

Relationship between Sense of Coherence and oral health in adults and elderly Brazilians

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Abstract: The purpose of this study was to investigate the relationship between Sense of Coherence (SOC) and oral health clinical variables (number of teeth present and absence of need for dental prostheses). The sample consisted of 720 adults and elderly Brazilians. The data were collected at home using the SOC-13 scale – a form of clinical examination for the evaluation of oral conditions – and a questionnaire evaluating socioeconomic aspects and the use of dental services. Statistical analysis, both univariate and multivariate, was performed by Poisson regression with robust variance adjustment. The average age of the participants was 60.2 years, and they were predominantly female (57.8%). Among the participants who had a strong SOC, the absence of the need for dental prostheses was 34% higher than among those with a weak SOC, demonstrating a significant difference between the groups (PR = 1.34, 95%CI = 1.06–1.70; p = 0.015). Individuals who had a strong SOC had a 5% higher prevalence of 14 or more existing teeth than those with a weak SOC, which was statistically significant after adjustment for co-factors (PR = 1.05, 95%CI = 1.01–1.11, p = 0.033). A strong personal Sense of Coherence has a beneficial influence on the oral health of adults and older people in Brazil.

Keywords: Sense of Coherence; Oral Health; Health Behavior; Health Promotion; Dental Prosthesis.

Introduction

Sense of Coherence (SOC) is a resource for coping with stressors; it is related to quality of life, and can be considered a predictor of health.^{1,2} The salutogenic theory proposed by Antonovsky³ – of which SOC is the core construct – argues that understanding the origin of health is more important than identifying the causes of disease. According to Antonovsky,³ SOC is “a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli from one’s internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement”.³

The SOC has been shown to be a promising resource for establishing healthy behaviors^{4,5,6,7,8,9,10,11,12,13,14,15,16} and a positive self-perception of oral health,^{14,16} which increases the interest in investigating its relationship



with clinical oral health. Coping strategies may have a protective effect against negative oral health outcomes, operating through behavioral pathways.¹⁷ The SOC is considered a determinant psychosocial factor of behaviors related to oral health in adolescents,⁵ which may be reflected in improved oral health in adulthood.¹² However, the relationship of SOC with physical health is more difficult to demonstrate.¹⁸ Since there is consistent evidence on the relationship between SOC and oral health behavior, the effect of the SOC on clinical oral health conditions may be mediated by these behaviors.

The literature shows that SOC can change throughout life.¹⁹ Thus, understanding the behavior of SOC in the older age groups, in an effort to look for ways to stimulate it, becomes a relevant strategy to improve the quality of life of adults and the elderly. Recently, Bernabé et al.²⁰ conducted one of the first studies that investigated the relationship of the SOC with clinical oral conditions, and found a strong association between the SOC and better oral conditions, indicating the relevance of directing inquiries accordingly.

In Brazil, this is the first study to investigate this relationship in adults and the elderly. For developing countries, the World Health Organization (WHO) defined elderly people as those aged above 60 years. The age group 50–59 years was included in the study because of its increase in the Brazilian population.^{1,21,22} There is a lack of studies investigating the oral health of older adults (50–59). Considering the aging process currently faced by the Brazilian population, the inclusion of this group is paramount to developing policies favoring its oral health and well-being.

The aim of this study was to investigate the relationship between the SOC and clinical oral health in adults and elderly Brazilians aged 50 to 74 years, testing the hypothesis that a strong SOC is associated with better clinical conditions of oral health (number of teeth present and need for dental prostheses).

Methodology

A cross-sectional population-based study was conducted in Porto Alegre, the main city of the state of Rio Grande do Sul, Brazil.

Sample

The sample size was calculated considering an outcome prevalence of 0.50, a confidence interval of 95% and bilateral error margin of 4%. Taking into account a design effect equal to 1.5 and possible non-answers and losses (10%), the sample consisted of 793 participants. Data analysis was conducted on 720 individuals.

The subjects of the study were selected through multistage, proportional, random sampling.²³ Porto Alegre is composed of 16 geographic areas called health districts. Health districts have similar social and epidemiological characteristics. A health district is formed by taking into account social and epidemiological characteristics. The following selections were all made randomly: first, three health districts, then, the census sectors from each district, the city block for data collection, and, finally, the corner from which the visits would start.

The number of subjects interviewed in the health districts was proportional to the total number of people living in each district. Home visits were conducted, and only one individual from each household was interviewed. If there was more than one eligible individual, a randomized selection was performed. Individuals not living in the area, whose age range was different from 50 to 74 years, and having apparent dementias or mental disorder were excluded.

Instruments and measures

The data was collected in people's homes by four pairs of previously trained and calibrated examiners and recorders, through interviews and clinical examinations. The instruments consisted of: (I) a structured questionnaire on socioeconomic, demographic data, use of dental services adapted from the SB Brazil 2003,²⁴ the National Oral Health Survey conducted in the year 2003, including the age groups adopted by WHO; (II) the reduced version of the SOC or SOC-13 scale;²⁵ (III) clinical examination performed under artificial light, using flat mirrors and CPI probes, according to WHO criteria complemented by SB Brazil 2003.²⁴

The SOC scale is a standard scale developed by Antonovsky³ and originally written in Hebrew and in English to be used cross-culturally. The original version of the scale has 29 items, whereas the short version has 13, and is known as the SOC-13

version. The SOC Scale has been translated and used in more than thirty languages in countries around the world, and has been applied in all social classes among adolescents and adults of all ages.¹ The short version has been validated and trans-culturally adapted for use among mothers of Brazilian children between 1 and 5 years,²⁶ but has not yet been used in the Brazilian population, with characteristics similar to those of the present study.

The SOC-13 comprises 13 questions and three domains, with answers presented in a 7-point Likert scale. Questions 2, 6, 8, 9 and 11 of the instrument refer to understanding (domain comprehensibility); questions 3, 5, 10 and 13, to management (domain manageability), and questions 1, 4, 7 and 12, to meaning (domain meaningfulness); however, it was recommended³ that the total SOC score should be used in the analysis, and was thus adopted in this study.

The SOC score is calculated by adding up the points for all items, and can range from 13 to 91. The SOC is stronger, the higher the score. After calculating their score, participants with missing values on more than three items were treated as “missing”. When there were three or fewer missing values, these were replaced by the mean value of the SOC items, as described by Suominen et al.²⁷

Four of the thirteen questions were negatively formulated by inverse scoring, *i.e.*, the scores were reversed in the analysis so that a high score represented a strong SOC. The instrument also contained two questions regarding face-to-face validation, based on Streiner and Norman.²⁸ in order to adapt the instrument cross-culturally for use in this population. The validation result showed that most found it easy to understand the questions (86.9%) and the responses (85.4%), and no significant differences were found in relation to age (p 0.165 and 0.682, respectively), according to the chi-square test.

A pilot study was conducted on a convenience sample of 40 participants with characteristics similar to those of the participants eligible for the study, to test the questionnaire application and to train the examiners. During this study, the reliability/reproducibility of the structured interviews and the clinical examinations were validated, with replication in 5% of the sample, and were reassessed one week after the first

evaluation. The level of intra- and interexaminer agreement on all the oral indices was evaluated by Kappa, yielding > 0.81 and 0.76 , respectively, at the beginning of the research. During the study, these coefficients were > 0.98 and 0.88 for intra- and interexaminer reproducibility, respectively, showing almost perfect agreement.

The SOC reliability was tested by internal consistency and stability of the measure (test-retest). The internal consistency of the overall score, calculated by Cronbach’s Alpha, was 0.80 , indicating good consistency, similar to that observed by Naaldenberg et al.²⁹ The intraclass correlation coefficient (ICC) was used to perform the test-retest, and had a result of 0.79 . The split-half reliability of the aforementioned Dutch study ranged from 0.68 to 0.86 .

The SOC score was dichotomized into “weak” for values lower than the median and “strong” for values equal to or greater than the median. The median was used in other studies⁹ as a cut-off point, when the purpose was to categorize the scores of SOC into two categories, weak or strong. In sociodemographic variables, age was collected in years and further categorized as adults (50–59 years) and elderly people (60–74 years).

Family income was collected as a continuous variable, and took into account the gross family income in reais (Brazilian currency), categorized based on the prevailing Brazilian minimum monthly wage of four hundred and fifteen (R\$415.00) reais (≤ 2 minimum wages; between 2 and 5 minimum wages; > 5 minimum wages). The definition of schooling considered the number of years of schooling completed in formal education, not counting the repeated grades/years, and also the specialty courses/graduate education, dichotomized by the frequency distribution (< 6 years; ≥ 6 years).²³

Oral health variables were: (I) behavioral variables that included dental attendance within the previous year (no; yes), and the reason for dental attendance (curative; preventive), both informed by the participant; (II) clinical variables that included dental caries, based on the DMFT: at least one decayed tooth (yes; no); number of teeth present (≤ 13 teeth; ≥ 14 teeth), using the median as the cut-off point, because standard deviation of number of teeth was high (SD 6.8) and only natural teeth were considered – teeth indicated

for extraction were not included; and the absence of need for dental prostheses, (“yes”, when there was no need, included individuals that had all their teeth and/or showed some type of prosthesis in good conditions, not needing replacement; “no”, when the individuals needed some type (or replacement) of fixed/removable prosthesis, or a combination of both, in the upper or lower jaw).

Statistical analysis

Statistical analyses were performed using Poisson regression with robust variance adjustment, using Stata 9.0 software (Stata, College Station, USA). The analysis took into account the cluster sample and the sampling stages of this study. Representativeness was ensured by adjusting the sample using the *svyset-weight* function in Stata 9.0, by assigning different weights to each group studied.²³

Initially, bivariate analysis (crude Poisson regression) was performed between the SOC and the oral health variables (dental attendance within the previous year, reason for dental attendance, dental caries, number of teeth present and need for dental prostheses). Those that showed statistically significant associations with the SOC (number of teeth present and need for dental prostheses) were considered dependent variables of this study, and the others were treated as potential confounders. The level of statistical significance in all analyses was 5% ($p < 0.05$).

Bivariate analysis was then performed between the independent variables and the outcomes. A significance level of ≤ 0.25 was established as the cut-off point for the selection of variables that would be included in the multivariate model, to avoid the exclusion of variables that could act as confounders. Bivariate analysis was performed between the sociodemographic variables and the outcomes. These variables were included in the final model, regardless of their significance level.

Three multivariate Poisson regression models were adjusted, one for each outcome, using the backward method. Analyses were performed to define the final model and identify possible confounding variables. At each stage, those that did not have at least one category with $p < 0.05$ were removed, starting with

the highest p-value. Thus, variables with $p > 0.05$ that did not cause changes in the risk estimates of other variables were excluded from the final model, with the exception of sociodemographic variables, which were maintained, regardless of the observed result.

This study is part of a research project called “Assessment of Dental Impact on the Daily Performance of Individuals from 50 to 74 years in Porto Alegre/RS,” approved by the Research Ethics Committee of the School of Dentistry of the *Universidade Federal do Rio Grande do Sul* – UFRGS (Protocol no. 46/05).

Results

Descriptive analysis

The study had a response rate of 91%, totaling 720 individuals investigated. The average age of the participants was 60.2 years (SD 7.5), and they were predominantly female (57.8%). Two-thirds of the sample showed no dental caries. Less than half had dental attendance within the previous year (45.2%), and the prevalence of dental attendance for preventive reasons was 31.8%. It was found that 48.5% of the sample had 14 or more natural teeth, 21% were edentulous, 28.5% had no need for dental prostheses, and only 4% had all their teeth.

The SOC score ranged from 23 to 91, with a mean of 68 (SD = 12.2) and median of 69. More than half of the sample (53.5%) showed a strong SOC. With respect to the sociodemographic distribution, high SOC scores were more frequent among women (63.4%) aged 60 years or older (60.2%), with over 6 years of schooling (50.4%) and a family income between 2 and 5 minimum wages (40.8%).

Bivariate and multivariate analysis

Table 1 presents the results of the bivariate analysis investigating the relationship between the SOC and both behavioral and clinical variables that could be used as outcomes (dental attendance within the previous year, reason for dental attendance, dental caries, number of teeth present and need for dental prostheses), considering that the variables selected were those that were significantly associated: number of teeth present (CI 1.01–1.11; $p = 0.031$) and lack of need for dental prostheses (IC 1.03–1.66; $p = 0.028$).

Table 1. Crude Poisson regression between the oral health variables and Sense of Coherence (n=720).

Outcome Variables	Sense of Coherence	
	PR crude (CI95%)	p-value
Dental Attendance within the previous year*		
No	1.00	-
Yes	0.98 (0.78–1.08)	0.326
Reason for Dental Attendance*		
Curative	1.00	-
Preventive	0.93 (0.75–1.15)	0.509
Number of Teeth Present		
≤ 13 teeth	1.00	-
≥ 14 teeth	1.05 (1.01–1.11)	0.031
Absence of Need for Dental Prosthesis		
No	1.00	-
Yes	1.30 (1.03–1.66)	0.028
Dental Caries		
Yes	1.00	-
No	0.94 (0.85–1.04)	0.290

PR: Prevalence Ratio; CI: Confidence Interval.

* Excluding those who never underwent dental attendance (n = 717).

Table 2 shows the results of the bivariate and multivariate analysis related to the absence of need for prostheses. After adjustment, the lack of need for dental prostheses was 34% higher among participants who had a strong SOC than among those with a weak SOC ($p = 0.015$). The dental attendance within the previous year, the reason for the dental attendance and the dental caries were included in the multivariate analysis, but were removed from the final model because they were not associated with the outcome and did not alter the risk estimates of the other explanatory variables.

The results of the crude and adjusted analyses between the independent variables and the number of teeth present are reported in Table 3. It was observed that individuals who presented a strong SOC had a 5% higher prevalence of 14 or more existing teeth than those with a weak SOC ($p = 0.033$), after adjustment for co-factors. This outcome was also associated with sex and age, in that men had 7% greater prevalence of 14 or more teeth present than women ($p = 0.006$), and the younger participants had a 5% greater prevalence than the older participants

($p = 0.046$), but these variables did not influence the relationship between the SOC and the outcome. The dental attendance variables within the previous year, reason for dental attendance, dental caries and the need for dental prostheses were not associated with the number of teeth present and did not alter the risk estimates of the other variables.

Discussion

It can be observed from the literature that this is one of the few studies investigating the relation between the SOC and clinical indicators, and studying a sample of adults and the elderly. In Brazil, studies using the SOC scale have focused on schoolchildren and teenagers, whereas this is the first population-based study to explore a different age group.

The majority of studies investigating the relationship between the SOC and oral health in adults were conducted in Finland, using a modified version of the SOC, containing 12 items.^{12,14,15,18,20} Therefore, this study provides information from a group with different characteristics, thus allowing comparisons with the SOC of a population presenting other cultural and behavioral values.

The association found between the SOC and clinical outcomes shows that individuals with a higher SOC have less need for dental prostheses and a higher number of teeth present. These are relevant results because they demonstrate the relationship between the SOC and the measured oral health conditions, in terms of clinical indicators.

Various studies have demonstrated the relationship of the SOC with habits, behavior and oral health conditions, as self-reported.^{8,10,12,13,14,30} However, the investigation of the relationship of the SOC with clinical health conditions is still scant in the literature. Freire et al.⁵ found an association between SOC and cavities in the posterior teeth of adolescents, a result that was not confirmed by multivariate analysis.⁵ When evaluating the relationship between the SOC and clinical oral health outcomes in adults, Bernabé et al.²⁰ found that a higher SOC was associated with fewer cavities and fewer missing teeth, after adjusting for social, demographic and behavioral variables.

The results of this study indicate that a higher SOC can contribute to a better oral health condition of adults and the elderly, observing also that the social and demographic factors had no influence on this result, thus confirming what was found in the study by Bernabé et al.²⁰ The lack of influence of socioeconomic status on the relationship between SOC and oral health behaviors in adults has been observed in previous studies.^{10,11} The finding of this association, in relation to the clinical conditions (number of teeth present and need for dental prostheses), suggests that reinforcing the SOC could result in favorable oral health outcomes, even if there were no changes in socioeconomic status.

For example, individuals with a higher SOC may be more motivated and empowered to seek care in public services, or to find alternatives to access dental care in institutions that offer services free of charge or at lower cost, such as unions and associations.

One of the pathways that the Salutogenic theory proposes is that individuals who have a higher SOC choose health-promoting behaviors for themselves with greater frequency.³¹ In this study, oral health behaviors related to the use of oral health services were not important in the relationship between SOC and outcomes, because their presence in the model caused little or no change in the risk measures. It was

Table 2. Results of crude and adjusted Poisson regression with outcome absence of need for dental prosthesis (n = 720).

Variables	Absence of the need for dental prosthesis					
	n ^a	n (%) ^b	PR _{crude} (CI95%)	p-value	PR Adjusted (CI95%)	p-value
Sense of Coherence						
weak	335	82 (24.5)	1.00	-	1.00	-
strong	385	123 (31.9)	1.31 (1.03–1.66)	0.028	1.34 (1.06–1.70)	0.015
Sex						
female	416	124 (29.9)	1.00	-	1.00	-
male	304	78 (25.6)	0.86 (0.66–1.11)	0.241	0.83 (0.64–1.07)	0.144
Age						
60–74 years	338	94 (27.7)	1.00	-	1.00	-
50–59 years	382	113 (29.5)	1.07 (0.85–1.35)	0.581	1.15 (0.91–1.46)	0.243
Income (family)						
≤ 2 wages	191	50 (26.2)	1.00	-	1.00	-
between 2 and 5 wages	287	83 (28.9)	0.10 (0.82–1.49)	0.515	1.16 (0.86–1.56)	0.336
5 wages	242	72 (29.7)	1.14 (0.83–1.54)	0.414	1.24 (0.90–1.71)	0.181
Education Level						
<6 years	292	87 (29.8)	1.00	-	1.00	-
>6 years	428	118 (27.6)	0.92 (0.73–1.17)	0.515	0.84 (0.66–1.08)	0.174
Dental Attendance within the previous year^c						
no	393	120 (30.5)	1.00	-		
yes	324	84 (25.9)	0.85 (0.67–1.08)	0.176		
Reason for Dental Attendance^c						
curative	489	142 (29.0)	1.00	-		
preventive	228	62 (27.2)	0.93 (0.73–1.21)	0.612		
Dental Caries						
yes	240	68 (28.3)	1.00	-		
no	480	137 (28.5)	1.01 (0.78–1.29)	0.953		

PR: Prevalence Ratio; CI: Confidence Interval.

^a Sample description.

^b Prevalence of outcome.

^c Excluding those who never underwent dental attendance (n = 717).

demonstrated that, in this case, the effect of the SOC on the oral conditions cannot be explained only by behavioral factors. However, considering that the model investigated included few behavioral variables, we

cannot rule out the possibility that there were other behavioral factors and clinical conditions that were not explored in this study, which could have an influence on the outcomes, explaining the relationships found.

Table 3. Results of the crude and adjusted Poisson regression with outcome number of teeth present (n = 720).

Variables	Number of teeth present					
	n ^a	n (%) ^b	PR crude (CI95%)	p-value	PR Adjusted (CI95%)	p-value
Sense of Coherence						
weak	335	148 (44.2)	1.00	-	1.00	-
strong	385	201 (52.2)	1.05 (1.00–1.11)	0.031	1.05 (1.01–1.11)	0.033
Sex						
female	416	185 (44.6)	1.00	-	1.00	-
male	304	171 (56.3)	1.08 (1.03–1.14)	0.003	1.07 (1.02–1.13)	0.006
Age						
60–74 years	338	152 (45.1)	1.00	-	1.00	-
50–59 years	382	203 (52.9)	1.05 (1.01–1.11)	0.038	1.05 (1.01–1.11)	0.046
Income (family)						
≤2 wages	191	92 (48.2)	1.00	-	1.00	-
between 2 and 5 wages	287	141 (49.1)	1.01 (0.95–1.07)	0.837	1.01 (0.95–1.08)	0.786
5 wages	242	116 (47.9)	1.00 (0.94–1.06)	0.961	1.00 (0.94–1.07)	0.973
Education Level						
<6 years	292	138 (47.3)	1.00	-	1.00	-
>6 years	428	211 (49.3)	1.01 (0.96–1.07)	0.592	1.00 (0.95–1.06)	0.911
Dental Attendance within the previous year^c						
no	393	194 (49.4)	1.00	-		
yes	324	153 (47.2)	0.98 (0.94–1.03)	0.568		
Reason for Dental Attendance^c						
curative	489	248 (50.7)	1.00	-		
preventive	228	99 (43.4)	0.95 (0.90–1.00)	0.070		
Dental caries						
yes	240	112 (46.7)	1.00	-		
no	480	237 (49.4)	1.02 (0.97–1.07)	0.494		
Need for Dental Prosthesis						
yes	515	248 (48.2)	1.00	-		
no	205	101 (49.3)	1.01 (0.95–1.06)	0.787		

PR: Prevalence Ratio; CI: Confidence Interval.

^a Sample description.

^b Prevalence of outcome.

^c Excluding those who never underwent dental attendance (n = 717).

In cross-sectional study designs, the exposure and outcome are simultaneously assessed; therefore, a temporal relationship between them cannot be established. Dental caries was measured at the time of the study, whereas tooth loss may have occurred a long time earlier. Nevertheless, these type of studies are important indicators of the relationship between the variables.

A noteworthy matter for discussion is the clinical relevance of the findings. In the case of the association between SOC and number of teeth, the difference between the groups was small and did not seem to be clinically important. However, it is believed that the homogeneity of the sample in relation to SOC levels may influence this outcome. The SOC score can range from 13 to 91. In this population, it ranged from 23 to 91, with a mean score of 68 (SD = 12.2). Even the participants classified with a weak SOC had high scores, most of which were very close to the median value (md 69), established as the cutoff for defining the categories. This distribution confirmed the relative homogeneity of the sample, which may have hindered the identification of differences of greater magnitude between the groups. This study, like others,^{9,14,16,32} chose to analyze the SOC as a categorical variable and not as a continuous variable, which also may have contributed to this result because categorization leads to loss of information.

The Salutogenic theory has been identified as an important resource that can be used in the field of health promotion in all age groups, offering possibilities of intervention that go beyond the limits of oral health clinical specialties. Therefore, it may be used as a basis for public health policies to promote oral health. The SOC framework may be used to foster individual and collective empowerment, thus enabling people to identify and use available resources to adopt healthy behaviors to improve their health and quality of life.⁷

Conclusion

The findings of this study showed that individuals with a strong SOC presented more number of teeth present and less need of dental prostheses than those with weak SOC, after adjustment for demographic, behavioral or social factors. However, the importance of subsequent longitudinal studies to clarify the relationship between SOC and oral health is recognized.

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