peruvian and international environments demand continuity and the study of its

validity and reliability because it is of great importance for cross-cultural studies and clinical evaluation, providing support functions, establishing intervention measures, and in this way achieving timely attention to various mental health problems (Ezpeleta et al., 2020; Fernández-Montalvo & Echeburúa, 2006; Garcia, 2019; López & Becoña, 2006; Tundo, Betro', & Necci, 2021).

The main objective of this study is to examine the evidence of the validity of the SA-45 through procedures such as Exploratory Structural Equation Modeling (ESEM), the Semi-Confirmatory Factor Analysis (SCFA) technique, and the relationship of the construct with other variables that measure the convergence and divergence of the instrument. Finally, the reliability of the SA-45 is analyzed based on the internal consistency method in order to corroborate the accuracy of the instrument.

2. METHODS

2.1. Participants

A total of 1637 adults between 18 and 65 years of age participated, 36.1% male, distributed among five macro-regions of Peru. Lima was represented by 33.6% of the sample, the Northern region by 19.4% (Ancash, La Libertad, Lambayeque, Cajamarca, and Piura), the Northeastern region by 14.2% (Amazonas, San Martin, and Loreto), the Central region by 21.5% (Junín, Ayacucho, and Apurímac) and the Southern region by 11% (Ica, Tacna, Arequipa, Cuzco, and Puno). 63.9% of the sample was female. The sample was non-probabilistic for convenience.

2.2. Instruments

The Symptom Assessment-45 Questionnaire (SA-45) was adapted by Davison et al. (1997) to identify depression, anxiety, somatization, hostility, psychoticism, interpersonal sensitivity, phobic anxiety, obsessive-compulsive, and paranoid ideation, following the structure of the Symptom Checklist 90 (SCL-90) (Derogatis, 1990). The instrument presents response options ranging from 0 (not at all) to 4 (very or extremely present). In its version translated into Spanish, the instrument presented a structure of nine related factors: the best fit model x2/gl = 1.67, the Comparative Fit Index (CFI = 0.88), the Root Mean Square Residual (SRMR = 0.06), the Root Mean Square Error of Approximation (RMSEA = 0.04), and also showed adequate reliability with coefficients between $\alpha = 0.70$ and 0.80 with the exception of the psychoticism factor (Sandín et al., 2008). Subsequently, the version by Holgado et al. (2019) obtained better fit indices than the study by Sandín et al. (2008), although the latter emphasizes that its validation is appropriate for non-clinical samples.

The Depression, Anxiety, and Stress Scale (DASS) self-report was developed in its extended version by Lovibond and Lovibond (1995). For the study, we used the brief version, the DASS-21, validated for American and Spanish university students (Bados et al., 2005), and there is also a Chilean version (Daza, Novy, Stanley, & Averill, 2002) with favorable psychometric properties.

Dispositional optimism (Life Orientation Test/LOT-R), revised version (Scheier, Carver, & Bridges, 1994). It consists of 10 items (three items assess optimism, three pessimism, and four items function as fillers), with five-point Likert responses ranging from *strongly agree (5) to strongly disagree (1)*. The LOT-R has demonstrated internal structure validity and reliability (Angelo, Bido, Corrêa, Hupfer, & Brandão, 2021; Gustems-Carnicer, Calderón, & Santacana, 2017; Hinz et al., 2017; Rondon & Angelucci, 2016).

2.3. Procedure

Through a virtual form, SA-45 was applied to the participants, together with the complementary instruments for the test convergence assessment, in a time of approximately 25 minutes. The participants agreed voluntarily and anonymously, preserving the confidentiality of the data provided and guaranteeing the absence of any type of harm surrounding the evaluation process (Aparisi, 2010). It is emphasized that this study was developed considering the version of Holgado et al. (2019), since the type of factorial structure obtained is more appropriate for university and

non-clinical samples. The remaining studies, Alvarado et al. (2012) and Sandín et al. (2008), have considered the version of Maruish et al. (1998) developed with a clinical sample, despite the fact that the sample of both were university students.

2.4. Data Analysis

We did a descriptive analysis of the data by looking at skewness and kurtosis values within the expected cut-off points (± 1.5). We also used the standardized skewness index (SSI) to get a better idea of how symmetric the variables were.

The ESEM approach was performed under the SCFA technique using a Target Matrix (TM), in addition to using a Procrustes rotation (Browne, 1972). The ESEM approach of the aforementioned SCFA allows factor analysis to be placed in an intermediate position between the exploratory and confirmatory strategies and provides greater flexibility to establish a match between theory and the data obtained (Marsh, Morin, Parker, & Kaur, 2014), and its use has been recommended in multidimensional personality scales in which it is difficult to find simple structures such as those indicated by Thurstone, and items are found to load on one dimension and saturate on another, showing its factorial complexity (Dominguez-Lara, Merino-Soto, Zamudio, & Guevara-Cordero, 2018), as is the case with the SA-45, which has nine dimensions. Additionally, the use of the TM helps us guide the data from the theory since it operates using a pre-specified or semi-specified TM. It indicates that each item loads on one factor and not on the others, to which is added a Procrustes rotation that adjusts the data to those expected in the TM (Digman, 1967).

For the present case, the TM was semi-specified with a factor saturation value of 0.9 when the item loaded on the respective factor and a factor loading of 0.15 on the remaining dimensions on which the item should not load. The same procedure is performed for the remaining dimensions. After this step, the Factor Congruence Coefficients (FCC) (Tucker, 1951) are obtained, which indicate the degree of correspondence between the matrix proposed and the data obtained, with values greater than .80 being expected. Finally, the internal consistency coefficient alpha, ordinal alpha, and McDonald's omega are obtained. The latter two are more appropriate for ordinal variables such as those used in this study, and the study is completed with evidence of convergent and discriminant validity and the calculation of their effect size (Cohen, 1988).

The above procedures were carried out using Excel spreadsheets and, in particular, the Factor software of Rovira University, which allows the execution of the SCFA with TM and Procrustes rotation.

3. RESULTS AND DISCUSSION

Table 1 provides the descriptive statistics of the SA45, showing skewness and kurtosis coefficients mostly in the expected range (±1.5). Furthermore, outliers were removed using the Mahalanobis distance. In addition, the mean and standard deviation of each variable analyzed are shown.

After the descriptive analysis, the semi-confirmatory factor analysis of the SA-45 was performed considering the nine dimensions hypothesized by the study of Holgado et al. (2019). In this regard, measures of the adequacy of the factorial matrix were obtained, finding favorable values such as a determinant of the matrix < 0.000; the Kaiser-Meyer-Olkin test (KMO = 0.965; Bartlett's test = 15291.1 (p = 0.00); that is, the correlation matrix may be factorizable.

Subsequently, the target matrix (TM) was used to approximate the solution matrix to a previously specified TM by means of a Procrustes rotation. According to the findings, it is observed that this even evidences a favorable goodness-of-fit measure (RMSEA = 0.004, RMSR = 0.021, FCC = 0.99, GFI = 1.000; Adjusted Goodness of Fit Index (AGFI = 1.000), and the factor loadings are acceptable to satisfactory ($\lambda > 0.30$), as seen in Table 2.

Table 1. Mean, standard deviation, skewness, kurtosis and SSI of the SA-45.

Item	M	S.D.	G1	G2	SSI
SA1	0.69	0.92	1.28	1.07	0.7561
SA2	0.42	0.66	1.62	2.79	1.8595
SA3	0.84	0.9	0.94	0.44	0.5802
SA4	0.24	0.56	2.6	6.84	4.1454
SA5	1.26	0.99	0.56	-0.11	0.2857
SA6	0.76	0.83	1.12	1.23	0.7984
SA7	0.79	0.9	1.04	0.63	0.6420
SA8	0.63	0.84	1.33	1.45	0.9425
SA9	0.89	0.92	0.96	0.59	0.5671
SA10	1.13	0.88	0.71	0.39	0.4584
SA11	0.87	0.88	0.87	0.41	0.5617
SA12	1.08	0.96	0.73	0.08	0.3961
SA13	0.56	0.76	1.38	1.86	1.1946
SA14	0.84	0.82	0.85	0.54	0.6321
SA15	0.79	0.79	0.77	0.32	0.6169
SA16	1.25	1	0.53	-0.29	0.2650
SA17	0.49	0.73	1.52	2.13	1.4262
SA18	0.98	0.92	0.76	0.15	0.4490
SA19	0.64	0.78	1.17	1.19	0.9615
SA20	1.02	0.9	0.72	0.14	0.4444
SA21	1	0.85	0.68	0.21	0.4706
SA22	0.78	0.96	1.21	0.91	0.6565
SA23	0.78	0.84	0.95	0.63	0.6732
SA24	0.92	0.88	0.76	0.23	0.4907
SA25	0.7	0.81	1.08	0.85	0.8230
SA26	0.76	0.82	0.98	0.68	0.7287
SA27	0.97	0.92	0.79	0.2	0.4667
SA28	1.08	0.89	0.67	0.19	0.4229
SA29	0.85	0.83	0.76	0.17	0.5516
SA30	1.09	0.9	0.61	-0.08	0.3765
SA31	0.68	0.83	1.12	0.72	0.7984
SA32	0.79	0.87	0.92	0.18	0.6077
SA33	0.43	0.69	1.72	3.06	1.8063
SA34	0.35	0.69	2.23	5.05	2.3419
SA35	0.45	0.76	1.74	2.63	1.5062
SA36	0.59	0.77	1.34	1.68	1.0963
SA37	0.56	0.82	1.55	2.31	1.1526
SA38	0.36	0.68	2.09	4.53	2.2599
SA39	0.69	0.78	1.01	0.86	0.8300
SA40	0.89	0.86	0.89	0.65	0.6017
SA41	0.87	0.87	0.96	0.81	0.6342
SA42	0.5	0.8	1.66	2.35	1.2969
SA43	0.4	0.68	1.75	3.03	1.8923
SA44	0.73	0.87	1.18	1.06	0.7795
SA45	0.59	0.86	1.52	1.99	1.0276

Note: M, Mean; SD, Standard deviation; g1, Fisher's skewness; g2, Fisher's kurtosis; SSI, Standardized skewness index.

Evidence of validity was identified in relation to other variables (Figure 1). The nine factors of the SA-45 were related to the DASS-21 as its dimensions of depression, anxiety, and stress, finding significant correlations with an effect size between medium (r = 0.30) and large (r = 0.50), confirming the existence of convergent validity. Regarding discriminant validity, the SA-45 was related to the Life Orientation Scale and its two dimensions (optimism and pessimism), finding negative and positive correlations, respectively, with effect sizes between small (r = 0.10) and medium (r = 0.30) that support discriminant validity.

Table 2. Matrix of factor loadings with Procrustes rotation of the SA-45, ICF, internal consistency and correlations between the latent constructs of the SA-45.

Item	F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	FCF	bootstrap- CI 90%
V1	**0.354**	0.243	0.067	0.256	0.067	**0.377**	0.09	0.101	0.097	0.814	(0.747 - 0.906)
V2	**0.49**	0.217	0.12	0.217	0.183	**0.41**	0.215	0.018	0.04	0.85	(0.800 - 0.925)
V3	0.193	**0.763**	0.132	0.12	0.016	0.25	0.238	0.152	0.205	0.97	(0.960 - 0.985)
V4	**0.311**	0.295	0.266	**0.311**	0.123	**0.715**	0.122	0.042	0.062	0.926	(0.910 - 0.953)
V5	**0.453**	0.16	0.054	0.119	-0.004	0.12	0.104	0.226	0.213	0.92	(0.881 - 0.977)
V6	0.271	**0.417**	0.278	0.183	0.15	**0.385**	0.181	**0.322**	0.237	0.8	(0.782 - 0.840)
V7	0.226	0.209	0.165	**0.648**	-0.098	0.223	**0.353**	0.221	0.231	0.898	(0.867 - 0.923)
V8	0.072	**0.704**	0.224	0.063	0.131	**0.303**	0.049	0.286	0.172	0.944	(0.926 - 0.968)
V9	**0.356**	0.231	0.095	0.079	0.266	0.163	0.164	**0.711**	-0.006	0.932	(0.914 - 0.975)
V10	**0.332**	0.218	0.168	0.192	0.183	0.041	**0.325**	**0.663**	0.093	0.925	(0.905 - 0.961)
V11	**0.252**	0.202	0.148	0.247	0.186	0.234	**0.353**	0.296	0.281	0.692	(0.615 - 0.804)
V12	0.26	**0.341**	0.282	0.252	0.143	0.196	**0.525**	0.229	0.278	0.87	(0.827 - 0.908)
V13	**0.512**	0.165	0.208	0.163	0.161	**0.579**	0.129	0.11	0.164	0.871	(0.826 - 0.903)
V14	**0.618**	0.162	0.143	0.192	0.224	**0.331**	**0.376**	0.242	0.164	0.905	(0.896 - 0.928)
V15	**0.728**	0.028	0.146	0.046	**0.301**	**0.434**	0.177	0.101	0.232	0.912	(0.885 - 0.950)
V16	**0.365**	0.188	0.14	0.113	0.03	0.184	0.185	0.096	**0.559**	0.912	(0.852 - 0.965)
V17	0.35	0.244	0.067	0.04	**0.663**	0.292	0.238	0.211	0.151	0.918	(0.881 - 0.942)
V18	0.033	0.123	**0.696**	0.137	-0.01	0.132	0.29	0.214	0.055	0.948	(0.939 - 0.973)
V19	**0.473**	0.128	**0.319**	0.076	0.291	**0.389**	-0.049	0.223	0.279	0.802	(0.738 - 0.860)
V20	**0.313**	0.197	0.202	0.177	0.105	0.076	0.196	0.193	**0.621**	0.943	(0.929 - 0.971)
V21	**0.363**	0.208	0.15	0.068	**0.399**	0.036	**0.31**	0.271	**0.47**	0.804	(0.761 - 0.860)
V22	0.105	**0.726**	0.119	0.14	0.169	-0.066	0.193	0.021	0.103	0.959	(0.949 - 0.984)
V23	0.173	0.284	**0.513**	0.186	0.041	0.258	0.123	0.162	0.215	0.907	(0.886 - 0.951)
V24	0.154	**0.725**	0.238	0.067	0.164	0.026	0.143	0.127	0.189	0.976	(0.969 - 0.988)
V25	0.218	**0.303**	**0.365**	0.153	0.278	0.28	0.187	0.165	0.298	0.791	(0.748 - 0.842)
V26	0.148	0.183	**0.609**	0.201	0.057	0.241	0.285	0.08	0.201	0.94	(0.900 - 0.974)
V27	0.275	0.221	0.224	0.144	**0.344**	-0.005	**0.305**	0.287	**0.3**	0.688	(0.611 - 0.767)
V28	0.269	0.193	**0.343**	0.031	**0.39**	0.085	**0.372**	0.247	**0.349**	0.629	(0.555 - 0.729)
V29	0.19	0.14	**0.762**	0.125	0.113	0.194	**0.308**	0.176	0.098	0.974	(0.963 - 0.990)
V30	0.266	0.166	**0.548**	0.143	0.167	0.037	**0.49**	0.248	0.19	0.8	(0.762 - 0.854)
V31	0.11	0.139	**0.724**	0.189	0.181	0.131	0.22	0.168	0.025	0.98	(0.969 - 0.993)
V32	**0.408**	0.227	0.252	0.051	**0.398**	0.147	-0.025	0.241	0.229	0.778	(0.756 - 0.826)
V33	**0.322**	0.24	**0.338**	**0.303**	0.289	**0.463**	-0.065	0.198	0.126	0.802	(0.756 - 0.847)
V34	0.137	0.244	0.231	**0.586**	**0.301**	**0.368**	0.039	0.106	0.014	0.884	(0.834 - 0.940)
V35	0.049	0.262	0.226	**0.73**	0.186	0.29	0.12	0.182	0.13	0.959	(0.936 - 0.985)

Item	F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8	F 9	FCF	bootstrap- CI 90%
V36	**0.352**	0.246	0.047	0.18	**0.522**	0.138	0.054	0.291	0.142	0.878	(0.845 - 0.926)
V37	0.041	**0.704**	0.112	0.214	**0.328**	0.036	0.243	0.077	0.123	0.943	(0.926 - 0.984)
V38	0.085	**0.534**	0.227	**0.424**	0.291	**0.325**	0.187	0.18	0.136	0.853	(0.840 - 0.894)
V39	**0.434**	0.061	0.116	**0.629**	0.037	0.031	**0.429**	0.124	0.168	0.856	(0.793 - 0.890)
V40	**0.587**	0.002	0.055	**0.311**	0.251	0.043	0.299	0.184	0.15	0.897	(0.854 - 0.943)
V41	**0.304**	0.196	0.216	**0.457**	0.132	-0.011	**0.522**	0.213	0.278	0.829	(0.789 - 0.882)
V42	**0.317**	0.166	0.08	0.188	**0.638**	0.133	0.188	**0.32**	0.146	0.932	(0.905 - 0.960)
V43	0.172	0.193	0.165	**0.747**	0.154	0.193	0.15	0.204	0.113	0.988	(0.986 - 0.995)
V44	**0.464**	0.078	0.102	0.198	**0.321**	0.034	-0.132	**0.372**	0.215	0.788	(0.656 - 0.838)
V45	**0.317**	0.132	0.109	**0.379**	0.207	0.128	-0.144	**0.309**	0.277	0.678	(0.659 - 0.734)
ICF	0.825	0.944	0.908	0.925	0.860	0.828	0.804	0.843	0.892	T-FCC	0.872 (0.87 -0.872)
α	0.79	0.84	0.84	0.91	0.80	0.67	0.79	0.66	0.71		
α_{ord}	0.87	0.85	0.89	0.84	0.89	0.83	0.85	0.74	0.77		
Ω	0.85	0.89	0.87	0.87	0.83	0.70	0.79	0.71	0.72		
F1	1.00										
F2	0.37	1.00									
F3	0.35	0.19	1.00								
F4	0.16	-0.10	0.30	1.00							
F5	-0.04	-0.09	0.20	0.49	1.00						
F6	-0.33	-0.35	-0.37	-0.01	0.07	1.00					
F7	-0.36	0.00	-0.20	-0.31	0.06	0.11	1.00				
F8	-0.20	-0.10	-0.12	-0.15	-0.11	0.27	0.39	1.00			
F9	-0.02	-0.29	-0.03	-0.02	0.05	0.15	-0.18	-0.04	1.00		

Notes: F1, paranoid ideation; F2, phobic anxiety; F3, somatization; F4, hostility; F5, interpersonal sensitivity; F6, psychoticism; F7, anxiety; F8, depression; F9, obsessive-compulsion; FCF, factor congruence coefficient; T-FCC, total factor congruence coefficient; α, alpha coefficient; αord, ordinal alpha; Ω, omega coefficient; Ω, omega coefficient.

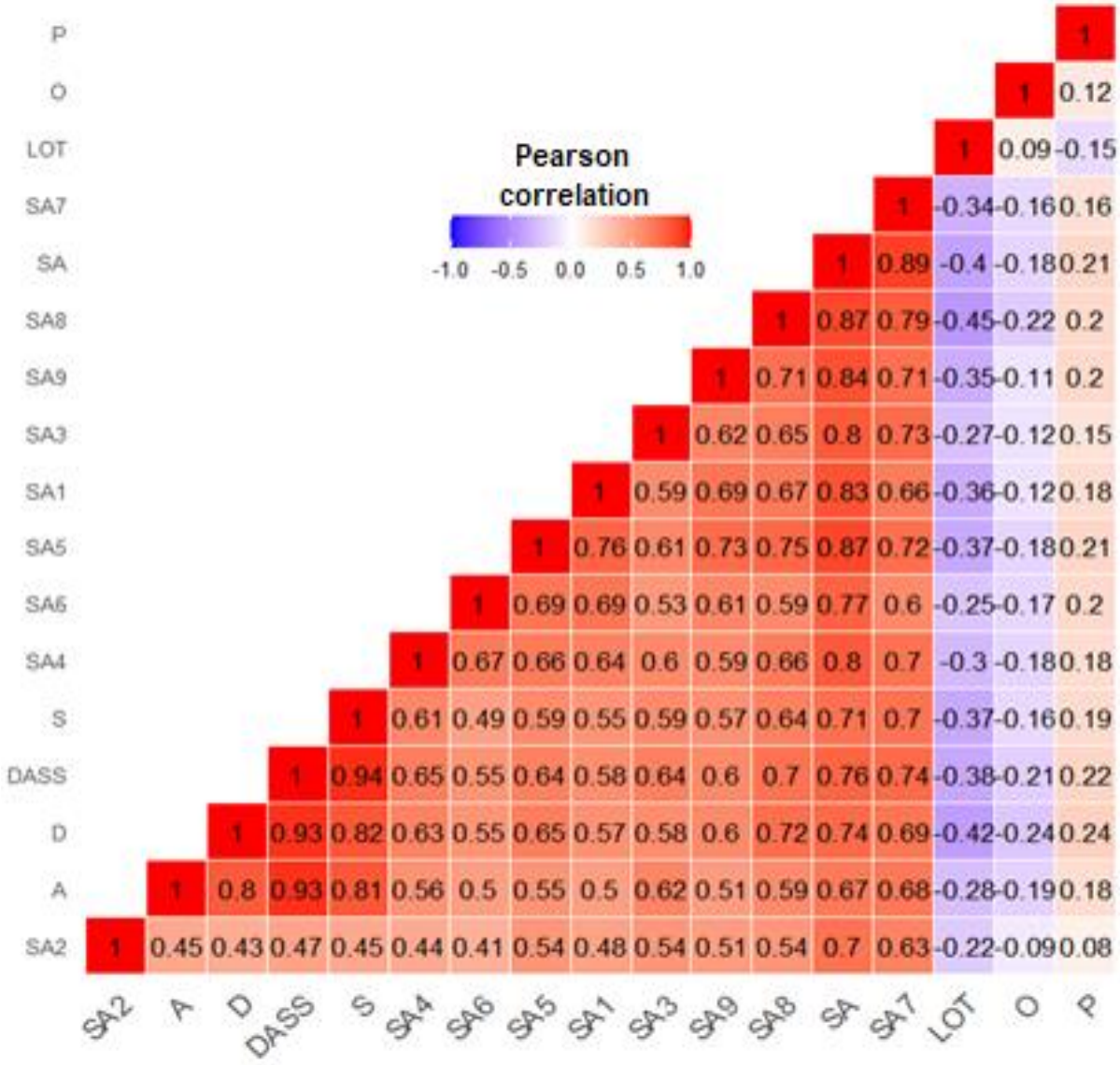

Figure 1. Heat map of SA-45 and the LOT-R and DASS-21.

Note: DAS, Depression, Anxiety and Stress Scale DASS-21 total score; D, depression; A, anxiety; S, stress; LOT, Life Orientation Scale LOT-R total score; O, optimism; P, pessimism; SA1, paranoid ideation; SA2, phobic anxiety; SA3, somatization; SA4, hostility; SA5, interp ersonal sensitivity; SA6, psychoticism; SA7, anxiety; SA8, depression; SA9 obsession-compulsion; With a cross (X), nonsignificant correlations.

The SA-45 is an instrument with important psychometric properties in relation to its factorial structure and internal consistency, even though it is an extensive multidimensional instrument. In this regard, its main features are analyzed in relation to previous versions.

We considered using an ESEM strategy with an objective matrix (OM) to which a Procrustes rotation was added, which allowed us to guide the data according to the theory, even more so when we have already mentioned that some items have factorial complexity, that is, just as they can score in one factor, they can also be part of another. In the EFA of Holgado et al. (2019) and Sandín et al. (2008), this overlap was already noted, as several items with factorial complexity were found. Furthermore, this explains why the versions by Holgado et al. (2019) and Sandín et al. (2008) are different since, in the EFA conducted by the former, it had already been observed that the items considered by Maruish et al. (1998) and later by Sandín et al. (2008) were not part of the same factor structure that they found. It is noteworthy that Holgado et al. (2019) argued that their instrument was validated with a sample of university students. On the contrary, the sample of Maruish et al. (1998) was of clinical type, so Holgado et al. (2019) considered their proposal more relevant for the case of a non-clinical sample. Regarding the study by Sandín et al. (2008), which supports the findings of Maruish et al. (1998), it is emphasized that this study

was conducted on a university sample, but the EFA was estimated with principal components and Kaiser's rule, methods that are currently not recommended for use (Ferrando & Anguiano-Carrasco, 2010) because they fail to report the factor loadings of the CFA performed, limiting themselves only to showing those of the EFA, which prevents comparison with this study.

In this case, the factorial structure proposed by Holgado et al. (2019) has been maintained, and FCCs higher than 0.80 (FCC >.80) have been found in almost all items and in the nine dimensions that make up the instrument, as well as FCC higher than .85 of the total scale (FCC> .85), which supports the factorial structure of the Peruvian version. Only the paranoid ideation dimension lost 2 items: item 11 (not feeling interested in things) and item 27 (feeling hopeless about the future), which in the Sandín et al. (2008) version is included in the depression subscale. In this respect, it makes sense since the pattern of paranoid distrust present in the items in this dimension cannot be identified. Contrary to the other studies (Alvarado et al., 2012; Maruish et al., 1998; Sandín et al., 2008), those items load within the anxiety subscale with acceptable factor loadings (λ >.30). Although analyzed in detail, they would not be assessing any anxiety component either, but would be more related to them for their psychopathological component.

Likewise, item 28 (concentration difficulties) was not included within the depression dimension, but interestingly, it has favorable factor saturation (λ >.30) in somatization, interpersonal sensitivity, anxiety, and obsession-compulsion, again reflecting the item's factorial complexity. This aspect has also already been seen in the study by Holgado et al. (2019), in which this item loads on other dimensions that do not correspond to it. Apparently, it would be convenient to keep this item in the obsession-compulsion scale as well as the remaining versions (Alvarado et al., 2012; Maruish et al., 1998; Sandín et al., 2008) since it would be reflecting some undesired mental component of an anxiogenic nature. In addition, the internal consistency of this scale (α =.66; αord =.74; Ω = 71) obtained acceptable but low values compared to the versions of Sandín et al. (2008) and Alvarado et al. (2012), both with an α =.85, and slightly lower than that of Holgado et al. (2019) with an α =.75. If we consider the fact that item 28 of this scale had to be withdrawn, we could point out that it is perhaps the weakest scale compared to the depression version of Sandín et al. (2008) and Alvarado et al. (2012), in which the items and internal consistency remain more stable.

Furthermore, the Psychoticism scale obtained an acceptable alpha coefficient, a high ordinal alpha, and an acceptable omega (α =.67; αord =.83; Ω =70), an aspect that remains deficient in the version of Holgado et al. (2019) (α = .57), Sandín et al. (2008) (α =.63) and Alvarado et al. (2012) (α =.57). In addition, the alpha coefficient is not adequate for scales with ordinal responses, so the ordinal alpha and omega coefficient would be more appropriate for evaluating the internal consistency of this subscale and the others.

It is also mentioned that the obsession-compulsion dimension kept its factorial structure, and despite having only three items, it obtained acceptable internal consistency values (α =.71; αord =.77; Ω =72) very similar to the version of Sandín et al. (2008) and Holgado et al. (2019) although slightly lower than the coefficient obtained by Alvarado et al. (2012) (α =.81).

In relation to the evidence of validity with other variables, the instrument achieved significant associations with the DASS-21, a psychopathological measure of anxiety, stress, and depression that shows high and medium effect sizes, which encourages the use of the SA-45 as a psychopathological measure. The SA-45 also associates negatively with optimism, and positively with pessimism, which is expected for a scale of its type, such as the SA-45.

4. CONCLUSION

SA-45 Peruvian version is an instrument with psychometric properties that reflects a defined factorial structure with nine dimensions and a favorable internal consistency in its dimensions. Likewise, evidence of convergent and discriminant validity was obtained with the DASS-21 and LOT-R measures, demonstrating their relevance for use in the Peruvian population.

One of the limitations is related to the virtual survey, which does not allow the evaluation of the population that does not use social networks. Due to the non-clinical sample type, another limitation would be related to the use of the instrument in the clinical population for clinical diagnoses.

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REFERENCES

Alvarado, B. G., Sandín, B., Valdez-Medina, J. L., González-Arratia, N., & Rivera, S. (2012). Confirmatory factor analysis of the SA-45 questionnaire in a Mexican sample. *Anales De Psicología/Annals of Psychology*, *28*(2), 426-433.

Angelo, D., Bido, D., Corrêa, M., Hupfer, B., & Brandão, R. (2021). Psychometric properties of the life orientation test (LOT-R) for sport. *Cuadernos De Psicología Del Deporte*, *21*(3), 257-268. https://doi.org/10.6018/cpd.426311

Aparisi, J. C. S. (2010). The principles of bioethics and the emergence of an intercultural bioethics. *Veritas*, *122*(22), 121-157. http://dx.doi.org/10.4067/S0718-92732010000100006

Bados, A., Balaguer, G., & Coronas, M. (2005). What does the SCL-90-R actually measure? Factorial structure in a mixed sample of university students and patients. *Psicología Conductual*, *13*(2), 181-196.

Browne, M. (1972). Oblique rotation to a partially specified target. *British Journal of Mathematical and Statistical Psychology*, *25*(2), 207-212. https://doi.org/10.1111/j.2044-8317.1972.tb00492.x

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale: Erlbaum.

Davison, M. L., Bershadsky, B., Bieber, J., Silversmith, D., Maruish, M. E., & Kane, R. L. (1997). Development of a brief, multidimensional, self-report instrument for treatment outcomes assessment in psychiatric settings: Preliminary findings. *Assessment*, *4*(3), 259-276. https://doi.org/10.1177/107319119700400306

Daza, P., Novy, D. M., Stanley, M. A., & Averill, P. (2002). The depression anxiety stress scale-21: Spanish translation and validation with a hispanic sample. *Journal of Psychopathology and Behavioral Assessment*, *24*(3), 195-205. https://doi.org/10.1023/A:1016014818163

Derogatis, L. R. (1990). *SCL-90-R: A bibliography of research reports 1975-1990*. Baltimore, MD: Clinical Psychometric Research.

Digman, J. M. (1967). The procrustes class of factor-analytic transformations. *Multivariate Behavioral Research*, *2*(1), 89-94. https://doi.org/10.1080/00273176709595116

Dominguez-Lara, S., Merino-Soto, C., Zamudio, B., & Guevara-Cordero, C. (2018). Big five inventory in peruvian college students: Preliminary results of its validation. *Psykhe*, *27*(2), 1-12.

Ezpeleta, L., Navarro, J. B., De La Osa, N., Trepat, E., & Penelo, E. (2020). Life conditions during COVID-19 lockdown and mental health in Spanish adolescents. *International Journal of Environmental Research and Public Health*, *17*(19), 7327. https://doi.org/10.3390/ijerph17197327

Fernández-Montalvo, J., & Echeburúa, E. (2006). Use and abuse of self-reports in the assessment of personality disorders. *Revista De Psicopatología Y Psicología Clínica*, *11*(1), 1-12.

Ferrando, P. J., & Anguiano-Carrasco, C. (2010). Factor analysis as a research technique in psychology. *Papeles Del psicólogo*, *31*(1), 18-33.

Garcia, H. D. (2019). Prevalence of clinical symptoms in patients and its relationship with variables related to the psychotherapeutic context. *Actualidades En Psicología*, *33*(127), 97-112.

Gempp, F. R., & Avendaño, B. C. (2008). Datos normativos y propiedades psicométricas del SCL-90-R en estudiantes universitarios chilenos. *Terapia Psicológica*, *26*(1), 39-58. https://doi.org/10.4067/s0718-48082008000100004

Gustems-Carnicer, J., Calderón, C., & Santacana, M. F. (2017). Psychometric properties of the Life Orientation Test (LOT-R) and its relationship with psychological well-being and academic progress in college students. *Revista Latinoamericana De Psicología*, *49*(1), 19-27. https://doi.org/10.1016/j.rlp.2016.05.001

Hinz, A., Sander, C., Glaesmer, H., Brähler, E., Zenger, M., Hilbert, A., & Kocalevent, R.-D. (2017). Optimism and pessimism in the general population: Psychometric properties of the life orientation Test (LOT-R). *International Journal of Clinical and Health Psychology*, *17*(2), 161-170. https://doi.org/10.1016/j.ijchp.2017.02.003

Holgado, F., Vila, E., & Barbero, I. (2019). Factor structure of the symptom assessment-45 questionnaire (SA-45) *Acción Psicológica*, *16*(1), 31–42. https://doi.org/10.5944/ap.16.1.22048

López, A., & Becoña, E. (2006). Cocaine dependence and psychopathology through the SCL-90-R. *Revista De Psicopatología y Psicología Clínica*, *11*(1), 13-20.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behaviour Research and Therapy*, *33*(3), 335-343. https://doi.org/10.1016/0005-7967(94)00075-u

Marsh, H. W., Morin, A. J., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual Review of Clinical Psychology*, *10*(1), 85-110. https://doi.org/10.1146/annurev-clinpsy-032813-153700

Maruish, M. E., Bershadsky, B., & Goldstein, L. (1998). Reliability and validity of the SA-45: Further evidence from a primary care setting. *Assessment*, *5*(4), 407-419. https://doi.org/10.1177/107319119800500410

Ramírez-Ortiza, J., Castro-Quinteroa, D., Lerma-Córdobaa, C., Yela-Ceballosa, F., & Escobar-Córdobaa, F. (2020). Consequences of the COVID-19 pandemic on mental health associated with social isolation. *Medicentro Electrónica*, *24*(3), 1-8. http://dx.doi.org/10.1590/SciELOPreprints.303

Rondon, B. J. E., & Angelucci, B. L. T. (2016). Psychometric properties of the life orientation test (LOT-R) in a diabetic venezuelan population. *Ansiedad Y Estres-Anxiety and Stress*, *22*(1), 11-18. https://doi.org/10.1016/j.anyes.2016.02.002

Sandín, B., Valiente, R. M., Chorot, P., Santed, M. A., & Lostao, L. (2008). SA-45: Short form of SCL-90. *Psicothema*, *20*(2), 290-296.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the life orientation test. *Journal of Personality and Social Psychology*, *67*(6), 1063. https://doi.org/10.1037/0022-3514.67.6.1063

Slavin-Mulford, J., Perkey, H., Blais, M., Stein, M., & Sinclair, S. J. (2015). External validity of the symptom assessment-45 questionnaire (SA-45) in a clinical sample. *Comprehensive Psychiatry*, *58*, 205-212. https://doi.org/10.1016/j.comppsych.2014.12.007

Tucker, L. R. (1951). *A method for synthesis of factor analysis studies (Personnel Research Section Report N° 984)*. Washington, DC: Department of the Army.

Tundo, A., Betro', S., & Necci, R. (2021). What is the impact of COVID-19 pandemic on patients with pre-existing mood or anxiety disorder? An observational prospective study. *Medicina*, *57*(4), 304. https://doi.org/10.3390/medicina57040304

Vassend, O., & Skrondal, A. (1999). The problem of structural indeterminacy in multidimensional symptom report instruments. The case of SCL-90-R. *Behaviour Research and Therapy*, *37*(7), 685-701. https://doi.org/10.1016/s0005-7967(98)00182-x