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Oral health, sense of coherence and dental anxiety among middle-aged women

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Abstract

Aims. The specific aims of this investigation were to analyze the relationship between sense of coherence (SOC), dental anxiety (DA) and oral health status among middle-aged women, measured both subjectively and objectively and adjusted for socioeconomic status (SES). ***Materials and methods.*** Randomly selected women, 38 ($n = 206$) and 50 ($n = 287$) years of age, were included in a cross-sectional health examination. The participants underwent a series of examination stages, including a clinical and dental radiographic examination. The women responded to questionnaires concerning SES, oral health, DA and SOC. ***Results.*** The number of teeth was significantly related to SOC, where more missing teeth revealed a lower SOC level among 50-year-olds. The variables of caries, apical periodontitis and filled surfaces were not statistically significantly associated with SOC. However, the self-reported measure of oral health was associated with SOC in both age groups. High DA was significantly related to self-perceived poor oral health regardless of age. Individuals with high DA also had fewer teeth, more filled surfaces and more approximal caries. The multivariate models showed that higher SOC levels were associated with better oral health, as estimated by objective or subjective measures, while the inverse results were seen for DA. Thus, individuals reporting high DA were more likely to have fewer teeth and poor perceived oral health, taking SES into account. ***Conclusions.*** Sense of coherence and dental anxiety are psychological aspects with respect to health- and risk-factors of oral health.

Key Words: *dental anxiety, epidemiological survey, oral health, sense of coherence, women*

Introduction

The salutogenic perspective emphasizes the importance of learning more about factors that contribute to health [1], as a complement to the biomedical model [2] exploring factors leading to illness. Antonovsky [1] developed the concept of sense of coherence (SOC), which conceptualized the individual global orientation in dealing with the stressors of life. SOC is defined as "a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving 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" [19].

These three core components of SOC are named comprehensibility, manageability and meaningfulness. According to Antonovsky, SOC develops during childhood and young adulthood, based on the individual's accumulated experiences of coping with stressors and difficulties during life. Internal and external resources are of great importance for the individual's ability to handle stressors and SOC is thus related to both psychological and social factors.

A strong SOC is thought to improve the ability to manage stressful situations and thereby contribute to health over time [1]. The salutogenic perspective has occasioned considerable research in the medical field. In their systematic review, Eriksson and Lindström [3] conclude that SOC is related to health, most strongly to perceived health and mental health and less strongly and less conclusively to objective health indicators.

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Recently, research has focused on SOC as a factor potentially related to oral health. In adults, a strong SOC is associated with positive oral health behavior [4,5], objective oral health [6–8], oral health-related quality-of-life [9] and subjective/perceived oral health [6,7,10]. SOC could act as a mediator between SES (socioeconomic status) and health [7] and SOC is thus related to SES [11].

Dental anxiety is a factor related to impaired oral health [12–14]. The prevalence of dental anxiety is 4–7% among adults [15–17]. In the first Swedish study on SOC and oral health, Lindmark et al. [10] reported that a stronger SOC was related to less dental anxiety.

From a behavioral/psychological perspective on oral health, SOC could be considered as a psychological and social factor facilitating oral health, while dental anxiety could be seen as a psychological factor making it more difficult to maintain or improve oral health, as well as contributing to problems with managing oral health-related behaviors such as regular dental attendance and completing dental treatment. The knowledge about SOC and oral health is limited, and there is little research on SOC and dental anxiety.

The specific aims of this investigation were to describe the sense of coherence, oral health status and dental anxiety among middle-aged women and to analyze possible associations between these three variables and socioeconomic factors, such as marital status, income, education and social group.

Materials and methods

Study population

The Population Study of Women in Gothenburg, Sweden, was initiated in 1968–1969. It was a combined medical and dental examination, to which 1622 women were randomly selected. At the start of the study, the women were 38, 46, 50, 54 and 60 years of age.

Subsequent surveys were made in 1980–1981, 1992–1993 and 2004–2005, when new groups of women, 38 and 50 years of age, were invited with the same inclusion criteria as the previous examination to ensure representativeness in all examinations. Detailed information on the sampling procedure has been published previously [18–21].

This study concerns women in Gothenburg, aged 38 and 50 years, from the survey in 2004–2005; thus, a cross-sectional design. There were $n = 206$ and $n = 287$ 38-year-olds and 50-year-olds, respectively.

The study was approved by the Regional Ethical Review Board at the University of Gothenburg (Dnr 134-05).

Non-participation

The number of non-participants in the total group was 356 (41%). The non-participants in 2004–2005 had lower income and were more often immigrants [21] compared with the participants.

Methods

In 2004–2005 the survey included a combined medical and dental examination. The participants underwent a series of examination stages, including a dental radiographic examination (panoramic radiograph (OP)). The women responded to questionnaires regarding socioeconomic status, oral health, dental anxiety and sense of coherence. A clinical oral examination was also included.

The Swedish version of the 13-item version [22] of Antonovsky's [1] original 29-item SOC questionnaire was used to measure SOC. The short version consists of 13 items related to the three inter-related SOC components; comprehensibility (five items), manageability (four items) and meaningfulness (four items) [1,22]. Each item was scored on a unitary scale, the Likert scale, which ranged from 1–7 points. This gives a total range from 13–91 points for the SOC score. A higher score indicates a stronger sense of coherence.

Dental anxiety was measured using the Dental Fear Survey (DFS), which consists of 20 items covering the following aspects of dental anxiety: anticipatory anxiety, physiological reactions and situational anxiety [23]. Responses are scored from 1 (no anxiety) to 5 (high intensity of anxiety), giving a total score from 20–100. A DFS score of 60 or higher has been used to assess dental anxiety [24] and is the cut-off point used in this study to detect dental anxiety.

Self-reported oral health was measured with a question where the participants rated their oral health as poor, moderate, good or very good. For the analysis this variable was dichotomized into poor (poor and moderate) and good (good and very good) oral health.

The number of teeth, approximal caries, apical periodontitis and the number of filled surfaces (the summary of amalgam and composite) were assessed from the panoramic radiographs. The number of teeth was dichotomized into 0–25 and 26–32 remaining teeth. The cut-off point was chosen as −1 SD from the mean number of teeth for the whole group of women. Apical periodontitis (AP) was dichotomized into no AP and one or more AP.

Marital status was given as not living together (i.e. single living, unmarried, divorced, widowed or married but not living together) or living together (i.e. cohabiting, married or in partnership).

Social group was divided into three categories, based on the women's own occupation. This information was transformed according to Carlsson's [25] standard occupational grouping system: low social group (skilled and unskilled workers), medium social group (small-scale employers, lower rank officials, foremen) and high social group (large-scale employers and high or intermediate rank officials).

Educational levels were based on the number of years of school attendance and reported as: low (1–9 years), medium (10–12 years) and high level of education (≥13 years).

Income was measured in thousands of Swedish kronor (SEK) per year. It was then divided into three categories; low, medium and high, where low income corresponds to the lowest 20% and high income to the highest 20%.

Statistical analysis

The statistical analysis consisted of descriptive statistics and inference testing using the *t*-test, the chi-square test, Fisher's exact test, one-way analysis of variance and multiple logistic regressions using SPSS 19.0. The chosen level of significance was $p < 0.05$.

Results

SOC and SES

Table I shows the socioeconomic variables in relation to age and SOC. There were substantial and statistically significant differences when the whole group was compared with regard to marital status, social group, educational level and income strata. Married/co-habiting individuals scored higher on SOC and for the SES variables, there was a gradient in SOC levels, with lower SOC scores for lower levels on the respective measures. With regard to age, the results for the 50-year-olds showed parallel results, but for the 38-year-olds significant differences were only seen between levels on the social group variable.

SOC and oral health

The relationships between objective and subjective measures of oral health and SOC showed a varying pattern (Table II). The number of teeth was significantly related to SOC, where more missing teeth among the 50-year-olds revealed a lower level of SOC, with a mean difference of more than 7-points. The variables of caries, apical periodontitis and filled surfaces were not statistically significantly associated with SOC. However, the self-reported measure of oral health differed significantly with regard to SOC among both age groups.

Dental anxiety, SOC and SES

Individuals with high dental anxiety scored significantly lower on the SOC test in both age groups (Table II). Among all the women and especially for those aged 50, dental anxiety was significantly associated with social group. There was a higher proportion of dental anxiety in the lower social groups ($\chi^2 = 11.2$, df = 2, $p < 0.003$) and parallel results were shown for education ($\chi^2 = 15.6$, df = 3, $p < 0.001$) and income ($\chi^2 = 12.2$, df = 2, $p < 0.002$). Dental anxiety also showed a gradient effect, with the lower category in each SES showing higher dental anxiety. However, no significant differences were seen among the 38-year-old women (data not shown).

Dental anxiety and oral health

The association between dental anxiety and measures of subjective and objective oral health revealed that high dental anxiety was significantly related to self-perceived poor oral health, regardless of age (Fisher's

Table I. Mean SOC (SD) and marital status, social class, education and income among women aged 38 and 50 years.

	SOC 38 years			SOC 50 years			SOC 38+50 years		
	n	*M*	SD	*n*	*M*	SD	*n*	*M*	SD
Single living	112	70.5	12.1	134	69.1⋆	13.5	246	69.7⋆	12.9
Living together	90	69.7	12.6	153	73.8⋆	10.8	243	72.3⋆	11.7
Low social group	54	66.6^{ab}	12.9	85	66.8^{ab}	14.1	139	66.7^{ab}	13.6
Medium social group	98	71.0^{b}	12.2	145	73.5^{b}	10.8	243	72.5^{b}	11.5
High social group	50	72.1^{a}	11.1	56	74.1^{a}	11.6	106	73.2^{a}	11.4
Low education	6	68.5	18.6	34	67.6^{a}	14.7	40	67.8^{a}	15.1
Medium education	82	69.1	13.5	109	69.9^{b}	12.7	191	69.5^{b}	13.0
High education	114	70.9	11.1	144	73.9^{ab}	11.2	258	72.6^{ab}	11.2
Low income (Quintile 1)	42	69.4	14.9	64	64.6⋆	14.5	106	66.5⋆	14.8
Medium income (Quintile 2–4)	119	69.9	11.8	166	72.3⋆	11.2	285	71.3⋆	11.5
High income (Quintile 5)	40	72.2	10.6	55	77.3⋆	9.3	95	74.9⋆	10.0

⋆significance ($p < 0.05$).
^{a,b}significance ($p < 0.05$) between groups for the separate variables.

Table II. Mean SOC (SD), objective/subjective oral health and dental anxiety among women aged 38 and 50 years.

	SOC 38 years			SOC 50 years			SOC 38+50 years		
	n	*M*	SD	*n*	*M*	SD	*n*	*M*	SD
0–25 teeth	16	69.1	9.6	58	65.8*	13.6	74	66.5	12.9
26–32 teeth	190	70.1	12.6	229	73.1*	11.6	419	71.7	12.1
No approximal caries	161	69.9	12.5	236	71.6	12.4	397	70.9	12.4
Approximal caries ≥1	42	71.2	11.4	50	71.7	12.6	92	71.5	12.0
No Apical Periodontitis	174	70.2	12.2	199	72.4	12.5	373	71.4	12.4
Apical Periodontitis ≥1	29	69.8	12.6	87	69.6	12.0	116	69.7	12.1
Filled surfaces[a] < Median	100	69.8	12.4	133	71.1	12.5	235	70.3	11.7
Filled surfaces[a] ≥ Median	103	70.4	12.1	153	72.1	12.3	254	71.6	12.9
Poor oral health	36	64.7*	13.9	78	68.3*	13.0	114	67.1*	13.4
Good oral health	165	71.3*	11.6	207	73.0*	12.0	372	72.2*	11.8
DFS ≥60	20	62.0*	13.5	32	65.8*	12.0	52	64.3*	12.6
DFS <60	186	70.9*	11.9	255	72.4*	12.3	441	71.8*	12.1

*Significance ($p < 0.05$).
[a]Filled surfaces: 38 yrs median = 15; 50 yrs median = 27; 38+50 yrs median = 21.

exact test, $p < 0.001$). Individuals with high dental anxiety also had fewer teeth (26.6 vs 28.2, $t = 3.6$, $p < 0.001$), more filled surfaces (15.8 vs 13.8, $t = 2.4$, $p < 0.015$) and more approximal caries (0.54 vs 0.24, $t = 2.9$, $p < 0.004$).

The multivariate models

The multivariate analyses included two models (Table III and IV) with binary logistic regressions using the number of teeth and self-rated oral health, respectively, as dependent variables and marital status, educational level and SOC scores as independent variables.

In a second step, dental anxiety was entered in the models to analyze the potential impact of dental anxiety on oral health/disease. The SES variables indicated high collinearity and parallel results with regard to SOC; thus, the choice was made to use education in the models. Both models indicate the same results irrespective of the dependent variable, with the exception that marital status was not a significant predictor in the self-reported measure of oral health.

The educational level had a gradient effect; the larger the number of years at school, the greater the likelihood of more teeth or better self-reported oral health (Tables III and IV). An increase by 10 SOC points predicts a 20% and 30% greater likelihood of having more teeth and better perceived oral health, respectively. The results indicate that higher SOC levels are associated with better oral health, as estimated by both objective and subjective measures.

In the second model, including dental anxiety as an independent variable, the analysis revealed similar results but with dental anxiety contributing with significant odds ratios of the magnitude of 2.5 and 4.7 in the models using the number of teeth and self-reported oral health as dependent variables, respectively (Tables III and IV). Thus, individuals reporting high dental anxiety were more likely to have fewer teeth and poorer perceived oral health.

Discussion

This study evaluated the relationship between SOC and oral health or disease with regard to the number of retained teeth and self-perceived oral health and dental anxiety among a random selection of middle-aged women in Gothenburg, Sweden. From a behavioral science perspective, the association between SOC and oral health may be positive, inasmuch as the higher the SOC level the better the oral health, while there appears to be an inverse relationship between dental anxiety and oral health, with high dental anxiety predisposing for poor oral health. The results from this study actually indicated these hypotheses and also added a clear and significant difference between individuals high and low in dental anxiety with respect to SOC with a mean difference in SOC scores around 8-points. Moreover, this study showed that, irrespective of an objective measure of oral health (number of retained teeth) or a subjective measure of oral health (self-reported), an increase in SOC scores predicted better oral health, taking different socioeconomic variables into account.

Table III. The multivariate logistic regression, with the number of teeth (dichotomized: 0–25/26–32) as the dependent variable and marital status, education and SOC as the independent variables among 489 women (aged 38 and 50 years).

Variable	Odds ratio	*p*-value	95% CI
Model I			
Single living (reference)			
Living together	1.82	0.030	1.06–3.13
Low education (reference)			
Medium education	4.15	< 0.001	1.98–8.73
High education	8.96	< 0.001	4.13–19.47
SOC	1.02	0.018	1.00–1.04
Model II, also including dental anxiety (DFS) as an independent variable			
Single living (reference)			
Living together	1.75	0.045	1.01–3.01
Low education (reference)			
Medium education	4.35	< 0.001	2.04–9.26
High education	8.27	< 0.001	3.77–8.12
SOC	1.02	0.052	1.00–1.04
Dental anxiety (reference)			
No dental anxiety	2.52	0.010	1.25–5.07

During the past decade several analyses of the relationship between the concept of sense of coherence and oral health and associated dental care behavior have been published [4,6,10]. The majority of the reported studies have used an observational cross-sectional study design. Few studies have applied a clinical trial approach [26]. The main findings have been that the SOC may be positively related to different aspects of oral health/disease and dental care behavior [4,5,27]. Thus, in a study from Finland, the number of teeth was positively associated with the SOC, but negatively associated with the number of teeth with caries and the number of teeth with periodontitis [6]. Lindmark et al. [8] found similar trends in their study with regard to SOC and oral status. Small differences were revealed in SOC levels between groups and, notably, non-significant *p*-values or small model fit contributions of the SOC to oral status in multivariate models adjusted for mainly sociodemographic variables [8]. The present study specifically showed two important aspects of health dimensions; objective and subjective oral health in relation to psychological factors. The number of teeth among the older cohort and self-reported oral health for both cohorts were significantly associated with mean SOC values, with low SOC scores related to poor oral health. The cut-off value for the number of teeth was high, but it was argued that even the loss of a few teeth, with regard to women's general high oral status today, would indicate affected oral health. Both multivariate models revealed similar patterns for SOC, regardless of self-reported oral health or the objective status of the number of teeth.

Table IV. The multivariate logistic regression with self-rated oral health (dichotomized: poor/good) as the dependent variable and marital status, education and SOC as the independent variables among 484 women (aged 38 and 50 years).

Variable	Odds ratio	*p*-value	95% CI
Model I			
Single living (reference)			
Living together	0.93	0.734	0.60–1.43
Low education (reference)			
Medium education	2.04	0.056	0.98–4.24
High education	2.30	0.023	1.12–4.72
SOC	1.03	0.001	1.01–1.05
Model II, also including dental anxiety (DFS) as an independent variable			
Single living (reference)			
Living together	0.86	0.510	0.55–1.35
Low education (reference)			
Medium education	2.15	0.049	1.00–4.58
High education	2.00	0.068	0.95–4.20
SOC	1.03	0.006	1.01–1.04
Dental anxiety (reference)			
No dental anxiety	4.69	< 0.001	2.50–8.81

A general conclusion in previous research is that psychosocial factors are of importance in health promotion [5,6]. The specific value of SOC and the salutogenic perspective is that it implies a focus on resources rather than problems and illness, e.g. by using self-preventive and promoting measures for gaining and maintaining good health [10,28]. The practical implications from these general statements are not however evident. It has been suggested that in dentistry information about an individual's SOC could be used as a complement to oral clinical status [10]. On the other hand, in their review on SOC, Erikson and Lindström [28] do not recommend SOC as a screening instrument because there are no guidelines for interpretation of an individual's SOC level.

Since SOC according to Antonovsky [1] is developed during childhood and young adulthood, interventions to increase SOC should be made in these ages [5]. As socioeconomic factors are of importance for developing a strong SOC, the present findings are arguments for structural interventions in the society. On a more specific level for dentistry, these findings emphasize the importance of dental care for young people and that it should be organized in a way that facilitates the development of SOC. Following the theory of SOC this should be done by helping patients succeed in dealing with stressors/events regarding their oral health by means of increasing comprehensibility, manageability and meaningfulness. Possibly,

comprehensibility could be increased by helping the young patient to understand, and predict the stressors by providing relevant information and manageability could be improved if the patient learns techniques and strategies to deal with these stressors. To improve the chance for the patient to experience success, goals should be reasonable and set in consideration of the patient's life context. It seems that the Motivational Interview techniques [29] could be a useful tool for this and also the concept of empowerment. Research is needed to evaluate treatment programs and their possible effects on oral health and SOC. Thus, the salutogenic theory and the growing evidence of a relationship between SOC and oral health provide ideas for clinical implications on how to improve dental care.

One aspect of dental care behavior in relation to SOC that has been sparsely reported on in the literature is dental anxiety. Dental anxiety may typically be related to avoiding dental care or irregular care, deteriorating oral health and psychological factors such as mood, general anxiety and oral health-related quality-of-life [12,30,31]. Furthermore, SOC has been found to be inversely related to depression and general anxiety [32]. Lindmark et al. [10] explored dental anxiety and SOC in a study where a higher SOC level was significantly associated with no dental anxiety. The scaling of dental anxiety was, however, of a non-validated character. The present analysis showed that ~ 10% of the cohorts reported high levels of dental anxiety, as measured with the Dental Fear Survey and the mean difference in SOC scores was significant with a range between 6.6–8.9 (Table II). Maintenance of dental anxiety has been described as a vicious circle of dental anxiety, avoidance of dental care, deteriorated oral health and feelings of shame [33]. SOC may have a role in this process inasmuch as to be able to have the coping abilities to keep a regular dental visiting habits and understand what measures to take that may be important in the maintenance of the teeth.

As far as the authors know, the causal pattern of the relationship between oral health, SOC and psychological factors is far from elucidated, as a longitudinal study design must be applied. Thus, it remains to be analyzed whether the health status and reported behavior actually cause the SOC levels or if it is the other way around. Adjacent to this causality inference is also the question of the stability of individual SOC scores over time, which was claimed by Antonovsky [1] to be the core of SOC, but where others remain hesitant as studies have found considerable instability of SOC scores over time [34]. There are still important aspects of oral health/disease and dental care behavior and SOC that should be elucidated using different designs and methods.

The strengths of the study were the fact that the sample is a random selection of middle-aged women, allowing generalization of the results and that different assessments of oral health, both self-reported and objectively measured oral health, were used. Obvious weaknesses of the study design are the cross-sectional examination which does not infer causality, the fact that only women were included, the narrow age distribution and the non-participation rate, which may have affected the result in any direction. However, the non-participation analysis showed that lower income was more prevalent in those not examined, indicating that the results would probably be even clearer and more pronounced with regard to low SOC levels and poor oral health had these subjects also been examined.

The conclusion of the results from the present study indicates that the sense of coherence, as measured on the SOC scale, and dental anxiety, as measured on the DFS scale, were inversely related to subjectively and objectively measured oral health. This revealed that SOC and dental anxiety are psychological aspects with respect to health and risk factors of oral health.

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