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Fondo Editorial USS

Study of suggestibility in adults: Conceptual delimitation and Psychometric development of the Brief Suggestibility Scale (BSS-12)

Estudio de la sugestionabilidad en adultos: Delimitación conceptual y desarrollo psicométrico de la Escala Breve de Sugestionabilidad (BSS-12)

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ABSTRACT: The study aimed to construct and validate a brief scale to measure the suggestibility of fake news in the Peruvian population. In the pilot study, a sample of 318 adults was collected; in the confirmatory study, a sample of 346 adults was collected. In the pilot study, the Exploratory Factor Analysis showed the presence of two factors that managed to explain 47% of the variability of the items. In the confirmatory study, the Confirmatory Factor Analysis showed that the two-dimensional model related to twelve items presented better-fit indices ($\chi2 = 89.87$; df = 53; $p < .005$; RMSEA = .051; SRMR = .040; CFI=.97; TLI=.96) compared to a unidimensional model. It was found that both dimensions present adequate reliability indices (cognitive: $\omega = .81$ and social: $\omega = .83$). Furthermore, the scale has shown evidence of being strictly invariant for the group of men and women in the sequence of invariance models proposed: metric invariance (ΔCFI = -.002; ΔRMSEA = .000), scalar (ΔCFI = -.011; ΔRMSEA = .006), and strict (ΔCFI = .001; ΔRMSEA = -.003). It is concluded that the BSS-12 scale shows strong evidence of adequate psychometric functioning to measure suggestibility in the Peruvian context.

Keywords: Suggestibility; Fake news; Infodemic; Anxiety; Confirmatory Factor Analysis

RESUMEN: *El estudio tuvo como objetivo construir y validar una escala breve para medir la sugestionabilidad ante noticias falsas en la población peruana. En el estudio piloto se recopiló una muestra de 318 adultos; en el estudio confirmatorio se recopiló una muestra de 346 adultos. En el estudio piloto, el análisis factorial exploratorio mostró la presencia de dos factores que lograban explicar el 47 % de la variabilidad de los ítems. En el estudio confirmatorio, el análisis factorial confirmatorio mostró que el modelo bidimensional relacionado con doce ítems presentaba mejores índices de ajuste ($\chi2 = 89,87$; df = 53; $p < 0,005$; RMSEA = 0,051; SRMR = 0,040; CFI = 0,97; TLI = 0,96) en comparación con un modelo unidimensional. Se encontró que ambas dimensiones presentan índices de fiabilidad adecuados (cognitiva: $\omega = 0,81$ y social: $\omega = 0,83$). Además, la escala ha demostrado ser estrictamente invariante para el grupo de hombres y mujeres en la secuencia de modelos de invariancia propuestos: invariancia métrica (ΔCFI = -0,002; ΔRMSEA = 0,000), escalar (ΔCFI = -0,011; ΔRMSEA = .006) y estricta (ΔCFI = .001; ΔRMSEA = -.003). Se concluye que la escala BSS-12 muestra fuertes evidencias de un funcionamiento psicométrico adecuado para medir la sugestionabilidad en el contexto peruano.*

Palabras Claves: Sugestionabilidad; Noticias falsas; Infodemia; Ansiedad; Análisis factorial confirmatorio

1. INTRODUCCIÓN

In the last century, the creation and massification of the Internet have allowed access to unlimited information; however, it has also helped expand the phenomenon of misinformation, fake news, and post-truth (Del Vicario et al., 2016; Swire-Thompson & Lazer, 2019). During the COVID-19 pandemic, the world population was surrounded by misinformation of such magnitude that the World Health Organization declared an information pandemic or infodemic (Rosenberg et al., 2020). Similarly, the mandatory social isolation imposed during the pandemic contributed to this "fake news" being distributed abnormally, given that people had more free time than before (Alvarez-Risco et al., 2020). During this context, it is essential to clarify that "misinformation" is the absence of accurate or inaccurate information, where the individual has conceptual and structural deficiencies that do not allow him to recognize what is true and essential. Therefore, he shares or acquires it without knowledge and by mistake. On the other hand, "disinformation" refers to information intentionally shared to deceive, manipulate, or confuse recipients; however, it will remain false due to a lack of knowledge, error, or intention (Søe, 2021).

The consequences of this infodemic have been notable, from the increase in mental health problems and psychological discomfort such as stress, anxiety, and depression (Rajkumar, 2020; Zheng et al., 2020). As well as the use of falsely promoted medical prescriptions, supposed cures such as hydroxychloroquine, azithromycin, ivermectin, methanol, cow urine, hot water, or eating garlic, used to cure or prevent COVID-19 (Naeem et al., 2021; Reihani et al., 2021; Tapia, 2020). Anti-vaccine movements also increased, intensifying fear and resistance towards vaccines (Hasanzad et al., 2022; Zhao et al., 2023). Likewise, there was an increase in social problems such as racism and xenophobia towards the Chinese population (Dhanani & Franz, 2021). The infodemic also increased hatred and discrimination against health professionals who were physically or verbally attacked. One of the main motivations was the belief that health personnel promoted the spread of COVID-19 contagion. Another reason was the belief that it was an attempt at human depopulation, in addition to other conspiracies such as that large companies seek to control the population by implanting a chip with vaccines or that hospitals are deliberately killing the sick (Kużelewska & Tomaszuk, 2022). The emergence of these conspiracy beliefs may also be associated with unnecessarily alarming press reports (Ioannidis, 2020) since, after the issuance of these reports, the first conspiracy theories about the origin of COVID-19 began to emerge (Douglas, 2021). The spread of these statements without any scientific support has had such an impact that they have influenced the population's behavior (Bastick, 2021).

A study conducted by Nieves-Cuervo et al. (2021) in six Latin American countries (Chile, Argentina, Brazil, Colombia, Mexico, and Peru) found that, compared to the other countries, Peru had the highest score of inability to recognize fake news (79.0%), in addition, It was the second country with the highest trust in social media content (46.0%) and at the same time had the highest mortality from COVID-19. Likewise, these problems have been predicted to persist even after the pandemic (Arroyo-Sánchez et al., 2020). This tendency to spontaneously accept messages from the environment is known as suggestibility (Kotov et al., 2004).

Several evaluation instruments were developed to measure susceptibility to hypnosis. However, regarding the evaluation and definition of the general construct of suggestibility outside the field of hypnosis, very few studies have been carried out (Kallio, 2021). Thus, for the scientific investigation of hypnotic suggestibility, a series of standardized instruments were developed to measure subjects' responses to suggestions and their increase during a hypnotic process (Palfi et al., 2020). Among the most used suggestibility tests based on hypnotic techniques are The Barber Suggestibility Scale – BSS (Barber & Calverley, 1963), The Carleton University Responsiveness to Suggestion Scale – CURSS (Spanos et al., 1983), The Harvard Group Scale of Hypnotic Susceptibility: Form A (Shor & Orne, 1962), among others.

On the other hand, among the most important tests in transition from this method is the Suggestibility Inventory (SI), which provides a total score on suggestibility, understood as a tendency or propensity to be suggested in different areas of daily life (González Ordi & Miguel-Tobal, 1999). In other areas of Psychology, such as clinical and forensic, there is The Gudjonsson Suggestibility Scale

(GSS), developed by Gudjonsson (1984), to evaluate the levels of interrogative suggestibility. Finally, the Multidimensional Iowa Suggestibility Scale (MISS) is the first scale to separate suggestibility as a personality trait (Kotov et al., 2004). However, some of the limitations of this scale are that there are no other studies in which the psychometric properties of this scale have been studied, nor are there studies in which an improvement has been made to the items. Regarding the psychometric properties of the MISS, the original study presented acceptable reliability indices in most of its components ($\alpha > .80$) and in the correlations between its dimensions. However, although it is mentioned that factor analyses were carried out for the construction of this scale, there is no evidence of the results of a confirmatory factor analysis, which would not help to support the dimensions proposed by the scale.

Conceptual delimitation

The suggestibility construct has been studied since before the end of the 19th century by individual and experimental psychology (Binet, 1900; Small, 1896). However, it is important to note that there was no clear differentiation between suggestibility and suggestibility (Coffin, 1941). Furthermore, it remains a concept that has yet to be fully defined (Kotov et al., 2004). Suggestibility is a mental state that favors suggestions and how one responds to them (Gheorghiu, 2000; Sidis, 1989). Thus, the suggestion and suggestibility of the term have been socially related to the negative characteristics of individuals, classifying them as "weak-minded," "weak in personality," or "easily influenced personalities" (González Ordi & Miguel-Tobal, 1999).

The concept of suggestibility was initially developed as an explanation of hypnotic phenomena (Gudjonsson, 1987), considering it as a trait that reflects the tendency to respond to hypnosis and hypnotic suggestions that vary from person to person (Milling, 2008) being this is the definition that has endured over time for the creation of the construct of suggestibility. In relation to other areas, such as forensic psychology, suggestibility has been described within a close social interaction, where people begin to accept the messages given during a formal interrogation, affecting their subsequent behavioral response (Gudjonsson & Clark, 1986). Suggestibility has also been defined in other ways. Kotov et al. (2004) define it as the tendency to accept, without much pressure, messages from oneself, other people, or any media through internalization of the message. This definition distinguishes suggestibility from other terms, such as submission, because more than a simple behavior change, the person must internalize the idea and take it as their own. Furthermore, according to González-Ordi et al. (2018), the construct refers to the ability to be carried away by the imagination and fantasize about things that happen or could happen, influencing feelings, beliefs, perceptions, and actions through direct or indirect messages. For these messages to be perceived, they do not require articulated speech but also gestures, facial expressions, and sounds (Almerigogna et al., 2008).

For Eysenck et al. (1972), it is a process where one or more people can cause one or more individuals to change their judgments, attitudes, opinions, or behavior patterns without critical judgment. This influence is exerted on the thoughts, feelings, will, or actions of another person without them rationalizing it (Stokvis & Pflanz, 1961), there being a notable reduction in the analytical-critical capacity, which is why the subject accepts a proposed as if it were true, without making a prior judgment (Brown et al., 2001). It has also been related to memory, and suggestibility is the extent to which subjects accept a piece of information after the event and incorporate it into their memories (Powers et al., 1979). To a certain degree, they manage to encode, store, and recover information according to the influence of social and psychological factors (Nicolas et al., 2011).

Considering the above, in the present study, suggestibility is defined as the tendency that each person has to accept and internalize messages without making necessary use of critical-analytical judgment. Furthermore, these can be direct or indirect, causing a change in the person's perceptions, attitudes, feelings, and beliefs. Likewise, when reviewing the literature on the possible factors involved in suggestibility, it was found that there is a factor that refers to the cognitive mechanism, which is defined as a mechanism where rationalization begins to have a minority role and The individual limits his or her attention to secondary aspects of the information received, such as the attractiveness of the message, the emotional response it generates or the prestige of the source that issues said message, thus implying less cognitive effort (Gheorghiu, 1989; Lundy, 1989). In addition, another factor was

found, which refers to the social mechanism, which involves the degree to which the behavior of individuals is influenced by other people or situations, with a tendency to follow what the majority considers appropriate and let others influence their judgments (Dalton & Daneman, 2006; Wagstaff, 1991).

The study of suggestibility has been positioned as a valuable way to improve knowledge about the relationship between mind and brain and to understand specific basic cognitive processes and other phenomena (Landry et al., 2017). However, explanatory and empirical studies have yet to be found that explain suggestibility outside the field of hypnosis, and there are much less adequate instruments for measuring this construct since suggestibility has been used for a long time to study hypnosis and not as an independent construct. Faced with these limitations, it is necessary to have reliable and valid instruments to evaluate the risk of suggestibility in the face of false information, and at the same time, be brief since they exclude redundant items, reduce fatigue and frustration when repeatedly answering similar items, boredom, and confusion. of phrases or words (Robins et al., 2001).

In this sense, the study aims to build and validate a brief scale to measure the suggestibility of fake news in the Peruvian population. Specifically, the study seeks to demonstrate (a) Validity based on the internal structure, (b) Measurement invariance, (c) Validity based on the relationship with other variables, and (d) Reliability.

2. MÉTODOS

Participants

Non-probabilistic convenience sampling was used to collect data from the pilot and confirmatory study samples. The inclusion criteria used in the study were: (a) Know how to read and write, (b) be of legal age, (c) be Peruvian, (d) sign informed consent, and (e) voluntary participation.
The pilot sample comprised 318 people of both sexes between the ages of 18 and 75 years (M = 31.0; SD = 11.6), with 63.5% women and 36.5% men. Regarding marital status, most participants were classified as single, making up 65.4% of the sample. Regarding the level of education, 68.9% indicated having a higher level of university education. Furthermore, 54.7% were from the Peruvian coast, 28.9% were born in the mountains, and only 12.9% were from the jungle (see Table 1).

For the confirmatory study, a sample of 346 people was collected between the ages of 18 and 75 years (M = 31.3; SD = 10.3) and of both sexes, of which 52.6% were women and 47.4% were men. It can be seen in Table 1 that the majority of the participants are single (58.1%), have higher university education (48.6%), and come from the coastal region (44.8%). It is also seen that most participants have a temporary job (30.9%) and a permanent job (30.3%), while 28.6% are students. Regarding monthly income, the majority have an income of between 1,000 to 2,000 soles (37.3%) and less than 930 soles (33.5%). Regarding variables associated with COVID-19, 36.1% of participants indicate that social networks are their primary source of information. At the same time, it is observed that only 48% of respondents reported being diagnosed with COVID-19, 70.8% indicated that one of their family members had COVID-19, and 96% indicated that they had received the COVID-19 vaccine. However, only 33.8% of those surveyed indicated that it is very likely that they will receive the booster dose.

Table 1
Sociodemographic data of the participants

Variables	Pilot sample		Confirmatory sample	
	n	%	n	%
Sex				
Female	202	63.5%	182	52.6%
Male	116	36.5%	164	47.4%
Civil status				
Married	79	24.8%	74	21.4%
Cohabitant	18	5.7%	58	16.8%
Divorced	13	4.1%	12	3.5%
Single	208	65.4%	201	58.1%
Widower	–	–	1	0.3%
Education level				

Variables		Pilot sample		Confirmatory sample	
		n	%	n	%
	Primary	1	0.3%	-	-
	Secondary	20	6.3%	59	17.1%
	university higher	219	68.9%	168	48.6%
	Technical	37	11.6%	79	22.8%
	Postgraduate	41	12.9%	40	11.6%
Origin					
	Coast	174	54.7%	155	44.8%
	Mountain range	92	28.9%	128	37%
	Jungle	52	16.4%	63	18.2%
Occupation					
	Permanent job	–	–	105	30.3%
	Temporary job	–	–	107	30.9%
	Unemployed	–	–	12	3.5%
	Student	–	–	99	28.6%
	At home	–	–	22	6.4%
	Retired	–	–	1	0.3%
Source of information					
	Family and friends	–	–	71	20.5%
	Government	–	–	70	20.2%
	Social networks	–	–	125	36.1%
	Television and radio	–	–	80	23.1%
Covid-19 diagnosis					
	Yes	–	–	180	48%
	No	–	–	166	52%
Familiares con Covid-19					
	Yes	–	–	245	70.8%
	No	–	–	101	29.2%
Vaccine					
	Sí	–	–	332	96%
	No	–	–	14	4%
Decision to get vaccinated					
	Very likely	–	–	144	41.6%
	Quite likely	–	–	121	35%
	hard to say	–	–	56	16.2%
	Very improbable	–	–	19	4.5%
	Not at all likely	–	–	6	1.7%
Decision for the 4th dose					
	Very likely	–	–	117	33.8%
	Quite likely	–	–	86	24.9%
	hard to say	–	–	67	19.4%
	Very improbable	–	–	61	17.6%
	Not at all likely	–	–	15	4.3%

Measures

Brief Suggestibility Scale (BSS-12)

The scale comprises twelve items that form a model of two related dimensions: Cognitive (1,2,7,9,10,11) and Social (3,4,5,6,8,12). The scale aims to measure a person's level of suggestibility regarding the messages they receive from their environment. In addition, the items present five response categories: Never (0), Almost never (1), Sometimes (2), Almost always (3), and Always (4). The dimensions do not present inverse items; therefore, a higher score would show higher suggestibility in the cognitive and social areas.

Generalized Anxiety Disorder (GAD-7)

For validity based on the relationship with other variables, the Generalized Anxiety Disorder scale (GAD-7) was used (Spitzer et al., 2006). Specifically, the version adapted to the Peruvian population was used (Zhong et al., 2015), whose objective is to detect the presence of generalized anxiety and assess the level of symptoms during the last two weeks. This scale is composed of 7 items, and each of them is scored on a 4-point scale indicating the frequency of symptoms, ranging from 0 (not at all)

to 3 (almost every day). The GAD-7 total score can range from 0 to 21, with a score greater than 10 indicating generalized anxiety disorder (Spitzer et al., 2006). On the other hand, the psychometric properties of the scale showed adequate fit indices for a unidimensional model (RMSEA= .051; CFI= .969; SRMR= .046), as well as adequate reliability indicators (α = .89) (Zhong et al., 2015).

Data Analysis

In the pilot study, Ayken's V coefficient (Aiken, 1980) was used for content validity, and an ad hoc program in MS Excel© format was used to compute it (Ventura-León, 2019). Values greater than .70 were considered positive evaluations of the item (Napitupulu et al., 2018). For the initial study of the internal structure of the scale, Exploratory Factor Analysis (EFA) was used using the Minimum Residuals (MinRes) method with Oblimin rotation, and to determine the number of factors to extract, Parallel Analysis was used (Luo et al., 2019). To this end, compliance with the essential data conditions was verified before performing the EFA. The conditions were verified through Bartlett's test of sphericity and the Kaiser Meyer Olkin (KMO) index.

In the confirmatory study, validity based on the internal structure was evidenced. For which the MLR estimator was used and to evaluate the fit of the proposed models, the coefficients CFI (>.95), TLI (>.95), RMSEA (<.08), and SRMR (<.08) were used (Kline, 2016; Schumacker & Lomax, 2015). Cronbach's alpha coefficient (Cronbach, 1951) and the omega coefficient (McDonald, 1999), were used to evaluate the reliability of the scale, where a value ω>.80 is appropriate (Raykov & Hancock, 2005). Multi-group Confirmatory Factor Analysis (MGCFA) was used to evaluate the factorial invariance of the scale according to sex, where a sequence of four hierarchical variance models was proposed: (1) configural invariance (reference model), (2) metric invariance (equality of factor loadings), (3) scalar invariance (equality of factor loading and intercept) and (4) strict invariance (equality of factor loadings, intercept and residuals). To compare the sequence of models, a modeling strategy was used, for which the differences in the RMSEA (ΔRMSEA) were used, where differences less than <.015 show the invariance of the model between the groups (Chen, 2007). The differences in the CFI (ΔCFI) were also used, where values less than <.010 show the invariance of the model between the groups (Chen, 2007). Regarding the validity of the scale based on other variables, an SEM model was proposed. The MLR estimator was used to estimate the model, and the same adjustment indicators were carried out in the Confirmatory Factor Analysis.

The RStudio environment (RStudio Team, 2018) for R (R Core Team, 2019) was used for the statistical analysis. Specifically, the “lavaan” package (Rosseel, 2012) was used to perform the CFA, and the “semTools” package (Jorgensen et al., 2018) was used to perform factorial invariance.

Procedure

For the present study, approval was obtained from the ethics committee of the Research Center of the Universidad Peruana Unión (2022-CE-FCS - UPeU-046). The study also complied with the standards established in the Declaration of Helsinki (World Medical Association, 2013). These principles were especially emphasized: (a) autonomy of people to participate in the study, (b) respect for participants, (c) beneficence, and (d) justice to treat participants with equity and transparency.
Data collection from both samples (pilot and study) was carried out in virtual mode to have greater access to participants from different parts of the country. For this, a virtual form was developed through the Google Forms tool. This form was shared through the most used social networks in the current context (WhatsApp and Facebook, among others). In the first part of the form, the informed consent was presented, which detailed the objective, the characteristics of the study, and the confidentiality of their participation. The final part of this section explicitly asked whether participants wanted to participate in the study. Questions about sociodemographic data were presented in the second part of the form. The scales selected for the study were presented in the last part of the form.

3. RESULTADOS

Pilot Study

Content-Based Validity

The results indicate that most of the items on the suggestibility scale for fake news did not present observations by the judges (2, 4, 5, 6, 11, 12, 14, 16). However, the judges suggested correcting items 1, 7, 10, and 13 by adding the phrase “without verifying the information” and, in the case of item 9, with the phrase “without verifying if it is true.” Items 8 and 15 present observations by one or more judges; item 8 (“I do not usually give importance to whether the source of information is true”) was modified by “I do not usually verify if the source of information is true.” information is accurate.” Similarly, item 15 (“I tend to easily believe the news I see or hear without having verified it with another source of information”) was modified by “I tend to believe the news without contrasting it with other sources of information.” Furthermore, item 17 (“I tend to be impressed by the news I see, read or hear”) was eliminated as it was similar to item 13 (“I tend to believe the news that moves and impresses me quickly”).

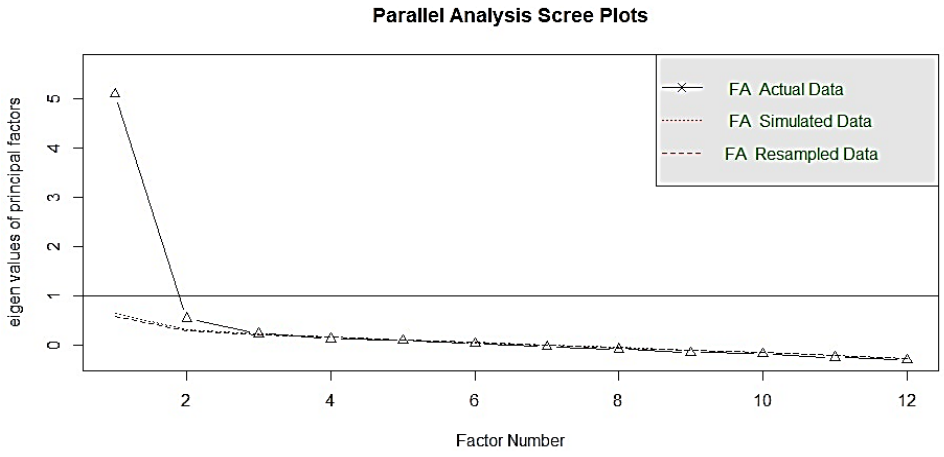
Initial study of the internal structure of the scale

A first Exploratory Factor Analysis (EFA) was carried out with the 16 items proposed, where three factors were formed, providing factors not initially considered in the conceptual delimitation. Given this result, item 3 was eliminated (“I do not usually verify if the source of information is true”) since its factorial weight was very high in another factor. The content of the item was similar to that of item 15 (“I tend to believe the news without verifying it with other sources of information.”) Item 8 (“I do not question the news I read, see or hear”) was also eliminated because it had a very low factor weight in all factors ($\lambda < .30$).

Next, a new EFA was carried out with the remaining items, where two dimensions were formed. On this occasion, the decision was made to eliminate some items whose statements did not adequately represent the definition of the construct, thus discarding items 9 ("I share on social networks news that others have shared with me without verifying whether it is true") and 11 ("I share information that I have heard despite not having verified it"). Finally, the scale comprised 12 items (1, 2, 4, 5, 6, 7, 10, 12, 13, 14, 15, 16).

A new exploratory factor analysis was carried out with all the remaining items. It can be seen in Figure 1 that the parallel analysis method revealed two factors.

Figure 1
Parallel analysis of the BSS-12 scales



Compliance with the assumptions for carrying out the EFA was verified in this new analysis, as in the previous ones, such as the Kaiser-Meyer-Olkin (KMO) sampling adequacy measurement test and the Bartlett sphericity test. As can be seen in Table 2, both assumptions were met, and it is also

observed that items (1,2,10,13,14,15) correspond to the first factor with a high factorial weight. Regarding item 13, although it presented a factor loading in both dimensions, it was decided to include it in the factor where it had the greatest factor weight, that is, in the cognitive mechanism. On the other hand, items (4,5,6,7,12, and 16) showed a high factorial weight in the second factor, which refers to the social mechanism of suggestibility. It is also seen in Table 2 that both factors manage to explain 47% of the variability of the set of items analyzed.

Table 2

Matrix of rotated factors of the BIS-12 scale

Items	Dimensions	CD	SD
S1	CD	.77	
S2	CD	.73	
S10	CD	.65	
S13	CD	.43	.30
S14	CD	.74	
S15	CD	.66	
S4	SD		.65
S5	SD		.86
S6	SD		.45
S7	SD		.60
S12	SD		.70
S16	SD		.61
% Total explained variance		47%	
KMO test		.91	
Bartlett test		$\chi2$ (378) = 25.931 p < .006	

Note: MC= Cognitive Dimension, MS= Social Dimension

Confirmatory study

Descriptive analysis of the items

Table 3 shows that, concerning the asymmetry and kurtosis indices, items 2, 3, 5, 7, 10, and 12 present a negative asymmetric distribution (g1 < 0), so there is a greater concentration of values on the left. On the other hand, items 1, 4, 6, 8, 9, and 11 present a positive asymmetric distribution (g1 > 0), meaning that the highest concentration of values is to the right of the mean. Concerning the kurtosis coefficient, the items present a high degree of concentration around the central values of the variable (g2 > 0), and both the asymmetry and kurtosis indices are within the expected parameters (As < ±2; Ku < ±7) (Finney & DiStefano, 2006).

When analyzing the response rate of the scale, it is observed in Table 3 that, in each of the items, all response categories were answered; likewise, the responses are concentrated between “almost never” and “sometimes,” in turn shows that item 10 (“I tend to believe in the opinion of experts, without verifying the information”) has the highest average score in the total sample (M = 1.99). It is also observed that item 4 (“I tend to believe the opinion of acquaintances more than that of professionals”) presents the lowest mean score in the total sample (M = 1.35).

Table 3 Descriptive analysis of the items and item response rate

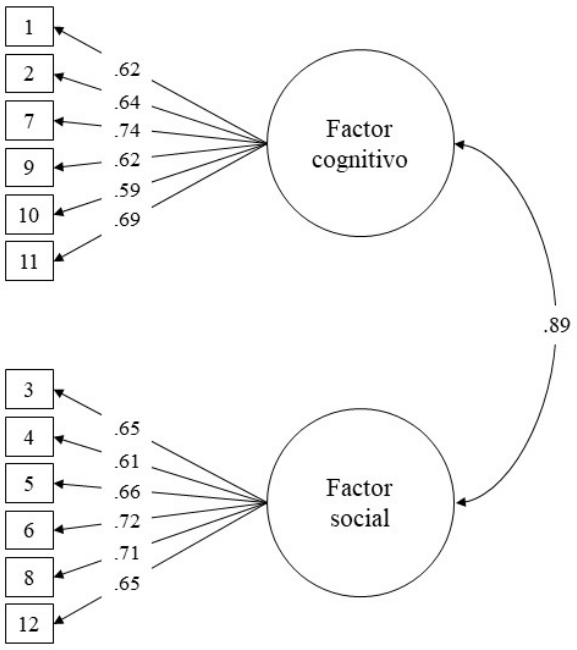
Items	*M*	*SD*	*g1*	*g2*	Response rate				
					0	1	2	3	4
1. Tiendo a creer las noticias que leo en los periódicos sin verificar la información.	1.58	0.88	0.02	-0.07	12.1%	30.6%	45.7%	9.8%	1.7%
2. Tiendo a creer rápidamente en noticias que me conmueven y/o impresionan.	1.64	0.89	-0.08	-0.53	10.7%	31.8%	41.3%	15.6%	0.6%
3. Tiendo a creer en las noticias que mis amigos y/o familiares comparten sin haber verificado información.	1.49	0.89	-0.15	-0.61	15.6%	30.3%	43.6%	10.1%	0.3%
4. Tiendo a creer más la opinión de conocidos que la de profesionales.	1.35	0.88	0.16	-0.56	17.3%	39.9%	33.2%	9.2%	0.3%
5. Cuando mis conocidos mencionan alguna información nueva, suelo considerarlo como cierta.	1.61	0.86	-0.33	-0.37	12.4%	26%	49.7%	11.6%	0.3%
6. Tiendo a creer las noticias que veo en internet sin verificar la información.	1.46	0.92	0.18	-0.32	15.6%	35.5%	37.3%	10.1%	1.4%
7. Tiendo a creer las noticias que veo en la televisión sin verificar la información.	1.68	0.92	-0.08	-0.16	11.8%	25.7%	47.4%	13%	2%
8. Tiendo a creer en las opiniones de los demás sin verificar la información.	1.48	0.88	0.12	-0.21	13.6%	36.4%	39.9%	9%	1.2%
9. Tiendo a creer las noticias que escucho en la radio sin verificar la información.	1.51	0.90	0.12	-0.42	12.7%	37.3%	37%	12.1%	0.9%
10. Tiendo a creer en la opinión de expertos, sin comprobar la información.	1.99	0.94	-0.20	-0.30	6.4%	21.4%	42.2%	26.6%	3.5%
11. Tiendo a creer en las noticias sin verificarlas con otras fuentes de información.	1.68	0.93	0.12	-0.11	10.4%	30.3%	43.4%	13%	2.9%
12. Si la mayoría está de acuerdo con una noticia, yo también estoy de acuerdo.	1.59	0.87	-0.18	-0.51	12.1%	30.1%	44.5%	13%	0.3%

Note: M= Median, DE= Standard Desviation, g^1= Fisher asymmetry coefficient, g^2= Fisher's kurtosis coefficient

Validity based on internal structure

In the study, it was found that the original model of two related dimensions presented adequate fit indices (χ2 = 89.87; df = 53; p < .005; RMSEA = .051 [IC90% .032 – .069]; SRMR = .040; CFI=.97; TLI=.96). In Figure 2, it can be seen that the items have factorial weights between moderate and high in the factor to which they belong (λ > .60). However, the relationship between both factors is high (.89), which could suggest the presence of a unidimensional model. Therefore, the existence of a unidimensional model was tested, which showed worse fit indices (χ2 = 110.29; df = 54; p < .001; RMSEA = .062 [IC90% .056 – .079]; SRMR = .043; CFI=.95; TLI=.97). Furthermore, when comparing both models using an ANOVA analysis, both models were found to be significantly different (p < .01), where the original two related dimensions model was the most parsimonious model (AIC = 9483.3, BIC = 9508.1) versus to the unidimensional model (AIC = 9507.6, BIC =9535.8). Therefore, the two-related factor model was chosen to explain the factor structure of the suggestibility scale.

Figure 2
Confirmatory Factor Analysis of the BSS-12 scale



Measure Invariance

Table 4 shows that the factorial structure of the scale has shown evidence of being strictly invariant for the group of men and women in the sequence of invariance models proposed: metric invariance (ΔCFI = -.002; ΔRMSEA = .000), scalar (ΔCFI = -.011; ΔRMSEA = .006), and strict (ΔCFI = .001; ΔRMSEA = -.003).

Table 4

Invariance models according to the age of the participants

Models	χ^2	df	*p*	SRMR	TLI	CFI	RMSEA	$\Delta\chi^2$	Δdf	*p*	ΔCFI	ΔRMSEA
Male	51.29	53	.541	.035	.99	.99	.000	—	—	—	—	—

Female	84.51	53	.004	.063	.92	.94	.065	—	—	—	—	—
Configural	136.86	106	.023	.050	.97	.97	.046	—	—	—	—	—
Metric	149.83	116	.019	.060	.96	.97	.045	12.9	10	.224	-.002	.000
Scalar	173.51	126	.003	.064	.96	.96	.051	25.8	10	.004	-.011	.006
Strict	184.02	138	.005	.064	.96	.96	.048	10.6	12	.563	.001	-.003

Note: χ2 = Chi square; df = degrees of freedom; SRMR: Standardized Root Mean Square Residual; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; Δχ2 = Differences in Chi square; Δdf = Differences in degrees of freedom; ΔRMSEA = Change in Root Mean Square Error of Approximation; ΔCFI = Change in Comparative Fix Index.

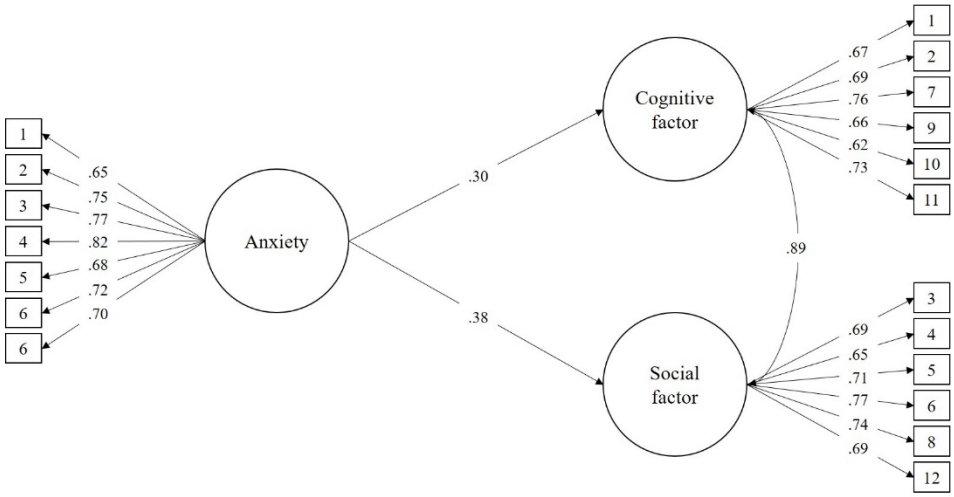
Reliability

In the present study, it was found that both dimensions present adequate reliability indices: cognitive (α = .81; ω = .81) and Social (α = .83; ω = .83). Furthermore, in the specific groups, the Cognitive dimension showed adequate internal consistency indices in the men (α = .83; ω = .83) and women (α = .80; ω = .80) groups. Similarly, the Social dimension showed adequate internal consistency indices in the men (α = .85; ω = .85) and women (α = .80; ω = .80) groups.

Validity based on the relationship with other variables

Considering the literature review, an SEM model was proposed to evaluate the relationship between the anxiety level and the dimensions of Suggestibility. It was evident that the structural model presents adequate fit indices (χ2 = 253.61; df = 149; p < .001; RMSEA=.045 [IC90% .035 – .054]; CFI=.98; TLI=.98), and their items adequately represent the measurement models. It can be seen in Figure 3 that the level of anxiety significantly predicts the cognitive (.30; p < .01) and social (.38; p < .01) factors of Suggestibility.

Figure 3
Predictive model of anxiety



4. DISCUSION

Since the information pandemic, called infodemic, was declared by the WHO as a public health problem in 2020 (Mheidly & Fares, 2020), there has been an increase in fake news that addressed

various solutions and theories around COVID-19. This increase generated negative consequences during the period of mandatory social isolation. In this context, suggestibility could help better understand the infodemic phenomenon in the Peruvian population. However, after reviewing the current scientific literature, it has not been possible to find any specific instrument that measures suggestibility in the face of fake news outside the field of hypnosis. That is why the objective of the present study was to construct and analyze the internal structure, the measurement invariance, and the validity based on the relationship with other variables of the BSS-12 scale.

First, a pilot study was carried out to explore the psychometric functioning of the developed scale and correct errors either in the wording of the items or in the dimensional structures proposed in the scale (Muñiz & Fonseca-Pedrero, 2019). When the first Exploratory Factor Analysis (EFA) of the 16 items initially proposed was carried out, item 3 was eliminated, which was very similar to item 15 since both indicated the act of not verifying information in general. Then, item 8 was eliminated since it did not reach the acceptable factor loading in any of the proposed factors ($\lambda < .30$) (Tabachnick & Fidell, 2019). Subsequently, a second EFA was carried out using the remaining items, which allowed the identification of 2 dimensions; during this analysis, it was perceived that some items did not adequately represent the definition of the construct of suggestibility, so items nine were discarded (I share on social networks news that others have shared with me without verifying whether it is true") and 11 (I share information that I have heard despite not having verified it), both of which refer more to the act of sharing information than to the process of internalizing the information message, which is what defines suggestibility. It is important to note that the act of sharing information can be linked to different factors, including social factors such as social approval of the environment, generating debate, attracting social attention, among others, and not necessarily to the user considering the message as true (Lobato et al., 2020; Metzger et al., 2021; Pennycook et al., 2021). After this process, the scale consisted of twelve items.

In the confirmatory study, a Confirmatory Factor Analysis was carried out to verify the internal structure of the BSS-12 scale. The two-dimensional model proposed for the scale was acceptable and yielded better-fit indices than a unidimensional model. The two resulting factors were identified as the cognitive and social factors of suggestibility. The cognitive factor refers to the process where the person's rationalization begins to play a minority role and limits their attention to secondary aspects of the information received, such as the attractiveness of the message, the emotional response it generates, or the prestige of the source it emits said message, thus implying less cognitive effort (Gheorghiu, 1989; Lundy, 1989). This definition is consistent with other studies reported in the scientific literature, where it was shown that suggestibility is related to a lower use of intellectual abilities (Gudjonsson, 1983; Singh & Gudjonsson, 1992). Other studies show that people with low intellectual performance and poor perceptual skills are more vulnerable to misinformation and have more difficulty changing their initial impression of news that they believe to be true but later find falsely communicated (De keersmaecker & Roets, 2017; Zhu et al., 2010).

In the same way, lower use of executive processes is inferred, which are of utmost importance to carry out complex mental activities necessary to plan, guide, review, regularize, and evaluate the behavior necessary to meet objectives effectively and adapt to the environment (Barkley, 2012). Reasoning and working memory are within this set of skills (Cristofori et al., 2019). These skills favor critical analysis during information processing, simultaneously demanding greater cognitive effort for part of the person (Evans & Stanovich, 2013). Logical reasoning and critical analysis are essential for discerning or differentiating between true and false information (fake news) (Bronstein et al., 2019; Pennycook & Rand, 2019). People with a lower capacity for these functions are more susceptible to sharing false information, paying more attention to the novel and emotional characteristics of the message rather than its credibility (Vosoughi et al., 2018). Therefore, people who use critical reasoning are less vulnerable to exposure to false content and are less likely to believe it (Pennycook & Rand, 2021).

On the other hand, social factors refer to the influence of the environment when internalizing a message (Dalton & Daneman, 2006; Wagstaff, 1991). Opinions surrounding people's common

environment can easily affect how they value different issues, from what to eat to which presidential candidate to vote for (Campbell-Meiklejohn et al., 2010). This phenomenon is known as social influence, which is the process where people adapt different aspects of their lives due to interaction with other people, thus attributing the rapid dissemination of certain values in a population (Moussaïd et al., 2013). In a recent study, social influence was observed as an important key in people's behavioral change; in this case, by seeing how populations better adapted to COVID-19 safety regulations depending on their social circles, they also did it (Tunçgenç et al., 2021). On the other hand, social influence has not only contributed to the internalization of the opinions of others, it has also been involved in the "emotional contagion" phenomenon between people and others without them being fully aware (Kramer et al., 2014).

Regarding the items, the study showed that items 7 (cognitive factor), 6, and 8 (social factor) are the ones that best represent each dimension of suggestibility. Item 7 ("I tend to believe the news I see on television without verifying the information") showed a greater factorial weight, which is why it best represents the cognitive factor. This result could be explained by studies that point out television's influence on people in a similar way as their interpersonal relationships do, modifying their attitudes and behaviors towards certain topics such as politics or health (Durante et al., 2019; Li et al., 2019).

On the other hand, television became the main medium used to guide and inform families during the health crisis due to the mandatory social isolation imposed during the Pandemic. Although the use of social networks predominated in the world, in Latin America, the preference for traditional media, including public television, is still relevant (Carrión et al., 2022; Romero-Rodriguez et al., 2021). Although distrust in public television increased during the Pandemic (Strömbäck et al., 2020; Tandoc et al., 2021), some studies argue that the population still tends to perceive traditional media (radio and television) as sources more reliable than information shared on social networks (Johnston, 2020; Kalogeropoulos et al., 2019; Piltch-Loeb et al., 2021). However, future studies must deeply analyze the cognitive components of suggestibility and its relationship with television consumption.

On the other hand, items 6 (“I tend to believe the news I see on the Internet without verifying the information”) and 8 (“I tend to believe the opinions of others without verifying the information”) are the ones that best represent the social factor; this could be explained by studies that mention social networks and the Internet as the main means of disseminating unverified content, either before, during and after the COVID-19 pandemic (Gupta et al., 2020; Tandoc, 2019). Similarly, other studies indicate that people tend to believe more in information from social contexts, especially from the circle of closest friends (Jun et al., 2017). Currently, social networks and the Internet are considered the main socialization platforms (Diomidous et al., 2016), which is why various studies point out the presence and prevalence of social phenomena in the context of virtuality, such as behavior gregarious, social influence, social conformity, emotional contagion, among others (Celliers & Hattingh, 2020; Colliander, 2019; Flanagin, 2017; Goldenberg & Gross, 2020; Mattke Jens et al., 2020). It should be added that these phenomena above play important roles in the spread and acceptance of false information on social networks (Wang et al., 2019).

Another result found in the study was the analysis of the factorial invariance of the BSS-12 scale. The results on the BSS-12 scale suggested that configural, metric, scalar, and strict invariance were maintained for both sexes, making it possible to compare both groups. In the scientific literature, it was found that men and women present certain differences when processing information from their environment, although these differences depend on the way the message is presented (Meyers-Levy & Maheswaran, 1991). Regarding studies on hypnotic and interrogative suggestibility, they point out that women and girls tend to be more suggestible than men (McFarlane et al., 2002; Page & Green, 2007). It is important to mention the little updated scientific literature on the topic. The reliability analysis showed that both dimensions of the BSS-12 scale have adequate internal consistency indices. Likewise, when analyzing the reliability in specific groups, it was found that both the cognitive and social dimensions presented adequate internal consistency indices in both the men's and women's

groups. These results indicate that the items of the BSS-12 scale adequately measure the dimensions of the suggestibility construct in the total sample and the specific groups.

Regarding validity based on the relationship with other variables, the results indicated that anxiety positively and significantly predicts suggestibility, with evidence of these results being found in other studies. In a recent investigation, it was found that individuals with high levels of anxiety tended to present higher levels of suggestibility, as well as to present difficulties when identifying fake news (Escolà-Gascón et al., 2023). In studies of hypnotic suggestibility, subjects exposed to traumatic experiences and with an anxious attachment profile they were tended to be more suggestible (Wieder & Terhune, 2019). Likewise, in studies carried out on the effects of diagnosis threat during and after the COVID-19 pandemic, it was found that highly suggestible subjects were more vulnerable to the effects of this phenomenon, in which a high presence of anxiety regarding expectations was found negative towards recovery from COVID-19; Likewise, both studies suggest suggestibility as a factor that increases the effects of diagnosis threat in people (Winter & Braw, 2022, 2023).

The results of the present study should be understood, taking into account the following limitations of the study. First, using non-probabilistic sampling techniques increases the likelihood of selection bias, making it impossible to observe how representative the findings are for the entire Peruvian population. Most participants are single or married people with a higher university education, complete or incomplete, who come from the country's coast or mountains. Therefore, future studies are recommended to use representative samples based on probability sampling techniques to improve the generalization of the results. Secondly, using an online survey to collect information allows participation only to people with Internet access and familiar with virtual forms, leaving aside other population groups. Therefore, face-to-face surveys and interviews should be used, which, despite requiring more time and cost, would help to include a larger population and extend the research coverage.

Third, using a self-report measure can generate social desirability biases; that is, participants may provide biased responses to the scale items due to the desire to present a more upbeat version of themselves or social pressure. Therefore, for future studies, the evaluation should be complemented with other measures that allow greater analysis of the responses, such as a semi-structured interview. Fourthly, an analysis based on Item Response Theory (IRT) still needs to be carried out, which would help better evaluate the scale items' functioning (Embretson & Reise, 2000). Fifth, test-retest reliability was not estimated, which allows for evaluation of the stability of the scale scores over time. Therefore, it is suggested that future studies be carried out using the test-retest method, in which the items are applied on different occasions to measure their stability over time (Vilagut, 2014).

Despite these limitations, the study shows strong evidence of the good psychometric performance of the BSS-12 scale to measure suggestibility in the Peruvian context. Specifically, it showed evidence favoring a structure of two related dimensions. Furthermore, the factorial invariance according to sex was also consistent, indicating that the instrument is suitable for evaluating the construct in both men and women. Also, a significant relationship was found between the level of anxiety and the cognitive and social dimensions of suggestibility, supporting its validity based on the relationship with other variables. Therefore, the BSS-12 scale is a valid and reliable instrument to measure suggestibility in the face of fake news, and it may be useful in expanding studies regarding this phenomenon in the Spanish-speaking population.

Declarations

Authors' contributions:

AR-H, ZGA-S, and LWV provided initial conception, organization, and main writing of the text. LWV prepared all figures and tables. AR-H, ZGA-S and LWV were involved in data collection and acted as consultants and contributors to research design, data analysis, and text writing, read and approved the draft.

Conflicts of interest

The author(s) declare(s) that there is no conflict of interest with respect to the research, authorship, and/or publication of this article.

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Data availability statement

Upon request authors are prepared to send relevant documentation or data in order to verify the validity of the results.

Ethics approval

The study was approved by the ethics committee of the Research Center of the Universidad Peruana Unión (2022-CE-FCS - UPeU-046). In addition, the study followed the Helsinki standards (World Medical Association, 2013). In addition, informed consent was obtained from all participants.

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