Appendix for article

In this file, we provide additional material for the article:

The impact of work-related psychosocial stressors on the onset of musculoskeletal disorders in specific body regions: A review and meta-analysis of 54 longitudinal studies

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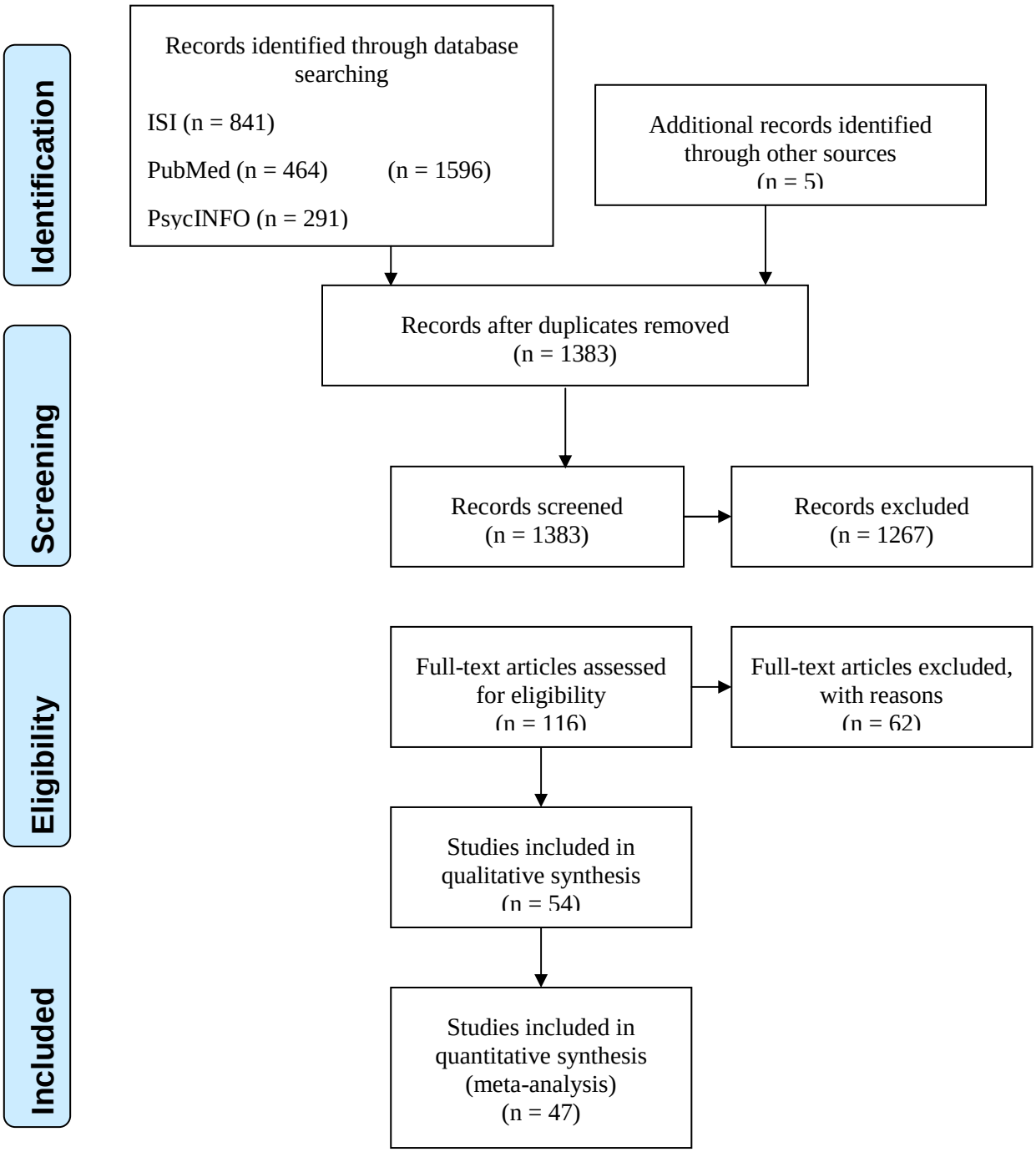
The additional material includes:

- Appendix-Figure-I: Flow diagram of article selection according to the PRISMA statement
- Appendix-Table-I: Categories of psychosocial risk factors

  Appendix-Table-II: Overview of study design and results of the 54 longitudinal studies included in the review
- Appendix-References: References of the 54 studies included in the review



Appendix-Figure-I: Flow diagram of article selection according to the PRISMA statement

Appendix-Table-I: Categories of psychosocial risk factors

Work environment		**Psychological distress (10)**	**Rest category (11)**
1. Social support (40)	**6. Job satisfaction (21)**	Psycho-logical distress (6)	Role conflicts at work (2)
General social support (21)	Job satisfaction (20)	Mental stress (3)	Role clarity (1)
Supervisor support (17)	Low occupational pride (1)	Stress symptoms (1)	Mastery of work (2)
Management support (1)			Harassment at work (2)
Co-worker support (18)	**7. Job strain (14)**		Threats or violence at work (1)
2. Job demands (42)	Job strain (14)		Fair leadership (1)
Job demands (34)	Iso-strain (1)		Empowering leadership (1)
Time pressure (4)			Management quality (1)
Hectic work (4)	**8. Job security (7)**		Fairness of the immediate supervisor's leadership (1)
Work load (2)	Job security (6)		Pleasant and relaxing culture of the work unit (1)
Job intensity (1)	Worry to lose job (1)		Supportive and encouraging culture of the work unit (1)
Hindrances at work (1)			Satisfaction with relation with colleagues (1)
Qualitative requirements (1)	**9. Stressful work (6)**		Satisfaction with relation with senior/supervisor (1)
Job pressure (1)	Stressful work (3)		Social climate (1)
Task difficulty (1)	Feeling stressed at work (2)		Quality of communication (1)
3. Job control (23)	Work causes stress or worries (1)		Commitment to work unit (1)
Job control (12)			Enjoy work (1)
Decision latitude (11)			Satisfaction with own achievements at work (1)
4. Decision authority (18)			Effort-reward imbalance (1)
Decision authority (11)			Reward for good work (1)
Influence at work (5)			Demands higher than competence (1)
Influence on decisions (3)			Active job (1)
Control over work pace (2)			Passive job (1)
Time control (1)			Meaningfulness (1)
Method control (1)			No education at employer's expense (1)
5. Skill discretion (22)			Positive challenges at work (1)
Skill discretion (11)			Predictability of work (1)
Monotonous work (6)			Work centrality (1)
Developmental possibilities (4)			Work dedication (1)
Learn new things (4)			
Repetitive work (1)			

Number in brackets indicates number of studies referring to the psychosocial variable respectively to the main category

Appendix-Table-II: Overview of study design and results of the 54 longitudinal studies included in the review

First author, Publication year, Country of study accomplishment, Duration follow-up	Characteristics of study population regarding work environment and MSDs at baseline, // MSD outcome measure	Psychosocial variables investigated	Most adjusted effect sizes with 95% confidence intervals[1]		Adjustments
NECK/SHOULDERS (N/S)					
Andersen et al. (2003), Denmark, 4 years	3,123 blue and white collar workers from industrial and service sectors responded at baseline; 1,546 at follow-up. Participants had to have a symptom score of < 12 regarding N/S pain at baseline // Self-reported onset of N/S pain + clinical examination to assess pain with pressure tenderness	High job demands Low job control Low social support	Onset N/S pain: **OR = 1.5 (1.3 - 1.8)** OR = 1.2 (1.0 - 1.5) OR = 1.0 (0.9 - 1.3)	Onset N/S pain with pressure tenderness: **OR = 1.7 (1.1 - 2.9)**; Multiv: **OR = 2.0 (1.2-3.3)** OR = 1.3 (0.8 - 2.1) OR = 1.3 (0.8 - 2.1)	Univariate: two other psychosocial factors investigated, repetitivity, force requirements, neck flexion, lack of recovery time, age, gender, BMI, intrinsic effort, physical leisure time activity, level of distress Multivariate: Combined physical exposure, gender, pain pressure threshold, level of distress
Andersen et al. (2007), Denmark, 2 years	4,006 blue and white collar workers from industrial and service sectors responded at baseline; 1,513 free from severe pain formed the study population. Subjects had 'not at all', 'very little' or 'little' been bothered by N/S pain during the 12 months preceding baseline. // Self-reported onset of severe N/S pain during the past 12 months	High job demands Low job control Low social support from supervisors Low social support from colleagues Low management quality Low job satisfaction	HR = 0.9 (0.7 - 1.3) HR = 1.3 (0.9 - 1.8) HR = 1.2 (0.8 - 1.6) HR = 1.3 (0.9 - 1.8) HR = 1.2 (0.9 - 1.6) **HR = 1.9 (1.1 - 3.2)**	Multivariate **HR = 2.1 (1.2 - 3.6)**	Univariate: sex, age, occupational group, intervention group Multivariate: additionally lifting at or above shoulder level, squatting > 5 minutes per hour, educational level, other chronic disease
Feveile et al. (2002), Denmark, 5 years	Employees were drawn from the Central Population Register. 3,990 responded at baseline; 1,895 free of N/S symptoms during 12 months prior to baseline were included in follow-up regarding N/S symptoms. // Self-report of development of N/S symptoms during the previous 12 months	High psychological job demands Low skill discretion Low decision authority High stress symptoms Low social support	♂/♀ ns or 0 ♂/♀ ns or 0 ♂/♀ ns or 0 ♂/♀ ns or 0 ♀ ns or 0; ♂**OR = 1.76 (1.24 - 2.50)**		All psychosocial factors investigated, age, smoking habits, same work, stress, repetitive work tasks, physically hard work, working with hands raised, twisting or bending, sedentary work, heavy lifting
Grooten et al. (2004), Sweden, 4 - 6 years	1,496 blue and white collar employees from a population-based sample included at baseline; 1,213 responded at follow-up and formed the study population. Subjects were excluded if they had sought care in the 6 months preceding baseline for either N/S pain or LBP. // Self-report of care seeking for a new episode of neck/shoulder pain	Few opportunities to learn, develop at work High mental demands Low decision latitude Poor general support Low meaningfulness High job strain High time pressure High degree of hindrances at work	♂RR = 0.6 (0.3 - 1.2); ♀RR = 0.9 (0.7 - 1.3) ♂RR = 0.3 (0.1 - 1.2); ♀RR = 1.2 (0.6 - 2.0) ♂RR = 0.8 (0.4 - 1.4); ♀RR = 1.0 (0.7 - 1.4) ♂RR = 0.8 (0.5 - 1.3); ♀RR = 1.1 (0.8 - 1.5) ♂RR = 0.7 (0.4 - 1.5); ♀RR = 1.1 (0.7 - 1.5) ♂RR = 0.6 (0.1 - 4.0); ♀RR = 0.9 (0.5 - 1.6) ♂RR = 0.7 (0.4 - 1.3); ♀RR = 1.1 (0.8 - 1.6) ♂RR = 1.4 (0.9 - 2.2); ♀RR = 0.9 (0.7 - 1.3)	Multiv: ♂RR = 0.4 (0.2 - 0.9) Multiv: ♂RR = 0.3 (0.1 - 1.1) Multiv: ♂RR = 1.0 (0.4 - 2.2) Multiv: ♂RR = 1.6 (0.9 - 2.6)	Univariate: age, previously sought care for N/S pain Multivariate: age, previously sought care for N/S pain, have ever smoked, BMI, physical activity, night work/shift work, solitary work, manual handling ≥ 50 N ≥ 60 min/day, high energy expenditure ≥3.5 TWA-MET and psychological variables listed under multivariate
Hannan et al. (2005), United States of	N/S cohort: 314 newly hired occupational computer users (> 15 h/week). Participants were free of N/S symptoms (excluded if	High job strain Low decision latitude High psychological job demands	HR = 1.65 (0.91 - 2.99) ns ns		Age, gender, experimental group, history of N/S symptoms, hours keying per week,

America, up to 6 months	discomfort > 5 on a scale 1-10 or analgesic medication in week before baseline). // Weekly self-report of N/S symptoms + symptom diary			supervisory support
Hooftman et al. (2009), The Netherlands, 3 years	748 blue and white collar and workers in caring professions from companies out of industrial and service branches formed the study population for sickness absence due to N/S pain. Subjects had no 'regular' or 'pro-longed' neck and/or shoulder pain in previous 12 months but could have 'no' or 'sometimes' neck and/or shoulder symptoms. // Sickness absence due to N/S symptoms ≥ 3 days listed in company registers	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂OR = 1.23 (0.70 - 2.19); ♀OR = 0.56 (0.28 - 1.15) ♂OR = 1.04 (0.61 - 1.76); ♀OR = 0.46 (0.21 - 1.00) ♂**OR = 0.48 (0.26 - 0.86)**; ♀OR = 0.92 (0.46 - 1.86) ♂OR = 0.86 (0.54 - 1.35); ♀OR = 1.42 (0.79 - 2.57) ♂OR = 1.28 (0.88 - 1.86); ♀**OR = 2.27 (1.27 - 4.07)**	Age, education, nationality, BMI, number of family members, smoker, alcoholic beverages/week, healthy eating, strenuous activity in private life, years of employment, work hours, workdays, some work-related and some private life physical risk factors, other psychosocial factors listed
Östergren et al. (2005), Sweden, mean of 403.1 days	4,919 vocationally active men and women (≥ 30 hours/week) aged 45-65 years residing in a Swedish city formed the study population at baseline. Participants could report 'never', 'once or twice' or 'sometimes' neck or shoulder symptoms during the 12 months before baseline. // Self-report of N/S complaints ('often' or 'all of the time' in the past 12 months)	High psychological demands Low decision latitude Low job support High job strain	♂OR = 1.04 (0.78 - 1.38); ♀OR = 1.10 (0.84 - 1.44) ♂OR = 0.93 (0.69 - 1.27); ♀OR = 1.14 (0.87 - 1.51) ♂OR = 1.14 (0.86 - 1.51); ♀OR = 1.13 (0.87 - 1.47) ♂OR = 0.94 (0.63 - 1.40); ♀**OR = 1.49 (1.10 - 2.03)**	Age, mechanical exposure, marital status, country of origin, educational level, and pain from other regions
Van den Heuvel et al. (2005), The Netherlands, 3 years	787 blue and white collar and workers in caring professions from companies out of industrial and service branches formed the study population. Subjects had no 'regular' or 'pro-longed' neck and/or shoulder pain in previous 12 months but could have 'no' or 'sometimes' neck and/or shoulder pain. // Self-report of 'regular' or 'prolonged' incident symptoms in neck and/or shoulders during last 12 months	High job demands Low skill discretion Low decision authority Low social support from co-workers Low social support from supervisors High job strain	**RR = 2.06 (1.19 - 3.55)** RR = 0.99 (0.48 - 2.05) RR = 1.25 (0.70 - 2.22) RR = 0.98 (0.51 - 1.92) RR = 0.93 (0.53 - 1.64) RR = 1.54 (0.97 - 2.44)	Age, gender, physical risk factors (flexion or rotation of the wrists, lifting, neck rotation, prolonged sitting, prolonged computer work and long working days), personal risk factors (negative affectivity, avoidance coping)
NECK				
Ariëns et al. (2001a), The Netherlands, 3 years	977 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population. Participants had no 'regular' or 'pro-longed' neck pain in the 12 months preceding the baseline but could have neck pain 'never' or 'sometimes'. // Self-report of 'regular' or 'prolonged' neck pain with episodes that lasted ≥ 1 day during the previous 12 months	High quantitative job demands Low skill discretion Low decision authority Low co-worker support Low supervisor support High conflicting job demands Low job security	**RR = 2.14 (1.28 - 3.58)** RR = 1.27 (0.59 - 2.74) RR = 1.60 (0.74 - 3.45) **RR = 2.43 (1.11 - 5.29)** RR = 0.95 (0.47 - 1.93) RR = 1.32 (0.68 - 2.56) RR = 1.27 (0.86 - 1.89)	Age, sex, and depending on the psychosocial variable investigated further adjustments for coping strategies, work-related physical and some of the here-listed psychosocial variables
Ariëns et al. (2002), The Netherlands, 3 years	758 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population. Participants had no sickness absence due to neck pain in the 3 months prior to baseline. // Sickness absence due to neck pain ≥ 3 days listed in company registers	High quantitative job demands Low skill discretion Low decision authority Low co-worker support Low supervisor support High conflicting job demands Low job security	RR = 1.96 (0.83 - 4.62) RR = 1.64 (0.73 - 3.69) **RR = 3.66 (1.44 - 9.26)** RR = 0.51 (0.10 - 2.70) RR = 0.96 (0.35 - 2.60) RR = 0.96 (0.51 - 1.83) RR = 1.70 (0.80 - 3.60)	Age, gender and other physical and psychosocial exposure variables and other covariates depending on whether they changed the effect estimates

Croft et al. (2001), United Kingdom, 1 year	3,034 18 to 75 year olds from a population-based sample free of neck pain lasting > 1 day in the month before baseline responded at baseline; 1,708 at follow-up. // Self-report of incident neck pain that lasted for > 1 day in the past 12 months	High psychological distress (18 - 36)	RR = 1.5 (1.0 - 2.2)	Sex, age, children, self-assessed health, lower back pain, previous neck injury
Eltayeb et al. (2009), The Netherlands, 2 years	268 computer office workers responded at baseline; 264 at follow-up. 24% women and 42% men had neck complaints at baseline. // Self-report of incident neck complaints lasting ≥ 1 week during the past 12 months	High job pressure High task difficulty High job strain Skill discretion (reference category unclear) Social support (reference category unclear) Decision authority (reference categ. unclear)	OR = 1.0 (0.9 - 1.03) OR = 1.2 (1.0 - 1.51) OR = 2.6 (0.11 - 16.2) OR = 0.9 (0.8 - 1.22) OR = 1.0 (0.9 - 1.10) OR = 0.9 (0.8 - 1.00)	Age, sex, previous history of neck complaints, computer working hours/day, equipment position, PC placement, awkward body posture, irregular head and body posture, work flow, other psychosocial variables listed
Hooftman et al. (2009), The Netherlands, 3 years	1,222 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population for neck symptoms. Subjects had no 'regular' or 'prolonged' neck pain in previous 12 months but could have 'no' or 'sometimes' neck pain. // Self-report of 'regular' or 'prolonged' neck symptoms during the past 12 months	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂**OR = 1.45 (1.10 - 1.91)**; ♀**OR = 1.18 (1.13 - 1.58)** ♂OR = 1.16 (0.87 - 1.54); ♀OR = 1.34 (0.99 - 1.82) ♂**OR = 1.37 (1.13 - 1.67)**; ♀OR = 1.12 (0.95 - 1.32) ♂**OR = 1.70 (1.30 - 2.23)**; ♀**OR = 1.43 (1.02 - 2.02)** ♂OR = 1.20 (0.98 - 1.48); ♀OR = 1.13 (0.85 - 1.51)	Age, education, nationality, BMI, number family members, smoker, alcoholic beverages/week, healthy eating, strenuous activity in private life, years of employment, work hours, workdays, some work-related and some private life physical risk factors, other psychosocial factors listed
Jensen (2003), Denmark, mean of 21 months	3,475 computer users responded at baseline; 2,576 at follow-up. Only nonsymptomatic respondents at baseline were included (≤ 7 days of neck symptoms in the last year). // Self-report of neck symptoms for > 7 days within the last year	High quantitative demands High cognitive demands Low developmental possibilities Low social support Low influence at work	♂/♀ns or 0 ♂/♀ns or 0 ♂/♀ns or 0 ♂/♀ns or 0 ♂ns or 0; ♀**OR = 2.2 (1.3 - 3.7)**	Previous neck or shoulder symptoms, duration of employment in the same job, computer skills, screen height relative to eye level, possibly listed psychosocial factors and other non-specified confounders
Korhonen et al. (2003), Finland, 1 year	232 employees from 3 municipal administrative units working with video display units with local or radiating neck pain < 8 days during the past 12 months responded at baseline; 180 at follow-up. // Self-report of local or radiating neck pain for ≥ 8 days during the last 12 months	Rather/very little influence on work load High job dissatisfaction High mental stress	OR = 1.7 (0.9 - 3.2) OR = 1.1 (0.5 - 2.3) OR = 1.0 (0.5 - 1.8) Multivariate: OR = 0.5 (0.2 - 1.4)	Univariate: Age, sex (+ VDU work time only for influence on work) Multivariate: physical work environment, distance of keyboard from edge of table, smoking, sex, age, VDU work time, frequency of physical exercise/week
Luime et al. (2004), The Netherlands, 1 year	769 blue and white collar workers and workers in caring from nursing homes and homes for the elderly formed the study population at baseline; 529 responded at follow-up. Participants had not had neck complaints at baseline and during 12 months prior to baseline. // Self-report of an episode of pain, stiffness or discomfort in the neck in past 12 months	High job strain Low job control High work demands Low supervisory support Low support from colleagues	OR = 1.55 (1.00 - 2.40) OR = 1.37 (0.91 - 2.06) OR = 1.22 (0.81 - 1.83) OR = 0.91 (0.60 - 1.37) OR = 1.05 (0.70 - 1.58)	Sex, age

Rugulies & Krause (2005), United States of America, up to 7.5 years	1,221 transit operators formed the study population. The study population was healthy and without neck injury prior to baseline. // First incidence of neck injury found in a worker's compensation insurer's database and on a medical bill in a medical bill review file	High psychological demands Low decision latitude Low supervisor support Low co-worker support Low total support Job strain based on tertiles Iso-strain based on tertiles	HR = 1.14 (0.84 - 1.55) HR = 1.27 (0.96 - 1.69) **HR = 1.42 (1.06 - 1.90)** HR = 1.27 (0.98 - 1.66) **HR = 1.39 (1.03 - 1.89)** **HR = 1.52 (1.13 - 2.05)** **HR = 1.73 (1.21 - 2.46)**	Age, sex, race/ethnicity, height, weight, years of professional driving, driving hours per week, vehicle type, self-reported physical demands, prevalence of neck pain at baseline
Rugulies & Krause (2008), United States of America, up to 7.5 years	1,179 transit operators formed the study population. The study population was healthy and without neck injury prior to baseline. // First incidence of neck injury found in a worker's compensation insurer's database and on a medical bill in a medical bill review file	High effort reward imbalance	**HR = 1.66 (1.16- 2.38)**	Age, sex, height, weight, physical work load (years of professional driving, driving hours per week, vehicle type), ergonomic problems, neck pain at baseline, job strain
Shannon et al. (2001), Canada, 1 year	712 blue and white collar workers and health care professionals working in hospitals (probably response rate at baseline). No information is given on history of neck pain at and prior to the baseline. // Self-report of neck pain in the past week	Psychological demands Job influence Decision latitude Social support Job insecurity	ns or 0 ns or 0 ns or 0 ns or 0 ns or 0	Neck pain at baseline, education, age, job interference with family, family interference with job, active coping, self-efficacy, readiness for change, role unclarity, hours worked, other psychosocial variables indicated, change variables
Tornqvist et al. (2009), Sweden, mean of 320 days; monthly follow-ups	1,283 employees from different occupations responded at baseline; 951 to last follow-up. Participants had ≤ 2 days of pain/aches in neck and/or scapular area during the month preceding the baseline. // Self-report of pain/aches in neck/scapular area ≥ 3 days during the preceding month	Demands higher than competence High job strain Low social support	RR = 1.34 (0.98 - 1.85) **RR = 2.15 (1.16 - 3.99)** RR = 1.24 (0.82 - 1.89)	Duration of computer work (h/day), duration of data/text entry (h/day), duration and frequency of continuous computer work without breaks > 10 min, duration of mouse use (h/day), mouse placement, comfort of the computer work environment, variation of work task, education, sex, age, psychosocial variables listed
Torp et al. (2001), Norway, 1 year	721 mainly blue collar workers of automobile repair garages formed the study population (98% males). 34% had 'some', 'much' or 'severe' neck pain in the 30 days before baseline. // Self-report of neck pain in the past 30 days	Psychological demands Decision authority Social support Management support	ß = 0.014 (ns pos. or 0 for high) **ß = -0.069 (sign. pos. for low)** ß = -0.051 (ns pos. or 0 for low) ß = -0.058 (ns pos. or 0 for low)	Age, gender, neck pain at baseline
Wahlström et al. (2004), Sweden, median 10.9 month	1,283 video display unit users responded at baseline; 671 free of neck pain at baseline were included in the analysis. // Self-report of newly developed neck pain (incl. scapular area) ≥ 3 days in last month	High job strain	IRR = 1.5 (0.95 - 2.52)	Perceived muscular tension, physical exposure, age
SHOULDERS				
Eltayeb et al. (2009), The Netherlands, 2 years	268 computer office workers responded at baseline; 264 at follow-up. 20% women, 42% men had shoulder complaints at baseline. // Self-report of incident shoulder complaints lasting ≥ 1 week during the past 12 months	High job pressure High task difficulty High job strain Skill discretion (reference category unclear) Social support (reference category unclear) Decision authority (reference categ. unclear)	OR = 0.1 (0.9 - 1.01) OR = 1.2 (0.9 - 1.40) **OR = 27.8 (16.2 - 36.1)** OR = 0.9 (0.8 - 1.21) OR = 1.0 (0.9 - 1.10) OR = 0.9 (0.8 - 1.00)	Age, sex, history of shoulder complaints, computer working hours/day, equipment position, PC placement, awkward body posture, irregular head and body posture, work flow, other psychosocial variables listed

Harkness et al. (2003a), United Kingdom, 1 year	803 newly employed workers from 12 diverse occupational settings and free from shoulder pain lasting at least 24 hours during the month before baseline responded at baseline; 638 at follow-up. // Self-report of onset of shoulder pain lasting at least 24 hours in the last month	High stressful work High monotonous work High hectic work Low job satisfaction Low social support from colleagues Low control over work Seldom learn new things High individual distress (GHQ ≥ 3)	OR = 0.9 (0.6 - 1.4) **OR = 1.9 (1.2 - 3.1)** OR = 0.9 (0.6 - 1.4) OR = 0.7 (0.2 - 2.1) OR = 1.0 (0.3 - 3.1) OR = 1.0 (0.5 - 2.0) OR = 1.0 (0.5 - 2.3) OR = 1.1 (0.7 - 1.9)	Multivariate: **OR = 1.7 (1.1 - 2.8)**	Univariate: Gender, age group, occupation Multivariate: additionally lifting with one or two hands, pushing/pulling, working with hands above shoulder, other pain
Hooftman et al. (2009), The Netherlands, 3 years	1,222 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population for shoulder symptoms. Subjects had not had 'regular' or 'prolonged' shoulder pain in the previous 12 months but could have 'no' or 'sometimes' shoulder symptoms. // Self-report of ‘regular’ or ‘prolonged‘ shoulder symptoms during the past 12 months	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂**OR = 1.58 (1.19 - 2.11)**; ♀OR = 1.22 (0.90 - 1.67) ♂OR = 1.19 (0.90 - 1.58); ♀**OR = 1.52 (1.10 - 2.11)** ♂**OR = 1.41 (1.07 - 1.85)**; ♀OR = 1.26 (0.89 - 1.78) ♂**OR = 1.40 (1.07 - 1.82)**; ♀OR = 1.29 (0.98 - 1.70) ♂OR = 0.94 (0.76 - 1.18); ♀OR = 0.99 (0.74 - 1.33)		Age, education, nationality, BMI, number of family members, smoker, alcoholic beverages/week, healthy eating, strenuous activity in private life, years of employment, work hours, workdays, some work-related and some private life physical risk factors, other psychosocial factors listed
Juul-Kristensen et al. (2004), Denmark, mean of 21 months	3,475 office workers responded at baseline; 2,576 at follow-up. Participants had to be nonsymptomatic at baseline in the shoulders and the nearby body regions (no symptoms or < 8 days in the year prior to baseline). // Self-report of higher frequency of days with muscular symptoms in the shoulders in the past 12 months or higher intensity of muscular symptoms in the shoulders in the past 3 months	High cognitive demands Low influence at work Low developmental possibilities Low social support	Higher frequency of days: OR = 1.00 (0.98 - 1.02) OR = 1.00 (0.98 - 1.01) OR = 1.00 (0.99 - 1.02) OR = 1.00 (0.99 - 1.01)	Higher intensity: OR = 1.01 (0.99 - 1.02) OR = 0.99 (0.98 - 1.01) OR = 0.99 (0.98 - 1.01) OR = 1.00 (0.99 - 1.01)	Gender, age, worked 50% of time, worked 75% of time, worked almost all time, no adjusted chair, no adjusted desk, no arm rest space, screen below eye height, never standing, glares or reflection, pauses - small influence, necessary to work fast, previous symptoms, sensory demands, other psychosocial factors listed
Kaergaard & Andersen (2000), Denmark, 2 years	243 female sewing machine operators responded at baseline; 178 were followed up. Investigated subgroup had no shoulder disorder at baseline (assessed with physical examination). // Self-report of shoulder disorders in the past 3 months and physical examination	Low social support High job strain	**RR = 3.72 (1.22 - 11.30)** ns or 0		Age, stress, duration of employment, job strain respectively social support
Luime et al. (2004), The Netherlands, 1 year	769 blue and white collar workers and workers in caring from nursing homes and homes for the elderly formed the study population at baseline; 529 responded at follow-up. Participants had not had shoulder complaints at baseline and during 12 months prior to baseline. // Self-report of an episode of pain, stiffness or discomfort in the shoulder in the past 12 months	High job strain Low job control High work demands Low supervisory support Low support from colleagues	OR = 1.49 (0.92 - 2.39) OR = 1.14 (0.73 - 1.76) OR = 1.11 (0.72 - 1.72) OR = 1.27 (0.82 - 1.96) OR = 0.76 (0.49 - 1.18)		Sex, age
Miranda et al. (2001), Finland, 1 year	3,312 blue and white collar employees of a forestry company responded at baseline; 2,094 with no (≤ 7 days) shoulder pain in the 12 months prior baseline were followed-up. // Self-report of incident shoulder pain ≥ 8	High mental stress	**OR = 1.9 (1.1 - 3.3)**		Age, sex, BMI, jogging, dancing, physical strenuousness of work, working with hand above shoulder level, working with the trunk flexed forward,

	days during the preceding 12 months				twisting movements of the trunk during a workday, working in sitting position, working with rotated neck
Smith et al. (2009), United States of America, 1 year	424 employees of health care and manufacturing sites formed the study population. Participants were free of shoulder symptoms in the year preceding baseline and had no history of acute trauma to the shoulder. // Self-report of incident shoulder pain of at least moderate intensity in the past 7 days, not caused by traumatic injury	High demands Low control High strain Active job (high demands/high control) Passive job(low demands/low control)	HR = 0.77 (0.48 - 1.23) **HR = 1.56 (1.004 - 2.41)** **HR = 2.19 (1.08 - 4.42)** HR = 1.72 (0.83 - 3.59) **HR = 2.17 (1.02 - 4.66)**		Age, gender, race, neck, elbow or hand/wrist symptoms at baseline, awkward upper arm posture
Tornqvist et al. (2009), Sweden, mean of 320 days; monthly follow-ups	1,283 employees from different occupations responded at baseline; 951 to last follow-up. Participants had ≤ 2 days of pain/aches in the shoulders during the month preceding the baseline. // Self-report pain/aches in shoulder joints/upper arms ≥ 3 days during the preceding month	Demands higher than competence High job strain Low social support	RR = 1.33 (0.92 - 1.92) RR = 1.06 (0.51 - 2.18) RR = 1.19 (0.72 - 1.98)		Duration of computer work (h/day), duration of data/text entry (h/day), duration and frequency of continuous computer work without breaks > 10 min, duration of mouse use (h/day), mouse placement, comfort of the computer work environment, variation of work task, education, sex, age, psychosocial variables listed
FOREARM					
Kryger et al. (2003), Denmark, 1 year	6,943 technical assistants from public and private companies responded at baseline (mainly office based tasks); 5,658 at follow-up. Participants had no or < moderate pain in the forearm in the past 7 days and < 'some' pain/discomfort during the past 12 months. // Self-report of moderate to severe symptoms in the forearm in the last 7 days and quite a lot of pain in the past 12 months	High demands Low control Low social support High time pressure	OR = 1.9 (1.0 - 3.4) OR = 1.0 (0.5 - 1.7) OR = 1.1 (0.6 - 2.0) OR = 1.7 (0.9 - 3.1)		Low control & low support: Hours/week with mouse in right hand, keyboard time in hours/week, high demands, time pressure High demands & time pressure: all physical workplace factors and all personal characteristics with p < .10, low control, low social support
Macfarlane et al. (2000), United Kingdom, 2 years	1,715 employees from a population-based sample responded at baseline; 1,260 free of forearm pain lasting ≥ 1 day during the month prior to baseline responded at follow-up. // Self-report of onset of forearm pain experienced during the past month for ≥ 1 day	Feel job too hectic or fast Feel job is boring or monotonous Job causes stress or worries Low feeling can learn new things Low feeling can make decisions Low job satisfaction High psychological distress (GHQ ≥ 3) Low satisfaction support supervisor/colleagues	RR = 2.0 (0.7 - 5.6) RR = 2.5 (0.95 - 6.6) RR = 3.3 (0.7 - 14.2) RR = 1.6 (0.8 - 3.3) RR = 2.0 (0.9 - 4.2) RR = 1.0 (0.4 - 3.0) **RR = 2.4 (1.5 - 3.8)** **RR = 4.7 (2.2 - 10)**	Multivariate: RR = 1.8 (0.8 - 4.1) Multivariate **RR = 2.6 (1.1 - 5.8)**	Univariate: sex, age Multivariate: Repetitive movement of arms, illness behaviour score, psychological distress respectively satisfaction with support from supervisor/ colleague
Nahit et al. (2003), United Kingdom, 1 year	782 newly employed workers from 12 diverse occupational settings free of forearm pain lasting at least 24 hours during the month before baseline formed the study population at baseline; 666 responded at follow-up. // Self-reported onset of forearm pain in the last month that lasted at least 24 hours	Monotonous work Stressful work Hectic work Lack of control over work Seldom learn new things Dissatisfied with job Dissatisfied with support from colleagues	**OR = 3.0 (1.6 - 5.7)** OR = 1.1 (0.5 - 2.2) OR = 1.2 (0.6 - 2.3) **OR = 2.6 (1.1 - 6.1)** OR = 1.3 (0.5 - 3.5) OR = 1.7 (0.6 - 4.7) OR = 1.4 (0.4 - 5.0)	Multivariate: **OR = 3.0 (1.5 - 5.8)**	Univariate: sex, age, occupational group Multivariate: sex, age, occupational group, repetitive movements of wrists, working with hands above shoulder

ELBOW					
Juul-Kristensen et al. (2004), Denmark, mean of 21 months	3475 office workers responded at baseline; 2,576 at follow-up. Participants had to be nonsymptomatic at baseline in the elbow and the nearby body regions (no symptoms or < 8 days in the year prior to baseline). // Self-report of higher frequency of days with muscular symptoms in the elbows in the past 12 months or higher intensity of muscular symptoms in the elbows in the past 3 months	High cognitive demands Low influence at work Low developmental possibilities Low social support	Higher frequency of days: OR = 1.01 (1.00 - 1.03) OR = 1.00 (0.98 - 1.02) OR = 0.99 (0.98 - 1.01) OR = 1.00 (0.98 - 1.01)	Higher intensity: OR = 1.01 (0.99 - 1.02) OR = 0.99 (0.98 - 1.00) OR = 1.00 (0.99 - 1.02) OR = 1.00 (0.99 - 1.01)	Gender, age, worked 50% of the time, worked 75% of the time, worked almost all the time, no adjusted chair, no adjusted desk, no arm rest space, screen below eye height, never standing, glares or reflection, pauses - small influence, necessary to work fast, previous symptoms, sensory demands, other psychosocial factors listed
Lassen et al. (2004), Denmark, 1 year	6,943 technical assistants and machine technicians out of public and private companies having mainly office based tasks responded at baseline. Participants with a specified baseline outcome were excluded from the analysis of the corresponding incident outcome. // Self-report of 1) any pain or discomfort and 2) severe pain (> 30 days) in the elbow during the past 12 months + physical examination	High strain High job demands Low decision latitude Low social support High time pressure	Any pain or discomfort elbow: OR = 1.21 (0.78 - 1.87) **OR = 1.33 (1.02 - 1.74)** OR = 1.03 (0.78 - 1.38) OR = 1.09 (0.87 - 1.36) OR = 1.11 (0.86 - 1.42)	Severe elbow pain: OR = 0.83 (0.34 - 1.95) OR = 1.07 (0.65 - 1.73) OR = 0.86 (0.50 - 1.45) OR = 0.91 (0.60 - 1.39) OR = 1.14 (0.71 - 1.80)	Right hand mouse time, keyboard time, ergonomic factors, personal factors and psychosocial factors listed
Leclerc et al. (2001), France, 3 years	700 employees eligible at baseline exposed to repetitive work mainly in industries but also supermarket cashiers; 598 formed the study population. Subjects in elbow cohort had no definite or suspected lateral epicondylitis at baseline (assessed in medical examination). // Incidence of definite or suspected lateral epicondylitis in follow-up med. examination	Low job control High psychological demands Low social support Low job satisfaction	ns or 0 ns or 0 ns or 0 ns or 0		At least age, gender, number of upper limb diagnoses, depressive symptoms, turn and screw, and psychosocial variables listed
ELBOW/FOREARM/HAND					
Andersen et al. (2007), Denmark, 2 years	4,006 blue and white collar workers from industrial and service sectors responded at baseline; 1,513 free from severe pain formed the study population. Subjects had 'not at all', 'very little' or 'little' been bothered by elbow/forearm/hand pain during the 12 months preceding the baseline. // Self-reported onset of severe elbow/ forearm/hand pain during the past 12 months	High job demands Low job control Low social support from supervisors Low social support from colleagues Low management quality Low job satisfaction	HR = 0.8 (0.5 - 1.2) HR = 1.5 (0.9 - 2.2) HR = 1.3 (0.8 - 1.9) HR = 1.5 (0.9 - 2.4) HR = 1.3 (0.9 - 2.0) HR = 1.3 (0.5 - 2.9)		Sex, age, occupational group, intervention group
ELBOW/WRIST/HAND					
Van den Heuvel et al. (2005), The Netherlands, 3 years	787 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population. Subjects had no 'regular' or 'pro-longed' elbow/wrist/hand pain in past 12 months but could have 'no' or 'sometimes' elbow/wrist/hand pain.	High job demands Low skill discretion Low decision authority Low social support from co-workers Low social support from supervisors High job strain	RR = 1.92 (1.00 - 3.71) RR = 0.90 (0.41 - 1.98) RR = 0.89 (0.45 - 1.74) **RR = 2.23 (1.01 - 4.90)** RR = 0.77 (0.41 - 1.46) RR = 1.15 (0.64 - 2.07)		Age, gender, physical risk factors (flexion or rotation of the wrists, lifting, neck rotation, prolonged sitting, prolonged computer work and long working days), personal risk factors (negative affectivity,

	// Self-report of 'regular' or 'prolonged' incident symptoms in elbow/wrist/hand			avoidance coping)
ARM/HAND				
Eltayeb et al. (2009), The Netherlands, 2 years	268 computer office workers responded at baseline; 264 at follow-up. 12.1% women, 13.6% men had forearm/hand complaints at baseline. // Self-report of incident forearm/hand complaints lasting ≥ 1 week during the past 12 months	High job pressure High task difficulty High job strain Skill discretion (reference category unclear) Social support (reference category unclear) Decision authority (reference categ. unclear)	OR = 0.9 (0.8 - 1.02) OR = 1.0 (0.9 - 1.30) **OR = 2.5 (1.6 - 13.10)** OR = 0.9 (0.8 - 1.25) OR = 1.0 (0.9 - 1.11) OR = 0.9 (0.8 - 1.02)	Age, sex, previous history of forearm/hand complaints, computer working hours/day, equipment position, PC placement, awkward body posture, irregular head and body postures, work flow, other psychosocial variables listed
Hannan et al. (2005), United States of America, up to 6 months	Arm/hand cohort: 333 newly hired occupational computer users (> 15 h/week). Participants had no arm/hand symptoms (excl. if discomfort > 5 on a scale 1-10 or analgesic medication in week prior baseline). // Weekly self-report of arm/hand symptoms + symptom diary	High job strain Low decision latitude Low psychological job demands	HR = 1.28 (0.58 - 2.85) ns ns	Age, gender, experimental group, history of arm-hand symptoms, hours keying per week, supervisory support
Hooftman et al. (2009), The Netherlands, 3 years	1,263 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population for arm/hand symptoms. Subjects had no 'regular' or 'prolonged' arm/hand pain in previous 12 months but could have 'no' or 'sometimes' arm/hand pain. // Self-report of 'regular' or 'prolonged' arm/hand symptoms during the past 12 months	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂OR = 1.14 (0.90 - 1.45); ♀OR = 1.23 (0.91 - 1.65) ♂OR = 1.06 (0.82 - 1.36); ♀OR = 0.96 (0.71 - 1.28) ♂OR = 1.30 (0.95 - 1.76); ♀OR = 1.07 (0.73 - 1.57) ♂**OR = 1.27 (1.02 - 1.57)**; ♀OR = 0.97 (0.74 - 1.25) ♂OR = 1.19 (0.98 - 1.43); ♀OR = 1.12 (0.86 - 1.44)	Age, education, nationality, BMI, number of family members, smoker, alcoholic beverages/week, healthy eating, strenuous activity in private life, years of employment, work hours, work days, some work-related and some private life physical risk factors, other psychosocial factors listed
Tornqvist et al. (2009), Sweden, mean of 320 days; monthly follow-ups	1,283 employees from different occupations responded at baseline; 951 to last follow-up. Participants had ≤ 2 days pain/aches in arm/hand in the month preceding the baseline. // Self-report of pain/aches in elbows/forearms and/or wrists and/or hands/fingers ≥ 3 days in the past month	Demands higher than competence High job strain Low social support	RR = 1.19 (0.82 - 1.71) RR = 1.11 (0.55 - 2.25) RR = 1.39 (0.90 - 2.15)	Duration of computer work (h/day), duration of data/text entry (h/day), duration and frequency of continuous computer work without breaks > 10 min, duration of mouse use (h/day), mouse placement, comfort of the computer work environment, variation of work task, education, sex, age, psychosocial variables listed
HAND/WRIST				
Feveile et al. (2002), Denmark, 5 years	Employees were drawn from the Central Population Register. 3,990 responded at baseline; 3,179 free of wrist/hand symptoms 12 months prior to baseline were included in follow-up regarding hand-wrist symptoms. // Self-report of development of wrist/hand symptoms during the previous 12 months	High psychological job demands Low skill discretion Low decision authority Low social support Stress symptoms	♂/♀ ns or 0 ♂/♀ ns or 0 ♂/♀ ns or 0 ♂/♀ ns or 0 ♂**OR = 1.74 (1.12 - 2.71)**; ♀**OR = 1.67 (1.16 - 2.41)**	All other psychosocial factors investigated, age, smoking habits, same work, stress, repetitive work tasks, physically hard work, working with hands raised, twisting or bending, vibrating hand tools

Jensen (2003), Denmark, mean of 21 months	3,475 computer users responded at baseline; 2,576 at follow-up. Only nonsymptomatic baseline respondents were included (≤ 7 days of hand/wrist symptoms in last year). // Self-report of hand/wrist symptoms for > 7 days within the last year	High quantitative demands High cognitive demands Low developmental possibilities Low social support Low influence at work	♂/♀ns or 0 ♂/♀ns or 0 ♂/♀ns or 0 ♂/♀ns or 0 ♂OR = 1.6 (0.6 - 4.0); ♀**OR = 2.4 (1.5 - 3.8)**			Previous hand, wrist or elbow symptoms, sensorial demands, possibly listed psychosocial variables and non-specified other confounders
Lassen et al. (2004), Denmark, 1 year	6,943 technical assistants and machine technicians out of public and private companies having mainly office based tasks responded at baseline. Participants with a specified baseline outcome were excluded from the analysis of the corresponding incident outcome. // Self-report of 1) any pain or discomfort and 2) severe pain (> 30 days) in the hand/wrist during the past 12 months + physical examination	High strain High job demands Low decision latitude Low social support High time pressure	Any pain or discomfort hand/wrist OR = 0.87 (0.55 - 1.38) OR = 0.98 (0.75 - 1.27) OR = 1.26 (0.95 - 1.65) OR = 1.02 (0.81 - 1.27) OR = 1.18 (0.91 - 1.52)	Severe hand/wrist pain OR = 0.82 (0.42 - 1.60) OR = 1.18 (0.77 - 1.80) OR = 1.30 (0.85 - 1.96) OR = 0.91 (0.64 - 1.27) OR = 1.08 (0.73 - 1.58)		Right hand mouse time, keyboard time, ergonomic factors, personal factors and psychosocial factors listed
Leclerc et al. (2001), France, 3 years	700 employees eligible at baseline exposed to repetitive work mainly in industries but also supermarket cashiers; 598 formed the study population. Subjects in hand/wrist cohort had no definite or suspected outcome disorder at baseline (assessed in clinical examination). // Incidence of definite or suspected carpal tunnel syndrome respectively wrist tendinitis in the follow-up medical examination	Low job control High psychological demands Low social support Low job satisfaction	Carpal tunnel syndrome: ♂/♀ ns or 0 ♂/♀ ns or 0 ♂/♀ ns or 0 ♂ ns or 0; ♀OR = 1.79 (0.84 - 3.84)	Wrist tendinitis: ns or 0 ns or 0 OR = 2.49 (0.96 - 6.44) ns or 0		Age, psychosocial variables listed and For carpal tunnel syndrome: ♂Tighten with force, press with the hand, hold in position ♀increased BMI ≥ 2kg/m2 For wrist tendinitis: gender, somatic problems, repetitive hitting, increased BMI ≥ 2kg/m2
BACK						
Alexopoulos et al. (2008), Greece, 1 year	853 blue and white collar employees of a shipbuilding, ship repairing company formed study population. 37% of those experienced ≥ 1 episode of LBP in the 12 months prior to baseline. // First occurrence of sickness absence due to LBP (retrieved from medical certifications)	High job demands Low decision authority Low skill discretion	HR = 1.34 (0.91 - 1.96) ns or 0 ns or 0			For decision authority and skill discretion: at least age For job demands: age, seen by a physician due to LBP during last 12 months, educational level, living alone, night shift, absence due to health problems in last year
Andersen et al. (2007), Denmark, 2 years	4,006 blue and white collar workers from industrial and service sectors responded at baseline; 1,513 free from severe pain formed the study population. Subjects had 'not at all', 'very little' or 'little' been bothered by low back pain during the 12 months preceding the baseline. // Self-reported onset of severe LBP during the past 12 months	High job demands Low job control Low social support from supervisors Low social support from colleagues Low management quality Low job satisfaction	HR = 1.2 (0.9 - 1.7) **HR = 1.7 (1.2 - 2.3)** HR = 1.1 (0.8 - 1.6) HR = 1.1 (0.8 - 1.6) HR = 1.3 (0.9 - 1.9) HR = 1.2 (0.6 - 2.2)	Multivariate: **HR = 1.5 (1.1 - 2.2)**		Univariate: sex, age, occupational group, intervention group Multivariate: additionally lifting (cumulative), standing < 30 minutes per hour
Bildt et al. (2000), Sweden, 4 years	484 people from population-based sample included at baseline and investigated regarding their working conditions and MSDs, 420 responded at follow-up; 183 of these were free of LBP in years prior to baseline and formed the study population. // Self-report of medical consultation and	Low occupational pride High job strain Few possibilities for on the job development No education at employer's expense	♂OR = 1.5 (0.7 - 3.0); ♀**OR = 2.2 (1.3 - 3.7)** ♂OR = 2.2 (0.8 - 5.8); ♀**OR = 2.3 (1.3 - 4.0)** ♂OR = 1.4 (0.7 - 3.0); ♀**OR = 2.6 (1.6 - 4.2)** ♂OR = 0.8 (0.5 - 1.3); ♀OR = 1.7 (1.0 - 2.8)	Multiv.: ♀**OR = 2.3 (1.1 - 4.7)**		Univariate: age Multivariate: ♀ at least temporary employment, age ♂at least lifting 5-15 kg, poor quality of social contacts (as individual factor), age

	treatment because of LBP or self-report of > 7 days of consecutive LBP in last year					
Burdorf & Jansen (2006), The Netherlands, 1 year	769 blue, white collar and workers in caring professions from nursing homes responded at baseline; 523 at follow-up. Participants had no LBP in 12 months prior baseline. // Self-report 1) LBP ≥ a few hours in past year; 2) sickness absence based on frequency and duration of LBP	High work demands Low job control	LBP: OR = 1.10 (0.76 - 1.58) OR = 1.12 (0.78 - 1.60)	Sickness absence due to LBP: OR = 0.83 (0.48 - 1.44) OR = 0.88 (0.51 - 1.51)		Age, physical load, high work demands respectively low job control
Clays et al. (2007), Belgium, mean of 6.6 years	2,556 white and blue collar workers and executives from private companies, public administrations or a bank responded at baseline. Results refer to an extracted subgroup of participants that had no 'occasional' back pain at baseline. // Self-report of onset of LBP ≥ 8 days in the last 12 months	High job demands Low decision latitude High job strain Low social support High job insecurity Low job satisfaction Feeling stressed at work	♂/♀ns or 0 ♂**RR = 1.49 (1.07 - 2.09)**; ♀ns or 0 RR = 1.21 (0.77 - 1.91); ♀ns or 0 ♂**RR = 1.48 (1.06 - 2.08)**; ♀ns or 0 ♂ns or 0; ♀RR = 1.10 (0.70 - 1.74) ♂RR = 1.57 (0.89 - 2.78); ♀ns or 0 ♂RR = 1.15 (0.82 - 1.62); ♀RR = 1.12 (0.70 - 1.78)			No adjustments have been made for the analysis in this subgroup
Elfering et al. (2002), Switzerland, 1 year	141 nurses that worked for the first year after their nursing training responded at baseline; 114 at follow-up. Sample could contain nurses with LBP but it is assumed that they were young and healthy as they were just entering professional life. // Self-report of 1) frequency of episodes of LBP; 2) duration of LBP episodes (> 7 days), 3) medical consultation due to LBP	Low time control High qualitative requirements Lack social support from closest colleague Low social support from supervisor Low method control Low job satisfaction	Frequency LBP episodes **OR = 4.61 (1.42 - 15.03)** ns or 0 ns or 0 ns or 0 ns or 0 ns or 0	Duration LBP episodes **OR = 2.19 (1.04 - 4.61)** ns or 0 ns or 0 ns or 0 ns or 0 ns or 0	Medical consultation due to LBP ns or 0 ns or 0 **OR = 5.75 (1.27 - 25.97)** ns or 0 ns or 0 ns or 0	Musculoskeletal problems at baseline, age, BMI, smoking, days off work, neuroticism, physical load, change in physical strain at follow up, some other psychosocial and work-related predictors that are not listed in detail
Eriksen et al. (2004), Norway, 15 months *(Results referring to a follow-up period of 3 months are not reported as it is the only study referring to a follow-up period < 6 months)*	4,266 nurses' aides not bothered or 'a little' bothered (47.6%) by LBP during 3 months prior to baseline responded at baseline; 3,651 at follow-up. // Self-report of 1) sick leave due to LBP of > 14 days during the past 12 months 2) sick leave lasting > 8 weeks during the past 12 months	Quantitative work demands Role conflicts at work Influence on decisions at work Control over work pace Social support from immediate supervisor Fairness immediate supervisor's leadership Supportive, encouraging culture of work unit Pleasant, relaxing culture of the work unit Rewards for good work Threats or violence at work Harassment at work Commitment to the work unit Mastery of work	Sick leave > 14 days: ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0	Sick leave > 8 weeks: ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0 ns or 0		Sick leave > 14 days: age, sex, level of affective symptoms, sleep complaints, fatigue, long term health complaints of any kind, frequency of positioning patients in bed, frequency of handling heavy objects at work, all psychosocial variables listed Sick leave > 8 weeks: age, sex, having ever changed work or work tasks because of pain, level of affective symptoms, sleep complaints, fatigue, widespread pain, long term health complaints of any kind, frequency of lifting and supporting patients manually between bed and chair, some of the psychosocial variables listed
Gheldof et al. (2007), Belgium and The Netherlands, 1.5 years	1,294 industrial workers (predominantly males out of metallurgical or steal industry) responded at baseline, 902 at follow-up; 206 that had 0 days of LBP in the year prior to baseline formed the study population.	High psychological job demands Job dissatisfaction High psychological distress High decision latitude High co-worker support	OR = 1.00 (0.95 - 1.05) OR = 0.51 (0.18 - 1.49) OR = 1.08 (0.98 - 1.20) OR = 1.01 (0.99 - 1.04) OR = 1.19 (0.98 - 1.44)			Only crude ORs except for high co-worker support (adjusted for age, sex, education, BMI, dynamic workload due to flexion and rotation of trunk, static

	// Self-reported development of short-term LBP (1-30 days of LBP in the year prior to follow-up)	High supervisor support	OR = 1.07 (0.95 - 1.19)			workload due to long-lasting standing, negative affectivity)
Harkness et al. (2003), United Kingdom, 1-2 years	788 newly employed workers from 12 diverse occupational settings that were free from low back pain lasting at least 24 hours during the month before baseline responded at baseline; 625 at follow-up after 1 year; 430 at follow-up after 2 years. // Self-report of onset of LBP lasting at least 24 hours in the last month	Stressful work Monotonous work Hectic work Low job satisfaction Low social support from colleagues Low control over work Seldom learn new things High individual distress (GHQ ≥ 3)	OR = 1.5 (0.9 - 2.4) **OR = 1.8 (1.1 - 3.0)** OR = 1.0 (0.7 - 1.5) OR = 0.7 (0.3 - 1.9) OR = 1.4 (0.5 - 3.7) OR = 0.7 (0.3 - 1.4) OR = 1.4 (0.6 - 3.1) OR = 1.1 (0.7 - 1.8)	Multivariate: **OR = 1.8 (1.1 - 2.8)**		Univariate: age, gender, occupation, all other listed psychosocial factors Multivariate: age, gender, occupation, lifting at or above shoulder level, pulling, kneeling, job demands, work in hot conditions, other pain
Hooftman et al. (2009), The Netherlands, 3 years	1,259 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population for low back symptoms. Subjects had no 'regular' or 'prolonged' back pain in previous 12 months but could have 'no' or 'sometimes' back pain. // Self-report of ‘regular‘ or ‘prolonged’ low back symptoms during the past 12 months	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂**OR = 1.28 (1.05 - 1.56)**; ♀OR = 1.34 (0.97 - 1.85) ♂**OR = 1.29 (1.09 - 1.52)**; ♀OR = 1.06 (0.82 - 1.36) ♂**OR = 1.28 (1.05 - 1.57)**; ♀OR = 1.29 (0.92 - 1.79) ♂**OR = 1.26 (1.06 - 1.51)**; ♀**OR = 1.41 (1.07 - 1.87)** ♂**OR = 1.17 (1.02 - 1.33)**; ♀OR = 1.12 (0.90 - 1.39)			Age, education, nationality, BMI, number of family members, smoker, alcoholic beverage/week, healthy eating, strenuous activity in private life, years of employment, work hours, work days, some work-related and some private life physical risk factors, other psychosocial factors listed
Hooftman et al. (2009), The Netherlands, 3 years	762 blue and white collar as well as workers in caring professions from companies out of industrial and service branches formed the study population for LBP related absence. Subjects had no 'regular' or 'prolonged' back pain in previous 12 months but could have 'no' or 'sometimes' back pain. // Sickness absence due to low back symptoms ≥ 3 days listed in company registers	High psychological demands Low skill discretion Low co-worker support Low supervisor support Low job satisfaction	♂OR = 1.01 (0.75 - 1.36); ♀OR = 0.98 (0.47 - 2.06) ♂OR = 1.31 (0.96 - 1.78); ♀OR = 0.70 (0.29 - 1.68) ♂OR = 1.42 (1.00 - 2.03); ♀OR = 1.84 (0.97 - 3.47) ♂OR = 1.11 (0.80 - 1.53); ♀OR = 0.89 (0.43 - 1.86) ♂**OR = 1.31 (1.03 - 1.67)**; ♀OR = 0.72 (0.28 - 1.81)			Age, education, nationality, BMI, number of family members, smoker, alcoholic beverage a week, healthy eating, strenuous activity in private life, years of employment, work hours, work days, some work-related and some private life physical risk factors, other psychosocial actors listed
Hoogendoorn et al. (2001), The Netherlands, 3 years	1,738 blue and white collar as well as workers in caring professions from companies out of industrial and service branches responded at baseline; 861 subjects that had no 'regular' or 'prolonged' LBP in the 12 months prior baseline but could have 'no' or 'sometimes' LBP formed study population. // Self-report of ‘regular’ or ‘prolonged’ LBP during the last 12 months	High quantitative job demands High conflicting demands Low decision authority Low skill discretion Low supervisor support Low co-worker support Low job satisfaction	RR = 1.41 (0.76 - 2.62) RR = 1.37 (0.81 - 2.32) RR = 0.98 (0.56 - 1.71) RR = 0.97 (0.53 - 1.75) RR = 1.29 (0.76 - 2.21) RR = 1.65 (0.92 - 2.95) RR = 1.75 (0.96 - 3.19)			Age, gender, exercise behaviour during leisure time, active problem solving, avoidance behaviour, social support seeking, trunk flexion, lifting, driving a vehicle at work, psychosocial variables investigated
Hoogendoorn et al. (2002), The Netherlands, 3 years (mean of 37 months)	1,738 blue and white collar as well as workers in caring professions from companies out of industrial and service branches responded at baseline; 732 subjects had no sickness absence of ≥ 3 days because of LBP in the 3 months before baseline and formed the study population. // Sickness absence for 1) ≥ 3 days due to LBP, 2) 3 - 7 days due to LBP, 3) > 7 days		≥ 3 days:	3 - 7 days:	> 7 days:	Age, gender, smoking, BMI, exercise behaviour during leisure time, coping skills, moving of heavy loads during leisure time, flexion or rotation of the upper part of the body during leisure time, driving a vehicle during leisure time, trunk flexion, lifting, driving a vehicle at work,
		High quantitative job demands	RR = 0.68 (0.30 - 1.40)	**RR = 0.10 (0.01 - 0.57)**	RR = 0.86 (0.37 - 1.80)	
		High conflicting demands	RR = 1.20 (0.61 - 2.19)	RR = 1.49 (0.49 - 3.67)	RR = 0.93 (0.40 - 1.89)	
		Low decision authority	RR = 0.69 (0.34 - 1.40)	RR = 0.44 (0.13 - 1.37)	RR = 0.80 (0.37 - 1.72)	
		Low skill discretion	RR = 1.10 (0.58 - 2.10)	RR = 1.27 (0.44 - 3.61)	RR = 1.19 (0.59 - 2.46)	
		Low supervisor support	RR = 1.43 (0.77 - 2.74)	**RR = 2.89 (1.06 - 8.94)**	RR = 0.77 (0.39 - 1.59)	
		Low co-worker support	RR = 1.46 (0.82 - 2.61)	RR = 0.88 (0.36 - 2.17)	RR = 1.49 (0.79 - 2.87)	
		Low job satisfaction	**RR = 1.95 (1.08 - 3.39)**	RR = 1.45 (0.50 - 3.63)	**RR = 2.13 (1.09 - 3.95)**	

	due to LBP (LBP listed in company registers)				job security, psychosocial variables investigated
Jansen et al. (2004), The Netherlands, 1 year	769 blue and white collar workers and workers in caring from nursing homes and homes for the elderly responded at baseline; 523 at follow-up. Participants had no LBP at baseline and 12 months before the baseline. // Self-report of any incident episode of LBP that lasted for at least a few hours in past year	Low decision authority Low skill discretion High work demands	RR = 1.91 (0.71 - 5.18) RR = 0.67 (0.27 - 1.66) RR = 1.78 (0.75 - 4.27)		Trunk flexion between 20° and 45°, trunk flexion over 45°, lifting and carrying loads over 10 kg, age, years in service + other psychosocial factors listed
Johnston et al. (2003), United States of America, median 6.5 months	9,466 retail material handlers responded at baseline; 6,311 at follow-up and were included as study population. 15.9% had a history of back problems in the 12 months prior baseline (≥ 4 occurrences of LBP with severity of ≥ 7 on a 1-10 scale); strain or sprain in LB; disease or surgery. // Self-report of ≥ 4 occurrences of LBP and the last one being of a severity of ≥ 5 on a scale from 1 to 10 in the 6 months before follow-up	High job intensity High scheduling demands High job dissatisfaction Lack of influence Low supervisor support	**OR = 1.8 (1.4 - 2.3)** **OR = 1.6 (1.3 - 2.1)** **OR = 1.7 (1.3 - 2.1)** OR = 1.2 (1.0 - 1.5) **OR = 1.4 (1.1 - 1.8)**		Gender, history of back Problems, lifting 20 lbs at work usually everyday, lack of job security/decision authority, high scheduling demands x job dissatisfaction, high job intensity x low supervisor support, psychosocial variables listed
Juul-Kristensen et al. (2004), Denmark, mean of 21 months	3,475 office workers responded at baseline; 2,576 at follow-up. Participants had to be nonsymptomatic at baseline in the low back and the nearby body regions (no symptoms or < 8 days in the year prior to baseline). // Self-report of higher frequency of days with muscular symptoms in the LB in the past 12 months or higher intensity of muscular symptoms in the LB in the past 3 months	 High cognitive demands Low influence at work Low developmental possibilities Low social support	Higher frequency of days: OR = 1.01 (0.99 - 1.02) OR = 0.99 (0.98 - 1.01) OR = 0.99 (0.98 - 1.01) OR = 1.01 (0.99 - 1.01)	Higher intensity: OR = 1.00 (0.99 - 1.02) OR = 1.00 (0.99 - 1.01) OR = 1.00 (0.99 - 1.01) OR = 0.99 (0.99 - 1.00)	Gender, age, worked 50% of the time, worked 75% of the time, worked almost all the time, no adjusted chair, no adjusted desk, no arm rest space, screen below eye height, never standing, glares or reflection, pauses - small influence, necessary to work fast, previous symptoms, sensory demands, other psychosocial factors listed
Kaila-Kangas et al. (2004), Finland, 28 years	756 blue and white collar workers from steel manufacturing companies that were free of chronic back disorders at baseline formed the study population. // First hospitalisation due to back disorders listed in the Finnish Hospital Discharge Register	High job demands Low job control Low supervisor support Low co-worker support	RR = 0.66 (0.28 - 1.58) **RR = 2.70 (1.04 - 8.17)** **RR = 3.28 (1.32 - 8.17)** RR = 1.08 (0.46 - 2.54)		Demographic factors, chronic back and other diseases, history of strenuous physical work, lifestyle, distress symptoms, all psychological variables listed
Kopec & Sayre (2004), Canada, 2-4 years	5,390 employees from a population-based sample being 18 to 74 years old and free of back problems at baseline responded at baseline. // Self-report back problems lasting/expected to last ≥ 6 months, diagnosed by health professional	Low job satisfaction	RR = 1.84 (0.89 - 3.78)		Sex, age, type of working hours, number of working hours, occupational class, physical exertion, total work stress
Latza et al. (2002), Germany, 3 years	571 male bricklayers working in the construction industry participated at baseline; 404 without chronic LBP at baseline were followed up. // Self-report of the occurrence of chronic LBP (≥ 90 days) during the preceding 12 months	High social support High time pressure High monotonous work Low job control Low satisfaction own achievement at work	OR = 1.40 (0.59 - 3.31) **OR = 6.30 (1.41 - 28.21)** OR = 1.40 (0.59 - 3.31) OR = 1.13 (0.40 - 3.20) OR = 1.85 (0.67 - 5.01)		Age

Linton (2005), Sweden, 1 year	1,914 workers aged 35 to 45 years from a population-based sample responded at baseline; subsample of 372 workers being free of spinal pain during the 12 months preceding the baseline was followed up; 313 responded at follow up. // Self-report of onset of significant (> 6 on a scale 1-10) back pain	High work load Worry to lose job Monotonous work Work social support (ref. category unclear) Job satisfaction (reference category unclear)	OR = 2.32 (0.98 - 5.49) OR = 0.53 (0.22 - 1.36) OR = 0.81 (0.30 - 2.18) OR = 0.72 (0.26 - 1.94) OR = 1.28 (0.50 - 3.24)		Work content, perceived physical work load, psychosocial variables investigated
Miranda et al. (2002), Finland, 1 year	3,312 blue and white collar employees of forestry company responded at baseline; 2,077 with no (< 0-7 days) sciatic pain in 12 months before baseline were followed-up. // Self-report of incident LBP radiating below the knee > 7 days during past 12 months	Rather much or much mental stress Low job satisfaction	OR = 2.2 (0.9 - 5.4) ns or 0		Age and sex For mental stress additionally: smoking, walking, jogging, twisting movements of the trunk, working in kneeling or squatting position, working with hand above shoulder level
Rugulies & Krause (2005), United States of America, up to 7.5 years	1,221 transit operators formed the study population. The study population was healthy and without back injury prior to baseline. // First incidence of low back injury found in a worker's compensation insurer's database and on a medical bill in a medical bill review file	High psychological demands Low decision latitude Low supervisor support Low co-worker support Low total support Job strain based on tertiles Iso-strain based on tertiles	HR = 1.02 (0.76 - 1.38) HR = 0.91 (0.69 - 1.20) HR = 1.02 (0.77 - 1.34) HR = 1.00 (0.78 - 1.29) HR = 0.97 (0.73 - 1.29) HR = 1.30 (0.96 - 1.75) HR = 1.41 (0.98 - 2.01)		Age, sex, race/ethnicity, height, weight, years of professional driving, driving hours per week, vehicle type, self-reported physical demands, prevalence of low back pain at baseline
Rugulies & Krause (2008), United States of America, up to 7.5 years	1,179 transit operators formed the study population. The study population was healthy and without back injury prior to baseline. // First incidence of low back injury found in worker's compensation insurer's database and on a medical bill in a medical bill review file	High effort reward imbalance	HR = 1.32 (0.94- 1.86)		Age, sex, height, weight, physical work load (years of professional driving, driving hours per week, vehicle type), ergonomic problems, low back pain at baseline, job strain
Shannon et al. (2001), Canada, 1 year	712 blue and white collar workers and health care professionals working in hospitals (probably response rate at baseline). No information is given on history of LBP at and prior to the baseline. // Self-report of LBP in the past week	Psychological demands Job influence Decision latitude Social support Job insecurity	**ß = 0.12 (sign. pos. for high)** **ß = -0.12 (sign pos. for low)** ns or 0 ns or 0 ns or 0		Back pain at baseline, education, age, job interference with family, family interference with job, active coping, self-efficacy, readiness for change, role unclarity, hours worked, other psychosocial variables indicated, change variables
Torp et al. (2001), Norway, 1 year	721 mainly blue collar workers of automobile repair garages formed the study population (98 % males). 48% had 'some', 'much' or 'severe' LBP in the 30 days before baseline. // Self-report of LBP in the past 30 days	Psychological demands Decision authority Social support Management support	ß = 0.005 (ns pos. or 0 for high) **ß = -0.078 (sign. pos. for low)** ß = -0.070 (ns pos. or 0 for low) **ß = -0.089 (sign. pos. for low)**		Age, gender, LBP at baseline
Tubach et al. (2002), France, 2 years	2,236 workers out of 15 occupational groups from the French national electricity and gas company answered at baseline and follow-up. 36.6% of the sample had visited a health professional in the year prior to baseline because of LBP. // 1) Self-report of sick leave due to LBP (≥ 8 days) during the past 12 months 2) Self-report of LBP with no or < 8 days sick leave during the past 12 months	Low decision latitude High psychological demands Low social support Low satisfaction at work	Sick leave ≥ 8 days: **RR = 3.1 (1.8 - 5.3)** RR = 1.4 (0.8 - 2.4) Multiv.: OR = 1.1 (0.6 - 2.0) **RR = 3.3 (1.7 - 6.3)** Multiv.: **OR = 3.4 (1.6 - 7.3)** **RR = 2.5 (1.2 - 5.0)**	LBP (multivariate): OR = 1.2 (0.9 - 1.6) OR = 1.4 (0.9 - 2.3)	Univariate: crude RRs Multivariate: Sex, smoking habits, pain score (Nottingham Health Profile), social isolation score, physical mobility score, bending forward or backward, twists, past history of LBP, employment grade, psychological demands respectively social support

Van Nieuwenhuyse et al. (2006), Belgium, 1 year	972 workers from healthcare institutions and distribution companies free of episodes of LBP lasting ≥ 7 consecutive days during the 12 months preceding the baseline responded at baseline; 716 were followed-up. // Self-report of LBP lasting ≥ 7 consecutive days during the past 12 months	High psychological job demands High job insecurity High job dissatisfaction Skill discretion (reference category unclear) Decision authority (reference cat. unclear) Supervisor support (ref. category unclear) Co-worker support (ref. category unclear)	ns positive ns or 0 ns positive ns positive ns or 0 ns or 0 ns or 0		No adjustments for: job insecurity, decision authority, supervisor support, co-worker support At least age and sex for: psychological job demands, job dissatisfaction, skill discretion
Yip (2004), Hong Kong, 1 year	224 nurses responded at baseline and 144 without LBP in the 12 months prior to baseline were followed up. // Self-report of onset of LBP for at least 1 day during the last 12 months	Low satisfaction relation with colleagues Low satisfaction relation with supervisor Low satisfaction with work (tasks) Feel stressed at work Enjoy your work High psychological distress	**RR = 2.52 (1.03 - 5.68)** ns or 0 ns or 0 ns or 0 ns or 0 ns or 0		For low satisfaction with relation with colleagues: age, current ward experience, bend to lift an item from floor level, assist patient while ambulating For all other psychosocial variables: crude RRs
ANY MORE GENERAL BODY REGIONS					
Andersen et al. (2007), Denmark, 2 years	4,006 blue and white collar workers from industrial and service sectors responded at baseline; 1,513 free from severe pain formed study population. Subjects had 'not at all', 'very little' or 'little' been bothered by any regional pain during 12 months preceding baseline. // Self-reported onset severe pain during past year	High job demands Low job control Low social support from supervisors Low social support from colleagues Low management quality Low job satisfaction	HR = 0.9 (0.7 - 1.1) HR = 1.2 (1.0 - 1.5) HR = 1.2 (0.9 - 1.5) **HR = 1.3 (1.1 - 1.7)** HR = 1.2 (1.0 - 1.5) **HR = 1.6 (1.1 - 2.3)**		Sex, age, occupational group, intervention group
Bergström et al. (2007), Sweden, 18 months and 3 years	2,187 blue and white collar workers employed in paper mills, a steelworks or at a truck manufacturer that were not on sick leave due to back or neck pain during the year preceding the baseline formed the study population. However, 10% of the subjects had neck pain, 21% back pain and 32% neck and back pain in the year prior to baseline. // Self-report of sick leave attributed to neck or back pain during the past year (including current sick-listing)		18 months follow up:	3 year follow-up:	Sex, age, neck and back pain during the past year, range of psychosocial variables
		High quantitative work demands	ns or0	ns or 0	
		High decision demands	ns or 0	OR = 0.55 (0.27 - 1.11)	
		High learning demands	ns or 0	ns or 0	
		High role conflicts	ns or 0	ns or 0	Positive challenges at work at 18 months follow-up and decision demands at 3 years follow-up were additionally adjusted for background/ demographic factors, lifestyle factors, health-related and pain-related characteristics, physical work characteristics
		High repetitive work	ns or 0	ns or 0	
		High bullying and harassment	ns or 0	**OR = 2.13 (1.03 - 4.38)**	
		High support from superior	ns or 0	ns or 0	
		High support from co-worker	ns or 0	ns or 0	
		High role clarity	ns or 0	ns or 0	
		High control of decisions	ns or 0	ns or 0	
		High control of work pace	**OR = 0.44 (0.26 - 0.76)**	ns or 0	
		High positive challenges at work	OR = 0.67 (0.40 - 1.12)	ns or 0	
		High fair leadership	ns or 0	ns or 0	
		High empowering leadership	ns or 0	ns or 0	
		High mastery of work	ns or 0	ns or 0	
		Good social climate	ns or 0	ns or 0	
		High predictability of work	ns or 0	ns or 0	
		High work centrality	ns or 0	ns or 0	
Gardner et al. (2008), United States of America, 6 months	1,108 newly hired workers from industries with high and low hand-intensive jobs responded at baseline; 962 at follow-up. 560 had no history of upper extremity symptoms in any location at baseline and formed the study population. // Self-report incident upper extremity symptoms (including shoulder) in past 6	High job insecurity High social support High decision latitude	OR = 1.20 (0.70 - 2.03) OR = 0.78 (0.46 - 1.34) OR = 1.03 (0.62 - 1.72)		Age, race, gender, BMI, wrist bending, forceful gripping, lifting > 2 lbs, vibrating tools, and social support, job decision latitude respectively high job insecurity

	months			
Joling et al. (2008), The Netherlands, 1 year	1,522 Dutch workers from representative sample formed the study population. 23.3% of the participants had 'regular' or 'prolonged' work-related MSDs at baseline (in neck; shoulders; elbows; wrists; hands; and/or back). // Self-report of 'regular' or 'prolonged' pain in neck, shoulders, elbows, wrists, hands, and/or back during the previous 12 months	High decision latitude High supervisory support High social support by colleagues High quality of communication in company High work dedication High quantitative job demands High emotional workload	OR = 0.87 (0.65 - 1.18) OR = 0.98 (0.73 - 1.31) OR = 1.08 (0.81 - 1.43) OR = 0.81 (0.59 - 1.11) OR = 0.83 (0.67 - 1.04) OR = 1.16 (0.93 - 1.45) OR = 1.00 (0.85 - 1.32)	For all except for quantitative job demands and emotional workload: age, gender, occupation, physical job demands, work-related musculoskeletal symptoms or disorders at baseline (WRMSD), quantitative job demands, emotional job demands For quantitative job demands and emotional workload: WRMSD at baseline, physical work load, computer work, decision latitude, supervisory support, co-worker support, quality of communication
Torp et al. (2001), Norway, 1 year	721 mainly blue collar workers of automobile repair garages formed the study population (98 % males). Participants had 'some', 'much' or 'severe' pain in: head (44%), neck (34%), shoulders (32%), arms (28%), upper back (19%), LB (48%), knees (34%) in the 30 days before baseline. // Self-report of pain in head, neck, upper back, low back, shoulders, arms and knees in the past 30 days	Psychological demands Decision authority Social support Management support	ß = -0.009 (ns neg. for high) **ß = -0.075 (sign. pos. for low)** ß = -0.015 (ns pos. or 0 for low) **ß = -0.089 (sign. pos. for low)**	Age, gender, any pain at baseline

[1] bold type indicates statistically significant results; ns = non-significant.

Appendix-References: References of the 54 studies included in the review

(The two studies marked with an asterisk were not included in the meta-analyses.)

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