

**Interpersonal problems can predict perceived team collaboration among
physicians: a nationwide 15-year longitudinal study**

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Abstract

Objective: Studies are required that early in the medical career can identify doctors who later experience problems with working in teams, and we therefore aimed to investigate whether interpersonal problems during medical school could predict perceived team collaboration.

Design: Nationwide and longitudinal cohort study of medical graduates in 1993/1994 (T1), who were followed-up 1 (T2), 10 (T3), and 15 (T4) years later. The predictor effects of IIP on perceived team collaboration was controlled for concurrent work-related factors, and their relative impact by means of linear regression models.

Setting: University of Oslo

Participants: The Young Doctor Cohort (N=505, 56% women) from the Longitudinal Study of Norwegian Medical Students and Doctors (NORDOC).

Main outcome measure: Perceived Team Climate and Collaboration (PTC) at T3 and T4.

Results: 206 (53 %) responded at all observational time points. There was a significant increase in PTC from T3 to T4 ($p < 0.001$). Adjusted predictors of PTC at both measuring points were low levels of IIP-Socially Avoidant ($p < 0.01$) and low job stress ($p < 0.01$). The IIP became a relatively more important predictor than work-related stress from T3 to T4 (by higher explained variance). The increase in PTC from T3 to T4 was predicted by a reduction in job stress ($p < 0.01$). There was no gender interaction with any of the predictors.

Conclusions: The Inventory of Interpersonal Problems predicted perceived team collaboration at both observational time points, with increasing relative importance over time

Introduction

Despite an increasing awareness of the importance of team collaboration in health,^{1;2} prospective studies on predictors of perceived collaboration in physicians are lacking. In particular, it would be pertinent if conditions around team collaboration could be predicted from individual factors scored already during medical school. This would enable early identification and specific training of students at risk of team work problems later in their career^{3;4}. Despite attempts to identify factors associated with poor collaboration, there is to our knowledge no studies with a prospective design that have determined risk factors of future problems with team collaboration.

Since it is reasonable to presume that team collaboration is dependent upon interpersonal skills⁵, we would expect interpersonal problems^{6;7} earlier in the career to be a main risk factor for future poor team collaboration.

In order to identify independent effects of such problems it is required to control for concurrent work-related and organizational factors that may impact upon team climate and collaboration. These factors include long working hours, perceived job stress, work position^{5;8} and time of tenure⁹. Studies have also found differences between genders in team collaboration^{5;10}, therefore it is important to control for age and gender.

We would expect individual factors to become more important relative to work-related factors over the years, since the physicians eventually choose their selected medical career and workplaces and leave the stressful mandatory postgraduate training¹¹.

In this nationwide and longitudinal study of Norwegian Medical Students and Doctors (NORDOC) we have included measures on team work climate and collaboration 10 and 15 years after graduation.

On this background we aimed to study the following research questions:

(I) Do interpersonal problems predict future levels of, or change in, perceived team collaboration, even when controlled for concurrent work-related factors?

(II) What is the relative impact of interpersonal problems versus work-related factors over the two periods, and are there any differences between the genders in these predictors?

Methods

Sample

The sample was drawn from the Young Doctor Cohort from NORDOC (The Longitudinal Study of Norwegian Medical Students and Doctors)¹², who received and responded to the questionnaires of Inventory of interpersonal problems (IIP). Students who graduated in 1993 and 1994 from all four medical schools in Norway comprised the original sample (N=631). We use data from the final term of medical school (T1), 1 year later, at the end of the hospital internship-year, (T2), then 10 (T3) and 15 (T4) years later. The mean observation times for T2, T3 and T4 were 1.2 (SD=0.2) 9.5 (0.6), and 14.6 (0.6) years, respectively. The students were provided with extensive questionnaires, consisting of 30-40 pages each. Some additional measurement instruments were randomly distributed to subsamples, and this applied to the IIP, which was distributed to 80% (505/631) of the total sample at either T1 and/or T2. Parts of the sample responded to IIP both at T1 and T2, for these we used the T2 scores. In all 78% (397/505), 56% being women, responded at IIP at one or both of these time points and this comprises the study sample of the present study. Two hundred and six/397 (53%, 54%

women) responded at both T1/T2, T3 and T4, and these were used in the present analyses. The IIP average score was the same for the those who responded at T3 and T4 as for those who did not respond, implying no selection bias with respect to this variable.

Perceived team collaboration (PTC)

The scale was measured at T3 and T4 with four items from a section of perceived working skills in the questionnaire. The respondents were asked to what extent they agreed on the following statements. (1) “There is an open and direct contact between the members of my working group”. (2). “In my working group we help and support each other.” (3) “In my working group we plan and coordinate our efforts”. (4). “In my working group we solve our problems in constructive ways.” Each item was scored on a Likert scale from 1 to 7, and the PTC was computed as the mean score of the four items, ranging from 1 to 7, with a higher score indicating a better team climate. The four elements showed a good internal consistency (Cronbachs alfa T3=0.93, T4=0.92). In order to study the change from T3 to T4, we entered the difference in PTC from T3 to T4 ($PTC_{diff} = PTCT4 - PTCT3$).

Inventory of Interpersonal Problems (IIP)

This is a self-report inventory that describes the types of interpersonal problems that people experience and the level of distress associated with them^{6,7} In the IIP-circumplex inventory there are 8 subscales that measure types of interpersonal problems that might be encountered. They are Domineering, Vindictive, Cold, Socially Avoidant, Non-assertive, Exploitable, Overly nurturant and Intrusive. Because of the low internal consistency for the “Intrusive”-scale, we excluded this variable from the analysis. The “non-assertive” scale was excluded from the analyses at T4 because preliminary analysis showed intercollinearity with the other scales. For further information about these scales, see Appendix.

Work-related variables:

Work position

The physicians were classified into three groups: the first one included hospital physicians, the second only general practitioners (GP), while all others (e.g. researchers, private specialists and unspecifieds) were included in group three. They were numbered 1= hospital physicians, 2= general practitioners, and 3=others. We used the hospital physicians as a reference group, and named the so-called dummy variables GP group and “others” group.

Perceived job stress was measured at T3 and T4 with a modified 32-item version of the Cooper Job Stress Questionnaire¹³), described in details elsewhere (Tyssen et. al 2000¹⁴). A factor analysis showed good internal consistency (Cronbach’s $\alpha=0.92$ at T4). The change in perceived job stress between T3 and T4 was entered as the difference in perceived job stress between T3 and T4.

Number of working hour per week was measured as a continuous variable. The change in working hours between T3 and T4 was entered as the difference in work hours between T3 and T4.

Job tenure was measured continuously as the number of months in the current position. A description of the independent variables is shown in table 1

Please insert table 1 about here

Statistics

The PTC scores were fairly normally distributed and thus suitable for parametric statistics, which was also confirmed by normal distribution of the standardized residuals in the regressions). We compared means at T1 and T2 with paired T-test, and effect size by Cohens' *d*. The sub-scales of the IIP predictor variable were established by using confirmative principal component analysis (varimax rotation), and internal consistency was tested with Chronbach's alpha. We used linear regressions to test the associations between the predictor variables and PTC as an outcome at T3 and T4; and in the multiple regression models, we entered the predictors in two blocks (forced entry), in order to study the relative impact of each of them. The first block consisted of the individual factors and the second block of the work-related factors. Contribution from each block was expressed in explained variance, adjusted R^2 . Collinearity was controlled for by using variance inflation factor. Statistical significance was set at the 0.05 level. IBM SPSS Statistics 19 was used for the analyses.

Missing data

Nine individuals had one missing item for one or two of the IIP-scales. For these, we replaced the missing score by the mean score of the completed items. For the 32-item stress instrument, 21 had missing values at T3, 24 had missing values at T4. For these, values were replaced by the mean score of the completed items when 25% or fewer of the items were missing. For working hours, 5 and 10 individuals was missing this at T3 and T4 respectively. For these, working hours was estimated by their work percentage, based on the mean of other individuals with the same work percentage.

Results

Levels and course of perceived team collaboration

The PTC level means at T3 and T4 were 4.85 (SD=1.25) and 5.23 (SD=1.16), respectively, (paired $t=0.22$ $p=0.001$) Cohens' d was 0.06. There was no significant sex difference.

Please insert table 2 about here

Univariate predictors

At T3, the univariate significant predictors of high PTC were: low levels of IIP-domineering: beta = -0.43, $p=0.033$, (-0.82 to -0.04), low IIP-vindictive: beta = -0.69, $p=0.001$, (-1.08 to -0.31), low IIP-cold: beta = -0.34, $p=0.018$, (-0.62 to -0.06), low IIP-socially avoidant: beta = -0.45, $p=0.001$, (-0.72 to -0.18), and low job stress: beta = -0.65, $p<0.001$, (-0.94 to -0.35).

At T4 the significant univariate predictors for high PTC were: low IIP- domineering ($p=.015$), low IIP-vindictive ($p<.0001$), low IIP-cold ($p=.013$), low IIP-socially avoidant ($p<.0001$), low overly nurturant ($p=0.006$), and low job stress ($p=0.002$) (Table 2)

Multiple regression analysis

In the first block at T3, the only significant predictor was low level of IIP-socially avoidant: beta = -0.46, $p=0.021$, (-0.87 to -0.04) sWhen the second block was included, high job stress in addition became a significant predictor of PTC: beta = -0.65, $p=0.002$, (-0.94 to -0.35) .The explained variance increased from adjusted $R^2 = 0.07$ to adjusted $R^2 = 0.12$ with the second block.

At T4 (table 2), low level of "socially avoidant" ($p = .004$) was a significant predictor in the first block, while in addition low job stress ($p = .033$) predicted high PTC when we included the second block. The explained variance increased from adjusted $R^2 = 0.09$ to adjusted $R^2 = 0.11$ with the second block.

Predictors of increase in PTC from T3 to T4 (PTCdiff)

The only significant adjusted predictor of PTCdiff was a reduction in job stress: $\beta = -0.97$, $p < 0.001$, (-1.44 to -0.50)

Sex differences

We computed interactions with gender for all predictors in all analyses, but none of these proved to be significant. This means that the predictors are of similar importance for both genders.

Discussion

A major finding was that low levels of interpersonal problems "social avoidance" independently predicted perceived team collaboration at both T3 and T4. The levels of perceived team collaboration increased significantly from the 10th (T3) to the 15th (T4) postgraduate year, and this increase was predicted by reduction in job stress. However, the effect size of the increase was small. Over the years interpersonal problems became relatively more important predictors of perceived team collaboration on the expense of work-related stress.

The average total IIP score was 0.83, which is high for a non-clinical sample, and indicates, in fact, that medical students and young doctors have more interpersonal problems than the general Norwegian population¹⁵.

Being socially avoidant predicted lower perceived team climate at the 10th and 15th year after graduation. Persons scoring high on social avoidance have difficulties with social interactions, socializing, and feel anxious and embarrassed in presence of others. Interestingly, such characteristics measured at an undergraduate/postgraduate level were risk factors for problematic perceived team work as long as ten to fifteen years later, even when controlled for concurrent work-related factors. The inventory of interpersonal problems may thus be used for screening of those that may need support and intervention in order to adapt to well-functioning team collaboration. Several clinical studies have explored on modification by therapy of interpersonal problems, such as group therapy interventions and psychotherapy¹⁶⁻¹⁸, that might be useful in this very sense, but this should be further elaborated in medical students. Interpersonal problems may also be useful as part of the screening procedure for selection to medical school. And those high on social avoidance might be offered extra attention and support during their undergraduate years.

The only work-related factor that was a significant predictor in our models at both time points was work stress. This is in accordance with other research among physicians that show a negative impact of work-related stress factors on performance^{19,20}, and we may presume this to be the case also with respect to team collaboration. Nevertheless, in the first two models, job stress was measured concurrently and we do not know anything about direction of effects or causality. Studies have also shown that being part of a well-functioning team decreases

stress²¹. More importantly therefore, the only work-related factor that predicted the increase in PTC in the third adjusted models was reduction in job stress between the 10th and 15th postgraduate year. This finding is in support of a positive effect on increased experienced team collaboration over time by stress reduction. Since we have controlled for individual factors, this might be relevant not only for the most vulnerable individuals, but be a more general team work promoting factor.

At the 10th postgraduate year, relatively more of the variance in our predictor model was explained by work-related factors, whereas in the 15th postgraduate year relatively more was predicted by interpersonal problems. This was in keeping with our hypothesis, and is also supported by the notion that the relationship between personality and performance have been shown to increase through medical training²².

It has previously been identified a decline in job stress in this cohort over the first 10 postgraduate years that seem to endure at the 15th postgraduate year¹¹, and this is also concurring with our hypothesis about a decline in the importance of work-related factors. Thus, a lower degree of stress may help the physicians to induce better perceived team collaboration at the work places²². As one gets more experience, one also gets more demanding tasks, such as leading surgeries or be senior resident in the emergency room. This might enhance team skills, and give a more positive view on the work environment.

We found no gender differences in our Norwegian sample, neither with respect to levels of perceived climate and cooperation nor to the significant predictors of such. This is surprising since a recent Swedish study found that female nursing and medical students were open to working in team than their male colleagues¹⁰. This may reflect fairly equal gender roles

among Norwegian medical doctors when it comes to working in a group of health professionals.

In our study, we found no difference due to being a general practitioner or a hospital physicians. A previous cross-sectional study found that general practitioners perceived better team climate than other health workers in primary care²³, and a Norwegian study found that the communication atmosphere was more selfish and competitive among hospital physicians than non-hospital physicians⁸. Only a small number of GPs participated in this study, which might explain why we did not find any difference in perceived team collaboration between the groups. We also did not find that long working hours lead to worse perceived team collaboration. This may reflect a relatively homogeneous work-life in Scandinavian countries, with little variance in work schedules and work hours per week.

Finally, we did not find that job tenure correlated with perceived team climate, despite that research among other professions has shown that the longer a team stay together, the better their results are²⁴. One reason for this may be that newcomers might easier get more support at the workplace compared with those who have been there for several years..

Strengths and limitations:

A major strength of our study is the longitudinal designed study of a nationwide representative sample. To our knowledge this is the first long term prospective study of team collaboration among doctors. Further, we have a relatively high response rate for longitudinal samples of physicians^{25 26}, which supports the original and external validity of our findings. It also increases the reliability of our data and validity of our findings that we have measured perceived team collaboration at two time points of the career, and with some years apart.A

limitation is that the self-report measure of team climate and collaboration does not measure the real functioning and climate of the team. Nevertheless, for the individual doctors, dissatisfaction with the team may be an overly important stress factor, as this has been shown with regards to other subjective work-related⁸. Another limitation is that our outcome measure has been poorly validated in other samples, as it was constructed for this study. However, the similarities with other instruments such as the Team Climate Inventory^{27;28}, and the internal validation of our measure proves its significance.

Conclusion

Higher levels of interpersonal problems at medical school/first postgraduate year predicted lower levels of perceived team collaboration in the 10th and 15th year after graduation, even when controlling for work related factors. It also seemed that such individual interpersonal problems became more important over the years of the career. Therefore, early intervention should focus on factors that may reduce interpersonal problems, such as fostering of team collaboration at medical school and maybe even psychotherapy for some individuals. One should also consider interpersonal skills when making admission selections to medical school.

Appendix:

Additional information about the Inventory of Interpersonal Problems (IIP):

In our study, IIPs were collected from 152 subjects at T1 and 245 at T2. We originally had a 64-item scale of IIP items. As 17 of the 64 items were not among those included in the eight sub-scales of Alden, only 47 items were available to create the same eight scales as described by Alden et al.,⁷. Thus each sub-scale would consist of four to eight items. Because of the low internal consistency for the “Intrusive”-scale, we excluded this variable from the analysis. The “non-assertive” scale was excluded from the analyses at T4 because preliminary analysis showed intercollinearity with the other scales.

	Example of item	No of items	Cronbach's alpha
Domineering	I try to control other people too much	6	0.69
Vindictive	I want to get revenge against people too	7	0.69
Cold	It is hard for me to get along with people	4	0.73
Socially avoidant	It is hard for me to ask other people to get together socially with me	5	0.75
Nonassertive	It is hard for me to be tell a person to stop bothering me	7	0.83
Exploitable	I let other people take advantage of me too much	4	0.71
Overly nurturant	I try to please other people too much	8	0.78
Intrusive	It is hard for me to stay out of other	4	0.45

	people's business		
Total IIP	Average of all items	47	0.83

Table 1

Variable	Range T3	Mean (SD) T3 or N(%)	Range T4	Mean (SD) T4 or N(%)
Gender (n = female)		113 (54.9%)		113 (54.9%)
Age	33-47	36.9 (2.3)	38-52	41.9 (2.4)
Job tenure (in months)	0-120	25.6 (23.0)	1-190	47.9 (39.2)
Working hours (per week)	15-70	44.0 (7.5)	18-97	40.7 (9.2)
Job stress	1.1-3.8	2.10 (0.57)	1.00-3.59	1.95 (0.48)
Hospital doctors		142 (68,9%)		134 (65,0%)
General practitioners		45 (21,9%)		47 (22,9%)
Other work position**		19 (9,2%)		25 (12,1%)
Domineering*	0-2	0.50 (0.44)		
Vindictive*	0-2.43	0.52 (0.43)		
Cold*	0-3.25	0.58 (0.61)		
Socially avoidant*	0-2.80	0.71 (0.62)		
Nonassertive*	0-3.43	1.24(0.71)		
Exploitable*	0-3.50	1.33 (0.82)		
Overly nurturant*	0-2.63	1.03 (0.56)		

**IIPs were measured at T1 or T2*

***Others consist of researchers private specialists and subjects who replied “other unspecified work position”.*

Table 3 – Perceived Team Collaboration at T4

Blocks entered in the multivariate analyses N= 206	Univariate analysis		Model 1 (Adjusted R ² = 0.09)		Model 2 (Adjusted R ² = 0.11)	
	Crude beta	95% CI	Unadjusted beta	95% CI	Unadjusted beta	95% CI
<i>Block 1: Individual factors</i>						
Age	0.01	(-0.04 to 0.06)	0.02	(-0.04 to 0.07)	0.01	(-0.04 to 0.06)
Sex (1= female 2 = male)	-0.10	(-0.42 to 0.23)	-0.00	(-0.32 to 0.31)	-0.11	(-0.44 to 0.22)
Domineering	-0.45**	(-0.81 to -0.09)	-0.10	(-0.52 to 0.32)	-0.04	(-0.46 to 0.39)
Vindictive	-0.73*	(-1.08 to -0.37)	-0.44	(-0.95 to 0.07)	-0.42	(-0.93 to 0.09)
Cold	-0.33**	(-0.59 to -0.07)	0.23	(-0.15 to 0.60)	0.31	(-0.07 to 0.69)
Socially avoidant	-0.55*	(-0.79 to -0.30)	-0.53*	(-0.88 to -	-0.51*	(-0.86 to -0.16)
Nonassertive						
Exploitable	-0.15	(-0.35 to 0.04)	0.15	(-0.13 to 0.44)	0.16	(-0.14 to 0.45)
Overly nurturant	-0.40*	(-0.68 to -0.12)	-0.27	(-0.69 to 0.15)	-0.29	(-0.72 to 0.13)
<i>Block 2: Work-related factors</i>						
GPs vs hospital physicians	0.08	(-0.30 to 0.47)			-0.15	(-0.64 to 0.34)
Others vs hospital physicians	-0.09	(-0.58 to 0.40)			-0.21	(-0.72 to 0.31)
Job stress	-0.51*	(-0.84 to -0.19)			-0.39**	(-0.75 to -0.03)
Job tenure	0.00	(-0.00 to 0.01)			0.00	(-0.00 to 0.01)
Working hours (pr.week)	-0.00	(-0.02 to 0.02)			-0.01	(-0.02 to 0.01)

* $p < 0.01$.

** $p < 0.05$

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