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COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY

Measurement of social support, community and trust in dentistry

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Abstract – *Background and aim:* Relationships among people at work have previously been found to contribute to the perception of having a good work. The aim of the present paper was to develop scales measuring aspects of social support, trust, and community among dentists, and to evaluate psychometric properties of the scales. *Material and methods:* In 2008, a questionnaire was sent to 1835 general dental practitioners randomly selected from the dental associations in Sweden and Denmark. The response rate was 68% after two reminders. Principal Component Analysis was applied to 14 items and scales were established based on the resulting factors. Internal consistency was evaluated by Cronbach's alpha. Differential Item Functioning (DIF) with respect to gender, nationality and employment sector was analysed using ordinal logistic regression methods. Construct validity was assessed in relation to self-rated health and a range of work satisfaction outcomes. *Results:* The percentage of missing values on the items was low (range 0.7%–3.8%). Two scales (range 0–100) were established to measure 'Community with Trust' (nine items, mean = 79.2 [SD = 13.4], Cronbach's alpha = 0.89) and 'Collegial Support' (five items, mean = 70.4 [SD = 20.8], Cronbach's alpha = 0.89). DIF of only minor importance was found which supported cultural equivalence. The two scales were weakly positively correlated with each other. 'Community with Trust' was in general more strongly correlated with work satisfaction variables than 'Collegial Support' was. *Conclusions:* Stability and internal consistency of the scales were considered as satisfactory. Content validity and construct validity were considered as good. Further validation in other populations is recommended.

Key words: dentistry; human service organization; psychosocial work environment; social relations

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A study of the development of the psychosocial work environment in Denmark has shown substantial deteriorations and only few improvements between 1997 and 2005 (1). A similar trend has been described for the Swedish labour market as a whole in the 1990s (2). Since the 1990s and until now a number of New Public Management reforms, founded in management and economic theory, were introduced in most countries across Europe including the Scandinavian countries (3, 4). The reforms imply increasing emphasis on value for money, efficiency, transparency, and contestability, also implicating changes in organization of work and in demands made on the workforce (5). The European health workforce faces challenges to balance between increasing demands on health services and restricted supply (6). A major problem is the changing needs of the population in combination with ageing of the health workforce (6). This requires common strategies to promote a sustainable health care workforce by maintaining health care workers on the labour market and attracting young people to the sector (6). Such challenges are also described for dentistry (7). Therefore, there is a need to study positive factors in working life that can support maintenance of a sustainable workforce.

Psychosocial work environment research traditionally takes its starting point in theoretical models such as the demand-control-support model (8, 9), where the individual perspective is predominant. However, results from interview-based

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studies of dentists (10–12) point to the importance of also including indicators of social capital, such as a sense of community and trust in relationships, when aiming to capture positive factors in the working environment. Social factors at the workplace influenced long-term career expectations in a study of vocational dental practitioners professional expectations (11). Larger team practices were found to be associated with good opportunities for work-related support, and to promote the sense of taking part in something bigger (11).

Trust may be considered as a fundamental quality in all kinds of human relations. It is essential in professional relationships in health care – not only between the patient and the health care professional but also among people at the workplace (10, 13, 14). In the context of work, it is considered relevant to study trust among colleagues (horizontal trust) and between management and employees (vertical trust) corresponding to the distinction suggested by Coleman (15). Luhmann regards trust as a way to reduce social complexity, as a feature of social control is built in when relations are characterized by trust [e.g. p. 115 in Ref. (16)]. People in trusting relationships seek input from one another, and they allow others to do their jobs without unnecessary supervision. Social contexts characterized by relatively continuing relations with changing dependency and some unpredictability provide a breeding ground for trust [p. 77 in Ref. (16)].

In the present study, we have as far as possible included items from Copenhagen Psychosocial Questionnaire (COPSOQ) based on findings from the preceding interview study (10). COPSOQ items have been tested in diverse occupational groups in Denmark and abroad [e.g. (17, 18)] which allows for distributional comparisons. However, some aspects of the psychosocial work environment that are relevant in dentistry are not fully covered by COPSOQ II.

In dentistry a positive working climate is characterized as feeling part of a community at the workplace, and the perception of having a good atmosphere with humour (10). Ambulance drivers have their own special humour, physicians another, and dentists a third. The special jargon within a group or a profession may be regarded as a means to define the group, thereby promoting a sense of community and belongingness in the group (19). Humour is a way to cope with difficulties and to take the heat out of a situation (19, 20). It promotes positive working relationships (19, 21) and is believed to be health promoting (22). Especially when searching for positive factors at work, it is also important to look at other factors than those traditionally included in work environment research, e.g. humour.

While a positive working climate includes the people at work in general, social support primarily concerns relations between peers in a context such as dentistry (23). Social support can be defined as that part of social relations concerning utilization of the network (24). Social support is associated with outcomes such as health and wellbeing and also with work-related outcomes, e.g. job satisfaction (24–28). However, there is a need for development of scales adapted to the specific context of Human Service Organizations (HSO) for the core concepts in work environment models (29, 30). In dentistry, seen as an example of an HSO, it is relevant to study support in relation to the core of the work, which is the handicraft and the relationship with patients (10, 23). Within the context of dentistry questions on interactions with colleagues and on opportunities for advanced training have been asked to measure peer contact as an important job resource (31, 32). In other studies emphasis has also been placed on the opposite, namely feeling alone in the work (33, 34). A scale tested in a previous study on dentists (23) was further developed and validated in the present study.

Until now only sparse knowledge has been available about the conditions that facilitate positive relationships in dentistry, and about the specific aspects of interaction with colleagues that are of special importance as a job resource. Valid and reliable scales are needed to gather deeper knowledge of this important part of work life.

The aim of the present paper was to develop scales measuring aspects of social support, trust and community at the practice and to evaluate psychometric properties of the scales for future research on work as a general dental practitioner.

Materials and methods

The present study is a part of an overall project which will include comparisons of subsamples of dentists working in different organisational forms. A cross-sectional survey of general dental practitioners in Sweden and Denmark was conducted in autumn 2008. Approximately 95% of dentists working in the public or private sectors are members of the Danish and Swedish Dental association registers

(35). In reality, according to the dental associations, almost every actively practicing dentist is a member of one of the associations. The Danish and Swedish Dental associations provided names and addresses for randomly selected samples of general dental practitioners working in each country. Power calculations with alpha 0.05 and beta 0.80 were performed based on data from a study on Danish dental practitioners (23). To achieve sufficient sample sizes, around 21% of the eligible population was included in the sample in Denmark, and 12% in Sweden. The questionnaire and a stamped response envelope were mailed to 1835 dentists. Non-respondents received two reminders, the second one with a new questionnaire and a stamped response envelope. Thirty-one dentists were excluded as they did not practice dentistry (retired dentists, full time teachers at dental schools, and full time administrative dentists). A net response of 68% was obtained, and subsequent data analyses were performed on data from 1226 dentists, 627 from Sweden and 598 from Denmark. A profile of the study population is provided in Table 1.

The complete questionnaire was designed to assess the professional relational work environment in dentistry and its effect on work fulfilment and job satisfaction. It included new questions formulated for the purpose of the present study combined with questions from other questionnaires. New questions were formulated in Swedish and Danish as a parallel process based on comprehensive discussions of cultural and conceptual understanding of the content within the research group.

Table 1. Profile of the study population in Denmark and Sweden

	Denmark (n = 598)	Sweden (n = 627)
Gender	(n = 594)	(n = 616)
Men	28.3%	47.9%
Sector	(n = 572)	(n = 598)
Public	27.8%	49.7%
Private	72.2%	50.3%
Number of dentists at practice	(n = 576)	(n = 607)
1	16.8%	20.6%
2–3	56.3%	33.4%
4–10	26.2%	34.4%
>10	0.7%	11.5%
Weekly work hours with direct patient contact	(n = 567)	(n = 582)
Mean (SD)	29.2 (7.5)	30.0 (7.8)
Years since graduation as a dentist	(n = 593)	(n = 615)
Mean (SD)	21.9 (6.8)	23.7 (11.3)

Sweden and Denmark are both Nordic countries, and the languages are close to each other. Many words are shared, but their exact meaning and usage may differ due to cultural differences as well as differences in organization of dentistry. Members of the research group know both Swedish and Danish. Moreover, completely bilingual colleagues were available for consultancy and a final check-up of the wording. The task was, besides a simple translation of words, also a cross-cultural adaptation of the concepts under study (36, 37). Facing the complexity of this task we decided to do the work ourselves. It was done by the research group comprising people with inside knowledge of the field, as well as people coming from different backgrounds, dentistry, public health, and social science. Our rationale was to assure a common understanding of concepts and thereby enhance the validity regarding cross-cultural and conceptual equivalence.

For the purpose of presentation of the project outside the Scandinavian context, the questionnaire was also translated into English. This translation of questions from Danish and Swedish respectively into English was done in cooperation between the research group and a native English-speaking colleague.

The newly developed questions were tested in an internet-based pilot study in the spring of 2008 on 140 dentists from public as well as private practices in Denmark and Sweden. Participants filled in the questionnaire and were asked to comment on content, wording and intelligibility. The final selection of items was based on distributional analyses and factor analyses of the responses to the pilot study amended with comments from respondents. The resulting questionnaire was then presented for 10 dentists from each country and discussed as to the understanding of the content of items (face validity) and the correctness of language before the final adjustments. Professional help was used for design and for correction of linguistic structure and usage. The questions included in the present study will be described in detail in the following section.

Measures

Social support at work

Four of five questions about social support at work were selected from a study conducted in 2002 on general dental practitioners from private practices

in Denmark (23). Based on an interview study on 'Good Work for dentists' performed prior to the present study (10), a number of new items were developed and tested in the pilot study together with selected items from the 2002 survey. In the final selection of questions it was considered important to cover practical as well as emotional aspects of support. In addition, it was critical that structural factors, such as working in a larger practice with colleagues present, should not be a precondition for answering the questions. Social support in relation to work was assessed by the following statements:

1.1 I discuss difficult treatments with colleagues;
1.2 I discuss problems concerning dissatisfied patients with colleagues;
1.3 In case of a complaint proceeding, I do have a colleague with whom I can discuss it;
1.4 I talk with colleagues about my wellbeing;
1.5 I have opportunity for practical assistance from a colleague if I need it.

The response options were: 'not at all', 'to a low degree', 'to a certain degree', 'to a high degree' or 'to a very high degree'. Questions 1.1–1.4 were taken from a previous study (22) and question 1.5 was formulated for the purpose of the present study.

Community at the practice

Two out of four questions concerning atmosphere and community (questions 2.1 and 2.2) were taken from the scale of social community in the second version of COPSOQ (17). The expression 'at work' was changed to 'practice' in order to target the wording to the context. Items 2.3 and 2.4 were formulated for the purpose of the present study. Item 2.4 substituted the item 'Is there good co-operation between the colleagues at work?' from the COPSOQ II scale for social community.

The atmosphere at the practice was assessed by asking the respondents to state the frequency of the following:

2.1 Is there a good atmosphere between you and your colleagues?
2.2 Do you feel part of a community at your workplace?
2.3 Do you have fun at the practice?

The response options were: 'never/hardly ever', 'seldom', 'sometimes', 'often', 'always/almost always'.

2.4 To what degree do you think good collaborative ability characterizes your practice?

The response options were: 'to a very little degree', 'to a little degree', 'to a certain degree', 'to a high degree' or 'to a very high degree'.

Trust

Four questions concerning trust (Questions 3.1–3.4) were selected from the scales 'horizontal trust' and 'vertical trust' in COPSOQ II (17) and address a workplace level rather than an individual level. These scales have been developed from theoretical considerations and analyses based on a representative sample of 3517 Danish employees (17). Luhmann argues that trust is the opposite to mistrust and at the same time the two concepts work as functional equivalents (16). This implicates a need for distinguishing between the concepts in measurement as also has been preferred for the stress scale in COPSOQ II (17). The aim was here to measure trust rather than mistrust. Three of the COPSOQ questions on trust covered the perception of withholding information in work relations. Based on a factor analysis and theoretical considerations, the questions on withholding information were chosen not to be included in the present paper. Question 3.5 was formulated for the study, and addressed the individual perspective of trust. The four questions included were:

3.1 Do the employees in general trust each other?
3.2 Does the management trust the employees to do their work well?
3.3 Do the employees trust the information that comes from the management?
3.4 Are the employees able to express their views and feelings?

The response options were: 'to a very small extent', 'to a small extent', 'to a certain extent, 'to a large extent' or 'to a very large extent'.

3.5 I have trusted relations with the staff at the practice.

The response options were: 'not at all', 'to a low degree', 'to a certain degree', 'to a high degree' or 'to a very high degree'.

Statistical analyses

Data quality was examined by looking at the percentage of missing data and the distributions on item level. Floor and ceiling effects were defined as the percentage of respondents making use of the respective outer response options.

Principal Component Analysis (PCA) with Varimax rotation was applied including all items for the purpose of empirically based data reduction. For determination of the number of factors to be retained

the Kaiser criterion and inspection of scree plots were used. As the Kaiser criterion tends to overestimate the number of factors, an additional Monte Carlo Parallel Analysis was applied in order to generate eigenvalues based on a random probability for results (38–40). The PCA was subsequently performed for subgroups according to gender, country and employment sector to evaluate the stability of the resulting factors across different subpopulations.

Scaling assumptions of the resulting factors were examined [e.g. the legitimacy of adding up items to generate scores without weighting or standardisation (41)] before scales were established as additive indexes with ranges 0–100. Reliability was addressed through assessment of Cronbach's alpha and intraclass correlation coefficient (ICC) (36, 42, 43). Means were compared across subgroups applying the non parametric tests of Kruskal–Wallis and Mann–Whitney *U* for distributions with unequal variances.

Differential item functioning (DIF) is a way to evaluate if the items relate to the scale in the same way for various subgroups (44) and is part of evaluating construct validity (45). DIF was analysed with respect to gender, nationality and employment sector using ordinal logistic regression methods (46). In each analysis the specific item was the dependent variable with the scale score and the background variable under study as independent predictors. DIF for an item requires a significant association of sufficient magnitude between the item and the background variable when controlling for the scale score (46, 47). In accordance with other studies, a sufficient magnitude for the association required that the background variable explained at least an additional 2% of the item variance (using the difference in Nagelkerke's Pseudo R^2) (47).

Another aspect of construct validity is convergent validity, which evaluates whether a construct (scale) relates to potential outcome constructs as expected based on theory (36). Using Kendall's Tau_b convergent validity for the developed scales was assessed in relation to self-rated health and a range of work satisfaction outcomes.

The study was approved by The Regional Ethical Review Board in Lund, Sweden (H15 501/2008). In Denmark no such permission was required.

Results

The percentage of internal missing values on the items was in general low, with an overall mean of 1.6% [range 0.7–3.8%; (Table 2)]. The highest frequencies were seen for the COPSOQ questions addressing trust (range 2.4–3.8%). There was a considerable ceiling effect for all items, but especially distinct for the COPSOQ items concerning good atmosphere (2.1) and community (2.2).

Table 2. Item characteristics for the total sample

Item		Percent ceiling	Skew	Percent missing	Sample mean (SD)
1.1	I discuss difficult treatments with colleagues	36.9	−0.8	0.7	74.6 (24.9)
1.2	I discuss problems concerning dissatisfied patients with colleagues	22.5	−0.6	1.1	66.4 (26.4)
1.3	In case of a complaint proceeding, I have a colleague with whom I can discuss it	46.0	−1.3	1.5	77.8 (26.7)
1.4	I talk with colleagues about my wellbeing	19.1	−0.3	0.9	59.6 (28.8)
1.5	I have opportunity for practical assistance from a colleague if I need it	35.0	−0.9	0.7	72.8 (26.7)
2.1	Is there a good atmosphere between you and your colleagues?	67.8	−1.5	0.8	90.9 (14.3)
2.2	Do you feel part of a community at your workplace?	64.4	−1.7	0.8	88.8 (17.3)
2.3	Do you have fun at the practice?	37.3	−0.8	0.9	79.4 (19.4)
2.4	To what degree do you think good collaborative ability characterizes your practice?	25.8	−0.9	1.5	75.3 (19.9)
3.1	Do the employees in general trust each other?	26.9	−0.4	3.8	76.0 (19.3)
3.2	Does the management trust the employees to do their work well?	32.3	−0.8	2.4	79.3 (17.6)
3.3	Do the employees trust the information that comes from the management?	15.0	−0.6	3.6	69.8 (19.4)
3.4	Are the employees able to express their views and feelings?	24.8	−0.9	2.3	73.3 (21.3)
3.5	I have trusted relations with the staff at the practice	37.0	−0.8	1.0	79.6 (19.2)

Bartlett's test of Sphericity, Kaiser–Meyer–Olkin test (KMO) and measures of sampling adequacy (MSA) of diagonals showed satisfying conditions and are presented in Table 3 together with results from the overall PCA. The PCA with Varimax rotation resulted in only two factors. The first factor organized nine items and explained 40% of the variance. The factor can be interpreted as *Community with Trust* as it includes items measuring a sense of community as well as trusted relationships. The second factor was interpreted as *Collegial Support.* It organized five items on an individual level and explained 17% of the variance. The Kaiser criterion, inspection of scree plot and parallel analysis all resulted in two factors. The result was also stable for subgroups according to gender, country and employment sector.

We found general support for the legitimacy of summing items without weighting or standardization as illustrated by roughly similar item mean scores and SDs within both scales and corrected item-total correlations above the recommended criteria of 0.4 for all items (Table 2) (48).

A scale for *Community with Trust* was established as an additive index with scores ranging 0–100 and each of the items in the scale given the same weight (Table 4). Floor/ceiling effect was 0.0/5.1%. Cronbach's alpha of the scale (consisting of the nine items) was 0.89 and did not increase if any of the items was excluded from the scale. Corrected item-total correlations ranged 0.57–0.69. For the *Community with Trust* scale no items showed DIF fulfilling our criteria in relation to gender or nationality as presented in Table 5. Sector explained 2.2% additional item variance for the item 'Do the employees trust the information that comes from the management?'. For a given level of *Community with Trust* dentists working in the private sector tended to endorse the item more often than dentists coming from the public sector.

Also a scale on *Collegial Support* range 0–100 was created (Table 6). Floor/ceiling effect was 0.1/8.3%. Cronbach's alpha of the scale (consisting of five items) was 0.84 and did not increase if any of the items was excluded from the scale. Corrected item-total correlations ranged 0.56–0.68. The results concerning DIF are presented in Table 7. For the *Collegial Support* scale no items fulfilling our criteria of DIF were found in relation to gender. The item 'I discuss problems concerning dissatisfied patients with colleagues' showed DIF with respect to nationality, which explained an additional 2.9% of the item variance. At a given level of collegial support, dentists coming from Denmark endorsed this item more often than their colleagues from

Table 3. Statistics from PCA factor analysis with Varimax rotation

Item		Factor 1	Factor 2	Communality
1.1	I discuss difficult treatments with colleagues		**0.835**	0.697
1.2	I discuss problems concerning dissatisfied patients with colleagues		**0.784**	0.626
1.3	In case of a complaint proceeding, I have a colleague with whom I can discuss it	0.233	**0.769**	0.646
1.4	I talk with colleagues about my wellbeing	0.245	**0.664**	0.501
1.5	I have opportunity for practical assistance from a colleague if I need it		**0.765**	0.594
2.1	Is there a good atmosphere between you and your colleagues?	**0.575**		0.593
2.2	Do you feel part of a community at your workplace?	**0.754**		0.590
2.3	Do you have fun at the practice?	**0.740**		0.569
2.4	To what degree do you think good collaborative ability characterizes your practice?	**0.767**		0.595
3.1	Do the employees in general trust each other?	**0.676**		0.464
3.2	Does the management trust the employees to do their work well?	**0.670**		0.483
3.3	Do the employees trust the information that comes from the management?	**0.689**		0.478
3.4	Are the employees able to express their views and feelings?	**0.712**		0.516
3.5	I have trusted relations with the staff at the practice	**0.679**	0.274	0.536
Eigenvalue		5.544	2.337	
Variance explained (%)		39.6	16.7	

Factor loadings < 0.15 not shown.
Major factor loadings marked in bold face.
Bartlett's test of sphericity: significant ($P < 0.001$) with the test statistic: 7109.
KMO: 0.907. Anti Image Correlation Matrix: MSA of diagonals: range 0.81–0.94.

Table 4. Scale characteristics for *Community with Trust* (range 0–100) for subsamples

Group	*n*	Missing (%)	Cronbach's alpha	ICC	Scale mean	Scale SD
All	1144	6.7	0.89	0.46	79.22	13.40
Swedish public dentists	290	2.4	0.90	0.50	74.82*	15.51
Swedish private dentists	265	12.0	0.87	0.43	83.14*	12.05
Danish public dentists	156	1.9	0.88	0.43	79.91*	11.66
Danish private dentists	384	7.0	0.88	0.44	79.76*	12.47
Female dentists	705	5.6	0.89	0.48	78.79	14.04
Male dentists	424	8.4	0.87	0.43	79.92	12.29

*Significant differences among groups at the 0.01 level.

Table 5. Test of DIF in the *Community with Trust* item pool

		Nationality		Sector		Gender	
Item	Wording	ΔR^2	*P*	ΔR^2	*P*	ΔR^2	*P*
2.1	Is there a good atmosphere between you and your colleagues?	0.007	0.979	0.013	0.008	0.004	0.014
2.2	Do you feel part of a community at your workplace?	0.003	0.555	0.005	0.068	0.005	0.009
2.3	Do you have fun at the practice?	0.016	0.000	0.008	0.000	0.003	0.029
2.4	To what degree do you think good collaborative ability characterizes your practice?	0.018	0.000	0.002	0.278	0.004	0.213
3.1	Do the employees in general trust each other?	0.001	0.305	0.001	0.187	0.001	0.281
3.2	Does the management trust the employees to do their work well?	0.000	0.577	0.001	0.565	0.001	0.802
3.3	Do the employees trust the information that comes from the management?	0.002	0.123	**0.022**	0.000	0.013	0.000
3.4	Are the employees able to express their views and feelings?	0.002	0.171	0.012	0.000	0.003	0.054
3.5	I have trusted relations with the staff at the practice	0.009	0.000	0.012	0.000	0.001	0.678

Bold values: significant $\Delta R^2 \geq 0.020$.

Table 6. Scale characteristics for *Collegial Support* (range 0–100) for subsamples

Group	*n*	Missing (%)	Cronbach's alpha	ICC	Mean	SD
ALL	1199	2.2	0.84	0.50	70.36	20.75
Swedish public dentists	293	1.3	0.79	0.43	74.71*	17.39
Swedish private dentists	295	2.0	0.86	0.55	64.20*	23.88
Danish public dentists	171	1.3	0.79	0.42	73.57*	15.88
Danish private dentists	401	2.9	0.84	0.51	70.64*	21.00
Female dentists	733	1.9	0.82	0.48	74.41*	19.01
Male dentists	450	2.8	0.83	0.49	63.78*	21.83

*Significant differences among groups at the 0.01 level.

Sweden. DIF was also found in relation to work sector. Dentists working in the public sector stated 'I discuss difficult treatments with colleagues' more frequently for a given level of collegial support than dentists from the private sector did. Thereby, an additional 2.6% of the item variance was explained by sector.

The overall results from the analyses were consistent for all subgroups. Scale characteristics including results from reliability analysis for subsamples are presented in Tables 4 and 6.

In Table 8, the correlation between the two scales and their associations with other variables are given. The scales for *Community with Trust* and *Collegial Support* were weakly positively correlated with each other. *Community with Trust* was in general more strongly correlated with the outcome variables than *Collegial Support* was. Most remarkable was the strong association between *Community with Trust* and the variable about the perception of having a good work life.

Table 7. Test of DIF in the *Collegial Support* item pool

		Nationality		Sector		Gender	
Item	Wording	ΔR^2	*P*	ΔR^2	*P*	ΔR^2	*P*
1.1	I discuss difficult treatments with colleagues	0.001	0.351	**0.026**	0.000	0.007	0.000
1.2	I discuss problems concerning dissatisfied patients with colleagues	**0.029**	0.000	0.002	0.029	0.002	0.036
1.3	In case of a complaint proceeding, I have a colleague with whom I can discuss it	0.005	0.000	0.004	0.029	0.004	0.003
1.4	I talk with colleagues about my wellbeing	0.008	0.000	0.002	0.105	0.001	0.432
1.5	I have opportunity for practical assistance from a colleague if I need it	0.003	0.550	0.000	0.902	0.003	0.028

Bold values: Significant $\Delta R^2 \geq 0.020$.

Table 8. Kendall's tau_b estimate of bivariate correlations between respectively *Community with Trust /Collegial Support* and the variables: work fulfilment, job satisfaction, having a good work life, self-rated health and having energy left over for private life

Kendall's tau_b	Scale for *Community with Trust*	Scale for *Collegial Support*	Work fulfilment	Job satisfaction	Having a good work life	Self-rated health	Energy left over for private life
Scale for *Community with Trust*		0.28*	0.37*	0.34*	0.44*	0.17*	0.24*
Scale for *Collegial Support*	0.28*		0.16*	0.14*	0.20*	0.10*	0.12*

*Significant at the 0.01 level (two-tailed).

Discussion

The response rate was high for all groups except for the dentists coming from private practices in Denmark, for whom it was moderate. The distribution of age, gender, and sector for respondents corresponds well with data on all general dental practitioners in Sweden (7). A special non-response analysis comparing respondents and non-respondents among dentists from Danish private practices was performed. This analysis showed no significant differences on main variables such as job satisfaction and self-rated health, even though non-respondents from this group were more likely to be males with a managerial responsibility than respondents (49). The DIF analyses confirmed that the items related similarly to the scales independent of gender, nationality and sector. Therefore, we do not find any reason to suspect that the potential under-representation of Danish male private practitioners should cause a bias of the results.

Items covering support, trust, and community at work resulted in development of two new scales: *Collegial Support* and *Community with Trust*. Thereby items from different original COPSOQ scales were merged into one dimension in the present study. The two-component factor solution was clear. The explained variance expresses the cumulative percentage of variance extracted by successive factors (50). When dealing with natural sciences it has been suggested that factor extraction should continue until all extracted factors account for at least 90% of the explained variance (50). In social sciences this criterion is seldom readily applied as the constructs are often less precise (50) as exemplified by factors such as *Community with Trust* and *Collegial Support*. In the context of social science the result of 56% explained variance is considered as satisfactory (50).

Internal consistency of the scales, evaluated using Cronbach's alpha, was found to be high for the total sample as well as for subgroups (51, 52). It makes sense to evaluate coefficient alpha when items – as here – are considered to be effects of an underlying construct and items therefore believed to correlate mutually (42, 53). Streiner argues that alpha should be considered as a prerequisite for internal consistency, but not synonymous with it (52). Moreover, high alpha values as in this study may point to redundancy of items and to a certain risk of having excluded important items (52). However, the ICC values point to a satisfactory homogeneity. All in all, reliability of the scales is considered as good.

The formulation of items was based on theoretical considerations combined with practical experiences from the field of dentistry. Moreover, results from a preceding explorative interview

study were included and the new questions were tested in a pilot study as well as being presented for dentists from both countries before the data collection took place. The overall method of instrument development was in accordance with general recommendations (36). Altogether, we believe that the choice of methods assure that the scales cover the important aspects of the constructs, and thereby enhance the content validity of the developed scales (36).

We consider the parallel procedure in development of questions in Swedish and Danish to be a strength even though it diverges from recommendations of using qualified translators, parallel translations and backward translations (36, 37). The procedure contributed to assure that the content of the scales was relevant and valid in both countries, which could have constituted a challenge if the questionnaire had been developed and tested in one country and afterwards translated for use in another country. DIF analysis is a way to evaluate consistency in the use of items across subpopulations (44, 54). In the present study, three items showed DIF when we used the conservative criterion of 2% (47). For two items the background variable *sector* explained an additional 2.2% and 2.6% respectively of the item variance, and for one item, nationality explained an additional 2.9% of the item variance. Other studies have proposed less conservative cut-points (46) and we therefore consider the found DIF to be of minor importance. The DIF analyses corroborated that translations of items in the scales for *Community with Trust* and *Collegial Support* were culturally equivalent in the Swedish and Danish version. All in all, DIF in relation to the scales under study was considered to be of a magnitude that does not compromise the use of the scales for comparisons between the studied dentists according to gender, nationality or sector.

Construct validation is considered to be an ongoing process of learning more about the construct, making new predictions and studying them (36). It is of special relevance when dealing with hypothetical constructs as, e.g. *Community with Trust* but also *Collegial Support*. The development of the *Collegial Support* scale represents – so far – the first step in a construct validation procedure. The items were partly taken from a previous study and new items were added. Thereby, the construct was developed to include more aspects than initially, and the scale was here tested on another and broader population of dentists.

The correlation between *Collegial Support* and *Community with Trust* was found to be weak. This supports the assumption of the two scales capturing two different constructs.

For *Community with Trust*, the expectations of a positive correlation with, respectively, job satisfaction related outcomes, and self-rated health (convergent validation) were corroborated. Associations between *Collegial Support* and the outcomes were weaker than those for *Community with Trust*. This last result may indicate a substantial difference between the individual perspective related directly to handling the work with patients in collaboration with peers, and the collective perspective including the overall atmosphere at the practice, when pointing to the prediction of positive outcomes in the work environment. Future research should address this through an adaptation of the existing work environment models when dealing with organizational forms such as dentistry.

For HSO, of which dentistry is an example, humour should also be considered in the measurement for theoretical as well as statistical reasons. The item about having fun at work (item 2.3) had lower non-response and a better distribution of the answers including a lower ceiling effect than was the case for the two COPSOQ items from the original community scale (items 2.1 and 2.2).

Collegial organization of the work is a characteristic trait for professions such as dentistry (55). In COPSOQ the items about trust are divided into two scales: vertical and horizontal trust, and are established for analyses at workplace level. In the present context, with measurement and analysis on the individual level, the chosen items about trust were taken from both scales and worked well together. This result may indicate that in professional organizations with small organizational units, it may be less relevant to distinguish between separate scales for vertical/horizontal trust. Still, it may be relevant to incorporate both aspects in the measurement to ensure content validity of the instrument. In the preceding interview study a core condition for having a good work as a dentist was formulated as being part of a positive working climate with mutual trust (10). The finding of one common scale for trust and community items instead of two separate scales corresponds well with this. In the light of the present results also the distinction between trust and community according to the original COPSOQ scales may have to be modified, when the study is carried out on small organizational units as in dentistry.

In future research the scales need to be further tested and validated on different populations and with additional methods. It would be useful to develop shorter versions and to test psychometric properties of the instruments in different populations (of dentists or others, e.g. general physicians). Moreover, testing the instruments at practice level could give important information in relation to concepts such as social capital. The development of these new scales has the advantage of being more specific for the dental profession than any generic instrument can be. On the other hand, a disadvantage is that it will only be possible to compare information at item level with other occupational groups. Generic instruments are especially valuable for the purpose of comparison of different occupational groups. The context of dentistry is characterized by small work units and has, by virtue of being an HSO, a moral dimension in work that is different from e.g. industrial settings. The scales may be useful for obtaining deeper knowledge of factors contributing to high scores of *Collegial Support* and *Community with Trust.*

In conclusion, stability and internal consistency of the scales for *Collegial Support* and *Community with Trust* were considered as satisfactory for the dentists included in the study. It was also stable across different subsamples. Cultural equivalence was corroborated by the DIF analyses. Content validity was considered as good, based on the development approach. All in all, the reliability and validity of the new scales may be considered as good for dentists in Sweden and Denmark.

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