

Original Article

Perceived Working Conditions and Sickness Absence - A Four-year Follow-up in the Food Industry

Anna E SIUKOLA¹, Pekka J VIRTANEN¹, Tiina H LUUKKAALA² and Clas-Håkan NYGÅRD¹¹School of Health Sciences, University of Tampere²Pirkanmaa Hospital District and School of Health Sciences, University of Tampere, Tampere, Finland

Objectives: To analyze the association between changes in perceived physical and psychosocial working conditions and change of sickness absence days in younger and older (< 50 and ≥ 50 years) food industry employees.

Methods: This was a follow up study of 679 employees, who completed working conditions survey questionnaires in 2005 and 2009 and for whom the requisite sickness absence data were available for the years 2004 and 2008.

Results: Sickness absence increased and working conditions improved during follow-up. However, the change of increased sickness absence days were associated with the change of increased poor working postures and the change of deteriorated team spirit and reactivity (especially among < 50 years). No other changes in working conditions were associated with the changes in sickness absence.

Conclusion: Sickness absence is affected by many factors other than working conditions. Nevertheless, according to this study improving team spirit and reactivity and preventing poor working postures are important in decreasing sickness absence.

Key Words: Occupational exposure, Social environment, Sick leave, Food industry, Follow-up studies

Introduction

The incidence of sickness absence is high at workplaces with poor physical working conditions [1,2]. The effect of a heavy physical workload is especially strong in combination with poor psychosocial conditions, such as low job control [3]. Research has also shown that many features of psychosocial working conditions (decision authority, adjustment latitude, job control, job complexity, supervisors' support and unfairness) are related to sickness absence [4-14].

Although much is known about factors associated with sickness absence, little is known about the relationship between changes in sickness absence and changes in working conditions.

Vahtera et al. [15] found that negative changes in the psychosocial work environment increased sickness absence and concluded that favorable changes in job control, job demands and social support at work might reduce the risk of sickness absence. Head et al. [16] reported that adverse changes in the psychosocial work environment predicted the incidence of long (> 7 days) but not short (≤ 7 days) spells of sickness absence; if the decision latitude or work demands increased, then the risk for long spells increased, whereas an increase in social support at work decreased the risk. By contrast, to the best our knowledge, there are no similar studies relating changes in physical working conditions to sickness absence.

The present study was conducted in a food industry com-

Received: May 23, 2011, **Revised:** October 13, 2011

Accepted: October 16, 2011, **Available online:** November 1, 2011

Correspondence to: Anna E SIUKOLA

School of Health Sciences

FI-33014 University of Tampere, Finland

Tel: +358-40-1901678, **Fax:** +358-3-3551-6057

E-mail: anna.siukola@uta.fi

pany. This industry is known for its demanding physical conditions due to the way in which production is organized (assembly-line work, repetitive and monotonous movements, hectic pace of work) and the physiological workload (much standing, bending, carrying or lifting of heavy loads) [17,18]. The work also includes high environmental exposure (heat, cold, draught, humidity, dust, odors).

The impacts of the working conditions depend on age [19]. Work ability also decreases with age [20,21]. There are, however, no studies relating age to the association between changes in working conditions and sickness absence. Nevertheless, it is known that short spells of absence are more common in young workers, while older ones have more long spells [22-24], and that sickness absence days also commonly increase with age [25].

The main aim of the present study was to investigate whether changes in perceived physical and psychosocial working conditions over a period of four years are associated with changes in sickness absence and whether these associations differ by age.

Materials and Methods

The study was carried out in a Finnish Food Industry Company employing about 2,000 people [26]. Survey questionnaires on physical and psychosocial working conditions, health and work ability were distributed to all employees in February 2005 and again in February 2009. The employees completed the questionnaires during working hours. Responses given in the beginning of the year clearly reflect past experiences (i.e., the conditions during previous year) of the employees rather than their expectations regarding future conditions. Sickness absence data for the years 2004 and 2008 were therefore used in determining whether changes in the working conditions are accompanied by changes in sickness absence.

Measurement of working conditions

The aspects of psychosocial working conditions studied were the incentive system, the task and goal system, incentive and participative leadership, team spirit and reactivity, task value, extrinsic incentives and opportunities to influence one's work [27]. The incentive system was evaluated using five propositional statements (sample item: "Personnel have an opportunity to develop their own work and work environment in this company"), the task and goal system with four propositions (sample item: "This company has clear and logical/realistic goals"), incentive and participative leadership with six propositions (sample item: "My manager pays attention to my sugges-

tions and wishes"), team spirit and reactivity with six propositions (sample item: "My colleagues discuss improvements to the work and/or the work environment"), task value with three propositions (sample item: "My job includes different and varied tasks"), extrinsic incentives with five propositions (sample item: "I get encouraging feedback on my work") and opportunities to exert influence with five propositions (sample item: "The organization allows its employees an opportunity to set their own goals"). Responses to each statement were given on a 5-point Likert scale with 1 = "totally disagree/very probably not" to 5 = "totally agree/very probably". Mean scores on each of the seven sum variables (ranging from 1.00 to 5.00) were used in the analysis of results. The Cronbach's alphas for the variables ranged from 0.71 to 0.89.

Physical working conditions were assessed with questions adopted from the Quality of Work Life Survey by Statistics Finland [28]. There are six single items about environmental exposure (draught, noise, heat, cold, poor indoor climate and poor lightning) and two questions about biomechanical exposure (repetitive movements and poor work postures). A 5-point Likert rating scale with values ranging from 1 = minimal inconvenience to 5 = extreme inconvenience was used for each item.

Measurement of sickness absence

The data on sickness absence (2004 and 2008) were obtained from the personnel register of the company. Sickness absence was measured in days and was related to the "time at risk", which was obtained by subtracting the time absent from work for reasons other than sickness during the year from the duration of the job contract. The measure of "time at risk" is a person-year, which is 1.0 if a person has been at work for a whole year. Accordingly, sickness absence days were the rates per person year adjusted for "time at risk". Employees were included in the study if they had a time at risk of more than six months in both 2004 and 2008.

Study subjects

A total of 1,201 employees responded in 2005 and 1,398 in 2009, and all provided written consent to the linking of the survey data to the sickness absence register. The response rates were 60% and 72%, respectively. However, only 734 individual employees responded to both surveys. This number reduced to 679 after exclusion of those with less than six months time at risk. Data on age, gender and occupational status (blue-collar or white-collar workers) were also obtained from the personnel register.

The sample included 64 % (n = 433) women and 70 % (n = 475) blue-collar employees, and the mean age in 2004 was 41

years (standard deviation 9.7), ranging from 20 to 62 years.

The study was approved by the Ethics Committee of the Pirkanmaa Hospital District.

Statistical analysis

Changes in the working conditions were calculated by subtracting the values of the year 2005 from the values of the year 2009. The change in sickness absence was calculated by subtracting the rate for 2004 from the rate for 2008. The changes were analyzed by linear regression. The multifactor model comprised age, gender, occupational status, changes in working conditions, changes in sickness absence and baseline level of working conditions and sickness absence, and the variables were introduced by the enter method. The sets of psychosocial factors and physical factors were analyzed separately. Separate analyses were also conducted for younger (< 50 years, $n = 517$) and older (≥ 50 years, $n = 162$) employees with age excluded as an adjusting factor. In addition, analyses with pooled variables of psychosocial factors and physical factors in the same model were conducted for all study subjects and by age group. Adjusted R square values were computed to adjust for the number of explanatory terms in a model. Variables were summarized in the form of means and standard deviations or as medians with ranges. The differences between baseline and follow-up were assessed by paired t-tests or by the Wilcoxon rank sum test. All statistical analyses were performed using SPSS version 19.0 (SPSS Inc., Chicago, IL, USA).

Results

The data for all employees (Table 1) show that sickness absence increased significantly ($p < 0.001$) from 2004 to 2008. The psychosocial working conditions improved on all indicators. Biomechanical exposure decreased with regard to repetitive and monotonous movements and poor working postures, and decreases in environmental exposure indicators were observed for draught, noise and cold working conditions.

Sickness absence increased from 2004 to 2008 in the younger group (< 50 years) from 6.0 to 8.0 ($p = 0.002$) and in the older group (≥ 50 years) from 6.0 to 12.5 ($p < 0.001$) days per person-year (Table 1). Changes in psychosocial factors did not differ by age group, even though there was a statistically significant improvement in team spirit and reactivity in the younger group, which was not found to be significant in the older respondents. Changes in the physical working conditions were positive or neutral in both groups, with the exception of increased exposure to poor lightning in older employees. Significant improvements were seen in draughty and cold envi-

ronmental conditions and in repetitive and monotonous movements and poor working postures by the younger group and in noise by the older group. Overall, in the older group there were fewer changes in physical factors than in the younger respondents.

Table 2 presents the results of the age, gender, sickness absence days adjusted linear regression models for physical and psychosocial factors separately (Model 1) and pooled (Model 2). Of the physical factors, only the change in poor working postures was associated with the change in sickness absence days: an increase in the change of poor working postures was accompanied with an increase of the change of sickness absence (t -value = 2.92, p -value = 0.004) (Model 1). Among the psychosocial factors, an association was observed between change in sickness absence and change in team spirit and reactivity, but was not statistically significant ($p = 0.084$). Results were parallel with those above, when the multivariate analyses were performed with pooled psychosocial factors and physical factors (Model 2). The association between the change of poor working postures and the change of sickness absence was still statistically significant ($t = 2.18$, $p = 0.029$).

In the age stratified analysis (Table 2), no new associations were revealed. The finding concerning poor working postures survived in both age groups ($t = 2.20$, $p = 0.028$, for younger; and $t = 2.06$, $p = 0.042$, for older employees). The change of decreased team spirit and reactivity was associated with change of increased sickness absence among the younger workers ($t = -2.22$, $p = 0.027$).

In the pooled model (Model 2) the association between the change in poor working postures and the change in sickness absence remains in the age stratified analysis for the younger group ($t = 2.06$, $p = 0.040$), but not for the older group ($t = 0.96$, $p = 0.342$). The association between the change in team spirit and reactivity and the change of sickness absence also remained and was statistically significant ($t = -1.99$, $p = 0.047$) in the younger group in the pooled model. In addition, according to the pooled analysis in the younger employees group, if disturbing exposure of cold changed (decreased), sickness absence ($t = -2.05$, $p = 0.041$) changed (increased).

Discussion

According to this four-year follow-up study among the personnel of a food industry company, negative changes in perceived team spirit and reactivity and in perceived poor working postures were associated with increased sickness absence days. The finding regarding team spirit and reactivity applied only to employees younger than 50 years. In addition among them

Table 1. Distributions of sickness absence days, perceived physical and psychosocial factors in the baseline year and in the follow-up year and their statistical differences among all study subjects and among two age groups

	All (N = 679)											
	< 50 years (n = 517)				≥ 50 years (n = 162)							
	Baseline	Follow-up	p-value*	z-value	Baseline	Follow-up	p-value*	z-value	Baseline	Follow-up	p-value*	z-value
Sickness absence days, median (range)	6.0 (0-261)	9.0 (0-319)	< 0.001	-4.90	6.0 (0-261)	8.0 (0-219)	< 0.001	-3.07	6.0 (0-189)	12.5 (0-319)	< 0.001	-4.34
	t-value	df	p-value	t-value	df	p-value	t-value	df	t-value	df	p-value	t-value
Physical factors, mean (SD)												
Draught	2.9 (1.30)	2.8 (1.23)	0.003	-2.94	2.9 (1.28)	2.8 (1.22)	0.003	-2.78	2.8 (1.34)	2.8 (1.25)	0.006	-1.04
Noise	3.2 (1.29)	3.1 (1.25)	0.006	-2.77	3.2 (1.28)	3.1 (1.23)	0.006	-1.80	3.2 (1.33)	3.0 (1.30)	0.072	-2.48
Indoor climate	2.7 (1.10)	2.6 (1.13)	0.100	-1.65	2.7 (1.09)	2.7 (1.14)	0.100	-1.23	2.6 (1.13)	2.4 (1.10)	0.221	-1.23
Lightning	2.1 (0.92)	2.1 (1.00)	0.263	1.12	2.1 (0.92)	2.1 (0.96)	0.263	0.64	2.0 (0.92)	2.1 (1.13)	0.523	1.16
Heat	2.1 (1.19)	2.0 (1.11)	0.731	-0.34	2.1 (1.19)	2.1 (1.10)	0.731	-0.46	2.0 (1.18)	2.0 (1.13)	0.647	0.16
Cold	3.0 (1.28)	2.8 (1.21)	< 0.001	-4.70	3.1 (1.23)	2.8 (1.20)	< 0.001	-4.57	2.9 (1.43)	2.7 (1.26)	< 0.001	-1.43
Repetitive and monotonous movements	3.0 (1.27)	2.9 (1.27)	0.004	-2.92	3.1 (1.28)	2.9 (1.29)	0.004	-3.29	2.8 (1.21)	2.8 (1.20)	0.001	< 0.01
Poor working postures	2.9 (1.26)	2.8 (1.23)	0.028	-2.20	3.0 (1.28)	2.9 (1.23)	0.028	-2.27	2.7 (1.18)	2.7 (1.20)	0.024	-0.40
Psychosocial factors, mean (SD)												
Incentive system	3.0 (0.67)	3.2 (0.73)	< 0.001	6.51	2.9 (0.65)	3.2 (0.73)	< 0.001	5.15	3.0 (0.74)	3.2 (0.72)	< 0.001	4.40
Task and goal system	3.5 (0.56)	3.6 (0.63)	0.048	1.98	3.5 (0.56)	3.7 (0.63)	0.048	1.51	3.6 (0.56)	3.6 (0.64)	0.131	1.42
Incentive and participative leadership	3.5 (0.69)	3.7 (0.78)	< 0.001	6.11	3.5 (0.68)	3.7 (0.76)	< 0.001	5.26	3.5 (0.73)	3.7 (0.83)	< 0.001	3.10
Team spirit and reactivity	3.4 (0.82)	3.5 (0.72)	< 0.001	4.04	3.5 (0.65)	3.6 (0.67)	< 0.001	4.06	3.3 (0.75)	3.4 (0.83)	< 0.001	1.12
Task value	3.4 (0.82)	3.8 (0.80)	< 0.001	13.57	3.4 (0.81)	3.8 (0.80)	< 0.001	12.19	3.4 (0.86)	3.8 (0.82)	< 0.001	5.97
Extrinsic incentives	2.7 (0.74)	2.9 (0.75)	< 0.001	6.37	2.7 (0.72)	2.9 (0.72)	< 0.001	5.59	2.7 (0.79)	2.9 (0.83)	< 0.001	3.06
Opportunities to influence	3.4 (0.71)	4.0 (0.62)	< 0.001	21.10	3.4 (0.70)	4.0 (0.60)	< 0.001	18.93	3.4 (0.77)	3.9 (0.68)	< 0.001	9.39

SD: standard deviation. *analyzed by paired samples t-test and results shown by t-value with degrees of freedom (df) despite of sickness absence days, which were analyzed by Wilcoxon Rank Sum test. Statistically significant results were shown in bold.

positive change, decrease of perceived cold, seemed to be significant for an increase in sickness absence.

However, changes in most of the studied features of physical and psychosocial working conditions were not associated with changes in sickness absence.

Differences by age in the associations between changes of working conditions and sickness absence were rare. This was contrary to our assumption that associations would be found among the older employees in particular, as in an earlier 11-year follow-up study, where municipal workers over 50 were susceptible to work disability [29]. The lack of associations with age in our study could partly be explained by a 'healthy worker effect' due to only those with enough good work ability remaining in the physically demanding food industry jobs.

In sum, only three out of fifteen indicators of working conditions were associated with the change in sickness absence. Moreover, the indicators showing the greatest change (task value and opportunities to exert influence) were unrelated to changes in absence days. Sickness absence is not likely to be strongly associated with features of the working conditions or the work community. The psychosocial environment outside work may also have effects on sickness absence [14]: for example, sickness absence seems to depend on a person's close community [30], as well on the local community in which an individual lives [31].

Although conceptually different, the indicators in our study clearly overlap with those used in the study by Vahtera et al. [15], such as job demands and job control. However, we found weaker associations than Vahtera et al. The reason may be that Vahtera's study was conducted in a different setting (public sector), and there were only healthy employees in the cohort. A specific new finding of our study was the association between a negative change in team spirit and reactivity and change with increased sickness absence. With respect to the much discussed quality of leadership, this study did not confirm the association with sickness absence and was therefore not in agreement with the findings of earlier research [32].

Psychosocial working conditions in general have lately dominated discussions about the reasons for sickness absence, in both research and practical work life. However, Laaksonen et al. [33] found that psychosocial working conditions, such as low job control in women and job dissatisfaction in men, were less significant predictors of sickness absence than the physical conditions (heavy workload and environmental exposures). In our study both aspects of working conditions were emphasized equally, but our findings do not permit us to state whether physical or psychosocial factors are more important. Furthermore, in the realm of physical working conditions, our study

supports the conclusion of Allebeck and Mastekaasa [34] that biomechanical factors (e.g., poor working postures) are more important for sickness absence than environmental conditions (e.g., draughts). The finding in our study that cold working conditions are associated with sickness absence among those below 50 years of age is difficult to explain and might be caused by some relationship between physical and psychosocial factors among younger employees.

The strength of this study is the follow-up design and the combination of the sickness absence register and a questionnaire. A research design in which change is related to change has been rare in the field of sickness absence research. In such a design, the most valid indicator of sickness absence is number of days, as it allows the use of more advanced statistics than the number of spells. A limitation inherent in an observational setting is that it is not possible to predict whether - and what kind of - changes occur in the presumed determinants of sickness absence during follow-up. In the beginning and during the study, the researchers did not become aware of any major and purposeful interventions in the working conditions. The changes, which took place, can be characterized as spontaneous, or due to the routine occupational safety and human resource management of the company.

The follow-up time-frames were different for the surveys (2005-2009) and the sickness absence data (2004-2008). This was considered to be the most reliable approach because employees' responses about their work reflect their past experiences and may therefore be more comparable with sickness absence data for the previous year. In the event that the basic assumption is wrong and that the employees' responses should reflect their experiences from the moment they complete the questionnaire and/or the expectations of the future working conditions, the mismatch of the data-set years could be seen as a limitation of the study. A further limitation was that factors outside work life [30] could not be included in the statistical analyses. Finally, the study was restricted to the food industry. While the exploration of sickness absence and working conditions in other industries was not possible within the scope of the present study, future research with the same design should be done in different industrial settings to test the generalization of the current findings.

In general, improvement in the employees' working conditions was paralleled by an increase in sickness absence. Taking this result strictly, we cannot subscribe to the encouraging statement at the end of many study reports that it is possible to lower the level of sickness absence by paying more attention to the psychosocial and physical working conditions. The findings of this study indicate that sickness absence is mostly caused by

reasons other than physical and psychosocial factors. Sickness absence is associated with many other things, both inside and outside working life. Nevertheless, it might be possible to decrease sickness absence by improving team spirit and reactivity in the work community among employees under 50 years old and by decreasing the physical exposure due to poor working postures among employees of all ages.

Since the opportunities to improve working conditions are more or less limited, depending on the work tasks [35], it might be rewarding, instead of conducting nonspecific intervention projects, to pay attention to the factors identified in this study (team spirit and reactivity and working postures) as an integral part of the schedule to promote employees' work ability and prevent sickness absence [35].

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

This work was supported by the Finnish Work Environment Fund [grant number 109405] and the Competetive Research Funding of the Tampere University Hospital [grant number 9L095].

References

- Voss M, Floderus B, Diderichsen F. Physical, psychosocial, and organisational factors relative to sickness absence: a study based on Sweden Post. *Occup Environ Med* 2001;58:178-84.
- Lund T, Labriola M, Christensen KB, Bültmann U, Villadsen E. Physical work environment risk factors for long term sickness absence: prospective findings among a cohort of 5357 employees in Denmark. *BMJ* 2006;332:449-52.
- Boedeker W. Associations between workload and diseases rarely occurring in sickness absence data. *J Occup Environ Med* 2001;43:1081-8.
- Duijts SF, Kant I, Swaen GM, van den Brandt PA, Zeegers MP. A meta-analysis of observational studies identifies predictors of sickness absence. *J Clin Epidemiol* 2007;60:1105-15.
- Duijts SF, Kant IJ, Landeweerd JA, Swaen GM. Prediction of sickness absence: development of a screening instrument. *Occup Environ Med* 2006;63:564-9.
- Nielsen ML, Rugulies R, Christensen KB, Smith-Hansen L, Kristensen TS. Psychosocial work environment predictors of short and long spells of registered sickness absence during a 2-year follow up. *J Occup Environ Med* 2006;48:591-8.
- Christensen KB, Nielsen ML, Rugulies R, Smith-Hansen L, Kristensen TS. Workplace levels of psychosocial factors as prospective predictors of registered sickness absence. *J Occup Environ Med* 2005;47:933-40.
- Hultin H, Hallqvist J, Alexanderson K, Johansson G, Lindholm C, Lundberg I, Möller J. Low level of adjustment latitude-a risk factor for sickness absence. *Eur J Public Health* 2010;20:682-8.
- North FM, Syme SL, Feeney A, Shipley M, Marmot M. Psychosocial work environment and sickness absence among British civil servants: the Whitehall II study. *Am J Public Health* 1996;86:332-40.
- Ishizaki M, Kawakami N, Honda R, Nakagawa H, Morikawa Y, Yamada Y; Japan Work Stress and Health Cohort Study Group. Psychosocial work characteristics and sickness absence in Japanese employees. *Int Arch Occup Environ Health* 2006;79:640-6.
- Otsuka Y, Takahashi M, Nakata A, Haratani T, Kaida K, Fukasawa K, Hanada T, Ito A. Sickness absence in relation to psychosocial work factors among daytime workers in an electric equipment manufacturing company. *Ind Health* 2007;45:224-31.
- Väänänen A, Toppinen-Tanner S, Kalimo R, Mutanen P, Vahtera J, Peiró JM. Job characteristics, physical and psychological symptoms, and social support as antecedents of sickness absence among men and women in the private industrial sector. *Soc Sci Med* 2003;57:807-24.
- Hanebuth D, Meinel M, Fischer JE. Health-related quality of life, psychosocial work conditions, and absenteeism in an industrial sample of blue- and white-collar employees: a comparison of potential predictors. *J Occup Environ Med* 2006;48:28-37.
- Melchior M, Niedhammer I, Berkman LF, Goldberg M. Do psychosocial work factors and social relations exert independent effects on sickness absence? A six year prospective study of the GAZEL cohort. *J Epidemiol Community Health* 2003;57:285-93.
- Vahtera J, Kivimäki M, Pentti J, Theorell T. Effect of change in the psychosocial work environment on sickness absence: a seven year follow up of initially healthy employees. *J Epidemiol Community Health* 2000;54:484-93.
- Head J, Kivimäki M, Martikainen P, Vahtera J, Ferrie JE, Marmot MG. Influence of change in psychosocial work characteristics on sickness absence: The Whitehall II Study. *J Epidemiol Community Health* 2006;60:55-61.
- Messing K, Tissot F, Saurel-Cubizolles MJ, Kaminski M, Bourguin M. Sex as a variable can be a surrogate for some working conditions: factors associated with sickness absence. *J Occup Environ Med* 1998;40:250-60.
- Savinainen M, Nygård C, Arola H. Physical capacity and work ability among middle-aged women in physically de-

- manding work - a 10-year follow-up study. *Advances in Physiotherapy* 2004;6:110-21.
19. Nygård CH, Huuhtanen P, Tuomi K, Martikainen R. Perceived work changes between 1981 and 1992 among aging workers in Finland. *Scand J Work Environ Health* 1997;23(Suppl 1):12-9.
 20. Tuomi K, Eskelinen L, Toikkanen J, Jarvinen E, Ilmarinen J, Klockars M. Work load and individual factors affecting work ability among aging municipal employees. *Scand J Work Environ Health* 1991;17(Suppl 1):128-34.
 21. Gamperiene M, Nygård JF, Sandanger I, Lau B, Bruusgaard D. Self-reported work ability of Norwegian women in relation to physical and mental health, and to the work environment. *J Occup Med Toxicol* 2008;3:8.
 22. Blank N, Diderichsen F. Short-term and long-term sick-leave in Sweden: relationships with social circumstances, working conditions and gender. *Scand J Soc Med* 1995;23:265-72.
 23. Knutsson A, Goine H. Occupation and unemployment rates as predictors of long term sickness absence in two Swedish counties. *Soc Sci Med* 1998;47:25-31.
 24. Thomson L, Griffiths A, Davison S. Employee absence, age and tenure: a study of nonlinear effects and trivariate models. *Work & Stress* 2000;14:16-34.
 25. Isacsson A, Hanson BS, Janzon L, Kugelberg G. The epidemiology of sick leave in an urban population in Malmö, Sweden. *Scand J Soc Med* 1992;20:234-9.
 26. Virtanen P, Siukola A, Luukkaala T, Savinainen M, Arola H, Nygård CH, Kivimäki M, Helenius H, Vahtera J. Sick leaves in four factories--do characteristics of employees and work conditions explain differences in sickness absence between workplaces? *Scand J Work Environ Health* 2008;34:260-6.
 27. Ruohotie P. Ammatillinen kasvu työelämässä [Professional growth at work]. *Ammattikasvatussarja* 8. Hämeenlinna (Finland): Tampereen yliopiston Hämeenlinnan opettajankoulutuslaitos; 1993. 414 p. Finnish.
 28. Lehto A, Sutela H. Three decades of working conditions - Findings of Finnish Quality of Work Life Surveys 1977-2008 [Internet]. Helsinki (Finland). Statistics Finland; 2009 [Cited 2011 May 17]. 205 p. Available from: http://www.stat.fi/til/tyoolot/tup_en.html
 29. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health* 1997;23(Suppl 1):49-57.
 30. Karlsson N, Skargren E, Kristenson M. Emotional support predicts more sickness absence and poorer self assessed work ability: a two-year prospective cohort study. *BMC Public Health* 2010;10:648.
 31. Virtanen P, Vahtera J, Nygård CH. Locality differences of sickness absence in the context of health and social conditions of the inhabitants. *Scand J Public Health* 2010;38:309-16.
 32. Kuoppala J, Lamminpää A, Liira J, Vainio H. Leadership, job well-being, and health effects-a systematic review and a meta-analysis. *J Occup Environ Med* 2008;50:904-15.
 33. Laaksonen M, Pitkaniemi J, Rahkonen O, Lahelma E. Work arrangements, physical working conditions, and psychosocial working conditions as risk factors for sickness absence: Bayesian analysis of prospective data. *Ann Epidemiol* 2010;20:332-8.
 34. Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 5. Risk factors for sick leave - general studies. *Scand J Public Health* 2004;63(Suppl):49-108.
 35. Böckerman P, Ilmakunnas P. Interaction of working conditions, job satisfaction, and sickness absences: evidence from a representative sample of employees. *Soc Sci Med* 2008; 67:520-8.