Demand, control and support at work among sick-listed patients with neck or back pain. A prospective study

Kjersti Myhre, MD[1], Bjørn Lau, Phd [2,3] Gunn Hege Marchand, MD[4], Gunnar Leivseth, PhD[4], Erik Bautz-Holter, PhD[1,5,] , Cecilie Røe, PhD[1,5]

1 Department of Physical Medicine and Rehabilitation, Oslo University Hospital, Ulleval, Oslo, Norway

2 National Institute of Occupational Health, Oslo, Norway

3 Lovisenberg Hospital, Oslo, Norway

4Faculty of Medicine, Department of Neuroscience, Norwegian University of Science and Technology, Trondheim, Norway

5 Faculty of Medicine, University of Oslo, Oslo, Norway

Correspondence to: Kjersti Myhre, Department of Physical Medicine and Rehabilitation, Oslo University Hospital, Ulleval, P.O.Box 4956 Nydalen, 0424 OSLO, Norway

Fax no: + 47 23 02 74 55

Telephone no: + 47 22 11 90 38

E-mail: kjersti.myhre@medisin.uio.no

Acknowledgements

The study was funded by the Norwegian Research Council. We thank Leiv Sandvik for statistical advice.

Abstract

Purpose

The major aim of this study was to assess changes in perceived demand, control and support at work in neck and back pain patients over one year. We also hypothesised that perceived changes in demand, control and support at work were associated with clinical improvement, reduced fear-avoidance beliefs and successful return to work (RTW).

Methods

Four hundred and five sick-listed patients, referred to secondary care, with neck or back pain were originally included in an interventional study. Two hundred twenty-six patients who reported perceived psychosocial work factors at both baseline and one-year follow-up were later included in this prospective study.

Results

The quantitative demand score was the only work-related subscale that showed a change, with a one-year score significantly lower than the baseline score ($p= 0.03$). Additionally, the regression analyses showed that decreases in fear-avoidance beliefs about work were consistently related to decreases in demand and increases in control, whereas decreases in disability, anxiety and depression were related to increases in support subscales.

Conclusions

The perception of demand, control and support is fairly stable over one year in patients with neck and back pain, despite marked improvement in pain and disability. Disability, anxiety, depression and fear-avoidance beliefs about work were significantly associated with the perception of work environment, whereas neck and back pain were not associated.

Keywords

Sick Leave; Work; Musculoskeletal Diseases; Social support; Psychology

Introduction

Neck and back pain are common ailments, and they are a major source of disability and work absences [1]. The disability from neck and low back pain is multi-factorial and not only related to medical factors [2, 3]. In particular, the importance of working conditions has been emphasised [4]. Although the physical work environment is still important to ensure safety and health at the workplace, the psychosocial work environment is considered to be the most important factor in disability prevention [5]. Several models have been developed to explain the relationship between perceived psychosocial work environment and health problems [6]. One of the most applied models is the job-demand-control-support model (JDCS) developed by Karasek and colleagues [7]. JDCS is a three-dimensional model integrating job demand, decision latitude and social support at work. The model is based on research showing that workers with high-strain jobs and low social support have higher risk of cardiovascular disease [8]. The influences of demand, control and support at work in occupational neck and back pain have attracted considerable interest over the years. Recent reviews suggest that high demand, low control and low supervisor support are probably associated with the presence of neck and back pain [9, 10].

In a previous study, the model was applied to patients on sick leave referred to specialised care due to neck and back pain [11]. The patients perceived higher demands on their physical endurance than the reference population did. Additionally, the perceived demand, control and support were closely associated with fear-avoidance beliefs about work [11]. Although a recent study focused on a Norwegian worker population reported quantitative demand and

decision control to be rather stable over a four-year period [12], we have no knowledge about the perception of demand, control and support over time in patient populations.

The view that a worker's health might influence the perceived psychosocial work environment has recently been proposed in a systematic review [13]. One of the most common mechanisms proposed to explain this "reversed effect" is the "perception" hypothesis. In this hypothesis, changes in worker well-being are suggested to cause an altered perception of the existing work environment, despite an actual unchanged work environment. Unhealthy workers might interpret their work environment more negatively over time due to reduced work capacity or by a selective recall of negative information or situations in individuals with poor affective health. Conversely, healthy workers are more likely to re-interpret their jobs positively over time [13]. In neck and back pain patients, a considerable reduction in pain and disability over the first year following a multidisciplinary intervention is expected [14, 15], as well as reduced emotional distress [14]. In addition, one of the priorities in multidisciplinary treatments is to reduce fear-avoidance beliefs, as high fear avoidance beliefs about work are found to be associated with prolonged sick leave and work loss [16]. Therefore, reduction in fear-avoidance beliefs about work is anticipated [14]. Furthermore, the majority of sick-listed back pain patients generally return to their usual work within one year [17-19].The extent to which the clinical recovery and return to work actually influence the perception of demand, control and support over time in a patient population is not known.

The overall aim of this study was to assess changes in perceived demand, control and support at work in neck and back pain patients over one year. We also hypothesised that changes in demand, control or support at work were associated with clinical improvement, reduced fear avoidance beliefs and successful return to work (RTW).

Methods

Design

This study was part of a randomised controlled multicentre trial of patients on sick leave due to neck and back pain [17]. All variables were measured at baseline and at one-year follow-up. The study was conducted in accordance with the Helsinki Declaration and was evaluated by the Regional Committees for Medical and Health Research Ethics in Southeast Norway (S09024b 2009/1000). It was authorised by the Data Protection for Research at Oslo University Hospital (1207-091208) according to the Norwegian guidelines.

Participants

Patients referred to the neck and back outpatient clinic at Oslo University Hospital (OUS), Ulleval and St. Olavs University Hospital (SOH), Trondheim, Norway, were recruited. All referred patients underwent a standardised medical examination to assess their eligibility for inclusion. To be included in the study, patients had to be between 18–60 years of age, employed and have sick leave duration between one and 12 months. The exclusion criteria were need for surgical treatment, cauda equina syndrome, symptomatic spinal deformities, osteoporosis with fractures, inflammatory rheumatic diseases, pregnancy, legal labour disputes, insufficient Norwegian language skills, cardiac, pulmonary, or metabolic disease with functional restrictions, and DSM-IV-diagnosed mental disorders.

Between August 2009 and August 2011, a total of 3,961 patients were screened for eligibility. The main reasons for ineligibility included not being sick-listed (50%), unemployed (26%), having a disorder suitable for surgical treatment (7%) and a lack of Norwegian language skills (6%). A total of 717 patients were eligible. Of these patients, 312 declined to participate. The remaining 405 patients were included in the intervention study (Figure 1) and were randomised to either work-focused multidisciplinary or clinical multidisciplinary intervention.

Assessments

We recorded age, gender, native language, marital status, smoking status, highest level of education and occupation at baseline. Level of education was categorised into the four groups of primary school (7–10 years), vocational high school or general academic secondary school, college or university for less than 4 years and college or university ≥4 years [20]. Occupation was categorised based on International Standard Classifications of Occupations, ISCO-88 [21]. Based on the ISCO-88 codes, we collapsed the occupations into four categories: low-skilled blue-collar workers (ISCO-codes 8 and 9), high-skilled blue-collar workers (ISCO-codes 6 and 7), low-skilled white-collar workers (ISCO-codes 4 and 5) and high-skilled white-collar workers (ISCO-codes 1, 2 and 3).

Intensity of pain during activity over the past week was reported on an 11-point numeric rating scale (NRS), ranging from 0 (no pain) to 10 (worst possible pain) [22]. Both neck/arm and back/leg pain were reported, and the highest pain rating of the two was used in the analyses. A minimum important change (MIC) of 2.0-2.5 points or 30% improvement on NRS has previously been proposed [22, 23].

The Oswestry Disability Index (ODI) [24, 25] and Neck Disability Index (NDI) [26, 27] are composed of 10 items ranging from 0 to 5. The summed score is presented as a percentage, where 0 represents no disability and 100 represents maximum disability. If more than five items were missing, no total ODI/NDI scores were calculated. A MIC of 30% improvement or 10 points for ODI has been previously proposed [23]. For participants reporting disability due to both NP and LBP, the highest disability score was used in the analyses and referred to as the Disability Index (DI) score.

Level of anxiety and depression were measured by the Hospital Anxiety and Depression Scale (HADS) [28]. This has been found to perform well in screening for symptom severity and

case evaluation of anxiety disorders and depression in somatic, psychiatric and primary care patients, as well as in the general population. The anxiety and depression subscales consist of seven items each, scored on a four-point scale from 0 to 3. Each item is added together, resulting in a subscale score from 0 to 21. One or two missing items in HADS were substituted by the subject's mean value. If more items were missing, no HADS score was computed.

Fear-avoidance was measured using Waddell's Fear–Avoidance Belief Questionnaire (FABQ), where each item was scored on a 7-point Likert scale ranging from 0 (strongly disagree) to 6 (strongly agree). The 7-item FABQ about work (FABQ-W) subscale was chosen in the analyses, as previous studies have shown an association between work-loss and disability [16]. The score ranges from 0 to 42 [16, 29], with high scores denoting strong fear-avoidance beliefs. No missing values were allowed when calculating the FABQ scores.

The General Nordic Questionnaire for Psychological and Social Factors at Work (QPS Nordic)[30] is a questionnaire used to identify psychological and social factors at work. The validity and reliability have been documented previously [31]. The questionnaire was constructed on the basis of common questionnaires on this subject. The total questionnaire comprises questions that are found to be important for health and well-being, independent of specific models. The QPS Nordic items covering the dimensions of demand, control and social support were used in this study. An overview of the subscales and items studied in the present analyses is given in Table 1. QPS Nordic subscale scores were calculated as mean scores of completed items for those completing at least two thirds of the corresponding items. We replaced the total subscale by the average of the patient group if more than one third of the items in a subscale were missing (10 subjects at baseline and 13 subjects at one-year follow-up). In nine subjects, we replaced a complete missing subscale with the average value

to achieve similar N for the nine QPS Nordic subscales. The average values were calculated and substituted in two subgroups, depending on whether the patient had returned to work or not.

In this prospective study of change in work environment, patients were defined as 'RTW' if they returned 100% or partly to their workplace.

Data analysis and statistics

We used paired *t*-tests to compare the average subscale values of the study population at baseline with one-year follow-up. To assess the size of the differences, Cohen's d values [32] were calculated. Cohen's d is defined as the difference between two means divided by the pooled standard deviation. We used the definition of effect sizes as given by Cohen, including small (d=0.2), medium (d=0.5) and large (d=0.8).

A hierarchical multiple regression analysis with each of the nine QPS Nordic subscale change-scores as dependent variables was performed. This was conducted to explore the relationship between the demographic characteristics, changes in clinical and mental health variables, work-focused intervention, RTW-status, and the subscales' change-score. First, we divided possible independent variables into two blocks: *demographic* and *functioning* blocks. Within each block, a series of standard univariate regression analyses were performed, and variables with p-values <0.2 were later included in the multiple regression analyses. In the *demographic* block the following variables were explored: age, gender, educational level, and occupations. Further, in the *functioning* block, we explored RTW-status, occurrence of work-focused intervention, and change-scores of pain intensity, DI, HADS-anxiety, HADS-depression, and FABQ-W. We controlled for age, gender, and the baseline value of the QPS Nordic subscale. All clinical variables were assessed with respect to normal distribution. Low co-linearity was found between the independent variables with tolerance greater than 0.9. The

final multiple regression analysis included variables with p-value < 0.2 from each block. The R^2 value was reported for each step. A statistical significance level of $p<0.05$ was adopted. Statistical analyses were performed using PASW Statistics, version 18 (IBM SPSS, IBM Corporation, NY, USA).

Results

Response-rate

Although we had a total response rate of 74% at one-year follow-up, the QPS Nordic response rate amounted to 56%, due to incomplete questionnaire responses. The characteristics of those patients who completed the QPS Nordic questionnaire are compared to those without a QPS Nordic response are shown in Table 2. Women were overrepresented as respondents (χ^2= 7.5, p=0.006). In addition, respondents were older (t=2.0, p=0.049) and reported higher levels of fear-avoidance beliefs about work (t=2.8, p=0.005) than non-responders. However, the magnitude of these differences was small (Cohen's d 0.20-0.29).

Patient characteristics

Clinical characteristics of the patients at baseline and one year are reported in Table 3.

Changes in demand, control and support subscales at one-year follow-up

The mean *Quantitative demands* score at one-year follow-up was significantly lower than the mean baseline score (p= 0. 025) (Table 4). The magnitude of the difference was rather small (Cohen's d = 0.15), and not present in the proportion of patients who were still 100% sick-listed at one year (p=0.64). No other significant differences were found among the measured subscales.

Determinants for changes in demand, control, and support subscales

The results from the univariate and multiple regression analyses for *Quantitative demands* are presented in Tables 5-7 and are used to illustrate the procedure in the regression analyses. Table 8 shows the final step in the hierarchical multiple regression analyses for all nine

subscales. A positive value in any change-score variable denotes an increased one-year follow-up score compared with baseline score.

In the univariate analyses, age was associated with *Quantitative demands*, *Control of decision* and *Control of work pacing*, while gender was associated with *Quantitative demands* and *Decision demands,* educational level was associated with *Quantitative demands*, *Decision demands* and *Support from co-workers*, and occupation was associated with *Quantitative demands*, *Decision demands*, and *Positive challenge at work*, ($p<0.2$). Demographic variables remaining in the final model (Table 8) were those associated with a subscale ($p<0.2$) after the demographic box multiple regression analyses (only shown for *Quantitative demands*). However, age and gender were controlled for in all multiple analyses. The RTW-status was not associated with any subscale, and work-focused intervention was only significantly associated with increased *Decision demands*.

In the final multiple regression analyses, higher age was inversely associated with change in *Quantitative demands* and *Learning demands*. No other demographic variable showed associations in the final step. A decrease in FABQ-W was significantly associated with a decrease in all *demands* dimensions (Q*uantitative, Decision, Learning*), and accounted for 3% of the variability of the change. A decrease in DI (disability) was associated with an increase in *Positive challenge at work*, which accounted for 2% of the variability. A decrease in HADS-A (anxiety) and FABQ-W were significantly associated with rise in *Control of work pacing*, and explained 8% of the variability. No clinical variables were associated with *Control of decision*. In the support dimensions, a decrease in DI and HADS-A were associated with increased *Support from superior* and explained 5% of the variability. Additionally, a decrease in HADS-D (depression) was associated with an increase in *Support from friends and family*. None of the investigated variables were significantly associated with *Support from co-workers*.

Discussion

In this study, the population reported decreases in perceived *Quantitative demands*, whereas no other changes in perceived psychological and social work factors during one year were reported. Further, the regression analyses showed that reduction in fear avoidance beliefs were consistently related to reduction in demand and increase in control subscales, while reductions in disability, anxiety, and depression were related to increases in support subscales. Inclusion of these variables in the multivariate models explained only 2-8 % of the variability of the subscales' changes.

The psychosocial constructs of demand, control, and support each include several aspects. Job control, as measured by QPS Nordic, refers to the individual's perceived possibility to choose between alternatives in the work situation and decide about work pace, breaks, flexitime, etc. In the same way, job demands refer to the time pressure and amount of work in a job, the demands for quick and complex decision making and attention, and requirement for better education or continuous training. To display the heterogeneous aspects of the job environment, we considered it necessary to examine each of the QPS Nordic subscales separately.

Changes in demand, control and support at one-year follow-up

Our first finding revealed that, except for *Quantitative demands*, eight subscales did not change at one-year follow-up. The QPS Nordic subscale *Quantitative demands*, which measures time pressure and amount of work, is probably a valid measure regardless of occupation or profession in this patient population. In contrast, *Decision demands* (demand for quick and complex decision making and attention) and *Learning demands* (demand for better education and continuous training), might vary among occupations or professions, but probably do not vary over a limited time period at the same workplace. Consequently, we did

not expect the average score of the decision or learning demands to change in a patient population with different occupations.

In previous studies, subjective job control has been found to be highly correlated with objective job control data (based upon expert ratings or average group assessments) in workers [33, 34]. As such, there is less reason to believe that job control will change significantly in the course of one year, even in a patient population. An exception might be with temporary work modifications.

Nonetheless, a previous study found that demand, control, and support subscale scores at baseline were quite similar to the scores of the reference worker population [11]. Furthermore, the rather stable quantitative demand and decision control over time in a Norwegian worker population [12] suggests that we could not expect major changes.

Although stability of quantitative demands and decision control in Norwegian workers over a four-year period [12], the reduced *Quantitative demands* in the present study might be explained by a concurrent substantial decrease in pain, disability and fear-avoidance belief. This may be supported by the "perception" hypothesis, suggesting that "changes in worker well-being may lead to an altered evaluation of existing job characteristics, even though the work environment itself may be unchanged"[13]. However, as this decline was only present in subjects with a successful return to work, it is possible that work modifications with lighter duties or reduced working hours had been introduced and facilitated the return to work. Nevertheless, we must assume that the demand, control, and support reported by patients who were still 100% sick-listed were based on their previous perception of the work environment. Unfortunately, we have no objective information indicating whether the work environment actually had been adapted.

Finally, the feasible changes in the work environment might not necessarily be associated with changes in 'major' work environment factors like demand, control, and support. In

previous prospective studies among workers, other work factors such as role conflict, social climate, empowering leadership, and fair leadership were closely associated to the level of neck and back pain intensity [35, 36]. Therefore, it is possible that the demand, control, and support concepts are not the only important work aspects to study among neck and back pain patients.

Determinants for changes in demand, control and support subscales

The second finding was the different associations between changes in the individual clinical factors and changes in demand, control, and support. A particularly interesting finding was a statistically significant association between reduced fear-avoidance beliefs about work and reduced perceptions of work demands. A reduced fear-avoidance belief about work was also associated with increased control of work pacing. More precisely, this means that if the subjective belief that work is harmful or might cause more pain decreases, this belief is associated with a concomitant decrease in subjective perceived job demands and an increase in control over work pace and breaks. Thus, opportunities for individual beneficial changes in these factors at the work place might seem important for an individual's perception of better coping and adjustment possibilities at work. However, a reduction in the fear-avoidance belief about work was not associated with changes in the perceived positive challenges at work, control of decisions, or social support. Control of decisions and the perception of the work as meaningful and positively challenging are probably more related to the occupation or the organisation's structure and do not change rapidly over time. Although changes in fear-avoidance beliefs about work only explained a small part of the variability in demand and control change scores, it is consistent with previously found cross-sectional associations between work environment and fear-avoidance beliefs about work [11].

We would argue that the most important work environment assessment is provided by the subject, even though we cannot exclude that high level of pain and disability influence the perception of work demand, which subsequently is misclassified [34, 37]. In that case, we would expect pain and disability change scores to be associated with the changes in the work factors. Such influence was only observed for disability regarding positive challenges in work and support from superiors, whereas pain had no significant effect.

Although Airila et al. [38] did not find any association between the trajectory of musculoskeletal pain and job demand, they found close associations between high levels of job demand and poor interpersonal relations and depression. Also, in our study, improvements in anxiety and depression were more closely related to the work factors (i.e., control and support) than to improvement in neck or back pain.

The current study showed that a successful RTW status had no relation to the development of the perceived work environment. Similarly, no additional effect of a work-focused intervention compared to a general multidisciplinary intervention regarding change in work environment was found. Indeed, the unchanged demand, control, and support for the entire study population suggest that none of the interventions influence these factors. This finding suggests that development in demand, control, and support was partly associated with the individual's subjective clinical assessment but not with objective measureable factors such as RTW status or intervention type.

Strength and limitations

The strength of the present study is its prospective design and rather large sample size. By including two regional neck and back clinics and participants with a wide variety of occupations, workplaces, and employers, this study's aspects increase the external validity. A further strength is the combination of demographic, clinical, and work-related information

about the participants. The application of scales from QPS Nordic, a validated comprehensive instrument designed for research into association between work and health as well as documentation of work conditions [31], was also a strength. However, the responsiveness of this instrument has, to the best of our knowledge, not been tested for a neck or back pain population.

Limitations to the present study are a low response rate of 56%, although the analyses showed mainly similar demographic and clinical characteristics in the QPS Nordic responders versus QPS Nordic non-responders.

Additionally, the prospective design of the study contributes to new knowledge regarding perceived psychosocial work environment among sick-listed neck and back pain patients. However, because we include score changes both as dependent and independent variables in the regression analyses, we no longer have a traditional prospective regression analysis. This analysis limits us to associations between the change scores variables and not any causality based on the associations found.

Conclusion

In conclusion, the perception of demand, control and support at work was fairly stable over one year in patients with neck and back pain, despite marked improvement in pain and disability. Disability, anxiety, and depression were more closely associated with the perception of work environment than pain. Decreased fear-avoidance beliefs about work were consistently associated with decreased demands and increased control of work pacing.

Conflict of interest

The authors declare that they have no competing interest.

Figure legends

Figure 1. Patient flow

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Figure 1. Patient flow

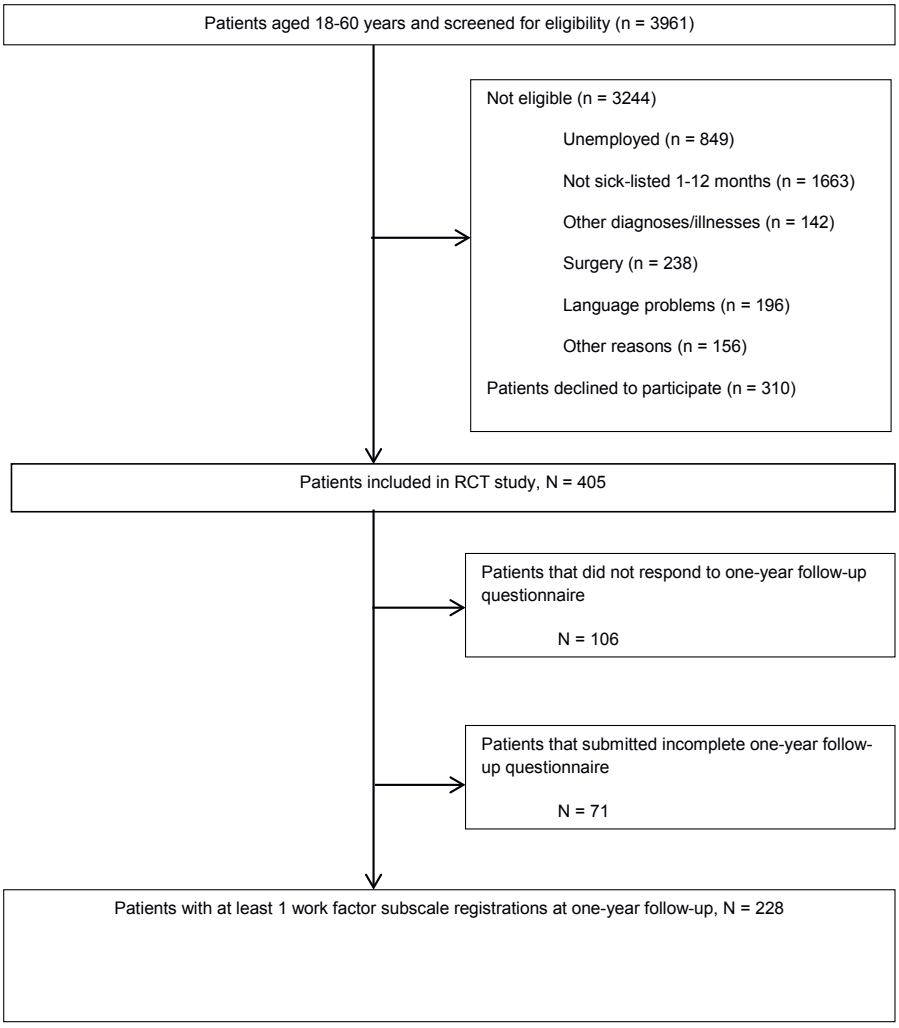

Table 1 Overview of subscales and items from QPS Nordic used in the analysis

Composite subscale	Subscales	Number of items	Total range of scores
Demand	Quantitative demands	4 items	1-5[a]
	Control demands	3 items	1-5 [a]
	Learning demands	3 items	1-5 [a]
Control	Positive challenge at work	3 items	1-5 [a]
	Control of decision	5 items	1-5 [a]
	Control of work pacing	4 items	1-5 [a]
Support	Support from superior	3 items	1-5 [a]
	Support from co-workers	2 items	1-5 [a]
	Support from friends and family	3 items	1-5 [a]

[a]Responses were given along a five-point scale ranging from 1 (very seldom or never) to 5 (very often or always). For each subscale, we reported the sum of the item score divided by the number of items (range 1–5).

Table 2 Baseline description of participants; total numbers in RCT vs. those completing and not completing QPS Nordic questionnaire subscale scores at one-year follow-up

		N (total) = 405				N (QPS Nordic responders) =228				N (Non QPS Nordic responders) = 177			
		N	%	Mean	SD	N	%	Mean	SD	N	%	Mean	SD
Age, years				40.6	9.9			41.4	9.8			39.5	9.9
Gender	Women	188	46			120	53			68	38		
	Men	217	54			108	47			109	62		
Educational level	Primary school	64	16			31	14			33	19		
	Secondary school	228	57			126	56			102	58		
	College < 4 years	68	17			42	19			26	15		
	College > 4 years	42	10			27	12			15	8		
Occupation	Low-skilled blue-collar	70	17			33	14			37	21		
	High-skilled blue-collar	87	22			48	21			39	22		
	Low-skilled white-collar	139	34			82	36			57	32		
	High-skilled white-collar	109	27			65	29			44	25		

RTW status	100% RTW	294	73			169	74			125	71		
	Partly RTW	29	7			20	9			9	5		
	Unsuccessful RTW	82	20			39	17			43	24		
Intervention type	Work-focused	203	50			118	52			85	48		
Smokers		118	30			62	28			56	32		
Use of analgesics		318	80			178	79			140	81		
Physical activity level	Sedentary	49	12			29	13			20	12		
BMI				27	4.8			27	4.9			27	4.8
Pain, NRS (Range 0-10)				6.2	2.2			6.1	2.2			6.3	2.3
DI (Range 0-100)				38.3	13.3			37.5	13.1			39.3	13.5
FABQ-W (Range 0-42)				27.7	10.0			26.4	9.9			29.3	9.9
HADS-A (Range 0-21)				7.1	4.0			6.9	3.9			7.3	4.2
HADS-D (Range 0-21)				5.3	3.9			5.1	3.8			5.6	3.9

BMI (Body Mass Index), DI (Disability Index, maximum of Oswestry Disability Index or Neck Disability Index), FABQ-W (Fear Avoidance Beliefs about Work), HADS-A (Hospital Anxiety and Depression Scale, Anxiety), HADS-D (Hospital Anxiety and Depression Scale,

Depression), NRS (Numeric Rating Scale), QPS Nordic (The General Nordic Questionnaire for Psychological and Social factors at Work, demand, control and social support subscales), RTW (Return to Work)

Table 3 Clinical characteristics of the study population at baseline and one-year follow-up and differences between the two points in time and t test p-value (values for QPS Nordic responders at both time points only)

	Baseline			12 MND			Baseline (t1) – one-year (t2)	
	N	Mean	SD	N	Mean	SD	Mean (t1-t2)	t test p-value
Pain (NRS)	227	6.1	2.2	227	4.8	2.7	1.3	<0.001[a]
ODI	206	34.8	13.0	206	25.6	15.1	9.2	<0.001[a]
NDI	85	37.9	14.2	85	32.6	16.8	5.3	0.001[a]
DI	222	37.5	13.2	222	28.4	16.3	9.1	<0.001[a]
FABQ-W	206	26.5	9.8	206	20.7	12.7	5.8	<0.001[a]
HADS-A	225	6.9	3.9	225	6.1	4.2	0.8	0.001[a]
HADS-D	225	5.1	3.8	225	4.2	4.4	0.9	<0.001[a]

DI (Disability Index, maximum of Oswestry Disability Index or Neck Disability Index), FABQ-W (Fear Avoidance Beliefs about Work), HADS-A (Hospital Anxiety and Depression Scale, Anxiety), HADS-D (Hospital Anxiety and Depression Scale, Depression), NDI (Neck Disability Index), NRS (Numeric Rating Scale), ODI (Oswestry Disability Index), QPS Nordic (The General Nordic Questionnaire for Psychological and Social factors at Work, demand, control and social support subscales)

[a] Significant at 0.05-level

Table 4 Mean values of QPS Nordic subscales scorings at baseline, one-year, and differences between the two points in time and t test p-value (values for QPS Nordic responders at both time-points only)

	Baseline			12 MND			Baseline (t1) – one-year (t2)	
	N	Mean	SD	N	Mean	SD	Mean (t1-t2)	t test p-value
Job demands								
Quantitative demands	225	3.09	0.82	228	2.96	0.91	0.119	0.025[a]
Decision demands	225	3.47	0.78	226	3.56	0.90	-0.085	0.062
Learning demands	225	2.48	0.69	226	2.42	0.70	0.074	0.128
Job control								
Positive challenge at work	225	3.94	0.83	225	3.98	0.87	-0.058	0.236
Control of decision	226	2.65	0.85	224	2.72	0.81	-0.065	0.169
Control of work pacing	226	2.67	1.20	224	2.69	1.14	-0.022	0.724
Job support								
Support from superior	225	3.54	1.08	219	3.61	1.06	-0.076	0.246
Support from co-workers	225	3.79	0.96	221	3.78	0.98	-0.001	0.984
Support from friends	225	4.00	0.97	222	3.92	1.01	0.069	0.227

QPS Nordic (The General Nordic Questionnaire for Psychological and Social factors at Work, demand, control and social support subscales)

[a]Significant at 0.05-level

Table 5 Univariate and multivariate regression analyses with demographic factors as independent variables and *Change of Quantitative Demands* as the dependent variable at one-year follow up for sick-listed patients with neck and back pain

	Univariate analyses			Multiple analysis		
Independent variables	**β**	**95 % CI for β**	**p value**	**B**	**95 % CI for β**	**p value**
Age	-0.107	-0.02 to 0.002	0.11[b]	-0.094	-0.02 to 0.00	0.17
Gender (men vs. women)	0.114	-0.03 to 0.39	0.09[b]	0.080	-0.11 to 0.36	0.29
Education level 2 (vs. level 1)	0.037	-0.15 to 0.27	0.59			
Education level 3(vs. level 1)	-0.123	-0.52 to 0.02	0.07[b]	-0.121	-0.52 to 0.03	0.08[b]
Education level 4 (vs. level 1)	0.070	-0.15 to 0.49	0.30			
High-skilled blue-collar (vs. low-skilled blue-collar)	0.110	-0.04 to 0.47	0.10[b]	0.013	-0.28 to 0.33	0.87
Low-skilled white-collar (vs. low-skilled blue-collar)	-0.103	-0.39 to 0.05	0.12[b]	-0.072	-0.36 to 0.12	0.33
High-skilled white-collar (vs. low-skilled blue-collar)	0.006	-0.22 to 0.24	0.93			

[b] p-value < 0.2

Table 6 Univariate and multivariate regression analyses with RTW status, intervention type, Change in; pain, disability, HADS Anxiety, HADS Depression, and FABQ-W as predictors and *Change of Quantitative Demand* as the dependent variable at one-year follow up for sick-listed patients with neck and back pain, controlling for age and gender

	Univariate analyses			Multiple analysis		
Independent variables	**β**	**95 % CI for β**	**p value**	**β**	**95 % CI for β**	**p value**
Age				-0.179	-0.025 to -0.004	0.006[a]
Gender				0.123	-0.07 to 0.44	0.058[b]
Quantitative demands baseline	-0.394	-0.50 to -0.26	<0.001[a]	-0.367	-0.48 to -0.23	<0.001[a]
RTW status (at work vs. fully sick-listed)	-0.029	-0.34 to 0.21	0.66			
Intervention type (work-focused vs. control)	0.077	-0.09 to 0.33	0.25			
Change in pain	-0.048	-0.05 to 0.02	0.48			
Change in DI	0.077	-0.00 to 0.01	0.26			
Change in HADS-A	0.130	0.00 to 0.06	0.052[b]	0.073	-0.014 to 0.047	0.28
Change in HADS-D	0.031	-0.02 to 0.04	0.64			
Change in FABQ-W	0.189	0.004 to 0.03	0.007[a]	0.161	0.002 to 0.023	0.17[b]

DI (Disability Index, maximum of Oswestry Disability Index or Neck Disability Index), FABQ-W (Fear Avoidance Beliefs about Work), HADS-A (Hospital Anxiety and Depression Scale, Anxiety), HADS-D (Hospital Anxiety and Depression Scale, Depression), RTW (Return to Work)

[a] Significant with p-value < 0.05

[b] p-value < 0.2

Table 7 Stepwise multiple regression analyses with HADS Anxiety, and FABQ-W as predictors and *Change in Quantitative Demands* as the dependent variable at one-year follow up for sick-listed patients with neck and back pain, controlling for age, gender, baseline value and educational level 3

Step	Independent variables	β	95 % CI for β	p value	R^2 (%)
1	Age	-0.109	-0.02 to -0.00	0.12	3
	Gender	0.084	0.09 to 0.36	0.23	
	Educational level 3	-0.097	-0.49 to 0.08	0.17	
2	Age	-0.159	-0.02 to -0.00	0.02[a]	16
	Gender	0.109	-0.03 to -0.38	0.10	
	Educational level 3	-0.039	-0.35 to 0.19	0.56	
	Quantitative demands baseline	-0.366	-0.48 to -0.23	<0.001[a]	
3	Age	-0.176	-0.03 to -0.00	0.007[a]	19
	Gender	0.127	-0.01 to 0.41	0.051	
	Educational level 3	-0.042	-0.35 to 0.18	0.52	
	Quantitative demands baseline	-0.364	-0.48 to -0.23	<0.001[a]	
	Change in FABQ-W	0.184	0.00 to 0.02	0.005[a]	

[a] Significant with p-value < 0.05

Table 8 The final step in the multiple regression analyses for each QPS subscale. Possible predictors were RTW status, intervention type, Change in; pain, disability, HADS Anxiety, HADS Depression, and FABQ-W and *Change of current QPS scale* was the dependent variable at one-year follow up for sick-listed patients with neck and back pain, controlling for age, gender and baseline value

QPS subscale	Independent variables	β	95 % CI for β	p value	R^2 (%)
Quantitative demands	Age	-0.176	-0.025 to -0.004	0.007[a]	
	Gender	0.127	-0.01 to 0.41	0.051	
	Educational level 3	-0.042	-0.35 to 0.18	0.52	19
	Quantitative demands baseline	-0.364	-0.48 to -0.23	<0.001[a]	
	Change in FABQ-W	0.184	0.004 to 0.024	0.005[a]	
Decision demands	Age	-0.090	-0.15 to 0.00	0.18	
	Gender	0.104	-0.04 to 0.32	0.13	
	Decision demands baseline	-0.271	-0.34 to -0.12	<0.001[a]	12
	Intervention type	0.095	-0.05 to 0.30	0.16	
	Change in FABQ-W	0.154	0.00 to 0.02	0.024[a]	
Learning demands	Age	-0.137	-0.18 to- 0.00	0.024[a]	
	Gender	-0.041	-0.17 to 0.16	0.97	30
	Learning demands baseline	-0.517	-0.64 to -0.40	<0.001[a]	
	Change in FABQ-W	0.162	0.00 to 0.02	0.007[a]	
Positive challenge at work	Age	0.04	-0.006 to 0.01	0.52	
	Gender	-0.066	-0.28 to 0.09	0.30	19
	Positive challenge at work baseline	-0.41	-0.47 to -0.25	<0.001[a]	
	Change in DI	-0.165	-0.01 to -0.002	0.008[a]	

Table 8 continued

QPS subscale	Independent variables	β	95 % CI for β	p value	R^2 (%)
Control of decision	Age	-0.034	-0.011 to 0.006	0.58	
	Gender	-0.031	-0.22 to 0.13	0.61	
	Control of decision baseline	-0.455	-0.49 to -0.28	<0.001[a]	27
	Change in DI	-0.124	-0.01 to -0.000	0.068	
	Change in FABQ-W	-0.131	-0.02 to 0.00	0.055	
Control of work pacing	Age	-0.070	-0.02 to 0.006	0.30	
	Gender	-0.026	-0.29 to 0.20	0.69	
	Control of decision baseline	-0.160	-0.32 to -0.03	0.019[a]	13
	Change in HADS-A	-0.163	-0.08 to -0.007	0.021[a]	
	Change in FABQ-W	-0.192	-0.03 to -0.005	0.006[a]	
Support from superior	Age	-0.015	-0.013 to 0.010	0.80	
	Gender	-0.066	-0.35 to 0.09	0.26	
	Support from superior baseline	-0.495	-0.56 to -0.35	<0.001[a]	29
	Change in DI	-0.146	-0.017 to -0.002	0.019[a]	
	Change in HADS-A	-0.129	-0.07 to -0.002	0.038[a]	
Support from co-workers	Age	0.041	-0.008 to 0.016	0.49	
	Gender	-0.049	-0.32 to 0.13	0.42	
	Educational level 3	0.084	-0.08 to 0.50	0.16	27
	Support from co-workers baseline	-0.507	-0.64 to -0.40	<0.001[a]	
	Change in DI	-0.099	-0.014 to -0.002	0.12	
	Change in HADS-A	-0.059	-0.05 to 0.018	0.36	
Support from friends/family	Age	-0.083	-0.018 to 0.003	0.18	
	Gender	-0.094	-0.37 to 0.04	0.12	23
	Support from friends/family baseline	-0.459	-0.51 to -0.30	<0.001[a]	
	Change in HADS-D	-0.175	-0.07 to -0.013	0.004[a]	

DI (Disability Index, maximum of Oswestry Disability Index or Neck Disability Index), FABQ-W (Fear Avoidance Beliefs about Work), HADS-A (Hospital Anxiety and Depression Scale, Anxiety), HADS-D (Hospital Anxiety and Depression Scale, Depression)

[a] Significant with p-value < 0.05