Association of Sense of Coherence and Clinical Signs of Temporomandibular Disorders

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Aims: *To investigate the association of sense of coherence (SOC) with clinical findings of temporomandibular disorders (TMD) among 30- to 64-year-old subjects.* ***Methods:*** *A nationally representative health examination survey called the Health 2000 Survey was carried out from 2000 to 2001. The data for this study were obtained from 4,859 subjects aged 30 to 64 years who had participated in an interview, been clinically examined, and returned a self-administered questionnaire. The questionnaire included a SOC scale which was a 12-item version of the SOC-13 scale. Based on a clinical examination for TMD, the following variables were formed: maximum interincisal distance < 40 mm, clicking, crepitation, pain in the temporomandibular joints (TMJs), and pain in the masticatory muscles. Odds ratios (OR) and 95% confidence intervals (CI) were estimated using logistic regression models.* ***Results:*** *Subjects with low SOC had higher odds to have distinct TMD findings, especially masticatory muscle pain, than those with high SOC. After adjustment for confounders, those with low SOC had more than twofold odds to have masticatory muscle pain (in at least one painful site) compared to those with high SOC (OR 2.2, 95% CI 1.4–3.6). Low SOC was also associated with TMJ pain on palpation (OR 3.2, 95% CI 1.5–6.6).* ***Conclusion:*** *Low SOC associates with myogenous TMD findings. SOC as a psychosocial aspect has a role in the background of TMD.* J OROFAC PAIN 2009;23:147–152

Key words: masticatory muscle pain, psychosocial, sense of coherence, temporomandibular disorders

The sense of coherence (SOC) is a concept used to explain the relationship between health and stressors of life.[1,2] Antonovsky formally defined SOC 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."[2] The above three are referred to as the three components of SOC; comprehensibility, manageability, and meaningfulness, respectively. First, an individual with a high sense of comprehensibility perceives information and stimuli as ordered, consistent, and predictable. Next, an individual with a high sense of manageability does not victimize him/herself in events where life treats him/her unfairly, and will therefore be able to cope.

Finally, an individual with a high sense of meaningfulness feels life making sense emotionally, so that posed demands can be seen to be worthy of investing energy and commitment.[2]

SOC has been suggested to be a highly applicable concept in the public health area.[3] The salutogenic theory to which it belongs proposes that the stronger SOC that the individual or group possesses, the more they may cope with the stressors and maintain their health status in the course of living.[1,2] A strong SOC is stated to decrease the likelihood of perceiving the social environment as (too) stressful. This reduces the susceptibility to the health-damaging effect of chronic stress by lowering the likelihood of repeated adverse neurophysiological reactions and negative emotions to stress perceptions.[2]

Temporomandibular disorders (TMD) are characterized as a heterogeneous set of clinical problems involving the masticatory musculature and/or the temporomandibular joint (TMJ). TMD are considered to be one of the musculoskeletal disorders, and are usually subclassified as myogenous, arthrogenous, or combined disorders. The symptoms and clinical signs of TMD include joint sounds, TMJ and masticatory muscle pain, and restricted mandibular movements.[4]

Certain psychological factors are related to TMD,[5–9] especially TMD of myogenous origin.[10,11] For example, TMD are associated with depressiveness, especially as part of a generalized pain condition.[12,13] The role of psychological stressors in TMD has been examined in a number of studies.[7,14–19] Furthermore, it has been noted that certain beliefs and coping strategies,[20–22] as well as optimism,[23] as life orientations are related to the experience of TMD.

Several studies have shown that SOC associates with oral and general health; subjects with a strong or moderate SOC have been found to have significantly fewer problems attributed to oral conditions than those with a weak SOC.[24] Conversely, several studies have also shown a connection between a weak SOC and various musculoskeletal diseases and chronic pain symptoms.[25–31] However, to our knowledge there exist no studies linking TMD and SOC. Based on the previous findings concerning the association of TMD with stress and coping factors and, on the other hand, on the finding that a strong SOC influences coping with stressors, we hypothesized that SOC associates with TMD. The aim of the present study was to investigate the association of SOC with clinical findings of TMD among 30- to 64-year-old subjects in the general population.

Materials and Methods

A nationally representative Health 2000 Survey was carried out from 2000 to 2001 by the National Public Health Institute of Finland. A two-stage, stratified, cluster sampling was planned by Statistics Finland. The sampling frame comprised adults aged 30 years or older living in mainland Finland. The Social Insurance Institution selected the sample that comprised 8,028 persons aged 30 years or older.[32] Of these, 6,986 (87%) subjects were interviewed in their home or in an institution. A total of 6,335 subjects (3,466 women and 2,869 men) took part in the clinical examination. The data for this study were obtained from 4,859 subjects aged 30 to 64 years who had participated in an interview, been clinically examined, and answered a self-administered questionnaire. The interviews were carried out by trained interviewers and included information about health and functional status, socioeconomic factors, and psychological and psychosocial variables. Additional information about the Health 2000 Examination is available at http://www.ktl.fi/health2000.

The questionnaire included a SOC scale, including 12 seven-point, Likert-type items with descriptive end-points derived from the short version of the SOC scale (SOC-13) proposed by Antonovsky.[33] All three components of the SOC, including comprehensibility, manageability, and meaningfulness, were measured by four items each, in order to give equal weight to all components. If a subject had up to two missing values on the SOC items, they were replaced by the mean value of the remaining SOC items of the individual. The practice of replacement of missing values has been presented previously by Suominen et al.[34] The SOC sum was then categorized into quintiles, of which the class I indicated the lowest and the class V the highest SOC categories.

Sociodemographic data used in this study were gender, age, level of education, and marital status. Age was classified into three categories: 30 to 44 years, 45 to 54 years, and 55- to 64-years old. Education based on self-report was categorized into three levels. The lowest category included subjects who had less than a high-school education and who did not have formal vocational education. The middle category included those who had graduated from high school or vocational school, and the highest category included those with a university degree or who had graduated from universities of applied sciences. Marital status was dichotomized taking married or cohabiting as one

group and placing the rest (divorced, widowed, or single subjects) in the other.

Clinical Assessment

Five calibrated examiners (dentists) performed a standardized clinical examination as part of the oral health study and assessed the signs of TMD and the grade of malocclusion. Experienced specialists trained the examiners in order to increase the reproducibility of the clinical examination. The examiners were videotaped while they performed the examination, and the videotapes were carefully reviewed by the trainers and the examiners together in order to minimize any differences in the clinical examination technique.

The standardized clinical examination of TMD included the recording of maximum mouth opening, auscultation of TMJ noises, and palpation of the TMJ and two masticatory muscles (temporalis anterior and masseter superficialis). Maximum mouth opening was measured with a ruler, and it was considered limited when less than 40 mm.[35] Joint noises (clicking and crepitation) were recorded bilaterally over the TMJ region with gentle digital palpation when the subject opened and closed the mouth. TMJ tenderness to palpation was assessed by applying a force about 5 N over the immovable condyle, and muscle tenderness was assessed with a force of about 10 N. Attempts were made to standardize the palpation force by exerting the forces on a measuring scale between the examinations. Joint and muscle pain on palpation was recorded if the subjects reported pain when asked or showed a protective reflex. Except for the maximum interincisal distance, all the findings were recorded separately for both sides, and they were combined and categorized as either present or absent. Five dichotomous variables were formed: limited maximum mouth opening, clicking, crepitation, pain in TMJs, and pain in masticatory muscles. Masticatory muscle pain was subclassified into the following categories: at least one/ at least two painful muscles. The percentual agreement between examiners and a reference examiner was 95% (kappa [κ] value 0.56, 95% confidence intervals [CI] 0.34–0.77) for maximum interincisal distance, 84% (κ 0.44, 95% CI 0.35–0.52) for clicking, 91% (κ 0.21, 95% CI 0.13–0.29) for crepitation, 92% (κ 0.26, 95% CI 0.19–0.34) for palpation pain in joints, and 95% (κ 0.47, 95% CI 0.41–0.53) for palpation pain in muscles.[36]

Table 1 Basic Characteristics of the Study Population (n = 4,859) According to the SOC Category*

	SOC category†				
	I	II	III	IV	V
Education					
Lowest	39.7	31.4	27.3	23.8	27.0
Middle	36.1	36.5	37.2	36.2	37.1
Highest	24.2	32.1	35.5	40.0	35.9
Age/years					
30–44	38.7	42.2	42.6	46.0	44.5
45–54	34.4	30.9	35.5	35.3	32.9
55–64	26.9	26.9	21.9	18.7	22.6
Gender					
Men	47.2	46.2	50.3	48.5	50.7
Women	52.8	53.8	49.7	51.5	49.3
Marital status					
Married/cohabiting	50.6	60.6	63.1	65.8	69.2
Single	49.4	39.4	36.9	34.2	30.8
TMD signs					
TMJ pain on palpation					
No	95.1	95.5	96.9	96.9	97.1
Yes	4.9	4.5	3.1	3.1	2.9
Masticatory muscle pain on palpation ≥ one site					
No	90.8	94.4	95.9	96.0	95.9
Yes	9.2	5.6	4.1	4.0	4.1
Masticatory muscle pain on palpation ≥ 2 sites					
No	96.4	98.6	99.4	98.6	98.9
Yes	3.6	1.4	0.6	1.4	1.1
Crepitation in one or both TMJs					
No	84.4	85.9	85.2	83.6	85.2
Yes	15.6	14.1	14.8	16.4	14.8
Clicking in one or both TMJs					
No	91.8	93.3	93.0	92.8	93.0
Yes	8.2	6.7	7.0	7.2	7.0
Maximum mouth opening					
Non-limited	92.1	92.2	95.2	93.4	93.2
Limited‡	7.9	7.8	4.8	6.6	6.8

*The values indicate the proportional numbers (%) of subjects.
†Measured with SOC scale (SOC-13).[2]
‡Maximum interincisal distance < 40 mm.

Statistical Analyses

Odds ratios (OR) and CIs were estimated using logistic regression models. Potential confounding factors such as age, gender, education, and marital status were included in the multivariate models as covariates. Stata 8.0 statistical package was used in the analyses to take into account two-stage cluster sampling. Weights were used to correct the effects of non-response. The weighting of the sample was based on post-stratification according to gender, age, and region.

Table 2 Association Between Signs of TMD and the SOC Category,* OR, and CI†

SOC	OR	95% CI
TMJ pain on palpation (n=4,859)		
I (lowest)	1.7	1.0–2.7
II	1.6	0.9–2.6
III	1.1	0.7–1.8
IV	1.1	0.6–1.9
V (highest)	1.0	
Masticatory muscle pain on palpation		
At least one painful site (n=4,858)		
I (lowest)	2.2	1.4–3.6
II	1.3	0.8–2.2
III	1.0	0.7–1.6
IV	1.0	0.6–1.6
V (highest)	1.0	
At least two painful sites (n=4,858)		
I (lowest)	3.2	1.5–6.6
II	1.2	0.5–2.9
III	0.6	0.2–1.5
IV	1.3	0.6–2.6
V (highest)	1.0	
TMJ sounds		
Crepitation in one or both TMJs (n=4,859)		
I (lowest)	1.0	0.8–1.4
II	0.9	0.7–1.2
III	1.0	0.8–1.3
IV	1.1	0.9–1.5
V (highest)	1.0	
Clicking in one or both TMJs (n=4,859)		
I (lowest)	1.2	0.9–1.7
II	1.0	0.7–1.4
III	1.0	0.7–1.4
IV	1.1	0.7–1.5
V (highest)	1.0	
Limited mouth opening‡ (n=4,835)		
I (lowest)	1.0	0.7–1.5
II	1.1	0.7–1.7
III	0.7	0.5–1.0
IV	1.0	0.7–1.4
V (highest)	1.0	

*Measured with SOC scale (SOC-13).[2]
†Adjusted for age, gender, education, and marital status.
‡Maximum interincisal distance < 40 mm.

Results

The basic characteristics of the study population are presented in Table 1. Those with low SOC had higher odds to distinct TMD findings, especially masticatory muscle pain, than those with high SOC (Table 2). After adjustment for age, gender, education, and marital status, those with the lowest SOC had more than twofold odds to have masticatory muscle pain in at least one painful site compared to those with the highest SOC (OR 2.2, 95% CI 1.4–3.6). Those with the lowest SOC had more than threefold odds to have masticatory muscle pain in at least two painful sites compared to those with highest SOC (OR 3.2, 95% CI 1.5–6.6). Low SOC (SOC category I) was also associated but to a lesser extent with TMJ pain on palpation (SOC category I (OR 1.7, 95% CI 1.0–2.7). There were no consistent associations between SOC and other TMD signs (ie, TMJ sounds and limited mouth opening) (Table 2).

Discussion

The results of this study have shown that low SOC associates significantly with masticatory muscle pain on palpation and TMJ pain on palpation. However, no associations were found between SOC and other TMD signs, ie, TMJ sounds and limited mouth opening. These results are in line with the previous findings that myogenous TMD are more commonly linked with psychological difficulties than arthrogenous TMD.[36–39] TMD of arthrogenous origin are related to pathological processes in TMJ and consequently seem to be less connected with psychological factors than myogenous TMD.[37,40]

The present study was a part of a comprehensive and nationally representative health survey. Because of the relatively high response rates it was possible to obtain information about signs and symptoms of TMD in the adult population as a whole. The population-based sample also offers an opportunity to estimate the associations between the conditions in the general population. Moreover, a population-based sample may at least partly exclude the bias related to care-seeking behavior, in contrast to patient studies.

The study design also allowed the use of several outcome variables, including the main signs of TMD. However, due to practical reasons, all signs examined in the proper clinical examination for TMD, ie, pain on mandibular movements or measurements of ranges of laterotrusion and protrusion movements as well as pain on palpation in all masticatory muscles, could not be included in the present study. Also for practical reasons, the clinical examinations were not performed by specialists but general dentists, which may have led to errors in measurements. This measurement error most likely indicates that the true associations could be stronger than those observed in this study.

As TMD are considered to be a subclassification of musculoskeletal disorders, the present study offers consistent results with several other studies concerning a connection between SOC and a variety of chronic pain musculoskeletal diseases and

symptoms strongly associating with psychological and psychosocial components. Namely, SOC has been found to be associated with neck-shoulder pain,[26] low-back disorders,[29] rheumatic disorders,[27] rheumatoid arthritis,[28,31] and fibromyalgia.[30] Further, it has been noted that among primary care patients with musculoskeletal disorders, the long-term sicklisted patients have significantly worse baseline SOC scores than the non-sicklisted patients.[41]

The association between a weak SOC and muscular TMD signs found in this study may be explained by several mechanisms. It can be suggested that the SOC may associate with TMD through its impacts on stress. The salutogenic theory proposes that the stronger SOC that the individual possesses, the more he/she may cope with stressors and maintain his/her health status in the course of living.[1,2] Especially myogenous TMD have been considered as a common stress-related condition showing marked comorbidity with depression and other muscular pain conditions such as fibromyalgia.[42] It has been stated that persons who experience their lives and environments as comprehensible, manageable, and meaningful may not become easily distressed and can stay healthier than others.[25]

Earlier findings have indicated that coping strategies play an important role in TMD pain experience.[20,22] Besides SOC, other psychosocial factors also linked with the coping ability have been noted in the background of TMD. In our earlier study we found that optimism was inversely associated with TMD symptoms as an independent determinant despite its correlation with depression.[23] These findings and the present study emphasize the role of psychosocial factors in TMD.

The SOC scale seems to be a reliable, valid, and cross culturally applicable instrument in measuring SOC.[43] In the present study, the SOC was measured by means of 12 items derived from the Antonovsky[33] short-scale version of the SOC (SOC-13). The short scale of SOC has been proposed for use when time or space limitations prevent the use of the full scale (SOC-29). The reliability of the present study´s SOC scale seems to be maintained, since the distribution of the individual´s mean SOC scores were comparable to previous Finnish SOC studies.[44,45]

The SOC has been proposed to be a fairly dispositional orientation of the personality[2,33,46] meaning that SOC begins to develop at an early age. Whereas SOC is not entirely developed during adolescence, it is assumed to be fully developed by age 30 and to remain rather stable thereafter.[2] Due to the fact that the majority of patients seeking treatment for TMD are young or middle-aged adults,[47] it can be suggested that the SOC of the individual has been mostly developed before the onset of TMD.

It can be concluded that SOC as a psychosocial aspect has a role in the background of TMD of muscular origin. Psychosocial factors should be taken into account in clinical practice since they may affect the prognosis as well as the individual treatment outcome.

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