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METHODOLOGY

Psychometric Properties Of The Highly Sensitive Person Scale In Mexican Population

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Abstract: Sensory Processing Sensitivity (SPS) is a genetically-determined trait that allows people to notice external and internal subtleties in sensory stimuli easily. This feature provides certain advantages to those who possess it, such as, greater empathy, artistic tastes or skills, also, this people can get greater benefit in circumstances with little exposure to sensory input. However, an unfavorable feature of the trait is an increased vulnerability to development psychopathology. In Mexico there is not an instrument to assess the presence of the SPS, thus, the purpose of this research was to analyze the psychometric properties of the Highly Sensitive Person Scale (HSP Scale) in Mexican population. The results showed that the adaptation of HSP Scale has adequate psychometric properties, so the essential contribution of this study is to provide a reliable and valid instrument that allows to discriminate the presence of the SPS.

Keywords: sensory processing sensitivity, highly sensitivity, personality, vulnerability, psychopathology

Introduction

Not all people perceive around them in the same way. Several studies[1,2] have found that a fifth of the population seems to notice more easily subtle differences in smells, tastes, colors, sounds, textures, as well as other sensations such as cold, heat, pain, hunger, the effect of medicines or coffee. Likewise, often they can distinguish subtleties in objects or surroundings and when they face a new situation, they usually take time to observe before acting. In addition, they have the ability to quickly identify people's emotional state and experience both pleasant and unpleasant emotions with intensity.

These people have a characteristic named Sensory Processing Sensitivity (SPS),[1] which is conceived as a genetically-determined trait and is not caused by any type of alteration in sensitive organs. It seems to be the manifestation of a highly sensitive nervous system where the brain processes sensory information in a deep and complex way,[2] which implies a greater degree of cognitive and semantic analysis.[3]

Psychophysiological Features Of SPS

Recent studies reveal that people with SPS exhibit greater neural activation in different regions of the brain. Some related to: a) consciousness, empathy and motor control in response to the emotions of others,[4] b) integration of sensory information, higher cognitive processing, decision-making and complex tasks, and c) response to subtle changes in any stimuli.[5] From these findings it is concluded

that highly sensitive person has an increased awareness and greater preparedness to respond to environmental stimuli, particularly important social situations, as well as a more elaborate sensory processing with greater attention to detail and subtleties.[4,5]

Measurement Of The SPS And Findings On The Unidimensionality Of The Construct

Based on the above, it is pertinent to point out that the SPS is a relatively recent construct that does not yet have extensive research. However, a scale has promoted its exploration. The self-report instrument designed to measure SPS is the Highly Sensitive Person Scale (HSP Scale) developed by Elaine Aron and Arthur Aron in 1997.

The HSP Scale consists of 27 (7-point Likert-type) items. It has adequate levels of reliability and validity (content, construct and discriminant). It has an internal consistency of 0.87 and a validity of 0.85 given by the Cronbach alpha. In the first study, the principal components factorial analysis yielded the solution of a single factor and this explained 47% of the variance.[1] There is a short version proposed by these authors with 12 items of the original scale,[6] even so, no information was found about their psychometric properties.

Subsequent studies in different populations, in turn, have reported multidimensional solutions for the scale; these had two, three or four factors where some items were dismissed because they did not contribute adequately to the factorial solution.

Within the studies that have found a structure of two factors, is the one carried out in Russian population.[7] This study included 13 items and named the dimensions as Ease of Excitation (EE), which items are related to feeling mentally overwhelmed by external demands and, Low Sensory Threshold (LST), whose items are associated with unpleasant sensory experience due to external stimuli. Names initially proposed by Smolewska, McCabe & Woody,[8] after finding a structure of three factors with 25 items of the original scale in Canadian population that, in addition, included the dimension called Aesthetic Sensitivity (AS) to contain items that alluded to the aesthetic conscience.

Grimen & Diseth,[9] also reported this three factors structure with 13 items in the Norwegian population. While in Turkish population[10] a four-factor structure was found with the original 27 items test, three of these dimensions were renamed as: External Stimulus Sensitivity (ESS), Damage Avoidance (DA) and, Sensitivity to Overstimulation (SO). The fourth factor remains as Aesthetic Sensitivity (AS).

Aim Of This Study

It is important to say that no studies were found that confirmed the unifactorial structure of the HSP Scale as reported in the original study. Nevertheless, the SPS is an issue that has captured the interest of different researchers around the world both for its implications in the differential psychology area, as in the field of clinical psychology. In this regard, it should be noted that, when the SPS has been evaluated globally through the total HSP score, it has been found to be moderately associated with neuroticism[8] in relation to the personality model of the five factors, as well as with negative affect,[11] mediated this relationship, due to difficulties in the processes of emotional regulation. However, when the dimensions have been evaluated separately, the results differ.

The increase in studies on SPS is expected to contribute to their understanding and independence of other constructs, especially those that are considered within the psychopathology. For this, it is necessary that the instrument that was originally built for its measurement and research be evaluated in other populations and lays the foundations for the investigation of this construct in other contexts, with people with particular characteristics given by culture and nurture.

Thus, the objective of this study was to analyze the psychometric properties of the HSP Scale adaptation to Mexican population, determine the reliability of the instrument, as well as its factorial structure and comparing with the original scale.

Method

Participants

The data was collected in an accidental-convenient non-probabilistic manner. The sample consisted of 1050 Mexican university students, 676 women and 374 men with an age range between 18 and 28 years (M = 20.65, SD = 1.92), from 19 undergraduate public education programs.

Materials

Highly Sensitive Person Scale.[1] It is a self-report instrument designed to measure the degree of highly sensitivity of adults. It consists of 27 items with Likert type responses ranging from 1 (not at all) to 7 (extremely), which were answered from the way the person feels. Examples: “Do

you notice the subtleties around you?", "Are you easily overwhelmed by bright lights, strong smells, rough fabrics or nearby siren sounds?". All the items are scored in the same direction so, a higher score, higher sensitivity level. Reliability analysis reported as α = 0.87 index and the factorial analysis by principal components suggested a single-factor solution that explained 54% of the variance. Subsequent factorial analyzes have reported two, three and four factors[7–10] as mentioned in the previous section.

The translation of the HSP Scale was carried out with the authorization of its authors. This has been made through double translation procedure (back-translation) under supervision of both languages' experts. Most of the items had to be culturalized taking care of the original meaning of each one.

Procedure

Participants read the Informed Consent Form, where they were acquainted about the details of the study, the anonymity of their participation and the confidentiality of their answers, as well as researchers contact information. Those who consented in writing to participate, the HSP Scale was provided. At the end of the application, the consent forms and the instruments were collected separately to ensure the confidentiality of the responses. Ethics committee of the University of Colima approved the estimated ethical aspects.

Analysis Of Data

Data analysis was performed with the statistical program R 3.4.2[12] with a 95% confidence level. The internal consistency index and the exploratory factor analysis were carried out using the psych package[13] while the confirmatory factor analysis was performed using the lavaan package.[14]

Results

HSP Scale Exploratory Factorial Analysis

Total sample was randomly divided into two groups. The exploratory factorial analysis was carried out with the first group, consisting of 525 cases, leaving the second group for the confirmatory factorial analysis, with 525 cases as well. The reliability index obtained for the 27 items of the HSP Scale was α = 0.89, the minimum value of corrected reactive-total correlation was r = 0.28 and the maximum value was r = 0.66. Items 2, 6, 10, 12, 15, 18, 22, 24 and 27 showed values below 0.40, however, in the absence of an increase in the reliability index of the scale when they were eliminated, it was decided that the result of the exploratory factorial analysis would determine which items would be rejected.

On the other hand, prior to carrying out the factorial analysis both the Bartlett sphericity test[15] and the Kaiser-Meyer-Olkin[16] adaptation factor sample, were applied, in both cases were obtained appropriate values ($\chi 2$ (26) = 181.76, $p < 0.001$ and KMO = 0.88). Likewise, to determine the suitability of the model through the exploratory factorial analysis, a factor load <0.40 was considered for each item, the cumulative variance, the correlation between factors and the reliability index by factor.The factorial analysis by maximum likelihood and varimax rotation yielded a structure of two factors formed by items 13 and 4, respectively, with eigenvalues of 4.05 (24% of the total variance) and 2.38 (14% of the total of the variance) explaining the 38% of the variance (Table 1). The reliability indexes of the factors were α = 0.86 and α = 0.79 and, the reliability index for the item 17 was α = 0.89, while the correlation between the factors was moderate (r = 0.57).

This results left out items: 2, 6, 10, 12, 15, 17, 18, 22, 24 and, 27. It is important to mention that these items coincide with those that had the lowest reactive-total correlation in the reliability analysis with the exception of item 17, which showed a correlation of 0.40.

It should be noted that the items that belong to the first factor of this model have been part of different factors in other reported versions, for this reason, it was not possible to retain a previously given name. Taking into account the content of the items, this factor was called Processed Sensitivity (PS) because are related to sensitivity experienced once the stimuli have been interpreted and not only perceived. Regarding the second factor, this was named as Low Sensory Threshold (LST), as in previous studies,[8,9] because the items allude to the immediate effect of external stimuli.

Confirmatory Factorial Analysis Of The HSP Scale

The confirmatory factorial analysis was carried out using the lavaan package,[14] where a reliability index of α = 0.88 was obtained with the 17 items of the HSP Scale. The two-factor model obtained in the exploratory factor analysis was evaluated and compared statistically with the one-factor model reported for the original scale (Table 2). Results confirmed that the adjustment of the two-factor model was adequate according to the parameters most commonly reported.[17]

Table 1 Factor Analysis Of The HSP Scale Items For Maximum Likelihood And Varimax Rotation

Item		Factors	
		1	2
21	Are the changes in your life unbalanced?	**0.67**	0.19
14	Do you feel nervous when you have to do many things in a short time?	**0.65**	0.19
19	When too many things happen around you, do you become upset, agitated, or restless in an unpleasant way?	**0.62**	0.29
23	Do you find it unpleasant to have many things to do at the same time?	**0.61**	0.12
11	Do you sometimes feel your nervous system too exhausted and think you should take a break?	**0.55**	0.29
26	When you must compete or are you going to be observed while doing a task, do you get so nervous or shaky that you do it worse than you would in another situation?	**0.53**	0.15
16	Do you feel upset when people want you to do too many things at the same time?	**0.51**	0.22
5	On busy days or work, do you need to isolate yourself a bit to have some relief from the stimuli?	**0.50**	0.26
3	Do other people's moods affect you?	**0.47**	0.18
4	Do you usually be more sensitive to pain than other people?	**0.47**	0.12
8	Do you have an inner life full of emotions, affections, thoughts, experiences, ideas, etc., which is difficult to define?	**0.45**	0.26
13	Do you get scared or startled easily?	**0.45**	0.23
20	Does being hungry deconcentrate or affect your mood?	**0.42**	0.24
9	Do loud sounds make you feel uncomfortable?	0.19	**0.78**
25	Do you feel upset with intense stimuli such as loud sounds or chaotic scenes?	0.29	**0.72**
7	Do you feel easily overwhelmed or overwhelmed by bright lights, strong smells or smells, harsh fabrics or nearby siren sounds?	0.18	**0.64**
1	Do you feel easily overwhelmed in the presence of strong sensory stimuli?	0.37	**0.47**

Note: Data in bold indicates a factor load >0.40.

Table 2 Confirmatory Factorial Analysis. Comparison Of Adjustment Values Of The Models

MODEL	χ^2 Model p>0.05	TLI Tucker Lewis Index > ó = 0.95	CFI Comparative Adjustement Index > ó = 0.90	RMSEA Root Mean Square Error Of Approximation < 0.08	(S)RMR Standardized) Root Mean Square Residual < 0.08
1 Factor	1411.57 (324), p<0.001	0.69	0.71	0.08	0.07
2 Factors	398.67 (117), p<0.001	0.88	0.90	0.07	0.05

This model yielded a value of χ2 and freedom degrees below the unifactorial model, a Tuker Lewis index (TFI) and a comparative adjustment index (CFI), higher by twenty hundredths and very close to the acceptable values. Both, error approximation of the quadratic mean (RMSEA) and the standardized quadratic root mean (SRMR), were below the 0.08 in the case of the two-factor model, but not in the unifactorial solution, where the RMSEA was equal at the desirable value.

Discussion And Conclusions

The purpose of this study was to examine the psychometric properties of HSP Scale adaptation to Mexican population. The results of this investigation did not confirm the scale unifactorial structure reported by its authors[1] nor the number of items that is compose whit. As well as the solution of three or four factors as was proposed in other studies [e.g.[8–10]]. The factorial analysis offered a two-factor solution with 17 items, a reliability index of α = 0.89 and a correlation between factors of r = 0.57. This structure was confirmed with adequate adjustment parameters and dismissed ten items of the original scale for its weakly contribution to the construct. However, due to the correlation between the factors, and the theorical assumptions that justify a unifactorial solution for the SPS, a higher total order factor is sustained.

These results coincided with was reported by Ershova et al,[7] both in the number of factors and in the inclusion of the thirteen items of that version, which did not occur with any other of the scales mentioned. In Aron & Aron,[6] 12 items short version and Grimen & Diseth of 13 items, only eight items were in common. Even with Smolewska et al,[8] version of 25 items, only 15 were shared, therefore, it is plausible to think that there is variability in the way of experiencing high

sensitivity depending on the social and/or cultural environment, so not all the scale original items manage to collect the experiences in all contexts. This raises the need to build a scale that evaluates the existence and degree of SPS from the experience of the Mexican population taking into account cultural and personality aspects and those related to parenting.

On the other hand, due to the multidimensionality of the SPS, and the low replicability of the results, it was not possible to use a name already given in previous studies for the first factor, for this reason, was renamed as Processed Sensitivity (PS). In addition, this factor included items 8, 19 and 23, with respect to Ershova et al.[7] These items are not in the Russian version, but yes in the Aron & Aron,[6]short version and in Smolewska et al,[8]version, although in this are forming part of three different factors.

Regaring the second factor of the structure found in this study, items 7, 9 and 25 have been part of the Low Sensory Threshold (LST) factor in three previous reported versions,[7–9] but not item 1, which has been excluded in all the reviewed reports for this investigation. Despite this, the second factor obtained by the factorial analysis included it, and for this version, it was decided to keep the name given by the other studies.

The model found in this study retained items that match those that have been part of the factors named in other studies such as Low Sensory Threshold and Ease of Excitation. In fact, they are the items that remain constant in most of the reported versions of the HSS, which allows these two factors to be thought of as core characteristics of the SPS that do not depend on factors associated with the social environment.

From what is found in this research and in the previous reviewed works, it is concluded that the internal structure of the HSP Scale remains without a final solution valid for all contexts, but without any doubt, it is a field with many possibilities for research and development. Therefore, future research should contemplate heterogeneous and numerous samples that consider different demographic and personality variables in order to define with greater clarity and amplitude, the associated spectrum with highly sensitivity.

It is pertinent to point out that SPS in overstimulating environments and with poor emotion regulation, can become a risk factor for the development of psychopathology, without being in itself or by definition. For this reason, the use of this scale in clinical contexts can help discriminate between symptoms and manifestations of the trait in the face of an unfavorable circumstance. However, the HSP was built based on research conducted with the American population, so it is advisable to use this version taking into account that there may be other ways of experiencing high sensitivity depending on the context, so it will be necessary to use other means to collect the experience.

One of the strengths of this research is the size sample, as well as have had higher education diversity programs and the years studied in each. Within the limitations, it should be noted that the participants shared sociodemographic characteristics such as schooling, occupation, place of residence, marital status and mostly age. Undoubtedly, it is necessary implement evaluations of high sensitivity level in different social and cultural contexts in order to know in detail the way in how this genetically-determined trait is experienced.

Another limitation was the absence of an analysis of the clinimetric properties[18–20] of the scale, which would yield fundamental information to understand and measure SPS in clinical contexts, or even to discriminate against it in the presence of psychopathology. For this reason, we consider it important to carry out this analysis in future research.

Finally, the results of this study indicated that HSP Scale adaptation to the Mexican population has adequate psychometric properties. In addition, given that Mexico did not have a previous scale that measured SPS, the essential contribution of this study is to provide a valid and reliable instrument to discriminate the presence of this construct.

Disclosure

The authors report no conflicts of interest in this work.

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