

THE DIMENSIONALITY OF ANTONOVSKY'S  
SENSE OF COHERENCE SCALES.  
AN INVESTIGATION WITH ITALIAN SAMPLES

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Antonovsky introduced the concept of Sense of Coherence (SOC), and, to measure it, developed a 29-item questionnaire as well as a shorter, 13-item, version. Despite wide application of SOC scales in research and clinical practice, their factor structure is still not completely clear. The aim of the present study was to analyze the dimensionality of both versions of Antonovsky's SOC scales (SOCS-29 and SOCS-13) in order to ascertain which model better represents the factor structure of the instruments among one-factor, three-correlated factor, and higher-order factor models. In Study 1, data were collected on a sample of 658 Italian university students who completed the SOCS-29. In Study 2, the SOCS-13 was administered to 372 Italian university students. Confirmatory Factor Analysis (CFA) using the Mean-Adjusted Maximum Likelihood (MLM) estimator was employed to obtain adjusted measure of fit for non-normal sample data. CFA showed that the three-correlated factor model better represents the structure of the 29-item scale, whereas the one-factor model better represents the short 13-item version. In line with the theoretical definition of the construct, and the methodological claim that short forms and full-length measures do not necessarily have the same psychometric properties, findings suggested that the SOCS-29 helps to spell out the three SOC components — comprehensibility, manageability, and meaningfulness — whereas the SOCS-13 provides a global measure of SOC as general orientation to life.

Key words: Sense of Coherence scales; Sense of Coherence scale short version; Confirmatory factor analysis; Salutogenesis.

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## INTRODUCTION

The Sense of Coherence (SOC) proposed by Antonovsky (1979) is central to the so-called salutogenic model of health and illness, emphasizing the process of staying healthy despite stress, in contrast to the traditional pathogenic model of medicine. SOC has been defined as a construct at the core of a complex human information-processing system aimed to resolve conflicts and endure the inevitable stress of human life. This construct is a global orientation to view the world and the individual environment as comprehensive, manageable, and meaningful, claiming that the way people view their life influences their health (Kouvonen et al., 2010; Wainwright et al., 2010).

As defined by Antonovsky (1979), these aspects reflect the three SOC components: comprehensibility (the degree to which individuals feel that information about themselves and the social environment is understandable and consistent), manageability (the degree to which individuals feel that the resources available to them are sufficient to adequately meet the demands posed by internal and external stimuli), and meaningfulness (the extent to which subjects feel certain areas of life are worthy of time and effort, and the degree of involvement in various domains of life). Antonovsky (1987, 1993) argued that these three components of SOC are dynamically interrelated in defining the individual's global orientation to life.

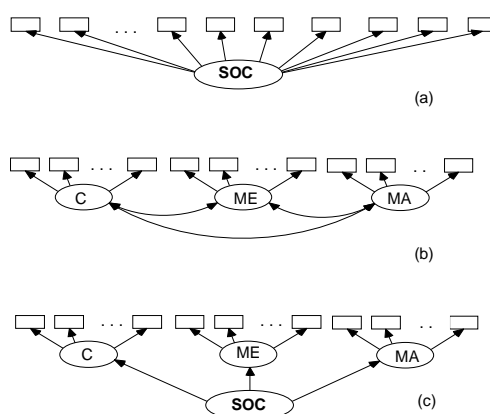
In order to measure SOC, Antonovsky (1979, 1987) developed the Sense of Coherence scales — the original 29-item scale (SOCS-29) and the shortened 13-item version (SOCS-13) — that are considered health-related questionnaires (Bowling, 1998; Gibson & Cook, 1996), mental-health measures (Compton, Smith, Cornish, & Qualls, 1996), and even coping measures (Gilbar, 1998; Jorgensen, Frankowski, & Carey, 1999). They have therefore been widely used in a considerable number of studies on health, health care, and psychological well-being. Besides the original Antonovsky's SOC questionnaires, more than 15 different alternative scales (in 33 languages, and 32 countries) have been introduced to measure SOC (Eriksson & Lindström, 2005). Nonetheless, the original Antonovsky's SOCS-29 and SOCS-13 should be considered as a landmark of this construct and its original conceptualization (e.g., Eriksson & Lindström, 2005; Olsson, Gassne, & Hansson, 2009).

As far as the psychometric properties of the SOC scales are concerned, reliability and validity for the 29-item version as well as for the 13-item version have been widely documented (see Antonovsky, 1993, and Eriksson & Lindström, 2005, for a review). However, its dimensionality is still not completely clear because different studies have supported different factorial structures. Some authors reported that the scales have a single-factor structure (e.g., Callhan & Pincus, 1995; Flannery & Flannery, 1990; Hawley, Wolfe, & Cathey, 1993). In contrast, other studies (e.g., Bishop, 1993; Feldt & Rasku, 1998; Gana & Garnier, 2001; Hart, Hittner, & Paras, 1991; Kravetz, Drory, & Florian, 1993) supported a three-correlated factor model where the factors reflected the three components of sense of coherence, defined by Antonovsky as comprehensibility, manageability, and meaningfulness. Moreover, referring to a three-factor structure, a non-correlated factor solution was also suggested (Sandell, Blomberg, & Lazar, 1998), but did not obtain further evidence in support. Frenz, Carey, Cornish, and Qualls (1993) proposed a second-order model with three first-order factors in which the second-order latent variable was believed to represent a generalized expectancy factor (sense of coherence) whose influence is shared by the three first-order expectancy factors (comprehensibility, manageability, and meaningfulness). In the Italian context, Barni and Tagliabue (2005) proposed a two-factor structure for the SOCS-

13 by excluding two items. To sum up, there is no agreement about the dimensionality of the scales (Larsson & Kalleberg, 1999; Sandell et al., 1998).

Most of the studies focusing on the psychometric properties of SOCS used one of the original scales (the long or the short form), assuming they are interchangeable. That might be the reason of the contrasting results about dimensionality. Hence, the disagreement might be due to the different factor structure between SOCS-29 and SOCS-13. Indeed, following methodological recommendations for developing short forms (Smith, McCarthy, & Anderson, 2000), the assumption that the validity evidence of the full-length measure applies automatically to the abbreviated version is not always true. A short form, and in particular an abbreviated form of a measure with a reduced coverage of the target domain, might be an instrument with partially different psychometric properties.

The aim of the present study was to investigate the structure of the original 29-item scale (SOCS-29) and the short 13-item version (SOCS-13) (Antonovsky, 1979, 1987) in order to give a contribution to the issue of dimensionality. In particular, because the content coverage of the target domain was reduced for the shortened version — composed by one-third of items of the long form — this reduction might result in a different factor structure of the scale. That is, starting from Antonovsky's definition of the construct — a global orientation to life with three dynamically interrelated components — we predicted that the SOCS-29 might help to spell out the three components (comprehensibility, manageability, and meaningfulness), whereas the SOCS-13 might provide a measure of sense of coherence as a global orientation to life. Specifically, applying a confirmative approach, we compared three models for both versions of SOCS: a one-factor model, a three-correlated factor model, and a higher-order factor model (Figure 1). These models are the most commonly used as well as those better reflecting Antonovsky's conceptualization of the construct. Thus, we excluded a three-uncorrelated factor model obtained by Sandell et al. (1998) — partly because many studies documented high correlations between the three factors (e.g., Bishop, 1993; Feldt & Rasku, 1998; Gana & Garnier, 2001; Kravetz et al., 1993) — and the two-factor model proposed by Barni and Tagliabue (2005), which, in the final model, excluded two items of the original form.



Note. C = Comprehensibility, ME = Meaningfulness, MA = Manageability.

FIGURE 1  
Graphical representation of the three proposed models  
for the Sense of Coherence scales (SOCS-29 and SOCS-13):  
(a) one-factor model; (b) three-correlated factor model; (c) higher-order factor model.

In the first study (Study 1), the long version was administered, and its dimensionality was studied along with the dimensionality of the short version. The latter was derived from the long one. In the second study (Study 2), only the short version was administered to replicate the findings of Study 1. Indeed, considering the short form as derived from the long one might be a methodological flaw because the shorter version might include systematic effects on responses due to the influence of neighboring items that are no longer part of the scale. These effects can be avoided when the short form is used by itself. Moreover, in Study 2, we included additional measures to provide further evidence about the factor structure of the scale.

## STUDY 1

### Methods

#### *Participants*

The sample was composed of 658 Italian university students (72% male) with a mean age of 23.33 years ( $SD = 4.09$ ). Students were randomly selected from various courses at the Departments of Psychology, Medicine, Nursing, and Engineering of the University of Florence. We ran the research with a sample of university students, consistently with previous studies, which involved university students and tested SOCS psychometric properties in a non-clinical sample (e.g., Olsson, Gassne, & Hansson, 2009; Sandell et al., 1998).

#### *Measures and Procedure*

The SOCS-29 consists of items scaled along a 7-point semantic differential with two anchoring phrases at both extremes. The Italian version of the SOCS-29 (see the Appendix) was obtained using the *backward-translation* method following the current guidelines for adapting tests (Hambleton, 2005). The original version of the scale was translated into Italian by a native Italian-speaking translator. The Italian version was back-translated into English by an English mother-tongue translator. To check the equivalence between the original version and the Italian one, the two English versions (original and back-translated) were compared. Discrepancies were corrected by consensus between the two translators. We did not employ the 13-item Barni and Tagliabue's SOCS Italian version because, while translating the long version, we derived the shorter form from it.

Participants received an informative sheet on the study, and were asked to give written informed consent. They were also informed that participation was both voluntary and anonymous. Each questionnaire was briefly introduced, and instructions for completion were provided.

## Results

Analysis of missing data revealed 20 missing data patterns (cases with five or more missing values). Because they represented less than 10% of the total cases in the sample, a list-wise

deletion was conducted, excluding cases with missing data (Kline, 1998). When missing values were fewer than five, missing data imputation was performed using the item mean.

Item distributions and descriptives were examined for assessment of normality (Table 1).

TABLE 1  
Descriptives for each item of the SOCS-29 (Study 1)

SOCS-29			
	<i>M(SD)</i>	Skewness	Kurtosis
Item 1	4.97 (1.29)	-.63	-.19
Item 2	4.57 (1.26)	-.13	-.33
Item 3	4.02 (1.31)	-.14	-.46
Item 4	5.24 (1.52)	-.87	.22
Item 5	3.66 (1.45)	.37	-.88
Item 6	3.89 (1.45)	.37	-.88
Item 7	5.42 (1.37)	-.72	.13
Item 8	5.17 (1.32)	-.75	.53
Item 9	4.70 (1.52)	-.34	-.61
Item 10	3.36 (1.52)	.15	-.65
Item 11	5.31 (1.08)	-.63	.76
Item 12	4.52 (1.57)	-.16	-.86
Item 13	5.48 (1.24)	-.75	.37
Item 14	5.27 (1.39)	-.63	-.24
Item 15	3.84 (1.38)	-.21	-.50
Item 16	4.65 (1.17)	-.18	.24
Item 17	3.62 (1.45)	.14	-.55
Item 18	4.27 (1.85)	-.18	-1.10
Item 19	4.09 (1.58)	-.17	-.76
Item 20	4.61 (1.56)	-.47	-.43
Item 21	3.60 (1.67)	.31	-.85
Item 22	5.36 (1.08)	-.91	1.58
Item 23	5.41 (1.50)	-1.02	.42
Item 24	4.03 (1.49)	.02	-.53
Item 25	3.64 (1.49)	.17	-.71
Item 26	3.93 (1.46)	-.04	-.61
Item 27	4.60 (1.18)	-.17	-.19
Item 28	4.97 (1.44)	-.58	-.29
Item 29	4.27 (1.55)	-.21	-.81

*Note.* Items are reported in the Appendix. SOCS-29 = Sense of Coherence scale – 29 items.

Several items deviated from normality (item 4, item 13, and item 23). Thus, Confirmatory Factor Analysis (CFA), using the Mean-Adjusted Maximum Likelihood (MLM) estimator (Mplus software; Muthén & Muthén, 2004), was employed in order to test the SOCS-29 and the SOCS-13 dimensionality. This estimator provides the Satorra-Bentler Scaled (chi-square  $SB\chi^2$ ; Satorra & Bentler, 2001) which provides an adjusted, robust measure of fit for non-normal sample data. It is more accurate than the ordinary chi-square test statistic (Bentler & Dudgeon, 1996).

Criteria for assessing overall model fit were mainly based on practical fit measures: the ratio of chi-square to its degrees of freedom ( $SB\chi^2/df$ ), the Comparative Fit Index (CFI; Bentler, 1990), the Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), and the Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980). For the ratio of chi-square to its degrees of freedom ( $SB\chi^2/df$ ), values below three were considered a fair fit (Kline, 1998). We deemed CFI and TLI values of .90 and above a fair fit (Bentler, 1995). For RMSEA, values equal or less than .08 were considered an adequate fit (Browne & Cudeck, 1993).

Results showed a poor overall fit for the one-factor model ( $M_1$ ), three-correlated factor model ( $M_2$ ), and higher-order factor model ( $M_3$ ) for both SOCS-29 and SOCS-13. Then, we modified  $M_1$ ,  $M_2$ , and  $M_3$  by following the modification indices generated for this model. We obtained  $M_{1\text{modified}}$ ,  $M_{2\text{modified}}$ , and  $M_{3\text{modified}}$ , adding two error covariances (between item 5 and item 6, and between item 10 and item 17) in the SOCS-29, and one error covariance (between item 5 and item 6)<sup>1</sup> in the SOCS-13. These covariances were also reported in previous studies (Feldt & Rasku, 1998; Gana & Ganier, 2001), and are coherent with the fact that those items have a very similar wording, are negatively formulated, and are contiguous in the questionnaire. Table 2 summarizes the goodness-of-fit results for the comparative models.<sup>2</sup>

With regard to the SOCS-29, among the three tested models the modified three-correlated factor model showed the best fit. Instead, CFA revealed an acceptable fit for the modified three-correlated factor model. Indeed, while CFI and TLI (respectively .87 and .86) failed to reach the cut-off of .90, both  $\chi^2/df$  and RMSEA values were adequate (Table 2), and all the estimated parameters (factor loadings, covariances among factors, and error covariances) were significant ( $p < .001$ ; Figure 2). Internal consistency values (Cronbach's alpha) were .77 for comprehensibility, .74 for manageability, and .80 for meaningfulness.

As for the SOCS-13 modified models, the resulting goodness of fit indices showed an acceptable fit for  $M_{1\text{modified}}$  as well as  $M_{2\text{modified}}$  (Table 2), whereas  $M_{3\text{modified}}$  failed to reach an adequate fit. Concerning the standardized estimates (displayed in Figure 3), factor loadings, and the error covariance of the  $M_{1\text{modified}}$ , as well as factor loadings, error, and factor covariances of the  $M_{2\text{modified}}$ , were significant ( $p < .001$ ). Nonetheless, the correlation between comprehensibility and manageability was .99. This high correlation suggested that these two factors could not be conceptualized as different components, but rather as items that tap into the same construct. In addition, because the one-factor model showed an adequate fit, following the parsimony principle as recommended in model testing (Kline, 2005), the  $M_{1\text{modified}}$  appeared to be the best choice. Internal consistency for the total scale was .80.

## Discussion

The models tested in this study were a one-factor model, a three-correlated factor model, and a higher-order factor model. The first of these models was performed to test the unidimensionality of the Sense of Coherence scale supported by Antonovsky (1993). The second model was specified on the basis of Antonovsky's (1987) theoretical considerations of the interrelated

TABLE 2  
Goodness-of-fit statistics for comparative models of the SOCS-29 and the SOCS-13

SOCS-29	$SB\chi^2(df)$	$SB\chi^2/df$	*CFI	*TLI	*RMSEA	Model Comparison	$SB\Delta\chi^2$	$\Delta df$	<i>p</i>
M <sub>1</sub> : One-factor model	1610.87 (377)	4.27	.71	.69	.07				
M <sub>2</sub> : Three-correlated factor model	1237.22 (374)	3.30	.80	.78	.06				
M <sub>3</sub> : Higher-order factor model <sup>a</sup>	1367.42 (377)	3.67	.77	.75	.06				
M <sub>1modified</sub> <sup>b</sup>	1273.37 (375)	3.39	.79	.77	.06	M <sub>1modified</sub> – M <sub>1</sub>	337.40	2	.001
M <sub>2modified</sub> <sup>b</sup>	928.03 (372)	2.49	.87	.86	.05	M <sub>2modified</sub> – M <sub>2</sub>	320.17	2	.001
M <sub>3modified</sub> <sup>b</sup>	1055.24 (375)	2.81	.84	.83	.05	M <sub>3modified</sub> – M <sub>3</sub>	312.18	2	.001
SOCS-13									
M <sub>1</sub> : One-factor model	406.26 (65)	6.25	.78	.73	.09				
M <sub>2</sub> : Three-correlated factor model	347.84 (62)	5.61	.81	.77	.08				
M <sub>3</sub> : Higher-order factor model <sup>a</sup>	582.56 (65)	8.92	.66	.60	.11				
M <sub>1modified</sub> <sup>c</sup>	170.19 (64)	2.66	.93	.92	.05	M <sub>1modified</sub> – M <sub>1</sub>	235.38	1	.001
M <sub>2modified</sub> <sup>c</sup>	120.05 (61)	1.97	.96	.95	.04	M <sub>2modified</sub> – M <sub>2</sub>	265.12	1	.001
M <sub>3modified</sub> <sup>c</sup>	355.06 (64)	5.55	.79	.74	.09	M <sub>3modified</sub> – M <sub>3</sub>	229.48	1	.001

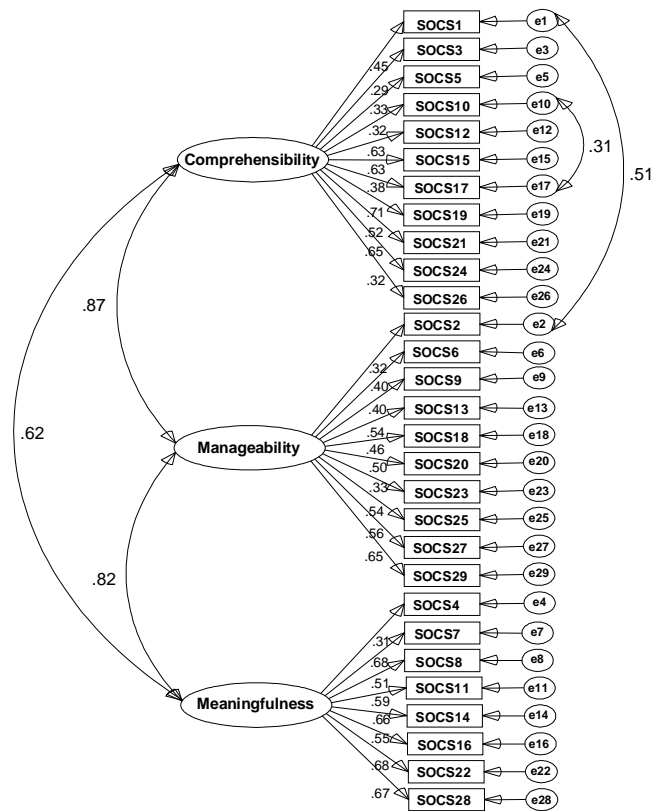
Note. SOCS-29 = Sense of Coherence scale – 29 items; SOCS-13 = Sense of Coherence scale – 13 items.  $SB\chi^2$  = Satorra-Bentler scaled  $\chi^2$ ;  $df$  = degrees of freedom; \*CFI = robust comparative fit index; \*TLI = robust Tucker-Lewis Index; \*RMSEA = robust root mean square error of approximation;  $SB\Delta\chi^2$  = Satorra-Bentler scaled difference  $\chi^2$ ;  $\Delta df$  = Difference in degrees of freedom between nested models; *p* = probability value of  $SB\Delta\chi^2$  test.

<sup>a</sup>To identify the higher-order structure of the model, residual variances of the three factors were constrained to be equal.

<sup>b</sup>The one-factor model and the three-factor model were modified with the inclusion of the covariances between items 5 and 6, and between item 10 and 17.

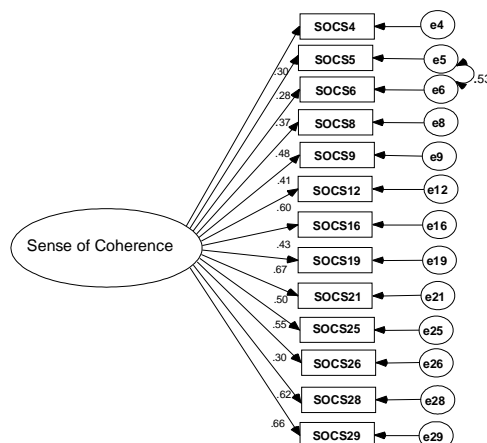
<sup>c</sup>The one-factor model and the three-factor model were modified with the inclusion of the covariance between items 5 and 6.





Note. SOCS = Sense of Coherence scale; for the number associated to SOCS or e, see the Appendix.

FIGURE 2  
Three-correlated factor model with two covariances between errors of the SOCS-29  
(standardized parameters, all significant at .001) (Study 1).



Note. SOCS = Sense of Coherence scale; for the number associated to SOCS or e, see the Appendix.

FIGURE 3  
Factor loadings: The Negative and Positive Mood States (NPMS).



component structure of the sense of coherence (comprehensibility, meaningfulness, and manageability). The last model was constructed on the basis of the hierarchical model, supported by previous studies (Feldt & Rasku, 1998; Frenz et al., 1993), in which sense of coherence represented a higher-order dimension that composed of the three above-mentioned components.

With regard to the SOCS-29, CFA failed to confirm the one-factor structure. Indeed, both initial and modified models showed a poor fit, indicating that the long version of the scale cannot be adequately represented by a single dimension. Thus, even if the fit of the model was not totally satisfactory, the three-correlated factor structure appeared to be the preferable one.

Concerning the SOCS-13, CFAs revealed an acceptable overall fit for both one-factor and three-correlated factor models. Between them, the unidimensional model was chosen following the parsimony principle (Kline, 2005). This choice was supported by the fact that comprehensibility and manageability dimensions were so highly correlated that it did not seem justified to refer to them as distinct components of the sense of coherence. As an alternative hypothesis, this result gave rise to the proposal of a two-dimension structure, but neither Antonovsky's theoretical claims, nor the extensive literature on the topic supported this solution, with the exception of Barni and Tagliabue (2005), although they referred to a 11-item version. Namely, the meaning of the comprehensibility and manageability combination is not theoretically clear, nor is the way in which it differs from the meaningfulness dimension. For all these reasons, we considered the one-factor model as the most suitable structure of the SOCS-13.

To sum up, the overall results seemed to support the claim, recently made by Olsson and colleagues (2009), that the SOCS-13 and the SOCS-29 — which are usually assumed to measure the SOC construct in the same way — are instead not so interchangeable. Starting from this concern, we suggested that the long and the short form of the scale might be used for different purposes. The long version might be especially useful when we are interested in specifying the three SOC dimensions both in research and in clinical practice. In contrast, the short version might be the better choice when (e.g., for survey purposes) a global measure of the sense of coherence is needed. To reinforce this conclusion, a second study was run in order to overcome one potential methodological flaw of the present study with regard to the short form.

## STUDY 2

This study was conducted to replicate the findings of Study 1 relative to the SOCS-13, the short form considered as derived from the long one. This procedure might lead to a methodological error because there might be systematic effects on the responses due to the influence of neighboring items, that is, items that were excluded to obtain the short form. These effects can be avoided by administering the brief scale by itself.

In this study, we aimed to support previous conclusions about the dimensionality of the SOCS-13, testing both the one-factor and the three-correlated factor models (we excluded the higher-order model given its very poor fit). In addition, we provided further evidence about the factor structure of the scale, over the model fit statistics derived from CFAs, referring to validity measures such as psychological well-being, sense of mastery, optimism and pessimism (for a review, see Eriksson & Lindström, 2005). Indeed, we argued that a multidimensional structure would be supported by partially different patterns of correlations (i.e., different strengths or directions) for the three factors. On the other hand, patterns of correlations which show the same di-

rections and similar strengths for the three factors might be considered evidence in support of the more parsimonious unidimensional model.

## Methods

### *Participants*

The sample consisted of 372 Italian university students (53% males) with a mean age of 22.15 years ( $SD = 5.4$ ). Consistent with Study 1, students were randomly selected from various courses at the Departments of Psychology, Medicine, Nursing, and Engineering of the University of Florence.

### *Measures and Procedure*

Along with the SOCS-13 scale, the Psychological Well-Being scales (PWB; Ryff, 1989; Italian version, Ruini, Ottolini, Rafanelli, Ryff, & Fava, 2003), the Pearlin-Schooler Mastery Scale (PMS; Pearly & Schooler, 1978), and the Revised Life Orientation Test (LOT-R; Sheier, Carver, & Bridges, 1994) were administered.

The PWB measures psychological well-being. Good indices of internal consistency were obtained for the Italian version (Ruini et al., 2003). It contains 84 Likert-type items using a 6-point scale which ranges from *strongly disagree* to *strongly agree*. This tool assesses six dimensions: self-acceptance (14 items;  $\alpha = .90$ ) measures attitude toward oneself and one's past life; autonomy (14 items;  $\alpha = .84$ ) measures sense of self-determination, independence, and freedom from norms; environmental mastery (14 items;  $\alpha = .86$ ) measures the ability to manage life and one's surroundings; personal growth (14 items;  $\alpha = .87$ ) measures being open to new experiences as well as having continued personal growth; purpose in life (14 items;  $\alpha = .86$ ) measures having life goals and a belief that one's life is meaningful; positive relations (14 items;  $\alpha = .86$ ) measures the quality of relationships with others.

The PMS measures sense of mastery. It contains seven Likert-type items using a 5-point scale ranging from *strongly disagree* to *strongly agree*. In the present study, the internal consistency of this scale was .82.

The LOT-R measures optimism and pessimism. It contains 10 Likert-type items using a 5-point scale that ranges from *strongly agree* to *strongly disagree*. Both the optimism scale and the pessimism scale contain three items and there are four filler items. In this study,  $\alpha$  was .72 for the optimism scale and .70 for the pessimism scale.

Participants received an information sheet on the study and were then asked to give written informed consent. They were also informed that participation was both voluntary and anonymous. Each questionnaire was briefly introduced, and instructions for completion were given.

## Results

A missing value analysis of data revealed 11 cases with three or more missing data. Because they represented less than 10% of the total cases in the sample, a listwise deletion was con-

ducted excluding those cases (Kline, 1998). When the missing values were less than three, missing data imputation was performed using the item mean.

Item distributions and descriptives were examined for assessment of normality (Table 3). Because some items (item 4, item 9, item 12) deviated from normality, as in Study 1, Confirmatory Factor Analysis (CFA) using the Mean-Adjusted Maximum Likelihood (MLM) estimator implemented in Mplus software (Muthén & Muthén, 2004) was employed.

TABLE 3  
Descriptives for each item of the SOCS-13 (Study 2)

SOCS-13			
	<i>M(SD)</i>	Skewness	Kurtosis
Item 1 (4)	5.15 (1.63)	-.63	-.59
Item 2 (5)	3.17 (1.58)	.56	-.41
Item 3 (6)	3.85 (1.44)	-.07	-.75
Item 4 (8)	5.39 (1.27)	-.90	.96
Item 5 (9)	4.92 (1.54)	-.44	-.62
Item 6 (12)	5.02 (1.64)	-.56	-.63
Item 7 (16)	4.83 (1.36)	-.49	.09
Item 8 (19)	4.63 (1.67)	-.33	-.74
Item 9 (21)	4.13 (1.73)	-.05	-1.00
Item 10 (25)	3.91(1.55)	.02	-.98
Item 11 (26)	4.29 (1.51)	-.28	-.33
Item 12 (28)	5.13 (1.64)	-.76	-.18
Item 13 (29)	4.74 (1.67)	-.46	-.78

*Note.* SOCS-13 = Sense of Coherence scale – 13 items. Between brackets, close to each item, the respective number in the original 29-scale is reported (see the Appendix).

Results showed a poor overall fit for both the one-factor model ( $M_1$ ) and the three-correlated factor model ( $M_2$ ). We, thus, modified  $M_1$  and  $M_2$  by taking the modification indexes generated for these models into account. In line with Study 1,  $M_1$  and  $M_2$  were modified ( $M_{1\text{modified}}$  and  $M_{2\text{modified}}$ ) adding one error covariance between item 5 and item 6. Table 4 summarizes the goodness-of-fit results for the comparative models.

We compared  $M_1$  and  $M_2$  with the respective modified version; results showed both an increase in CFI and a decrease in RMSEA. Fit indices evidenced an acceptable fit for both  $M_{1\text{modified}}$  and  $M_{2\text{modified}}$ . With reference to the standardized estimates, factor loadings of  $M_{1\text{modified}}$  were all significant ( $p < .001$ ), with values ranging from .25 to .67. With regard to  $M_{2\text{modified}}$ , factor loadings, ranging from .29 to .79, were all significant ( $p < .001$ ), as well as correlations among factors whose values were: .76 between comprehensibility and meaningfulness, .78 between manageability and meaningfulness, .99 between comprehensibility and manageability. For the reasons given in Study 1,  $M_{1\text{modified}}$  appeared to be the best model. Internal consistency for the total scale was .80.

TABLE 4  
Goodness-of-fit statistics for comparative models of the SOCS-13

SOCS-13	$SB\chi^2(df)$	$SB\chi^2/df$	*CFI	*TLI	*RMSEA	Model comparison	$SB\Delta\chi^2$	$\Delta df$	$p$
M <sub>1</sub> : one-factor model	351.64 (65)	5.41	.72	.66	.11				
M <sub>2</sub> : three-correlated factor model	276.75 (62)	4.46	.79	.73	.10				
M <sub>1modified</sub> <sup>a</sup>	162.83 (64)	2.54	.90	.88	.06	M <sub>1modified</sub> – M <sub>1</sub>	170.89	1	.001
M <sub>2modified</sub> <sup>a</sup>	116.14 (61)	1.90	.93	.91	.05	M <sub>2modified</sub> – M <sub>2</sub>	91.69	1	.001

*Note.* SOCS-13 = Sense of Coherence scale – 13 items.  $SB\chi^2$  = Satorra-Bentler scaled  $\chi^2$ ;  $df$  = degrees of freedom; \*CFI = robust comparative fit index; \*TLI = robust Tucker-Lewis Index; \*RMSEA = robust root mean square error of approximation;  $SB\Delta\chi^2$  = Satorra-Bentler scaled difference  $\chi^2$ ;  $\Delta df$  = Difference in degrees of freedom between nested models;  $p$  = probability value of  $SB\Delta\chi^2$  test.

<sup>a</sup>The one-factor model and the three-factor model were modified with the inclusion of the covariance between items 5 and 6.

Finally, measures used to test validity supported our choice, because correlations among the PWB score, the PMS score, and optimism and pessimism subscales of the LOT-R showed the same directions and similar strengths when taking into account the subscales and total score of the SOCS-13 (Table 5).

TABLE 5  
Correlations between the total score and each dimension of the SOCS-13 with the Psychological Well-Being scale (PWB) score, the Pearlin-Schooler Mastery Scale (PMS) score, and the optimism and pessimism scores of the Revised Life Orientation Test (LOT-R) (Study 2)

	SOCS-13			
	Comprehensibility	Manageability	Meaningfulness	Total
PWB	.37	.40	.42	.49
PSM	.60	.60	.53	.71
LOT-R optimism	-.42	-.42	-.36	-.48
LOT-R pessimism	.27	.37	.26	.36

*Note.* SOCS-13 = Sense of Coherence scale – 13 items. All correlations were significant at .001.

## Discussion

This study, replicating findings of Study 1, further supported the claim that the SOCS-13 can be adequately represented by a one-factor model. Moreover, validity measures, included in order to obtain additional evidence about the factorial structure of the scale, strengthened this claim. Indeed, the same pattern of correlations was observed when relating psychological well-being, sense of mastery, and optimism/pessimism to the sense of coherence measured as a single dimension (total score), or taking into account its three dimensions (comprehensibility, meaningfulness, and manageability scores).

## CONCLUSION

In a scenario characterized by many different scales assessing sense of coherence, the original Antonovsky's scales (SOCS-29 and SOCS-13) should be considered as a landmark of his construct and original conceptualization. Unfortunately, despite a wide application of the SOCS-29 and the SOCS-13 in research and in clinical practice, their factor structure is still not completely clear.

The present work hypothesized that contrasting results about the factor structure of Antonovsky's Sense of Coherence scales might have arisen from considering the 29-item scale and the shorter 13-item version as interchangeable. The disagreement might be the consequence of the different factor structure between the long form and the short form due to item reduction and, consequently, to the content coverage reduction of the target domain. This claim is supported by results of both Study 1 and Study 2. Indeed, the three-correlated factor model seems to better describe the structure of the 29-item scale, whereas the one-factor model better represents the short 13-item version. That is, according to the theoretical definition of the construct, we might state

that the SOCS-29 helps to spell out the three components (comprehensibility, manageability, and meaningfulness), whereas the SOCS-13 provides a global measure of sense of coherence as general orientation to life. In other words, consistent with the methodological claim that the psychometric properties of the full-length measure do not apply automatically to the abbreviated form (Smith et al., 2000), the SOCS-29 version has a factor structure different from the SOCS-13 one. Recently, Olsson and colleagues (2009) have shown that different SOC scales which claim to measure the same SOC construct are not always interchangeable and, therefore, researchers should make sure they are using the same scales. The present paper aimed to provide evidence for their claim.

Nonetheless, further studies are needed in order to strengthen the present findings. First of all, future research should give support to the three-factor structure of the long version of the SOCS. Indeed, the not completely adequate fit of this model represents a limitation to the present conclusions. In particular, it may be useful to test the current hypothesis about the different factorial structure of the two versions of SOCS with clinical samples and through a cross-country comparison, given that the present investigation was conducted with Italian samples.

In conclusion, our findings suggest that the SOCS-29 and the SOCS-13 evaluate the same construct, but the shorter version might provide a reliable and valid measure of the global sense of coherence, whereas the 29-item version might provide measures of the three interrelated components that define the individual global orientation to life.

#### ACKNOWLEDGMENT

We wish to thank professors Giovanni Rauei, Emanuele Galvanetto, Patrizia Meringolo, Moira Chiodini, Sandra Carpi Lapi, Stefano Lera, Laura D'Addio, and Luca Pietrini, of the University of Florence for devoting some of their teaching time with their students, as well as all the students who participated in the study. We would also like to thank Federica Spinelli Bini, Beatrice Pagliai, and Gianluca Puccinelli of *Personae* for valuable aid in data managing, and Susan Seeley for her linguistic assistance.

#### NOTES

1. Numbers refer to the 29-item version.
2. The Satorra-Bentler scaled chi-square difference test (TRd) is computed as follows:  $TRd = (T_0 * c_0 - T_1 * c_1) / cd$ , where  $T_0$  and  $T_1$  are the chi-square values for the nested and comparison model, respectively. The difference test scaling correction ( $cd$ ) is computed as follows:  $cd = (d_0 * c_0 - d_1 * c_1) / (d_0 - d_1)$ , where  $d_0$  corresponds to the degrees of freedom in the nested model,  $c_0$  is the scaling correction factor for the nested model,  $d_1$  corresponds to the degrees of freedom in the comparison model, and  $c_1$  is the scaling correction factor for the comparison model. Be sure to use the correction factor given in the output for the  $H_0$  model.

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APPENDIX  
SOCS-29 — Orientation to Life Questionnaire — Italian version

Di seguito troverà una serie di domande relative a vari aspetti della nostra vita. Ogni domanda ha sette possibili risposte disposte su una scala numerata da 1 a 7. Dopo avere letto le alternative poste agli estremi della scala esprima la sua posizione facendo una crocetta su un valore, da 1 a 7, che meglio rappresenta ciò che pensa e prova. Per favore, fornisca una sola risposta ad ogni domanda [Below you will find some questions on several aspects of life. Each question has seven possible answers on a scale from 1 to 7. After reading the alternatives/options at the ends of the scale, indicate your preference/choice/response by circling one number, from 1 to 7, that better represents what you think and feel. Please, provide only one answer per question.]

Reverse items: 1, 4, 5, 6, 7, 11, 13, 14, 16, 20, 23, 25, 27  
Comprehensibility items: 1, 3, 5, 10, 12, 15, 17, 19, 21, 24, 26  
Manageability items: 2, 6, 9, 13, 18, 20, 23, 25, 27, 29  
Meaning items: 4, 7, 8, 11, 14, 16, 22, 28  
SOC-13 Items: 4, 5, 6, 8, 9, 12, 16, 19, 21, 25, 26, 28, 29

1. Quando parla con le persone, ha la sensazione che non la comprendano? [When you talk to people, do you have the feeling that they don't understand you?]

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<i>mai</i>					<i>sempre ho questa sensazione</i>	
[never]					[always have this feeling]	

2. In passato quando ha avuto da fare qualcosa che dipendeva dalla cooperazione con altri, ha avuto la sensazione che: [In the past, when you had to do something which depended upon cooperation with others, did you have the feeling that it:]

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<i>sicuramente non sarebbe stata fatta</i>					<i>sicuramente sarebbe stata fatta</i>	
[surely wouldn't get done]					[surely would get done]	

3. Pensi alle persone con le quali viene in contatto quotidianamente, al di fuori di coloro cui si sente maggiormente vicino/a. Quanto bene conosce la maggior parte di loro? [Think of the people with whom you come into contact daily, aside from the ones to whom you feel closest. How well do you know most of them?]

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<i>sente che sono estranei</i>					<i>li conosce molto bene</i>	
[you feel that they're strangers]					[you know them very well]	

4. Ha la sensazione che non le importi veramente di cosa accade intorno a lei? [Do you have the feeling that you don't really care about what goes on around you?]

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<i>molto raramente o mai</i>					<i>molto spesso</i>	
[very seldom or never]					[very often]	

5. È successo in passato che lei fosse sorpreso/a dal comportamento di persone che pensava di conoscere bene? [Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?]

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<i>mai successo</i>					<i>sempre successo</i>	
[never happened]					[always happened]	

(appendix continues)

Appendix (continued)

6. È successo che le persone su cui contava l'abbiano delusa? [Has it happened that people whom you counted on disappointed you?]

1	2	3	4	5	6	7
<i>mai successo</i>						<i>sempre successo</i>
[never happened]						[always happened]

7. La vita è: [Life is:]

1	2	3	4	5	6	7
<i>piena di interesse</i>						<i>completamente routine</i>
[full of interest]						[completely routine]

8. Fino ad ora la sua vita ha avuto: [Until now your life has had:]

1	2	3	4	5	6	7
<i>assolutamente nessun chiaro obiettivo o scopo</i>						<i>obiettivi e scopi molto chiari</i>
[no clear goals or purpose at all]						[very clear goals and purpose]

9. Ha la sensazione di essere trattato/a ingiustamente? [Do you have the feeling that you're being treated unfairly?]

1	2	3	4	5	6	7
<i>molto spesso</i>						<i>molto di rado o mai</i>
[very often]						[very seldom or never]

10. Negli ultimi dieci anni la sua vita è stata: [In the past ten years your life has been:]

1	2	3	4	5	6	7
<i>piena di cambiamenti senza che lei sapesse cosa sarebbe accaduto in seguito</i>						<i>completamente coerente e chiara</i>
[full of changes without your knowing what would happen next]						[completely consistent and clear]

11. La maggior parte delle cose che farà in futuro saranno probabilmente: [Most of the things you do in the future will probably be:]

1	2	3	4	5	6	7
<i>assolutamente affascinanti</i>						<i>mortalmente noiose</i>
[completely fascinating]						[deadly boring]

12. Ha la sensazione di essere in una situazione non familiare e di non sapere cosa fare? [Do you have the feeling that you are in an unfamiliar situation and don't know what to do?]

1	2	3	4	5	6	7
<i>molto spesso</i>						<i>molto di rado o mai</i>
[very often]						[very seldom or never]

13. Cosa meglio descrive come vede la vita? [What best describes how you see life?]

1	2	3	4	5	6	7
<i>si possono sempre trovare soluzioni alle cose dolorose nella vita</i>						<i>non c'è soluzione alle cose dolorose della vita</i>
[one can always find a solution to painful things in life]						[there is no solution to painful things in life]

(appendix continues)

Appendix (continued)

14. Quando pensa alle cose della sua vita, molto spesso: [When you think about your life, you very often:]

1	2	3	4	5	6	7
<i>sente quanto è bello essere vivi</i> [feel how good it is to be alive]			<i>domanda a se stesso/a</i> <i>perché mai esistere</i> [ask yourself why you exist at all]			

15. Quando fronteggia un difficile problema, la scelta della soluzione è: [When you face a difficult problem, the choice of a solution is:]

1	2	3	4	5	6	7
<i>sempre confusa e difficile da trovare</i> [always confusing and hard to find]			<i>sempre completamente chiara</i> [always completely clear]			

16. Fare le cose di tutti i giorni è: [Doing the things you do every day is:]

1	2	3	4	5	6	7
<i>una fonte di forte piacere e soddisfazione</i> [a source of deep pleasure and satisfaction]			<i>una fonte di dolore e noia</i> [a source of pain and boredom]			

17. La sua vita nel futuro sarà probabilmente: [Your life in the future will probably be:]

1	2	3	4	5	6	7
<i>piena di cambiamenti senza</i> <i>che lei sappia cosa accadrà in seguito</i> [full of changes without knowing what will happen next]			<i>completamente</i> <i>coerente e chiara</i> [completely consistent and clear]			

18. Quando qualcosa di spiacevole è successo in passato la sua tendenza era: [When something unpleasant happened in the past your tendency was:]

1	2	3	4	5	6	7
<i>“rodarsi” su questo</i> [“to eat yourself up” about it]			<i>dire: “va bene, c’è quella cosa, devo</i> <i>convivere con questa cosa” e andare avanti</i> [to say “ok that’s that, I have to live with it” and go on]			

19. Ha idee e sensazioni molto confuse? [Do you have very mixed-up feelings and ideas?]

1	2	3	4	5	6	7
<i>molto spesso</i> [very often]			<i>molto di rado o mai</i> [very seldom or never]			

20. Quando fa qualcosa che le dà una buona sensazione: [When you do something that gives you a good feeling:]

1	2	3	4	5	6	7
<i>è certo che continuerà a sentirsi bene</i> [it’s certain that you’ll go on feeling good]			<i>è certo che succederà qualcosa</i> <i>che rovinerà la sensazione</i> [it’s certain that something will happen to spoil the feeling]			

21. Le capita di provare sentimenti che preferirebbe non provare? [Does it happen that you have feelings [inside] you would rather not feel]

1	2	3	4	5	6	7
<i>molto spesso</i> [very often]			<i>molto di rado o mai</i> [very seldom or never]			

(appendix continues)

Appendix (continued)

22. Prevede che la sua vita personale nel futuro sarà: [You anticipate that your personal life in the future will be:]

1	2	3	4	5	6	7
<i>totalmente senza significato o scopo</i> [totally without meaning or purpose]			<i>piena di significato e scopo</i> [full of meaning and purpose]			

23. Pensa che ci saranno sempre persone sulle quali può contare nel futuro? [Do you think that there will always be people whom you'll be able to count on in the future?]

1	2	3	4	5	6	7
<i>è certo che ci saranno</i> [you're certain there will be]			<i>dubita che ci saranno</i> [you doubt there will be]			

24. Succede che lei abbia la sensazione di non sapere esattamente cosa sta per accadere? [Does it happen that you have the feeling that you don't know exactly what's about to happen?]

1	2	3	4	5	6	7
<i>molto spesso</i> [very often]			<i>molto di rado o mai</i> [very seldom or never]			

25. Molte persone — anche quelle con un carattere forte — qualche volta si sentono come perdenti in certe situazioni. Quante volte si è sentito così nel passato? [Many people — even those with a strong character — sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?]

1	2	3	4	5	6	7
<i>mai</i> [never]			<i>molto spesso</i> [very often]			

26. Quando è successo qualcosa, ha trovato generalmente che: [When something happened, have you generally found that:]

1	2	3	4	5	6	7
<i>aveva sovrastimato o sottostimato la sua importanza</i> [you overestimated or underestimated its importance]			<i>aveva visto le cose nella giusta proporzione</i> [you saw things in the right proportion]			

27. Quando pensa alle difficoltà che probabilmente fronteggerà in importanti aspetti della sua vita, ha la sensazione che: [When you think of the difficulties you are likely to face in important aspects of your life, do you have the feeling that:]

1	2	3	4	5	6	7
<i>avrà sempre successo nel superare le difficoltà</i> [you will always succeed in overcoming the difficulties]			<i>non avrà successo nel superare le difficoltà</i> [you won't succeed in overcoming the difficulties]			

28. Quanto spesso ha la sensazione che c'è poco significato nelle cose che fa nella sua vita quotidiana? [How often do you have the feeling that there's little meaning in the things you do in your daily life?]

1	2	3	4	5	6	7
<i>molto spesso</i> [very often]			<i>molto di rado o mai</i> [very seldom or never]			

29. Quanto spesso prova sentimenti che non è sicuro/a di poter tenere sotto controllo? [How often do you have feelings that you're not sure you can keep under control?]

1	2	3	4	5	6	7
<i>molto spesso</i> [very often]			<i>molto di rado o mai</i> [very seldom or never]			