Evaluation of the psychometric properties of the SOC-13 scale in Mexico

Evaluación de las propiedades psicométricas de la escala SOC-13 EN México

Abstract

This study assessed the psychometric properties of the Sense of Coherence scale with 13 items, SOC-13, in a Mexican of 617 participants aged 18-60 years old. Confirmatory factor analysis showed a good model fit for a three factor solution: CFI = 0.97, TLI = 0.96, SRMR = 0.05 and RMSEA = 0.03. Reliability analysis showed that the SOC13 had an adequate omega coefficient for the whole scale (Ω general = 0.87), but slightly low internal consistency for all three subscales. (Ω Manageability = 0.72, Ω Comprehensibility = 0.70, Ω Meaningfulness = 0.76). In order to reinforce McDonald's Omega coefficient results composite reliability (CR) and average variance extracted (AVE) was computed. Comprehensibility factor showed a CR = .75 and AVE = .43, Manageability a CR = .45 and AVE = .22. Finally, Meaningfulness showed a CR = .68 and an AVE = 0.42. Multidimensional scaling was related to the CFA factor solution. Limitations were due to the wide age range of the sample and that the sample was non-randomized. Future studies should focus on further analysis to better understand how Mexican people use their sense of coherence in everyday life.

Key words: Sense of Coherence, Psychometric Properties, Reliability of Omega, CFA,

Mexico.

Resumen

Este estudio evaluó las propiedades psicométricas de la escala Sentido de Coherencia con 13 reactivos, SOC-13 en un grupo de 617 participantes mexicanos con edades entre 18-60 años. Análisis factorial confirmatorio mostró una adecuada bondad de ajuste para una solución de tres factores (CFI = 0.97, TLI = 0.96, SRMR = 0.05 Y RMSEA = 0.03. Los análisis de confiabilidad mostraron una adecuada confiabilidad general (Ω general = 0.87), y una fiabilidad ligeramente baja para los tres factores del SOC (Ω Manejabilidad = 0.72, Ω Comprensibilidad = 0.70, Ω Significatividad = 0.76). Además, una confiabilidad compuesta de .75 para Comprensibilidad, .45 Manejabilidad y .68 de Significatividad. Asimismo, un promedio de varianza extraída de .43 para Comprensibilidad, .22 para Manejabilidad y .42 de Significatividad. Las limitaciones del estudio se deben a la amplia gama de edad de la muestra y que ésta no fue aleatoria. Los estudios futuros deberían emplear análisis adicionales para comprender mejor la forma en que los mexicanos emplean el sentido de coherencia en su vida cotidiana.

Palabras clave: Sentido de Coherencia, Propiedades Psicométricas, Confiabilidad de

Omega, CFA, México.

Sense of Coherence (SOC) has proved to be an interesting variable that has been studied a lot around the world. Systematic reviews have shown the importance and empirical evidence that this construct has shown in different research fields and topics. Sense of Coherence scales have been translated in at least 33 languages and studied in 32 different countries (Antonovsky, 1993; Eriksson & Lindstrom, 2005). Regardless of the amount of investigations that have been done, the psychometric properties of the Spanish version of the SOC-13 scale has not been assessed in many studies. Virues-Ortega, Martinez-Martin, Del Barrio and Lozano (2007) studied this scale on Spaniards with 70 years or more. Moreover, this questionnaire has never been studied in a Mexican sample. Therefore, a psychometric evaluation of the Sense of Coherence scale in a Mexican sample should be addressed in order to gather information about this variable in a Latin American population.

Antonovksy (1988), defined Sense of coherence as follows:

"a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that: (a) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; (b) the resources are available to one to meet the demands posed by these stimuli; and (c) these demands are challenges, worthy of investment and engagement" (p. 19).

SOC has three important components Comprehensibility, Manageability and Meaningfulness (Antonovksy, 1988; Antonovsky, 1993; Frenz, Carey & Jorgensen, 1993). To develop a strong SOC and cope with stress, the person should have as many General Resistance resources (GRR) as possible can. These are "characteristics of the

person, group or the environment that can facilitate effective tension management" (Antonovsky, 1979, p 99). Over the years, SOC has shown great psychometric properties. Reliability has ranged between .71 and .80 in different groups and languages such as, Portuguese, Farsi, Dutch, Spanish and Italian (Bonnato, Branco, Mota, Ramos-Jorge, Kaeppler, Paiva & Pordeus, 2009; Mahammadzadeh, Poursharifi & Alipour, 2010; Naaldenberg, Tobi, Van den Esker & Vaandrager, 2011; Sardu, Mereu, Sotgiu, Andrissi, Jacobson & Contu, 2012; Van Schalkwyk & Rothmann, 2008; Virues-Ortega, Martinez-Martin, Del Barrio & Lozano, 2007).

In spite of an adequate internal consistency, over the course of the years there have been many different types of SOC scales. First of all, Anotnovsky (1988) presented the first two Sense of Coherence scales (SOC-29 and SOC-13) which were a one-dimensional scale. Further studies have found that the SOC scale is rather multidimensional than one dimensional (Eriksson & Lindstrom, 2005; Frenz, Carey & Jorgensen, 1993). Other revisions have proposed different Sense of Coherence scales, such as an 11 item questionnaire, (Naaldenberg et al, 2011), 12 item scale (Lerdal, Fagermoen, Bonsaken, Gay & Kottorp, 2014), 9 item scale (Klepp, Mastekaasa, Sorensen, Sandanger, & Kleiner, 2007) and SOC-II and Emotional SOC versions that had stronger relationship with physical outcomes (Flensborg-Madsen, Ventegodt, & Merrick, 2006; Flensborg-Madsen, Ventegodt, & Merrick, 2006a). Regardless of that, a systematic review concluded that all this different scales have shown to adequately measure Sense of Coherence and have a good internal consistency. Therefore, new studies about this scale should be aimed on measuring SOC in different ways such as experimental studies and qualitative measures and to further evaluate this variable in populations that have not been assessed yet (Eriksson & Lindstrom, 2005). Up to date, there has only been two studies that we know of that had measured SOC by using an

experimental design (Amirkhan & Greaves, 2003) and a qualitative approach (Griffiths, Ryan & Foster 2011). In addition, as we already have mentioned, a review to the SOC scale is due to be done on a Mexican sample. Hence, this study could fill the gap on the assessment of the psychometric properties of the SOC-13 scale in Mexico.

Besides that, SOC has proven to be a strong predictor of mental health (Eriksson, & Lindstrom, 2006), quality of life (Eriksson, & Lindstrom, 2006a) and in less amount physical health (Flensborg-Madsen, Ventegodt, Merrick, 2005). Other studies have found out that people with stronger SOC tend to practice more health behaviors, like eating healthier diets and practice more physical activity (Lindmark, Stegmayr, Nilsson, Lindahl & Johansson, 2005; Ochiai, Syunichi & Kiyoshi, 2012; Ray, Suominen & Roos, 2009 Savolainen, et al. 2009; Wainright, et al. 2007).

Therefore, this study could be helpful for two main reasons. First, it will fill the void of the absence of a SOC scale in another Latin American population, in this case a Mexican sample. This would further develop the wide range of empirical findings about Sense of Coherence and their psychometric properties. Moreover, this scale would be adapted in a different context and culture, a collectivist culture were family and cultural groups are strongly influential that differs from European countries were individualist environments are the most common (Mezulis, Abramson, Hyde & Hankin, 2004). Second, the adaptation of a useful tool that measures Sense of Coherence could help have a better understanding of a variable that enhances mental health, quality of life and health behaviors. For that reason, the aim of this study is to assess the psychometric properties of the SOC-13 scale in a Mexican sample.

Method

Participants

A sample of 617 people participated on this study. They were recruited by 27 research assistants from eleven states of the country including: Federal District, State of Mexico, Hidalgo, Oaxaca, Puebla, Aguascalientes, Durango, Guanajuato, Michoacan, Veracruz and Tabasco in equivalent proportions. 192 of the participants were men (31%) and 427 (69%) were women. Their age ranged between 18-60 years old. The mean age was 39.18 years old (SD = 9.05). 51 participants had primary school, 114 had attended to senior school, 157 were undergraduate students or had a bachelor's degree, 231 people had graduated from university and 58 people had postgraduate studies either masters or doctoral degrees. Moreover, 147 participants were single, 345 were married, 63 were divorced, 56 had a free union and 6 were widows or widowers. 132 people did not have children, 104 had one child, 223 had two children, 117 had three children and 41 people had 4 or more children. All participants took the questionnaire in their home town. Even though the sample size was big enough to be representative of the country the participants were not chosen randomly, each research assistant invited people in his or her social circle that met the age criteria from 18 to 60 years of age. Written informed consent was given to each participant.

Instruments

A Spanish version of the SOC-13 was used. This scale has three components Comprehensibility, Manageability and Meaningfulness and rates on a 7-point likert scale, it used only a total score and the coding for items 1, 2, 3, 7 and 10 should be reversed. SOC scores range from 13 to 91 (Antonovksy, 1988). According to Antonovsky (1993) the mean alpha of the SOC-13 scale was 0.82 (range = 0.74-0.81).

Moreover, he concluded that content, construct and criterion validity were adequate. Eriksson and Lindstrom (2005) found that the SOC-13 scale had a Cronbach's Alpha reliability that ranged from 0.70 to 0.92.

Procedure

Informed consent, the short form SOC scale and demographics form questionnaire were voluntarily completed. The survey process took approximately 25 minutes. Instruments were administered anonymously and all questionnaires were maintained in a protected location. In order to get the results, descriptive statistics for all scales were calculated. Multivariate normality analyses were calculate for items distribution. Confirmatory factor analysis was assessed to calculate the construct's structure. Reliability was analyzed using McDonald's Omega, Composite reliability and Average Variance Extracted. Finally, non-metric multidimensional scaling was used in order to compare the amount of factor extracted in previous analyses.

Results

Table 1: Descriptive statistics of ítems from the SOC-13 scale

|	Mean	SD	Skewness	Kurtosis
SOC item 1***	2.75	1.8	0.81	-0.4
SOC item 2*	4.26	1.9	-0.24	-1.08
SOC item 3**	4.08	2	-0.08	-1.27
SOC item 4***	5.58	1.57	-1.15	0.63
SOC item 5**	4.8	2.02	-0.56	-0.97
SOC item 6*	4.98	1.91	-0.62	-0.82
SOC item 7***	2.43	1.47	1.1	0.75
SOC item 8*	5.04	1.91	-0.73	-0.64
SOC item 9*	4.65	2.12	-0.34	-1.34
SOC item 10**	3.61	1.95	0.35	-1.12
SOC item 11*	4.67	1.84	-0.39	-0.96
SOC item 12***	5.44	1.72	-1.05	0.11
SOC item 13**	5.29	1.82	-0.93	-0.25
*Comprehensibility, **Manageability, ***Meaningfulness				

Table 1 shows that the average score of the Comprehensibility and Manageability subscales are almost the same in all their items. Meanwhile, meaningfulness scale has two items with the highest mean scores in all 13 items and the two lowest mean scores in all the scale. Skewness and Kurtosis showed that all items have a univariate normal distribution with a Skewness lower than 3 or a Kurtosis lower than 8 (Kline, 2015). In spite of that, a multivariate normality analysis was assessed. Mardia and Henze-Zirkler test showed that all items don't have a normal multivariate distribution ($\chi^2 = 1921.344$, p < 0.001, HZ = 2.158749, p <0.001).

Table 2: Fit indices for CFA analysis

	χ^2	gl	CFI	TLI	RMSEA	SRMR
Model without 2 items	93.626	40	0.96	0.95	0.05	0.04
Model without 3 items	92.294	32	0.96	0.94	0.06	0.04
Model without 3 items and 1 error correlation	71.904	31	0.97	0.96	0.05	0.03

Table 2 shows model fit results for different confirmatory factor analysis solutions. A model without three items (1, 2, and 10) and an error correlation between items 8 and 9 was the best fitting model. All model fit indexes showed adequate values with this factor solution according to Hu and Bentler's criterion (Hu & Bentler, 1999).

Figure 1: SOC 13 model
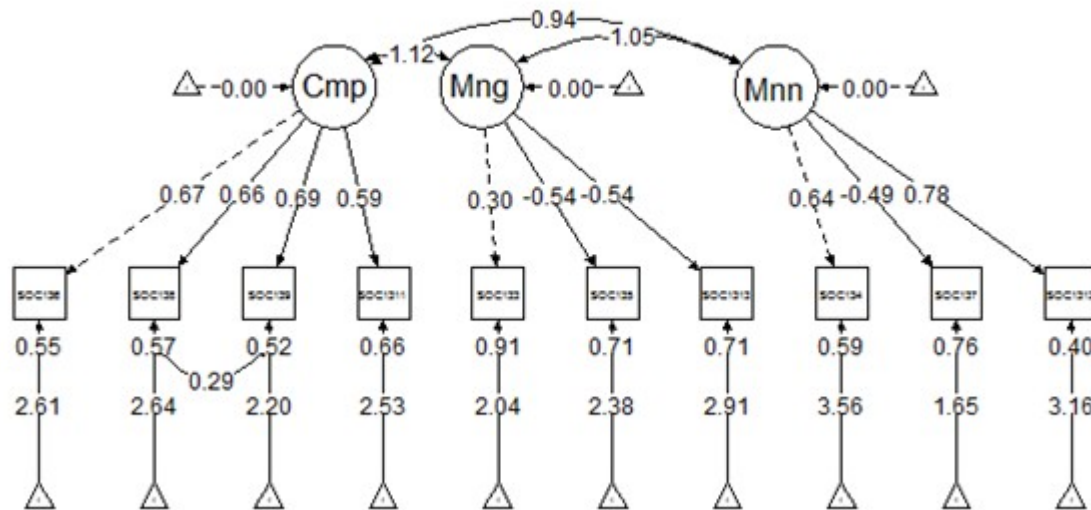
Results showed one item was dropped from each of the three subscales. Comprehensibility factor was formed by items 6, 8, 9 and 11 with standardized betas between .59 and .69. Manageability factor was constructed between items 3, 5 and 13 with standardized betas between -.54 and .30. Finally, Meaningfulness was comprised by items 4, 7 and 12 with standardized betas between -.49 and .64. All items had coefficients higher than .40 except for item 3. In spite of that, this item had to be retain in the factor solution because latent variables cannot be constructed with only two items (Kline, 2015).

Reliability analysis showed that the SOC13 had an adequate omega coefficient for the whole scale (Ω general = 0.87). But slightly low internal consistency for all three subscales. (Ω Manageability = 0.72, Ω Comprehensibility = 0.70, Ω Meaningfulness = 0.76). In order to reinforce McDonald's Omega coefficient results composite reliability (CR) and average variance extracted (AVE) was computed. Comprehensibility factor showed a CR = .75 and AVE = .43, Manageability a CR = .45 and AVE = .22. Finally, Meaningfulness showed a CR = .68 and an AVE = 0.42.

Figure 2: Configuration plot for SOC 13 scale
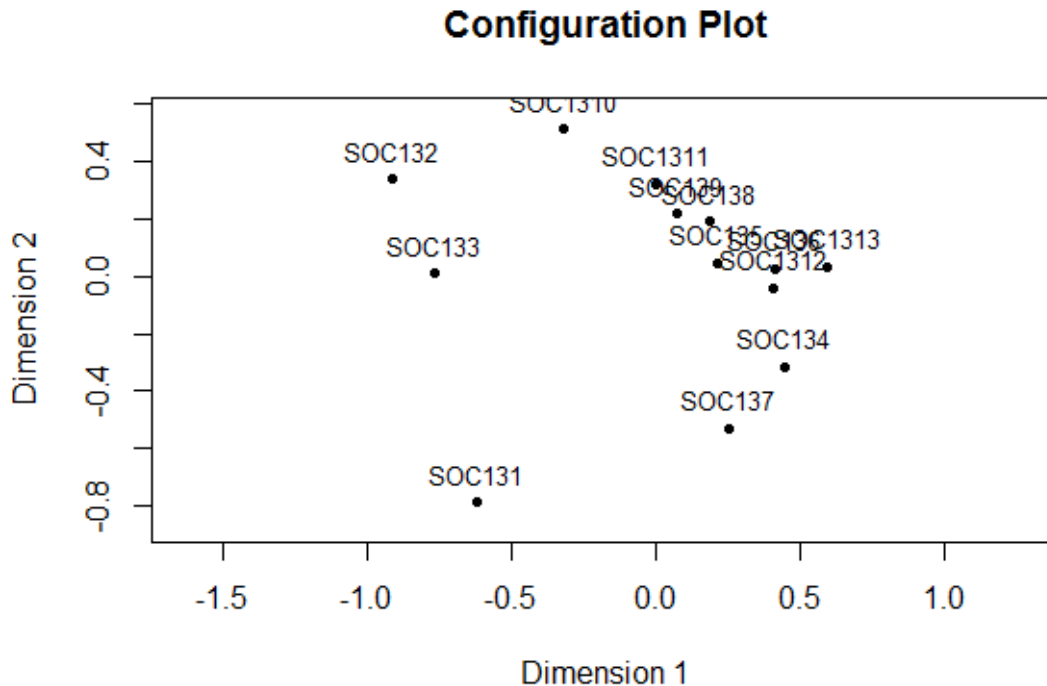
The Configurational plot from the multidimensional scaling analysis showed that items 1, 2, 3 and 10 were the ones that were further apart from the group of items. The CFA solution showed that those items had a low standardized beta ($\beta < .40$). This analysis show that these results are consistent. In summary items 1, 2, 3 and 10 are problematic for the measurement of Sense of Coherence in this sample.

Discussion

This study had the aim of assessing the psychometric properties of the SOC-13 scale in a Mexican sample. After evaluating the reliability and validity of the scale, we found out that the SOC-13 scale has an adequate internal consistency for the entire scale and the three different factors (George & Mallery, 2003). Manageability did not show an adequate internal consistency. All three factors had a very similar reliability measure. According to George & Mallery (2003) reliability was below the optimal threshold. It is

possible that the amount of items in each factor could explain these results as the quantity of items has an impact in the overall reliability test; smaller amounts of items tend to decrease internal consistency (Gliem & Gliem, 2003).

Regarding the construct validity, confirmatory factor analysis did show a three factor solution which is similar to what Antonovsky (1988) stated about the three components of the Sense of Coherence. In that sense, these results show that a one factor solution was not a good model fit. Therefore, for this sample the SOC construct should be measured separately using Comprehensibility, Manageability and Meaningfulness as separate factors.

As the results show, Comprehensibility factor was formed by the items 6, 8, 9 and 11. These items described internal feelings of discomfort, confusion, low self-esteem and the tendency to overreact or minimize the results of a specific situation. In other words, negative outcomes and feelings of distress. Therefore, these items try to explain the inability to make stimulus structured and predict what is happening in the environment, which describes Comprehensibility (Antonovsky 1988). Item two had to be dropped because it showed a standardized beta lower than adequate (Kline, 2015). It is possible that item 2 showed a misfit because it is reversed coded making it more difficult to understand than other items. Furthermore, nearly all the items talk about emotions and how to make judgements. Meanwhile, item 2 is related to "being surprised" by a specific situation. It is possible that difference in sentence wording could have affected item fit.

Moreover, Manageability factor was accounted for items 3, 5 and 13. Item 10 did not show a good model fit and had to be excluded from the model. This understanding of Sense of Coherence is similar to previous research (Cohen, 1997;

Skirka, 2000; Pallant & Lae, 2002; Smith & Meyers, 1997; Sumikawa & Yamazaki, 2006) that suggests that internal resources are associated with SOC and the ability to cope with stress and feel well. Also, this finding suggests what previous research has shown, SOC is associated with external resources (Antonovsky & Sagy, 1986; Nilsson, Holmgren & Westman, 2000; Vuori, 1994; Wolff & Ratner, 1999). This interest towards social feedback and attention to the environment could be similar to what Swann and Buhrmester, (2012) stated, people are more attentive to social feedback when they think that this will give them coherence and verify their own views.

Meaningfulness, factor was accounted for items 4, 7, 12. In this case, item 1 didn't show a good model fit and it had to be deleted from the scale. As we can recall, this factor is related to the motivational aspect of sense of coherence and how people can think about their future. Previous findings and theories, have also suggested a relationship between having a purpose in life, meaning in life and Sense of Coherence (Heine, Prolux, & Vohs, 2006; Nygren, Jonsen & Gustafson, 2005; Steger, Frazier, Oishi & Kaler, 2006).

This study had some limitations to take notice. In spite of having an adequate sample size, participants were not chosen randomly; therefore not all Mexican people had the same opportunity to be selected. Future studies could assess the psychometric properties of the Sense of Coherence by using randomized samples that could decrease selection bias. Moreover, the age range was steep, with an average age near 40 years old, this could affect the results due to SOC sensitivity to age, other studies have found that older people tend to have a greater SOC (Naaldenberg et al., 2011; Zielinska-Wieczkowska, Ciemnoczolowski, Kedziora-Kornatowska & Muszalik, 2012). However high variance in age provides a general glance of the distribution of sense of coherence among Mexicans. Other studies could try focusing on specific ages or stages of life

span. Furthermore, standardizing scores by age and types of items by using complex techniques such as Rasch modelling could help understand the difference in SOC between ages and at the same time have standard scores that are according to each age range (Lerdal, et al., 2014).

For instance, it is important to note that a strong SOC is not thought to have the function of a single coping strategy. On the contrary, it has multiple ways to cope with stress and allows individuals to choose adequate ways to deal with difficulties (Vossler, 2012). Due to internal consistency and further revision of the factors solutions and items, we realized that the SOC 13 scale is a reliable and useful tool to measure Sense of Coherence in Mexican samples. It can be used as a three factor construct. In spite of that, more studies should be assessed to further evaluate the psychometric properties of this concept.

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