Bilaga till rapport

Arbetsmiljöns betydelse för besvär och sjukdom i nacke, axlar, armar och händer/Occupational exposures and complaints of neck, shoulder, arm and hand, rapport 349 (2022)

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Arcury et al 2016 [66] USA **Risk of Bias** Moderate	Prospective cohort 1 year Manual workers 2009/2010–2010/2011	Participants were self-identified as Latino or Hispanic, worked 35 hours or more per week in a manual job, and aged 18 years or older. n=254 124 women and 123 men	**Job demand, job control, and job support** The job demand measures, heavy load and awkward position, were based on an established workload instrument Job control measures included skill variety and decision latitude, each based on 3 items modified from the Job Content Questionnaire The support measure, perceived supervisor control, was	**Rotator cuff syndrome** Outcome measures was collected by clinical evaluation.		Multivariate model of risk factors for incident rotator cuff syndrome (RCS) adjusted for diagnosis of condition at baseline, gender, age, indigenous language, industry and supervision indicators. Odds ratio; OR (95% CI) Heavy load: 0.59 (0.10 to 3.59) Awkward posture: 2.10 (0.83 to 5.27) Psychological demand: 3.80 (1.42 to 10.08) Decision latitude: 1.48 (0.28 to 3.49) Perceived supervisor control: 3.45 (0.77 to 15.48) Work safety climate: 1.00 (0.80 to 1.26)

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			assessed with 7 items from an established instrument.			
Bodin et al 2012 [61] France **Risk of bias** Moderate	Prospective cohort 5 years General working population 2002/2005–2007/2010	Participants were French salaried workers, including temporary and part-time workers, that underwent a mandatory annual health examination by an occupational physician in charge of the medical surveillance of a group of companies. n=1655 709 women and 946 men	**Physical, psychosocial work, and factors organizational factors** Work status and exposure to work-related risk factors were assessed with the self-administered questionnaire including information on the characteristics of the job and tasks and work organization. The response categories for biomechanical factors were presented on a 4-level Likert-type	**Shoulder pain (SP), incident cases** SP was assessed by a self-administered questionnaire. "Incident cases" were defined as subjects free from SP at baseline who stated they had SP during the 7 days preceding the second questionnaire.	Incidence of Shoulder pain (SP) in relation to work organization, biomechanical and psychosocial factors. Incidence (%) <u>Factors related to work organization</u> Paced work *Men* No 843 (11.0%) Yes 89 (13.5%) *Women* No 633 (20.1%) Yes 52 (28.9) Overtime hours *Men* No 299 (11.7%) Yes 636(10.5%) *Women* No 323 (20.7%) Yes 373 (20.1%) Lack of prior information on amount of work to be done each day *Men* No 818 (10.6%) Yes 123 (14.6%)	Multivariate model for risk factors of incidence of shoulder pain in the male and female working populations. Odds ratio; OR (95% CI) Temporary employment Women: 2.1 (1.1 to 3.87) Arms above the shoulder Men: 1.5 (1.0 to 2.3) Low decision latitude Women: 1.6 (1.0 to 2.3)

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			scale, as follows: never or practically never, rarely (less than 2 h per day), often (2 to 4 h per day) and always (more than 4 h per day). The psychosocial work factors were assessed using the validated French version of Karasek's Job Content Questionnaire.		*Women* No 681 (20.3%) Yes 25 (28.0%) Variable weekly working time *Men* No 403 (11.7%) Yes 542 (10.7%) *Women* No 359 (18.9%) Yes 342 (22.2%) Work with temporary workers *Men* No 683 (11.4%) Yes 263 (10.3%) *Women* No 512 (19.9%) Yes 192 (22.4%) Temporary employment *Men* No 868 (11.1%) Yes 77 (11.7%) *Women* No 622 (19.6%) Yes 83 (27.7%) <u>Working postures and biomechanical constraints</u> High repetitiveness of tasks (≥4h/day) *Men*	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No 764 (10.6%) Yes 179 (12.9%) *Women* No 508 (18.7%) Yes 194 (25.8%) Arms above shoulder *Men* No 581 (9.5%) Yes 363 (13.8%) *Women* No 491 (18.7%) Yes 215 (24.7%) Arms abducted (≥2h/day) *Men* No 822 (11.2%) Yes 121 (10.7%) *Women* No 624 (20.2%) Yes 82 (23.2%) Holding hand behind the trunk (≥2h/day) *Men* No 907 (10.7%) Yes 36 (22.2%) *Women* No 677 (20.2%) Yes 30 (26.7%) <u>Psychosocial factors at work</u>	

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					High psychological demand *Men* No 504 (10.9%) Yes 435 (11.5%) *Women* No 372 (21.8%) Yes 329 (18.8%) Low decision latitude *Men* No 537 (11.2%) Yes 398 (11.3%) *Women* No 296 (15.5%) Yes 404 (24.0%) Low supervisor support *Men* No 566 (11.3%) Yes 370 (11.1%) *Women* No 448 (19.9%) Yes 242 (21.5%) Low coworker support *Men* No 762 (10.6%) Yes 172 (12.8%) *Women* No 566 (19.3%) Yes 126 (26.2%)	

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					Other Exposure to cold temperature (≥4h/day) *Men* No 875 (11.3%) Yes 68 (8.8%) *Women* No 679 (20.2%) Yes 26 (30.8%) High visual demand *Men* No 769 (11.2%) Yes 172 (9.9%) *Women* No 575 (19.3%) Yes 123 (26.8%)	
Bodin et al 2012 [65] France **Risk of bias** Moderate	Prospective cohort 5 years General working population 2002/2005–2007/2010	Participants were French salaried workers, including temporary and part-time workers, that underwent a mandatory annual health examination by an occupational physician in charge of the	**Physical, psychosocial work, and factors organizational factors** Work factors were assessed by a self-administered questionnaire. Physical work factors were	**Rotator cuff syndrome (RCS)** RCS was first assessed by a self-administered questionnaire. In cases of RCS, the occupational physicians conducted a	Incidence of rotator cuff syndrome (RCS) according to personal and work-related factors. RCS/not RCS (%) Factors related to work organization Paced work *Men* No 43/691 (5.9%) Yes 7/82 (7.9%) *Women* No 39/516 (7.0%) Yes 3/35 (7.9%)	Multivariate model of risk factors for incident rotator cuff syndrome (RCS) *in the male working population* adjusted for age and high perceived physical exertion Odds ratio; OR (95% CI) Repeated and sustained posture with the arms above shoulder level (≥2h/day): 1.6 (0.8 to 3.2)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		medical surveillance of a group of companies. n=1611 617 women and 839 men	assessed using the European consensus criteria document for evaluation of the work-relatedness of upper-extremity MSD. The psychosocial work factors were assessed using the validated French version of Karasek's Job Content Questionnaire.	physical examination. RCS was diagnosed if there was at least inter-mittent pain in the shoulder region (without paresthesia), worsened by active elevation movement of the upper arm and if a following shoulder tests was positive.	<u>Overtime hours</u> *Men* No 17/268 (6.0%) Yes 33/509 (6.1%) *Women* No 26/255 (9.3%) Yes 19/312 (5.7%) Work with temporary workers *Men* No 34/562 (5.7%) Yes 17/224 (7.1%) *Women* No 26/424 (5.8%) Yes 19/97 (11.5%) High visual demand *Men* No 39/642 (5.7%) Yes 12/144 (7.7%) *Women* No 34/464 (6.8%) Yes 10/100 (9.1%) Lack of prior information on amount of work to be done each day *Men* No 45/674 (6.3%) Yes 5/112 (4.3%) *Women* No 44/445 (7.5%) Yes 1/26 (3.7%)	Low coworker support: 2.0 (1.1 to 3.9) Multivariate model of risk factors for incident rotator cuff syndrome (RCS) *in the female working population* adjusted for age (Odds ratio; OR, 95% CI) Work with temporary workers: 2.2 (1.2 to 4.2) Repeated and sustained arm abduction (60–90°): 2.6 (1.4 to 5.0)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Variable weekly working time *Men* No 19/333 (5.4%) Yes 32/451 (6.6%) *Women* No 26/288 (8.3%) Yes 18/280 (6.0%) Temporary employment *Men* No 50/735 (6.4%) Yes 1/49 (2.0%) *Women* No 43/531 (7.5%) Yes 2/38 (5.0%) <u>Working postures and biomechanical constraints</u> High repetitiveness of tasks (≥4h/day) *Men* No 41/623 (6.2%) Yes 10/161 (5.9%) *Women* No 30/415 (6.7%) Yes 14/148 (8.6%) Repeated and sustained posture with the arms above shoulder level (≥2h/day) *Men*	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No 39/704 (5.3%) Yes 12/82 (12.8%) *Women* No 38/513 (6.9%) Yes 7/55 (11.3%) Repeated and sustained arm abduction (60–90°) *Men* No 34/514 (6.2%) Yes 17/273 (5.9%) *Women* No 25/432 (5.5%) Yes 20/138 (12.7%) Holding hand behind the trunk (≥2h/day) *Men* No 48/758 (6.0%) Yes 3/28 (9.7%) *Women* No 42/544 (7.2%) Yes 3/27 (10.0%) Exposure to cold temperature (≥4h/day) No 49/736 (6.2%) Yes 2/51 (3.8%) *Women* No 41/550 (6.9%) Yes 4/17 (19.1%)	

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					<u>Psychosocial factors at work</u> High psychological demand *Men* No 21/418 (4.8%) Yes 30/365 (7.6%) *Women* No 24/281 (7.9%) Yes 20/286 (6.5%) Low skill discretion *Men* No 27/409 (6.2%) Yes 22/375 (5.5%) *Women* No 20/225 (8.2%) Yes 25/341 (6.8%) Low decision authority *Men* No 33/558 (5.6%) Yes 17/227 (7.0%) *Women* No 25/351 (6.7%) Yes 20/218 (8.4%) Low supervisor support *Men* No 29/482 (5.3%) Yes 24/299 (7.4%) *Women* No 24/364 (6.2%) Yes 21/197 (9.6%)	

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					Low coworker support *Men* No 36/651 (5.2%) Yes 15/130 (10.3%) *Women* No 34/466 (6.8%) Yes 10/93 (9.7%)	
Bovenzi et al 2015 [38] Italy **Risk of bias** Moderate	Prospective cohort 3-years Professional drivers 2003–2006	Participants were professional drivers with a minimum of one-year professional driving. All participants derived from the VIBRISKS study n=317 All participants were male	**Physical and psychosocial factors** The drivers were interviewed by certified occupational health personnel who were trained to administer a structured questionnaire developed within the VIBRISKS project.	**Neck and shoulder pain (NSP)** NSP were investigated using a modified version of the Nordic questionnaire. Cases of neck and/or shoulder pain in the previous 12 months were those who reported at least one episode of pain lasting one day or more.		Work-related factors and regional musculoskeletal pain partially adjusted for body mass index, smoking, drinking, education, physical activity, previous exposures to whole-body vibration and/or heavy workload, and survey time Odds ratio; OR (95% CI) **Neck pain** *(episodes/duration/intensity)* *Episodes* **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 0.94 (0.47 to 1.87) 45 min/day: 1.26 (0.85 to 1.86)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Duration **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 1.46 (0.74 to 2.89) 45 min/day: 1.49 (1.00 to 2.23) *Intensity* **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 1.25 (0.62 to 2.50) 45 min/day: 1.43 (0.94 to 2.15) *Epsiodes* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 1.25 (0.85 to 1.85) >1 h/day: 1.65 (0.70 to 3.88) *Duration* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 1.32 (0.89 to 1.95)

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						>1 h/day: 1.44 (0.60 to 3.42) *Intensity* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 1.15 (0.77 to 1.71) >1 h/day: 1.46 (0.62 to 3.43) *Episodes* **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.20 (0.80 to 1.81) Often: 1.57 (1.03 to 2.41) *Duration* **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.14 (0.76 to 1.73) Often: 1.40 (0.91 to 2.14) *Intensity* **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.34 (0.88 to 2.03) Often: 1.84 (1.19 to 2.85)

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						Episodes **Job decision** (Often=1.0) Sometimes: 1.66 (0.98 to 2.78) Seldom/never: 1.82 (1.07 to 3.09) *Duration* **Job decision** (Often=1.0) Sometimes: 1.44 (0.81 to 2.56) Seldom/never: 1.72 (0.95 to 3.12) *Intensity* **Job decision** (Often=1.0) Sometimes: 1.62 (0.91 to 2.87) Seldom/never: 1.70 (0.94 to 3.07) *Episodes* **Job support** (Often=1.0) Sometimes: 0.95 (0.62 to 1.47) Seldom/never: 1.09 (0.57 to 2.08) *Duration* **Job support** (Often=1.0) Sometimes: 1.31 (0.84 to 2.03)

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						Seldom/never: 1.39 (0.73 to 2.64) *Intensity* **Job support** (Often=1.0) Sometimes: 1.31 (0.84 to 2.05) Seldom/never: 1.98 (1.02 to 3.82) **Shoulder pain** *(episodes/duration/intensity)* *Episodes* **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 1.18 (0.35 to 3.98) 45 min/day: 2.48 (1.27 to 4.85) *Duration* **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 0.99 (0.32 to 3.06) 45 min/day: 2.16 (1.14 to 4.08)

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						Intensity **Lifting (>15 kg) with trunk bent or twisted** (0–15 min/day=1.0) 16–45 min/day: 0.84 (0.25 to 2.85) 45 min/day: 2.50 (1.26 to 4.95) *Epsiodes* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 0.93 (0.18 to 4.88) >1 h/day: 2.00 (1.02 to 3.92) *Duration* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 1.89 (0.99 to 3.58) >1 h/day: 1.29 (0.27 to 6.18) *Intensity* **Work with hands above shoulder level** (Never=1.0) <1 h/day: 0.97 (0.18 to 5.16) >1 h/day: 2.38 (1.19 to 4.78)

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						Episodes **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.09 (0.51 to 2.32) Often: 1.07 (0.51 to 2.24) *Duration* **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.02 (0.50 to 2.10) Often: 1.34 (0.67 to 2.69) *Intensity* **Driving with trunk bent or twisted** (Never=1.0) Sometimes: 1.02 (0.47 to 2.20) Often: 1.14 (0.54 to 2.42) *Episodes* **Job decision** (Often=1.0) Sometimes: 1.65 (0.70 to 3.89) Seldom/never: 1.96 (0.81 to 4.74) *Duration* **Job decision** (Often=1.0)

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						Sometimes: 1.54 (0.68 to 3.47) Seldom/never: 1.61 (0.70 to 3.69) *Intensity* **Job decision** (Often=1.0) Sometimes: 1.78 (0.75 to 4.20) Seldom/never: 2.07 (0.86 to 4.96) *Episodes* **Job support** (Often=1.0) Sometimes: 1.59 (0.74 to 3.39) Seldom/never: 2.35 (0.77 to 7.17) *Duration* **Job support** (Often=1.0) Sometimes: 1.39 (0.68 to 2.86) Seldom/never: 2.16 (0.77 to 6.08) *Intensity* **Job support** (Often=1.0) Sometimes: 1.36 (0.62 to 2.94) Seldom/never: 2.27 (0.73 to 7.05)

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Burt et al 2013 [80] USA **Risk of bias** Low	Prospective cohort 2 years General working population	Participants were full-time workers with at least 3 months on the job in either a hospital, a school bus manufacturing plant or an engine assembly plant n=347 201 (57.9%) were male and 146 (42.1%) were female	**Hand activity level and job-level exposure** Hand activity level (HAL) was rated by an ergonomist using the HAL 10-point visual analog scale and recorded using a modified Borg CR-10 scale. Each task was also videotaped and analyzed. Job-level exposure variables were created by combining exposure data across tasks for each study participant to represent his or her entire job	**Carpal tunnel syndrome (CTS)** CTS was assessed by a health assessment entailed electrodiagnostic testing of median and ulnar nerves, a physical examination, and questionnaires at baseline.	Work-related factors and a new episode of dominant hand CTS controlling for BMI. Hazard ratio; HR (95% CI) CTS non-cases (n=318) and CTS cases (n=29) *Force Match avg* CTS non-cases 3.8 (2.4) CTS cases 4.9 (2.7) *Force Match peak* CTS non-cases 5.9 (3.5) CTS cases 7.5 (3.5) *Exertions/min** CTS non-cases 14.1 (9.1) CTS cases 16.9 (10.4) *Forceful exertions/min** CTS non-cases 4.0 (5.3) CTS cases 6.0 (5.6) *% Time in exertion** CTS non-cases 69.9 (18.5) CTS cases 71.9 (20.6) ***% Time in forceful exertion**** CTS non-cases 16.4 (17.8) CTS cases 29.5 (24.4) *0 to <20%* CTS non-cases 210 (66.0) CTS cases 10 (34.3)	Work-related factors and a new episode of dominant hand CTS controlling for BMI. Hazard ratio; HR (95% CI) **Time in forceful exertion** (≥20% to <60%) vs: 2.83 (1.18 to 6.79) >60% vs <20%: 19.57 (5.96 to 64.24) **Job strain** High vs low/active/passive: 2.13 (1.00 to 4.54)

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					20% to <60% CTS non-cases 100 (31.4) CTS cases 14 (48.3) *60%+* CTS non-cases 8 (2.6) CTS cases 5 (17.2) **ACGIH TLV** *<AL* CTS non-cases 97 (30.5) CTS cases 5 (17.2) *AL to TLV* CTS non-cases 9 (2.8) CTS cases 1 (3.4) *TLV+* CTS non-cases 212 (66.7) CTS cases 23 (79.3) *ACGIH TLV ratio (TLR)* CTS non-cases 1.50 (1.11) CTS cases 2.09 (1.35) **HAL** *Observer HAL avg* CTS non-cases 4.1 (1.5) CTS cases 4.6 (1.6) *Observer HAL* CTS non-cases 5.1 (1.7) CTS cases 5.3 (1.7) *Wrist posture avg, % ROM†* CTS non-cases 18.8 (7.0) CTS cases 19.4 (6.2)	

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					Wrist posture peak% ROM† CTS non-cases 75.5 (20.9) CTS cases 73.4 (18.8) *Wrist flex/extend avg % ROM†* CTS non-cases 19.6 (7.2) CTS cases 20.7 (8.7) *Wrist flex/extend peak % ROM†* CTS non-cases 59.5 (20.8) CTS cases 60.7 (19.9) *Wrist deviation avg % ROM†* CTS non-cases 17.8 (9.6) CTS cases 17.5 (10.2) *Wrist deviation peak % ROM†* CTS non-cases 70.4 (22.8) CTS cases 66.1 (22.0) **Job strain** *Low/passive/active* CTS non-cases 221 (69.5) CTS cases 13 (44.8) *High* CTS non-cases 86 (27.0) CTS cases 12 (41.4) *6 had missing values for these variables. †8 had missing values for these variables.	
Christensen et al 2010 [27] Norway	Prospective cohort 2004 to 2009	Participants were employees and management from different organizations.	**Psychological, social and mechanical work factors**	**Neck pain** Intensity of neck pain during 4 weeks prior to	Work-related factors and intensity of neck pain adjusted for age, sex and neck pain at baseline Odds ratio; OR (95% CI) **Quantitative demands**	

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Risk of bias Low	General working population Follow-up 2 years	n=2419 877 (36.3%) were male and 1542 (63.7%) were female	Data was collected by a web-based survey. The psychological and social factors were assessed by the General Nordic Questionnaire for Psychological and Social Factors at Work	answering the questionnaire. If the subject answered ‘‘a little bothered”, ‘‘rather intensely bothered”, or ‘‘very intensely bothered”, the question was followed by items reflecting the duration of the health complaint, whether it had been experienced at work, and whether it was believed to be caused by work.	Category 1: 1.00 [ref] 2: 0.84 (0.51 to 1.38) 3: 0.94 (0.59 to 1.51) 4: 0.86 (0.52 to 1.44) 5: 1.19 (0.62 to 2.28) Continuous: 0.99 (0.85 to 1.17) **Decision demands** Category 1 and 2: 1.00 [ref] 3: 0.91 (0.58 to 1.44) 4: 0.82 (0.52 to 1.29) 5: 0.93 (0.57 to 1.54) Continuous: 0.97 (0.82 to 1.14) **Decision control** Category 1: 1.00 [ref] 2: 0.69 (0.42 to 1.13) 3: 0.70 (0.43 to 1.12) 4: 0.60 (0.36 to 1.00) 5: 0.66 (0.33 to 1.30) Continuous: 0.89 (0.76 to 1.04) **Control over work intensity** Category 1: 1.00 [ref] 2: 1.09 (0.74 to 1.62) 3: 1.26 (0.86 to 1.85) 4: 0.97 (0.67 to 1.42) 5: 1.01 (0.69 to 1.49) Continuous: 0.98 (0.88 to 1.09) **Role conflict**	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Category 1: 1.00 [ref] 2: 1.01 (0.73 to 1.40) 3 1.24 (0.91 to 1.69) 4: .48 (0.91 to 2.39) 5: 2.97 (1.29 to 6.74) Continuous: 1.25 (1.08 to 1.45) **Role clarity** Category 1 and 2: 1.00 [ref] 3: 1.28 (0.54 to 3.14) 4: 1.56 (0.69 to 3.67) 5: 1.42 (0.63 to 3.32) Continuous 1.00 (0.83 to 1.20) **Support from immediate superior** Category 1: 1.00 [ref] 2: 1.16 (0.50 to 2.74) 3: 1.13 (0.53 to 2.45) 4: 0.84 (0.39 to 1.87) 5: 1.0 (0.48 to 2.33) Continuous: 1.00 (0.84 to 1.17) **Empowering leadership** Category 1: 1.00 [ref] 2: 0.74 (0.48 to 1.14) 3: 0.63 (0.43 to 0.93) 4: 0.53 (0.35 to 0.81) 5: 0.64 (0.41 to 0.99) Continuous 0.88 (0.79 to 0.99) **Fair leadership** Category 1: 1.00 [ref]	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					2: 1.26 (0.48 to 3.39) 3: 1.06 (0.44 to 2.57) 4: 0.91 (0.38 to 2.20) 5: 0.82 (0.35 to 1.98) Continuous: 0.89 (0.76 to 1.03) **Predictability during the next month** Category 1 and 2: 1.00 [ref] 3: 0 .95 (0.44 to 2.08) 4: 1.05 (0.53 to 2.15) 5: 0.88 (0.45 to 1.77) Continuous: 0.90 (0.77 to 1.06) **Social climate** Category 1 and 2: 1.00 [ref] 3: 1.12 (0.61 to 2.07) 4: 0.94 (0.51 to 1.76) 5: 0.92 (0.48 to 1.76) Continuous: 0.89 (0.73 to 1.09) **Positive challenge** Category 1 and 2: 1.00 [ref] 3: 0.56 (0.27 to 1.19) 4: 0.51 (0.25 to 1.06) 5: 0.48 (0.23 to 0.99) Continuous: 0.90 (0.75 to 1.07) **Physical workload** ('manual handling') Category 1: 1.00 [ref] 2: 1.25 (0.94 to 1.65) 3: 1.24 (0.81 to 1.90)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					4: 1.04 (0.58 to 1.82) Continuous: 1.12 (0.95 to 1.32) **Working with arms raised to or above shoulder level** Category 1: 1.00 [ref] 2: 1.19 (0.91 to 1.55) 3: 1.40 (0.95 to 2.07) 4: 1.17 (0.66 to 2.05) Continuous: 1.12 (0.98 to 1.29)	
Christensen et al [54] 2021 Norway **Risk of Bias** Low	Prospective cohort 2015 General working population Follow-up 6 months	Participants derived from a probability sampling of the Norwegian workforce drawn from the Norwegian Central Employee Register by Statistics Norway. n=951 449 were male and 502 were female	**Associations of leadership** Leadership style were assessed by questionnaires. Transformational leadership was measured with the 7-item Global Transformational Leadership Scale (GTL). Abusive supervision was measured with a five-item version of Tepper 2000 scale.	**Neck pain** Neck pain were measured by single items from a symptom checklist that encompasses multiple health complaints. The intensity of pain complaints was assessed by asking ‘‘have you experienced the following affliction the previous 12 months?”.		Association between leadership and neck pain. Adjusted for sex, age, educational level, and pain at baseline. Estimate from Structural equation modeling (95% CI) Abusive supervision 0.178 (0.088 to 0.268)** Transformational leadership –0.117 (–0.188 to –0.046)** **P<0.01

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Christensen et al [52] 2021 Norway **Risk of Bias** Low	Prospective cohort 1974 to 2016 General working population Follow-up 7 years n=2323 1044 were male and 1279 were female	Participants derived from a longitudinal population-based cohort study carried out in the municipality of Tromso.	**Shift work** Shiftwork was measured by questionnaire, with the single item “Have you had shift work during the previous 3 months?”, with optional answers “Yes” and “No”.	**Chronic pain** Chronic musculoskeletal pain was assessed by questionnaire. Participants were asked whether they had suffered from pain and/or stiffness in muscles and joints in that lasted for three or more consecutive months during the previous year.	Association between shift work and chronic pain. Odds ratio; OR (95% CI) <u>Neck/shoulder pain</u> Shift work: 0.99 (0.75 to 1.29) <u>Arm/hand pain</u> Shift work: 0.96 (0.71 to 1.28)	
Coenen et al [39] 2016 Netherlands **Risk of bias** Moderate	Prospective cohort 3-year follow-up General working population	Participants were workers from 34 companies representing several industrial and service branches. These workers were classified by experts into	**Occupational postures** Video recordings were collected at four randomly chosen moments during the course of a single work day. Recordings	**Neck and shoulder symptoms** Musculoskeletal symptoms were assessed by questionnaire using a Dutch version of the	Associations of occupational postures (expressed in low and high risk) and musculoskeletal symptoms during follow-up. OR (95% CI) **Neck/Shoulder pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.79 (0.52 to 1.22)	Associations of occupational postures (expressed in low and high risk) and musculoskeletal symptoms during follow-up. Adjusted for all external force exertion at the hands, age, gender, body height and weight

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		occupational groups, based on their expected physical work load, according to the International Standard Classification of Occupations (ISCO 1968). Only task groups containing workers with external forces on the hands of 1 kg or less were included. n=789 518 (69%) were male	lasted 5–15 min each, depending on the variability of the worker's tasks. Observers analysed all recordings yielding continuous observation of a range of postures (i.e. standing/sitting/kneeling, trunk flexion and rotation, neck flexion and rotation and arm elevation	Nordic questionnaire Symptoms were defined as 'problems (discomfort and/or pain) during the past 12 months'. Workers reporting regular or prolonged discomfort and/or pain in these regions were defined as musculoskeletal symptoms-cases.	*Upper arm elevation (Total duration)*[2] Low: Reference High: 0.83 (0.56 to 1.23) **Shoulder pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.85 (0.53 to 1.36) **Neck pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.65 (0.41 to 1.02) *Upper arm elevation (Total duration)*[2] Low: Reference High: 0.70 (0.46 to 1.06) [1] Maximal continuous duration of an awkward body posture (in hours/day). [2] Total duration of an awkward body posture (in hours/day).	and number of years in the job. OR (95% CI) **Neck/Shoulder pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.83 (0.51 to 1.34) *Upper arm elevation (Total duration)*[2] Low: Reference High: 0.83 (0.54 to 1.28) **Shoulder pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.95 (0.57 to 1.59) **Neck pain** *Upper arm elevation (Maximal duration)*[1] Low: Reference High: 0.69 (0.42 to 1.12) *Upper arm elevation (Total duration)*[2] Low: Reference High: 0.75 (0.48 to 1.18)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						[1] Maximal continuous duration of an awkward body posture (in hours/day). [2] Total duration of an awkward body posture (in hours/day).
Coggon et al [90] 2019 18 countries **Risk of Bias** Moderate	Prospective cohort Follow-up mean interval of 14 months General working population	Participants derived from the CUPID study, which comprised office workers who regularly used computers, nurses, and "other workers" (mainly carrying out repetitive manual tasks with their hands or arms – for example, mail sorters). n=9082 3099 were male and 5983 females	**Work exposure** Risk factors was assessed by questionnaire (either self-administration or at interview) according to occupational group.	**Disabling wrist/hand pain (WHP).** Pain experience was assessed by questionnaire which assessed pain in the wrist/hand area that had lasted for longer than a day during the past month, and if so, whether the pain had made it difficult to perform one or more of five listed activities.	Association between psychosocial aspects of work and Disabling wrist/hand pain (WHP). Adjusted for age, gender, and BMI. Prevalence rate ratio; PRR (95% CI) Work for >50 h per week: 1.0 (0.8 to 1.1) Time pressure at work: 1.1 (1.0 to 1.2) Lack of support at work: 1.0 (0.9 to 1.2) Lack of job control: 1.0 (0.9 to 1.2) Job security: 1.1 (1.0 to 1.2)	
Dalboge et al [55]	Case-control (nested within a cohort study)	Randomly selected cases and two controls	**Job physical exposure**	**Surgery for subacromial**	**Associations between Occupational exposure and Surgery for subacromial impingement syndrome**	**Associations between Occupational exposure and Surgery for**

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
2017 Denmark **Risk of Bias** Low	 General working population 2007 to 2001	(matched om sex and date of birth) was included n=3000 case-control sets	<u>Mechanical exposure</u> Data were collected with questionnaires. Job titles were linked to Shoulder-JEM based on expert ratings <u>Psychosocial factors</u> Data were collected with questionnaires, questions were based on the short version of the Copenhagen Psychosocial questionnaire and transformed into psychosocial JEM	**impingement syndrome** Outcome identified as first-time surgery under ICD-10, groups M19 or M75.1–M75.9	**Odds ratio; OR (95% CI)** <u>Men</u> Arm elevation years 0: 1.0 >0–10: 2.0 (1.6 to 2.5) >10–60: 2.3 (1.8 to 3.0) Repetition years 0: 1.0 >0–10: 1.7 (1.4 to 2.1) >10–17.5: 2.6 (1.5 to 4.6) Force years 0: 1.0 >0–10: 2.0 (1.6 to 2.5) >10–30: 2.6 (2.0 to 3.4) Shoulder load years 0: 1.0 >0–15: 1.6 (1.2 to 2.0) >15–20: 2.2 (1.7 to 2.9) Psychological strain Low strain (low demands and high control): 1.0 Passive (low demands and low control): 1.3 (1.0 to 1.7) Active: (high demands and high control): 0.7 (0.5 to 1.1) High (high demands and low control): 1.6 (1.2 to 2.2)	**subacromial impingement syndrome, adjusted for *. Odds ratio; OR (95% CI).** *Men* Arm elevation years 0: 1.0 >0–10: 2.0 (1.5 to 2.5) >10–60: 2.3 (1.8 to 3.0) Repetition years 0: 1.0 >0–10: 1.6 (1.3 to 2.0) >10–17.5: 2.2 (1.2 to 4.1) Force years 0: 1.0 >0–10: 2.2 (1.6 to 2.6) >10–30: 2.5 (1.9 to 3.5) Shoulder load years 0: 1.0 >0–15: 1.5 (1.3 to 2.0) >15–20: 2.3 (1.7 to 3.0) Psychological strain Low strain (low demands and high control): 1.0 Passive (low demands and low control): 1.0 (0.8 to 1.4)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Psychological support High: 1.0 Low: 1.3 (1.0 to 1.6) <u>Women</u> Arm elevation years 0: 1.0 >0–10: 1.6 (1.3 to 1.9) >10–60: 1.9 (1.4 to 2.6) Repetition years 0: 1.0 >0–10: 1.5 (1.2 to 1.9) >10–17.5: 2.2 (1.0 to 4.4) Force years 0: >0–10: 1.7 (1.4 to 2.1) >1–-30: 2.3 (1.6 to 3.3) Shoulder load years 0: 1.0 >0–15: 1.4 (1.0 to 1.7) >15–20: 1.7 (1.2 to 2.4) Psychological strain Low strain (low demands and high control): 1.0 Passive (low demands and low control): 1.0 (0.8 to 1.4)	Active: (high demands and high control): 0.8 (0.6 to 1.1) High (high demands and low control): 1.2 (0.6 to 1.1) Psychological support High: 1.0 Low: 1.3 (1.0 to 1.6) <u>Women</u> Arm elevation years 0: 1.0 >0–10: 1.5 (1.2 to 1.9) >10–60: 1.9 (1.4 to 2.6) Repetition years 0: 1.0 >0–10: 1.5 (1.2 to 1.9) >10–17.5: 1.9 (0.9 to 4.2) Force years 0: 1.0 >0–10: 1.7 (1.4 to 2.0) >10–30: 2.0 (1.3 to 2.9) Shoulder load years 0: 1.0 >0–15: 1.3 (1.0 to 1.7) >15–20: 1.7 (1.1 to 2.4)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Active: (high demands and high control): 0.7 (0.5 to 0.9) High (high demands and low control): 1.2 (0.9 to 1.5) Psychological support High: 1.0 Low: 1.0 (0.8 to 1.1)	Psychological strain Low strain (low demands and high control): 1.0 Passive (low demands and low control): 1.0 (0.7 to 1.3) Active: (high demands and high control): 0.8 (0.6 to 1.1) High (high demands and low control): 1.2 (0.9 to 1.5) Psychological support High: 1.0 Low: 0.8 (0.6 to 1.0) *For each occupational mechanical exposure, we adjusted for occupational psychosocial factors (support (two categories) and job strain (four categories)), lifestyle factors (BMI (three categories), pack-years of smoking (four categories) and leisure time shoulder intensive sports (three categories)), diabetes mellitus (no/yes) and region of residence (five regions). In the models for occupational psychosocial factors, we

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						adjusted for arm-elevation-years (three categories) together with lifestyle factors, diabetes mellitus and region of residence.
Dale et al 2014 [81] USA **Risk of bias** Low	Prospective cohort 3 years General working population 2004 to 2009	Participants were predominantly employed in clerical, service, and construction jobs. They were working at least 30 hr per week, and newly hired or benefits eligible within the last 30 days. n=710 457 (64.4%) were male and 253 (35.6%) were female	**Physical factors** Physical work exposures were assessed by surveys. Further information on the data collection is missing.	**Carpal tunnel syndrome (CTS)** CTS was assessed by a survey (description of symptoms on a hand diagram) and bilateral nerve conduction studies of the hand conducted by trained technicians. Diagrams were rated separately by an occupational therapist and an occupational physician Subjects were counted as a CTS case if they	Work-related factors and carpal tunnel syndrome. Odds ratio; OR (95% CI) **Lifting objects>4 hr per day** Most recent: 2.60 (1.25 to 5.40) Peak: 3.00 (1.21 to 7.40) Employed-time weighted: 1.87 (0.91 to 3.84) **Forearm rotation>4 hr per day** Most recent: 1.21 (0.51 to 2.87) Peak: 1.39 (0.68 to 2.87) Employed-time weighted: 0.46 (0.11 to 1.95) **Wrist bending>4 hr per day** Most recent: 1.60 (0.77 to 3.30) Peak: 1.05 (0.50 to 2.23) Employed-time weighted: 1.84 (0.89 to 3.80) **Forceful gripping>4 hr per day** Most recent: 2.34 (1.12 to 4.89) Peak: 1.94 (0.93 to 4.02) Employed-time weighted: 2.30 (1.08 to 4.92)	Work-related factors and carpal tunnel syndrome adjusted for age, gender, and BMI Odds ratio; OR (95% CI) **Lifting objects>4 hr per day** Most recent: 2.98 (1.41 to 6.31) Peak: 3.61 (1.41 to 9.24) Employed-time weighted: 2.23 (1.05 to 4.73) **Forearm rotation>4 hr per day** Most recent: 1.23 (0.51 to 2.94) Peak: 1.36 (0.66 to 2.83) Employed-time weighted: 0.38 (0.09 to 1.66) **Wrist bending>4 hr per day** Most recent: 1.48 (0.71 to 3.12) Peak: 0.98 (0.46 to 2.10)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				met the case definition (symptoms plus median neuropathy) for either hand.	**Thumb pressing>4 hr per day** Most recent: 1.73 (0.78 to 3.84) Peak: 1.11 (0.53 to 2.30) Employed-time weighted: 0.29 (0.04 to 2.19) **Finger pinching>2 hr per day** Most recent: 0.55 (0.16 to 1.83) Peak: 0.82 (0.37 to 1.81) Employed-time weighted: 0.77 (0.27 to 2.26)	Employed-time weighted: 1.97 (0.94 to 4.12) **Forceful gripping>4 hr per day** Most recent: 2.70 (1.26 to 5.78) Peak: 2.21 (1.03 to 4.73) Employed-time weighted: 2.69 (1.21 to 5.96) **Thumb pressing>4 hr per day** Most recent: 1.71 (0.76 to 3.86) Peak: 1.12 (0.54 to 2.35) Employed-time weighted: 0.30 (0.04 to 2.21) **Finger pinching>2 hr per day** Most recent: 0.62 (0.18 to 2.08) Peak: 0.87 (0.39 to 1.93) Employed-time weighted: 0.84 (0.29 to 2.47)
Descatha et al 2013 [72] USA	Prospective cohort	Participants were years or older, working at least 30 h per week, and were	**Physical and psychosocial workload factors**	**Epicondylitis (medial and lateral)**	Associations between work-related risk factors and epicondylitis. Odds ratio; OR (95% CI) <u>Lateral epicondylitis:</u>	Associations between work-related risk factors and epicondylitis. Adjusted for several

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Moderate	Follow up varies between 26 and 71 months General working population 2004 to 2006	recruited from eight employers and three trade unions representing manufacturing, construction, biotechnology, and healthcare. Subjects with a history of carpal tunnel syndrome and/or elbow symptoms at were excluded from the study. n=699 449 (64.2%) were male and 250 (35.8%) were female	Self-reported workplace psychosocial measures and the duration of eight physical exposures were collected by a questionnaire at baseline.	Epicondylitis was assessed with a questionnaire and physical examination. The case definition of epicondylitis required symptoms of recurrent or persistent elbow pain in the past year and positive physical examination in the same arm.	**Lack of social support** No: 1 Yes: 1.3 (0.5 to 3.1) **Bending** No or <1 h/day: 1 1–2 h/day: 0.8 (0.1 to 7.4) 2–4 h/day: 2.8 (0.7 to 10.5) ≥4 h/day: 4.4 (1.5 to 13.1) **Rotating** No or <1 h/day: 1 1–2 h/day: 1.0 (0.2 to 4.6) 2–4 h/day: 2.3 (0.8 to 6.7) ≥4 h/day: 2.7 (1.2 to 6.2) **Gripping** No or <1 h/day: 1 1–2 h/day: 1.3 (0.4 to 4.2) 2–4 h/day: 1.5 (0.5 to 4.3) ≥4 h/day: 1.7 (0.7 to 4.0) **Bending ≥4h/day and Rotating ≥2 h/day** No: 1 Yes: 2.5 (1.1 to 5.3) <u>Medial epicondylitis:</u> **Lack of social support** No: 1	factors. Odds ratio; OR (95% CI) **Bending ≥4h/day and rotating ≥2 h/day (yes)** <u>Lateral epicondylitis:</u> *All:* 2.5 (1.1 to 5.3) <u>Medial epicondylitis:</u> *All:* 3.1 (1.4 to 6.8) <u>Lateral or medial epicondylitis:</u> *All:* 3.0 (1.6 to 5.8) *Men:* 2.8 (1.2 to 6.2) *Women:* 3.6 (1.2 to 11.0) **Lack of social support (yes)** <u>Lateral epicondylitis:</u> *All:* 1.0 (0.4 to 2.6) <u>Medial epicondylitis:</u> *All:* 1.1 (0.4 to 2.8) <u>Lateral or medial epicondylitis:</u> *All:* 0.9 (0.4 to 2.1) *Men:* 0.5 (0.1 to 1.7) *Women:* 2.3 (0.7 to 7.9)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Yes: 1.4 (0.6 to 3.2) **Bending (**Because no worker with medial epicondylitis reported less than 1 h of bending, reference included also 1–2 h/day**)** No or <1 h/day: 1 1–2 h/day: 1 2–4 h/day: 4.9 (1.1 to 20.7) ≥4 h/day: 8.2 (2.4 to 27.9) **Rotating** No or <1 h/day: 1 1–2 h/day: 0.5 (0.1 to 3.9) 2–4 h/day: 2.8 (1.0 to 7.7) ≥4 h/day: 2.5 (1.0 to 5.8) **Gripping** No or <1 h/day: 1 1–2 h/day: 2.1 (0.6 to 7.2) 2–4 h/day: 1.9 (0.5 to 6.5) ≥4 h/day: 3.8 (1.5 to 9.6) **Bending ≥4h/day and Rotating ≥2 h/day** No: 1 Yes: 3.6 (1.7 to 7.7) <u>Lateral or medial epicondylitis:</u> **Lack of social support** No: 1	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Yes: 1.1 (0.5 to 2.3) **Bending** No or <1 h/day: 1 1–2 h/day: 2.5 (0.6 to 11.4) 2–4 h/day: 3.9 (1.1 to 13.8) ≥4 h/day: 6.9 (2.4 to 19.9) **Rotating** No or <1 h/day: 1 1–2 h/day: 1.0 (0.3 to 3.6) 2–4 h/day: 2.6 (1.1 to 6.3) ≥4 h/day: 2.7 (1.3 to 5.4) **Gripping** No or <1 h/day: 1 1–2 h/day: 1.7 (0.6 to 4.5) 2–4 h/day: 1.5 (0.6 to 4.0) ≥4 h/day: 2.8. (1.4 to 5.8) **Bending ≥4h/day and Rotating ≥2 h/day** No: 1 Yes: 3.5 (1.9 to 6.5)	
Descatha et al 2012 [62] France **Risk of bias**	Prospective cohort 12 years	The participant were blue-collar and clerical workers, managers, and supervisors employed in	**Biomechanical exposure** Data were collected with self- administered questionnaires.	**Shoulder pain** Shoulder pain was assessed with a self-administered Questionnaire.		Moderate and severe shoulder pain in 2006, and occupational factors assessed in 1994–1995 among workers with no self-reported shoulder pain at baseline. Adjusted

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Moderate	Energy production and distribution. 1989 to 2006	energy production and distribution. n=1482 All participants were male		Severe shoulder pain was defined as pain or discomfort of >4 on an 8 point-scale. Moderate pain was defined as pain rating lower than these thresholds.		for age, BMI, regular sports, history of shoulder trauma, and date of retirement. Odds ratio; OR (95% CI) *Moderate shoulder pain* **Exposed to arm elevation >90° while carrying loads (years)** <1: 1.00 1–25: 1.01 (0.58 to 1.73) ≥25: 0.83 (0.21 to 3.22) **Exposed to arm elevation >90° without carrying loads (years)** <1: 1.00 1–25: 1.27 (0.78 to 2.07) ≥25: 0.82 (0.30 to 2.21) *Severe shoulder pain* **Exposed to arm elevation >90° while carrying loads (years)** <1: 1.00 1–25: 0.93 (0.51 to 1.70) ≥25: 4.03 (1.21 to 13.47)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Exposed to arm elevation >90° without carrying loads (years) <1: 1.00 1–25: 1.50 (0.87 to 2.56) ≥25: 0.59 (0.19 to 1.83)
Eltayeb et al [42] 2011 Africa **Risk of bias** Moderate	Prospective cohort 1 year Office workers 2005 to 2006	The participants were computer office and bank workers that performed jobs with a variety of computer tasks. Participants with severe psychiatric or behavioral disorders or previous surgery of the upper extremity were excluded. n=186 119 (64%) were male and 67 (36%) were female	**Work-related Psychological Factors** Data were collected with self- administered questionnaires.	**Pain in neck, shoulders, and forearms** Self-reported pain assessed in the Arabic Upper Extremity Questionnaire (AUEQ).	Associations between psychological risk factors at baseline and pain in neck, shoulders, and forearms at follow-up. Odds ratio; OR (95% CI). <u>Neck symptoms</u> Low skill discretion: 1.08 (0.93 to 1.06) Low decision authority: 1.03 (0.87 to 1.21) Time pressure: 1.04 (0.84 to 1.29) High tasks difficulty: 1.41 (1.06 to 2.39) High social support: 0.93 (0.87 to 0.99) Positive workflow: 0.96 (0.89 to 1.04) High job strain: 1.07 (0.66 to 1.71) <u>Shoulder Symptoms</u> Low skill discretion: 1.40 (0.89 to 1.11) Low decision authority: 1.02 (0.87 to 1.95) Time pressure: 1.18 (0.95 to 1.45) High tasks difficulty: 1.05 (0.86 to 1.24) Low social support: 1.02 (0.96 to 1.06) Positive workflow: 1.04 (0.96 to 1.13) High job strain: 1.03 (0.94 to 1.14)	Associations between psychological risk factors at baseline and pain in neck, shoulders, and forearms at follow-up, adjusted for age, sex, and previous history of symptoms. Odds ratio; OR (95% CI). <u>Neck symptoms</u> Low skill discretion: 1.01 (0.94 to 1.09) Low decision authority: 1.07 (0.82 to 1.17) Time pressure: 1.31 (1.00 to 1.90) High tasks difficulty: 1.85 (1.73 to 1.99) High social support: 0.91 (0.84 to 0.99) Positive workflow: 0.98 (0.87 to 1.14) High job strain: 1.01 (0.55 to 1.80)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					<u>Forearms/Hands Symptoms</u> Low skill discretion: 1.09 (1.02 to 1.16) Low decision authority: 1.18 (1.01 to 1.39) Time pressure: 1.33 (1.06 to 1.66) High tasks difficulty: 1.10 (0.95 to 1.27) Low social support: 1.04 (0.98 to 1.11) Positive workflow: 1.05 (0.96 to 1.14) High job strain: 1.07 (0.44 to 1.19)	<u>Shoulder Symptoms</u> Low skill discretion: 1.07 (0.96 to 1.18) Low decision authority: 1.08 (0.71 to 1.19) Time pressure: 1.53 (1.13 to 2.07) High tasks difficulty: 1.86 (1.74 to 1.91) Low social support: 1.10 (0.95 to 1.31) Positive workflow: 0.96 (0.84 to 1.08) High job strain: 1.45 (0.21 to 3.70) <u>Forearms/Hands Symptoms</u> Low skill discretion: 1.04 (0.95 to 1.13) Low decision authority: 1.07 (0.85 to 1.34) Time pressure: 1.41 (1.11 to 1.78) High tasks difficulty: 1.17 (1.00 to 1.37) Low social support: 1.02 (0.86 to 1.22) Positive work: 1.46 (0.91 to 1.69) High job strain:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						1.13 (0.63 to 2.04)
Fan et al 2014 [75] USA **Risk of bias** Low	Prospective cohort 2-years Manufacturing and service sector 2001–2004	Participants were full-time employees in 12 different manufacturing and health care facilities, such as office work, assembly work, wood product manufacturing, and technical occupations in health care delivery. Cases with dominant side epicondylitis were excluded at baseline. n=601 312 (52%) were male and 295 (48%) were female	**Work-related factors** Physical workload was assessed by the strain index (comprises intensity of exertion, duration of exertion, efforts per minute, hand/wrist posture, speed of work, and duration per day of the job). Strain Index Computation was calculated for each worker by videotaping while performing his/her job. Psychosocial work-related factors were assessed by self-	**Epicondylitis** An occupational physician, a registered nurse, or a physical therapist completed a brief physical examination of the neck and upper extremities. Positive elbow or forearm symptoms were defined as: 1) any pain, aching, stiffness, burning, numbness, or tingling in the elbow or forearm region in the past seven days.	Incidence of epicondylitis according to Strain Index and Six Parameters. HR (95% CI) or EPI cases/not EPI or n exposed/EPI cases **Lateral epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.56 (0.72 to 3.40) Hazard >7: 1.90 (0.92 to 3.92) Low exposure ≤5: 1 High exposure >5: 2.00 (1.13 to 3.54) Low exposure ≤5: 1 Medium exposure 5.1–12: 2.01 (1.04 to 3.88) High exposure >12: 1.98 (1.04 to 3.78) *Intensity of exertion (IE)* EPI/not EPI Light: 36/453 Somewhat hard: 12/187 Hard: 7/51 Very hard: 2/26 Near max: 0/1 *Duration of exertion* EPI/not EPI <10: 1/20 10–29.9: 7/75	Incidence of epicondylitis (EPI) according to Strain Index and Six Parameters. Adjusted for age, gender, and poor general health. HR (95% CI) **Lateral epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.47 (0.67 to 3.22) Hazard >7: 1.88 (0.91 to 3.90) Low exposure ≤5: 1 High exposure >5: 2.06 (1.16 to 3.65) Low exposure ≤5: 1 Medium exposure 5.1–12: 2.00 (1.04 to 3.87) High exposure >12: 2.12 (1.11 to 4.05) **Medial epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.00 (0.36 to 2.81)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			administered questionnaire.	2) symptoms that lasted more than one week or occurred more than three times in the previous 12 months. 3) no previous accident or sudden injury at the elbow/forearm area at the time of the onset of symptoms. A positive clinical case was defined as positive symptoms at the elbow or forearm from the structured interview plus a corresponding positive physical exam on the	30–49.9: 10/141 50–79.9: 23/325 ≥80: 16/139 *Efforts per minute* EPI/not EPI <4: 9/129 4–8.9: 15/121 9–14: 18/220 15–19.9: 9/103 ≥20: 6/127 *Hand/wrist posture* EPI/not EPI Very Good: 0/14 Good: 7/127 Fair: 25/305 Bad: 25/250 Very Bad: 0/4 *Speed of work (SW)* EPI/not EPI Very Slow: 4/14 Slow: 5/125 Fair: 37/400 Fast: 10/150 Very Fast:1/13 *Duration per day (hours)* EPI/not EPI 4–8: 37/465 ≥8: 20/235 *Psychosocial* n exposed/EPI cases High job demands: 354/33 No: 211/23	Hazard >7: 1.09 (0.42 to 2.83) Low exposure ≤5: 1 High exposure >5: 1.41 (0.64 to 3.12) Low exposure ≤5: 1 Medium exposure 5.1–12: 1.11 (0.40 to 3.07) High exposure >12: 1.69 (0.69 to 4.13) **Lateral and/or medial epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.21 (0.63 to 2.30) Hazard >7: 1.31 (0.71 to 2.42) Low exposure ≤5: 1 High exposure >5: 1.69 (1.03 to 2.78) Low exposure ≤5: 1 Medium exposure 5.1–12: 1.73 (0.97 to 3.07) High exposure >12: 1.65 (0.92 to 2.95)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				symptomatic side.	High decision latitude: 275/27 No: 290/29 High social support: 292/30 No: 273/26 High job security: 393/38 No: 172/18 Social contents n exposed/EPI cases Work team: 330/34 Individual: 258/23 *Job contents* n exposed/EPI cases Very strong structural restraints: 316/28 Very minor to strong structural restraints: 272/29 *Pace* n exposed/EPI cases Self or social/peer: 476/52 Piece rate or quota, machine, or line: 124/17 **Medial epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.03 (0.37 to 2.85) Hazard >7: 1.10 (0.42 to 2.83)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low exposure ≤5: 1 High exposure >5: 1.42 (0.64 to 3.13) Low exposure ≤5: 1 Medium exposure 5.1–12: 1.14 (0.41 to 3.13) High exposure >12: 1.67 (0.69 to 4.04) *Intensity of exertion (IE)* EPI/not EPI Light: 15/429 Somewhat hard: 7/184 Hard: 3/50 Very hard: 1/26 Near max: 0/1 *Duration of exertion* EPI/not EPI <10: 0/20 10–29.9: 1/73 30–49.9: 7/140 50–79.9: 10/319 ≥80: 8/138 *Efforts per minute* EPI/not EPI <4: 4/131 4–8.9: 7/118 9–14: 10/214 15–19.9: 3/101 ≥20: 2/126 *Hand/wrist posture* EPI/not EPI Very Good: 0/14 Good: 5/127	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Fair: 8/300 Bad: 13/245 Very Bad: 0/4 *Speed of work (SW)* EPI/not EPI Very Slow: 0/14 Slow: 0/125 Fair: 20/390 Fast: 5/148 Very Fast: 1/13 *Duration per day (hours)* EPI/not EPI 4–8: 18/458 ≥8: 8/232 *Psychosocial* n exposed/EPI cases High job demands: 337/16 No: 194/6 High decision latitude: 260/12 No: 271/10 High social support: 271/9 No: 260/13 High job security: 369/14 No: 162/8 *Social contents* n exposed/EPI cases Work team: 312/16 Individual: 244/9	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Job contents n exposed/EPI cases Very strong structural restraints: 302/14 Very minor to strong structural restraints: 254/ 11 *Pace* n exposed/EPI cases Self or social/peer: 444/20 Piece rate or quota, machine, or line: 112/5 **Lateral and/or medial epicondylitis** *Strain Index* HR (95% CI) Safe ≤3: 1 Action 3.1–7: 1.25 (0.66 to 2.38) Hazard >7: 1.30 (0.71 to 2.40) Low exposure ≤5: 1 High exposure >5: 1.65 (1.00 to 2.71) Low exposure ≤5: 1 Medium exposure 5.1–12: 1.73 (0.98 to 3.08) High exposure >12: 1.57 (0.88 to 2.79) *Intensity of exertion (IE)* EPI/not EPI Light: 46/436 Somewhat hard: 14/189 Hard: 8/51 Very hard: 2/26 Near max: 0/1	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Duration of exertion EPI/not EPI <10: 1/20 10–29.9: 8/75 30–49.9: 11/142 50–79.9: 30/326 ≥80: 20/140 *Efforts per minute* EPI/not EPI <4: 12/131 4–8.9: 17/122 9–14: 25/220 15–19.9: 9/103 ≥20: 7/127 *Hand/wrist posture* EPI/not EPI Very Good: 0/14 Good: 11/128 Fair: 28/307 Bad: 31/250 Very Bad: 0/4 *Speed of work (SW)* EPI/not EPI Very Slow: 4/14 Slow: 5/126 Fair: 47/400 Fast: 12/150 Very Fast: 2/13 *Duration per day (hours)* EPI/not EPI 4–8: 48/466 ≥8: 22/237	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Psychosocial n exposed/EPI cases High job demands: 360/39 No: 215/27 High decision latitude: 281/33 No: 294/33 High social support: 296/34 No: 279/32 High job security: 399/44 No: 176/22 *Social contents* n exposed/EPI cases Work team: 338/42 Individual: 262/27 *Job contents* n exposed/EPI cases Very strong structural restraints: 322/34 Very minor to strong structural restraints: 278/35 *Pace* n exposed/EPI cases Self or social/peer: 476/52 Piece rate or quota, machine, or line: 124/17	
Fan et al 2014 [68] USA	Prospective cohort 2001–2004	Participants were workers full-time employees in 12 different	**Psychosocial and Work Organizational Factors**	**Lateral epicondylitis (LE)**	Univariate Analysis: Personal, Psychosocial, and Work Organizational Factors of the Study	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Low	Manufacturing and health care facilities Follow-up up to 3.5 years	manufacturing and health care facilities. n=611 52% were male and 48% were female	Time studies were conducted for each forceful hand exertion and posture using the Multimedia Video Task Analysis (MVTA) software Data reduction method was developed for the SI scores computation in multiple force jobs Work organizational factors were assessed at the department level by fielder ergonomists using an observational tool	Case definition. The diagnosis of epicondylitis was based on symptoms and findings of the physical examination. A positive clinical case of LE was defined as positive symptoms at the elbow or forearm plus a positive physical exam on the symptomatic side.	Population by Case Status of Lateral Epicondylitis, Dominant Side Hazar Ratio; HR (95% CI) **Psychosocial work** High job demands: 0.98 (0.58 to 1.66) Low job demands: 1.00 Low decision latitude: 1.11 (0.66 to 1.88) High decision latitude: 1.00 Low job satisfaction: 1.54 (0.91 to 2.60) High job satisfaction: 1.00 Low social support: 1.01 (0.60 to 1.70) High social support: 1.00 Low job security: 1.23 (0.70 to 2.14) High job security: 1.00 **Work organization** <u>Social contents</u> Work team, min. to high coordination: 1.57 (0.93 to 2.64)* Individual: 1.00 <u>Job contents</u> Very strong structural restraints: 1.06 (0.63 to 1.79)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Very minor to strong structural restraints: 1.00 Pace: 1.00 (0.57 to 1.75) Piece rate or quota, machine, or line: 1.00 Rotation: Yes 1.22 (0.68 to 2.17) No 1.00 **Posture of wrists and forearms** Wrist flexion/extension ≥15° for ≥40% time: 0.94 (0.56 to 1.58) <40% time 1.00 Wrist flexion/extension ≥45° for ≥2% time: 0.98 (0.58 to 1.66) <2%: 1.00 Forearm pronation ≥45° for ≥40% time: 1.60 (0.93 to 2.73) * <40% time: 1.00 Forearm supination ≥45° for≥5% time: 1.19 (0.71 to 2.00) <5% time: 1.00 Forearm rotation ≥45° for ≥45% time: 1.41 (0.82 to 2.42) <45% time: 1.00 **Hand force** Any pinch grip force: 1.20 (0.64 to 2.24) No pinch grip: 1.00	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Any power grip force: 1.65 (0.97 to 2.82) No power grip: 1.00 Lifting ≥3% time: 1.28 (0.76 to 2.15) <3% time: 1.00 Duty cycle ≥10% time: 1.43 (0.84 to 2.43) <10% time: 1.00 Frequency of forceful exertion for ≥2 times/min: 1.18 (0.69 to 2.00) <2 times/min: 1.00 **Posture and/or force, at the job level** **Wrist flexion/extension ≥15° and force** Wrist flexion/extension ≥15° for ≥40% time AND any power grip: 1.52 (0.78 to 2.96) ≥40% time AND no power grip: 0.77 (0.40 to 1.50) <40% time AND any power grip: 1.32 (0.55 to 3.15) Neither: 1.00 Wrist flexion/extension ≥15° for ≥40% time AND lifting ≥3% time: 1.18 (0.60 to 2.33)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					≥40% time AND lifting <3% time: 0.74 (0.36 to 1.50) <40% time AND lifting ≥3% time: 0.96 (0.43 to 2.13) Wrist flexion/extension ≥15° for ≥40% time AND duty cycle ≥10% time: 1.30 (0.66 to 2.54) ≥40% time AND duty cycle <10% time: 0.68 (0.33 to 1.43) <40% time AND duty cycle≥10% time: 0.99 (0.45 to 2.20) Neither: 1.00 Wrist flexion/extension ≥15° for ≥40% time AND Freq force ≥2/min: 1.09 (0.56 to 2.13) ≥40% time AND Freq force <2/min: 0.67 (0.33 to 1.36) <40% time AND Freq force ≥2/min: 0.77 (0.34 to 1.74) Neither: 1.00 **Wrist flexion/extension ≥45° and force** Wrist flexion/extension ≥45° for ≥5% time AND any power grip ≥5% time AND no power grip: 0.91 (0.46 to 1.79) <5% time AND any power grip: 1.94 (0.85 to 4.39) Neither: 1.00	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Wrist flexion/extension ≥45° for ≥5% time AND lifting ≥3% time: 1.11 (0.54 to 2.27) ≥5% time AND lifting <3% time: 0.93 (0.45 to 1.95) <5% time AND lifting ≥3% time: 1.52 (0.68 to 3.43) Neither: 1.00 Wrist flexion/extension ≥45° for ≥5% time AND duty cycle ≥10% time: 1.22 (0.60 to 2.50) ≥5% time AND duty cycle <10% time: 1.00 (0.47 to 2.11) <5% time AND duty cycle ≥10% time: 2.06 (0.91 to 4.66) * Neither: 1.00 Wrist flexion/extension ≥45° for ≥5% time AND Freq force ≥2/min: 1.02 (0.51 to 2.04) ≥5% time AND Freq force <2/min: 0.86 (0.41 to 1.77) <5% time AND Freq force ≥2/min: 1.28 (0.55 to 3.02) Neither: 1.00 **Forearm pronation ≥45° and force** Forearm pronation ≥45° for ≥40% time AND any power grip: 3.03 (1.39 to 6.64) *** ≥40% time AND no power grip:	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					1.53 (0.76 to 3.06) <40% time AND any power grip: 1.49 (0.63 to 3.53) Neither: 1.00 Forearm pronation ≥45° for ≥40% time AND lifting ≥3% time: 2.89 (1.19 to 7.04) ** ≥40% time AND lifting <3% time: 1.62 (0.70 to 3.76) <40% time AND lifting ≥3% time: 1.36 (0.56 to 3.31) Neither: 1.00 Forearm pronation ≥45° for ≥40% time AND duty cycle ≥10% time: 2.97 (1.27 to 6.96) ** ≥40% time AND duty cycle <10% time: 1.46 (0.65 to 3.31) <40% time AND duty cycle ≥10% time: 1.31 (0.54 to 3.17) Neither: 1.00 Forearm pronation ≥45° for ≥40% time AND Freq force ≥2/min: 2.28 (1.00 to 5.19) ** ≥40% time AND Freq force <2/min: 1.36 (0.63 to 2.94) <40% time AND Freq force ≥2/min: 1.03 (0.44 to 2.42) Neither: 1.00	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Forearm supination ≥45° and force Forearm supination ≥45° for ≥5% time AND any power grip: 1.48 (0.62 to 3.55) ≥5% time AND no power grip: 1.86([0.96 to 3.60) * <5% time AND any power grip: 2.86 (1.41 to 5.82) *** Neither: 1.00 Forearm supination ≥45° for ≥5% time AND lifting ≥3% time: 1.32 (0.66 to 2.62) ≥5% time AND lifting <3% time: 1.89 (0.92 to 3.90) * <5% time AND lifting ≥3% time: 2.09 (1.02 to 4.27) ** Neither: 1.00 Forearm supination ≥45° for ≥5% time AND duty cycle ≥10% time: 1.47 (0.74 to 2.93) ≥5% time AND duty cycle <10% time: 1.59 (0.76 to 3.34) <5% time AND duty cycle ≥10% time: 2.02 (0.98 to 4.13) * Neither: 1.00 Forearm supination ≥45° for ≥5% time AND Freq force ≥2/min: 1.29 (0.66 to 2.51) ≥5% time AND Freq force <2/min:	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					1.36 (0.65 to 2.82) <5% time AND Freq force ≥2/min: 1.35 (0.64 to 2.83) Neither: 1.00 **Forearm rotation ≥45° and force** Forearm rotation ≥45° for ≥45% time AND any power grip: 2.83 (1.16 to 6.90) ** ≥45% time AND no power grip: 1.88 (0.83 to 4.28) <45% time AND any power grip: 2.31 (0.82 to 6.53) Neither: 1.00 Forearm rotation ≥45° for ≥45% time AND lifting ≥3% time: 2.27 (0.88 to 5.88) * ≥45% time AND lifting <3% time: 1.50 (0.58 to 3.84) <45% time AND lifting ≥3% time: 1.25 (0.43 to 3.61) Neither: 1.00 Forearm rotation ≥45° for ≥45% time AND duty cycle ≥10% time: 3.10 (1.05 to 9.15) ** ≥45% time AND duty cycle <10% time: 2.20 (0.77 to 6.30) <45% time AND duty cycle ≥10% time: 2.22 (0.70 to 7.04) Neither: 1.00	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Forearm rotation ≥45° for ≥45% time AND Freq force ≥2/min: 1.96 (0.80 to 4.84) ≥45% time AND Freq force <2/min: 1.52 (0.63 to 3.66) <45% time AND Freq force ≥2/min: 1.20 (0.42 to 3.37) Neither: 1.00 *p<0.1 **p<0.05 ***p<0.01	
Fanavoll et al 2016 [51] Norway **Risk of Bias** Moderate	Prospective cohort 11 years follow-up General working population 1984–1986 + 1995–1997	Participant derived from the Nord-Trøndelag Health Study (HUNTStudy) which comprised working inhabitants aged >20 years n=45 925 42% were women and 58% men	**Psychosocial work exposure** Work stress and job control were assessed with questionnaire.	**Chronic neck/shoulder pain** Musculoskeletal symptoms were assessed with the Standardized Nordic Questionnaire.	Risk of chronic neck/shoulder pain among the women and men in the 11-year follow-up associated with the perceived work stress and job control at baseline. Adjusted for age. Relative risk; RR Women (n=10 750) <u>Work stress</u> Not at all: 1.00 Rarely: 1.04 A certain amount: 1.16 Almost all the time: 1.29 <u>Job control</u> p=0.100 I decide: 1.00 For the most part: 0.94 A little: 1.01 Not at all: 1.09	Risk of chronic neck/shoulder pain among the women and men in the 11-year follow-up associated with the perceived work stress and job control at baseline. Adjusted for age (continuous), body mass index (continuous), smoking (never, former, current, unknown), occupation (non-manual, manual, unknown), education (≤9 years, 10–12 years, ≥13 years, unknown), psychological well-being (good, fair, poor, unknown), and

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Men (n=15 056) Work stress p<0.001 Not at all: 1.00 Rarely: 1.25 A certain amount: 1.49 Almost all the time: 1.63 Job control p=0.020 I decide: 1.00 For the most part: 1.00 A little: 1.11 Not at all: 1.14	leisure time physical exercise (inactive, 1 session per week, 2–3 sessions per week, ≥4 session per week, unknown) Women (n=10 750) Work stress Not at all: 1.00 Rarely: 1.06 (0.96 to 1.17) A certain amount 1.19 (1.08 to 1.32) Almost all the time: 1.27 (1.10 to 1.48) Job control p=0.100 I decide: 1.00 For the most part: 0.95 (0.85 to 1.05) A little: 0.91–1.12 Not at all: 1.04 (0.92 to 1.19) Men (n=15 056) Work stress p<0.001 Not at all: 1.00 Rarely: 1.28 (1.12 to 1.46) A certain amount 1.56 (1.37 to 1.77) Almost all the time: 1.71 (1.46 to 2.00)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Job control p=0.020 I decide: 1.00 For the most part: 1.05 (0.96 to 1.15) A little: 1.14 (1.03 to 1.25) Not at all: 1.09 (0.95 to 1.26)
Garg et al 2014 [73] **Risk of Bias** Moderate	Prospective cohort 6 years Manufacturing facilities	Participants were production workers that performed a variety of operations. Those with unpredictable changes in job physical exposures or for whom it was not feasible to quantify physical exposure were excluded. n=495 166 (34%) were male and 329 (66%) were female	**Job physical exposure** At baseline the health outcomes team administered a questionnaire, structured interview, and physical examination. Data were collected for each individual worker and for each hand separately by trained ergonomics analysts using standardized methods.	**Lateral epicondylitis (LE)** Symptoms and history of disorders were recorded in a structured interview for each arm separately. LE was determined at a standardized physical examination for those subjects that met the LE case definition	Associations Between Physical Risk Factors and lateral epicondylitis incidence. Hazard Ratio; HR (95% CI). Employer cares Strongly Agree: 1.0 Agree: 1.2 (0.63 to 2.44) Neither/Nor: 1.1 (0.47 to 2.62) Disagree: 1.5 (0.52 to 4.24) Strongly Disagree: 0.9 (0.21 to 4.14) Get along with Co-workers Always: 1.0 Often: 1.4 (0.80 to 2.32) Never/Seldom: 0.6 (0.08 to 4.43) Supervisor shows appreciation Always: 1.0 Often: 0.5 (0.25 to 1.18) Seldom: 1.1 (0.55 to 2.20) Never: 0.8 (0.29 to 2.37) Peak Force Rating	Multivariate Model for Risk of Lateral Epicondylitis with the Strain Index as Continuous Variable. Adjusted for Age (years), Family and Swimming. Hazard Ratio; HR (95% CI). Strain Index Score: per unit SI≤9.0: 1.18 (1.02 to 1.37) per unit SI>9.0: 0.99 (0.96 to1.02) Multivariate Model for Risk of Lateral Epicondylitis with the TLV for HAL as Continuous Variable TLV for HAL Score Hazard ratio (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			Data included: (i) length of work shift and duration of each task (ii) analyst peak hand force rating (Borg CR-10 scale), and (iii) videotaping of tasks. Threshold Limit Value (TLV), Hand Activity Level (HAL), and the Strain Index (SI) SI and TLV for HAL were computed for each task that a worker performed		Continuous (per unit increase): 1.1 (0.89 to 1.35) <u>Hand Activity Level (HAL)</u> Continuous (per unit increase): 1.2 (0.98 to 1.36) <u>TLV for HAL Score</u> per unit increase for score ≤1.55: 2.245 (0.94 to 5.35) per unit increase for score >1.55: 1.017 (0.13 to 1.63) TLV for HAL (ACGIH Limits) <AL (<0.56): 1.0 ≥AL-≤TLV: 1.0 (0.47 to 2.16) >TLV (>0.78): 1.8 (0.91 to 3.64) TLV for HAL (Dichotomized) ≤ TLV (0.78): 1.0 >TLV (>0.78): 1.8 (1.07 to 3.08) Intensity of exertion (SI definition) Light: 1.0 Somewhat: 0.7 (0.42 to 1.33) Hard: 2.9 (0.39 to 21.17) Efforts per minute Continuous (per unit increase): 1.01 (0.99 to 1.02) Efforts per minute (SI Rating)	per unit score≤1.55: 2.17 (0.93 to 5.07) per unit score>1.55:36 0.87 (0.46 to 1.64)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					EpM<4: 0.3 (0.05 to 2.46) 4≤EpM<9: 1.2 (0.49 to 2.77) 9≤EpM<15: 0.2 (0.06 to 0.98) 15≤EpM<20: 0.5 (0.20 to 1.11) Duration of exertion (%) Continuous (per unit increase): 1.01 (0.99 to 1.02) Duration of exertion) (SI rating) 10≤DC<30: 0.6 (0.07 to 4.11) 30≤DC<50: 0.5 (0.15 to 1.68) 50≤DC<80: 0.9 (0.50 to 1.50) DC≥80: 1.0 Speed of work (SI rating) Slow: 0.5 (0.13 to 2.17) Fair: 1.0 Fast: 2.5 (0.77 to7.88) Typical hand/wrist posture (SI rating) Good: 0.2 (0.03 to 1.60) Fair: 1.0 Poor: 0.7 (0.31 to 1.40) Very poor: 1.4 (0.19 to 9.85) Strain Index (P=0.02) Linear SplineTerms per unit increase for SI≤ 9.0: 1.213 (1.04 to 1.41) per unit increase for SI>9.0: 0.988 (0.96 to 1.02)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Strain Index [Moore et al., 2006 Limit] SI≤6.1: 1.0 SI>6.1: 2.6 (1.26 to 5.28)	
Gerr et al 2014 [46] USA **Risk of bias** Low	Prospective Cohort Data collected during each week of follow-up Manufacturing facility 2004–2007	Participants were full-time employees at a household appliance manufacturing facility. n=318 153 (48.1%) were male and 165 (51.9%) were female	**Forceful exertions, repetition, and postures** Each participant were sample 10-min of each of his or her task(s). The intensities of distal upper extremity and neck/shoulder forceful exertions were estimated with surface electromyography (EMG). Repetitive hand movements were assessed with the Hand Activity Level (HAL) method.	**Musculoske-letal disorders** Symptoms, illness or injury of the upper extremities was first assessed with a questionnaire. Participants who met criteria for MSD was examined by an experienced occupational medicine physician who performed a standard clinical assessment.	Associations Between Physical Risk Factors and Neck/Shoulder (N-S) Outcomes. HR (95% CI). Unadjusted *N-S Symptoms* Percentage time shoulder elevation 60° to 90°: 1.00 (0.98 to 1.03) Percentage time shoulder elevation >90°: 1.03 (0.97 to 1.07) Percentage time neck Flexion: 0.99 (0.98 to 1.00) Percentage time neck Extension: 1.01 (0.98 to 1.04) Hand Activity Level: 1.06 (0.90 to 1.23) Trapezius EMG amplitude: 1.00 (0.99 to 1.01)	Associations Between Physical Risk Factors and Neck/Shoulder (N-S) Outcomes. HR (95% CI). A number of factors were adjusted in each outcome model, for example: physical risk factors, sex, height, history of hand symptoms, education, history of neck pain, job strain, weekly stress level, weekly job change, second job hours per week, hand intensive activity hours per week, supervisor support, comorbid conditions, and history of hand symptoms. *N-S Symptoms* Percentage time shoulder elevation 60° to 90°: 1.00 (0.97 to 1.03) Percentage time shoulder elevation >90°: 1.04([0.99 to 1.09)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			Multimedia Video Task Analysis was used to assess postures of the neck, shoulder, and wrist.			Percentage time neck Flexion: 0.98 (0.97 to 1.00) Percentage time neck Extension: 0.98 (0.95 to 1.01) Hand Activity Level: 1.15 (0.96 to 1.38) Trapezius EMG amplitude: 0.99 (0.98 to 1.00)
Gerr et al 2014 [28] USA **Risk of bias** Low	Prospective Cohort Data collected during each week of follow-up Manufacturing facility 2004–2007	Participants were full-time employees at a household appliance manufacturing facility. n=318 153 (48.1%) were male and 165 (51.9%) were female	**Psychosocial and work organization risk factors** Subscales of the Job Content Questionnaire (JCQ; Karasek et al., 1988) were administered to all participants. Work practices and work organization factors were recorded on a preprinted log documenting daily work.	**Musculoske-letal disorders** Symptoms, illness, or injury of the upper extremities was first assessed with a questionnaire. A participant was classified as having incident symptoms when he or she reported new-onset pain, numbness, tingling, or burning (a) of 30 min or more	Associations Between Psychosocial and Work Organizational Risk Factors and Neck/Shoulder (N-S) Outcomes. HR (95% CI). Unadjusted <u>N-S Symptoms</u> Job strain Low demand/high control: 1.00 High demand/high control: 1.87 (1.02 to 3.42) Low demand/low control: 1.61 (0.85 to 3.05) High demand/low control: 1.81 (0.98 to 3.33) Coworker support: 0.94 (0.86 to 1.02) Supervisor support: 0.99 (0.92 to 1.07)	Associations Between Psychosocial and Work Organizational Risk Factors and Neck/Shoulder (N-S) Outcomes. HR (95% CI). Full-cohort and sex-stratified associations between psychosocial risk factors and hand/arm symptoms adjusted for all psychosocial risk factors listed for the model as well as height, hand-intensive activities (hours per week), weekly stress level, weekly job change, comorbid conditions, second job (hours per week), and history of hand symptoms. Associations between psychosocial risk

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				total duration over the course of the previous week, (b) of intensity 5 or higher on a 0-to-10 VAS or resulting in use of analgesic medication, and (c) not resulting from acute trauma. Participants who met criteria for MSD was examined by an experienced occupational medicine physician who performed a standard clinical assessment. If the clinical examination was positive, then the participant was also classified as	Negative affectivity: 1.03 (1.00 to 1.07) Weekly stress level: 1.36 (1.26 to 1.48) Weekly job change: 3.36 (2.12 to 5.30)	factors and hand/arm disorders controlled for all psychosocial risk factors listed in table as well as history of hand symptoms, body mass index, comorbid conditions, weekly stress level, weekly job change, second job (hours per week), and Hand Activity Level. <u>N-S Symptoms (Female)</u> Job strain: Low demand/high control: 1.00 High demand/high control: 2.85 (1.08 to 7.51) Low demand/low control: 2.18 (0.82 to 5.77) High demand/low control: 2.01 (0.75 to 5.39) Coworker support: 0.94 (0.83 to 1.06) Supervisor support: 1.03 (0.93 to 1.13) Negative affectivity: 1.00 (0.95 to 1.05) Weekly stress level: 1.32 (1.22 to 1.44) Weekly job change: 2.30 (1.43 to 3.71)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				an incident disorder case.		<u>N-S Symptoms (Male)</u> Job strain: Low demand/high control: 1.00 High demand/high control: 0.82 (0.28 to 2.37) Low demand/low control: 0.88 (0.26 to 2.93) High demand/low control: 0.35 (0.09 to 1.32) Coworker support: 1.07 (0.86 to 1.32) Supervisor support: 1.05 (0.87 to 1.28) Negative affectivity: 1.01 (0.93 to 1.09) Weekly stress level: 1.25 (1.09 to 1.44) Weekly job change: 2.27 (0.90 to 5.74) <u>N-S Symptoms (Full cohort)</u> Job strain: Low demand/high control: 1.00 High demand/high control: 1.67 (0.85 to 3.26) Low demand/low control: 1.41 (0.71 to 2.82)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						High demand/low control: 1.17 (0.58 to 2.35) Coworker support: 0.97 (0.88 to 1.07) Supervisor support: 1.04 (0.95 to 1.13) Negative affectivity: 1.00 (0.96 to 1.05) Weekly stress level: 1.32 (1.22 to 1.44) Weekly job change: 2.16 (1.34 to 3.50)
Gremark et al 2020 [43] Sweden **Risk of Bias** Low	Prospective cohort Mean follow-up time 29 months Sonographers 2010 to 2015	Participants were female sonographers employed in all the clinical physiology and cardiology departments in hospitals throughout Sweden. The inclusion criteria were: working at least 20 h per week and performing sonography for at least four hours per week during	**Work exposure** A questionnaire used at baseline included questions on personal characteristic, working conditions, ergonomic and visual conditions, physical- and psychosocial workload.	**Pain in neck/shoulders or elbows/hands** Subjective musculoskeletal complaints (aches, pain, or discomfort) in the neck, shoulders, elbows, and hands during the past 12 months was assessed using the Nordic Questionnaire	Associations between psychosocial workload and musculoskeletal pain. Prevalence ratio; PR (95% CI). <u>Neck/shoulders</u> Working hours/week 20–36: 1 37–41: 1.21 (0.99 to 1.47) Good visual conditions Yes: 1 No: 1.38 (1.11 to 1.72) Job demands (cut-off: 2.44) Low: 1 High: 1.37 (1.14 to 1.66) Job control (cut-off: 2.83) Low: 1	Associations between psychosocial workload and musculoskeletal pain. Adjusted for BMI and physical exercise and for pain at baseline. Prevalence ratio; PR (95% CI). <u>Neck/shoulders</u> Sensory demands (cut-off: 80) Low: 1 High: 1.12 (0.95 to 1.33)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		the previous three months n=208 All subjects were female		The body regions were merged into the two separate regions neck/shoulder and elbow/hand.	High: 0.84 (0.69 to 1.02) Job support (cut-off: 2.87) Low: 1 High: 0.82 (0.67 to 1.00) Sensory demands (cut-off: 80) Low: 1 High: 1.09 (0.91 to 1.32)	
Hallman et al 2016 [41] Denmark **Risk of bias** Moderate	Prospective Cohort 1-year period Blue-collar workers 2012–2013	Participants derived from 15 Danish workplaces in three occupational sectors (cleaning, transportation, and manufacturing. n=625 280 (45%) were female and 345 (55%) were male	**Sitting time** The participants were equipped with triaxial accelerometers attached on the thigh, dominant upper arm, hip, and trunk.	**Neck–shoulder pain** SMS every fourth week over 12 months. Pain intensity in the neck–shoulder region during the previous month rated with numerical rating scale (NRS), which ranges from 0 ('no pain') to 10 ('worst pain imaginable').	Association between per cent sitting time at work and trajectories of neck–shoulder pain (scale 0–10), stratified by occupational sector. The estimates B (95% CI). Cleaning (n=120) Sitting*: 0.021 (–0.018 to 0.060) p=0.294 Manufacturing (n=448) Sitting*: 0.005 (–0.006 to 0.017) p=0.383 Transportation (n=57) Sitting*: 0.014 (–0.023 to 0.051) p=0.464 * Percentage of working hours, continuous variable	Association between per cent sitting time at work and trajectories of neck–shoulder pain (scale 0–10), stratified by occupational sector. Adjusted for gender, age, BMI, lifting/carrying time at work, sitting time at leisure, physical activity at work and leisure, upper arm elevation >60° at work. The estimates (B) 95% CI. Cleaning (n=120) Sitting*: 0.019 (–0.026 to 0.064) p=0.407 Manufacturing (n=448)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Sitting*: 0.007(–0.007 to 0.021) p=0.296 Transportation (n=57) Sitting*: 0.009 (–0.077 to 0.094) p=0.841
Halonen et al 2019 [48] Sweden **Risk of bias** Moderate	Prospective Cohort General working population 2010–2016	Participants derived from the Swedish Longitudinal Occupational Survey of Health (SLOSH) study. n=3239 1639 were female and 1600 were male	**Effort–reward imbalance (ERI)** A short version of the ERI (S-ERI) questionnaire consisting of ten effort–reward items was used.	**Neck-shoulder pain** In the questionnaires, neck-shoulder pain was assessed by asking whether the participants had experienced neck and shoulder pain in the past three months.	Risk for affecting neck-shoulder pain in relation to highest quartile of effort–reward imbalance (ERI). Adjusted for age, sex, and panel. Risk ration; RR (95% CI) <u>Total effect</u> From ERI to neck-shoulder pain: 1.24 (1.03 to1.49)	Risk for affecting neck-shoulder pain in relation to highest quartile of effort–reward imbalance (ERI). Adjusted for age, sex, panel, marital status, education, chronic disease, and physical work. Risk ration; RR (95% CI) <u>Total effect</u> From ERI to neck-shoulder pain: 1.22 (1.00 to 1.48)
Hanvold et al 2013 [29] Norway **Risk of bias**	Prospective Cohort 2.5-year period General working population	Participants were hairdressers, electricians, students, and other various work followed during their first	**Upper-trapezius muscle activity** Activity was evaluated by bilateral surface EMG.	**Neck and shoulder pain** Pain was assessed by questionnaires, using a	The association between neck and shoulder pain and sustained trapezius muscle activity. Incidence rate ratio; IRR (95% CI) <u>All</u> Sustained muscle activity	The association between neck and shoulder pain and sustained trapezius muscle activity, adjusted for time, prior neck and shoulder pain, self-reported mechanical

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Moderate	2006/7–2009	years of working life. n=40 23 (57,5%) women and 17 (42.5%) men	Sustained trapezius muscle activity was defined as the relative time (% of time during the full working day) with activity >0.5% EMGmax continuously for >4 minutes. The relative time of sustained muscle activity during a full working day was divided into three groups: Low (0–29%) Moderate (30–49%) High (50–100%)	mannequin drawing of the neck and shoulder region. A pain index was calculated by multiplying pain intensity (0–3) and duration (1–4), giving a pain index ranging from 0–12.	Low level: 1.00 Moderate level: 1.32 (0.56 to 3.12) High level: 2.64 (1.28 to 5.44) <u>Men</u> Sustained muscle activity Low level: 1.00 Moderate level: 2.05 (0.48 to 8.82) High level: 3.93 (1.18 to 13.06) <u>Women</u> Sustained muscle activity Low level: 1.00 Moderate level: 0.87 (0.36 to 2.07) High level: 1.94 (0.80 to 4.72)	workload, control over work intensity, tobacco use and physical activity during leisure time. Incidence rate ratio; IRR (95% CI) <u>All</u> Sustained muscle activity Low level: 1.00 Moderate level: 1.67 (0.75 to 3.72) High level: 2.89 (1.45 to 5.79) <u>Men</u> Sustained muscle activity Low level: 1.00 Moderate level: 2.59 (0.93 to 7.15) High level: 6.49 (1.91 to 22.07) <u>Women</u> Sustained muscle activity Low level: 1.00 Moderate level: 1.18 (0.54 to 2.63) High level: 1.95 (0.93 to 3.66)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Hanvold et al 2014 [44] Norway **Risk of bias** Moderate	Prospective cohort Nine follow-up points General working population 2002–2009	Participants were technical school students (hairdressers, electricians, and media/design) followed from school, through their apprenticeship and into working life. n=420 267 women and 153 men	**Psychosocial work factors** were assessed by five Questionnaires with items selected from the General Nordic Questionnaire for Psychological and Social Factors at Work.	**Neck and shoulder pain** The participant's neck and shoulder pain for the preceding four weeks was assessed with questionnaires that included a mannequin drawing from the "Nordic Questionnaire on musculoskeletal symptoms" with shaded areas indicating the shoulder and neck region to give a united understanding of the pain region	The unadjusted generalized estimating equations (GEE) analyses of the association between neck and shoulder pain and work related and individual risk factors. Rate ratio; RR (95% CI) <u>All</u> Control over work intensity (0–4): 1.00 (0.96 to 1.05) Low: 1.00 Moderate: 0.99 (0.90 to 1.09) High: 1.02 (0.92 to 1.13) Quantitative work demands (0–4): 1.01 (0.97 to 1.05) Low: 1.00 Moderate: 1.03 (0.92 to 1.15) High: 1.02 (0.92 to 1.14) <u>Men</u> Control over work intensity (0–4): 1.03 (0.97 to 1.11) Low: 1.00 Reference Moderate: 0.99 (0.85 to 1.16) High: 1.11 (0.94 to 1.31) Quantitative work demands (0–4): 1.02 (0.94 to 1.10) Low: 1.00 Reference Moderate: 1.02 (0.80 to 1.30) High: 0.98 (0.78 to 1.23)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					<u>Women</u> Control over work intensity (0–4): 0.99 (0.93 to 1.05) Low: 1.00 Reference Moderate: 0.99 (0.88 to 1.11) High: 10.99 (0.86 to 1.12) Quantitative work demands (0–4): 1.01 (0.96 to 1.06) Low: 1.00 Reference Moderate: 1.03 (0.91 to 1.18) High: 1.05 (0.92 to 1.20)	
Hanvold et al 2015 [63] Norway **Risk of bias** Moderate	Prospective Cohort 2.5-year period General working population 2006/7–2009	Participants were young adults (median age, 21) in their first years of working life. They were all sampled from a cohort followed from 2002 consisting of 420 technical school students from the greater Oslo area, representing student hairdressers, student electricians and	**Work with elevated arms** Shoulder postures and movements were assessed by an inclinometer on each upper arm. The percentage of time spent with the upper arms elevated >30, >60 and >90, were used. Episodes lasting for >5, >10 and >20 s were	**Shoulder pain** during the preceding 4 weeks was assessed using a pain drawing. The participants were asked to shade in areas within an outline of a human figure that correspond to areas of their bodies in pain	Association between work-related arm elevation (% of working time) and shoulder pain (0-18). RR (95% CI). Unadjusted <u>All:</u> Arm elevation >60°: 1.05 (0.99 to 1.10) Arm elevation >60°, 5s: 1.01 (0.94 to 1.07) Arm elevation >90°: 0.96 (0.88 to 1.04) Arm elevation >90°, 5s: 0.92 (0.79 to 1.06) <u>Men:</u> Arm elevation >60°: 0.98 (0.91 to 1.06)	Association between work-related arm elevation (% of working time) and shoulder pain (0–18). Adjusted for time, prior shoulder pain, self-reported mechanical workload, work demands, tobacco use and physical activity during leisure time. In addition, adjustments for gender were done in the analyses of all subjects. RR (95% CI). <u>All:</u> Arm elevation >60°: 1.07 (1.01 to 1.13)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		art/media /design students n=41 23 were female and 18 were male	processed. The mean duration of the measurements was 6 h and 5 min (range 3 h, 39 min–8 h. 37 min).		Arm elevation >60°, 5s: 0.98 (0.90 to 1.07) Arm elevation >90°: 0.97 (0.87 to 1.09) Arm elevation >90°, 5s: 0.98 (0.83 to 1.16) <u>Women:</u> Arm elevation >60°: 1.23 (1.13 to 1.34) Arm elevation >60°, 5s: 1.71 (1.41 to 2.07) Arm elevation >90°: 1.72 (1.20 to 2.45) Arm elevation >90°, 5s: 3.50 (1.67 to 7.35)	Arm elevation >60°, 5s: 1.01 (0.95 to 1.09) Arm elevation >90°: 0.97 (0.88 to 1.07) Arm elevation >90°, 5s: 0.94 (0.80 to 1.11) <u>Men:</u> Arm elevation >60°: 1.04 (0.96 to 1.14) Arm elevation >60°, 5s: 1.05 (0.95 to 1.15) Arm elevation >90°: 1.04 (0.93 to 1.17) Arm elevation >90°, 5s: 1.05 (0.89 to 1.22) <u>Women:</u> Arm elevation >60°: 1.28 (1.13 to 1.46) Arm elevation >60°, 5s: 1.99 (1.54 to 2.59) Arm elevation >90°: 1.44 (1.02 to 2.03) Arm elevation >90°, 5s: 3.41 (1.49 to 7.81)
Harris et al 2011 [82] USA	Prospective cohort 2.5-years follow-up	Participants were workers who performed primarily hand-intensive manual	**Force and repetition exposure**	**Hand/wrist tendinosis in the right hand**	Associations Between Physical Risk Factors and hand/wrist tendinosis incidence. HR (95% CI). Unadjusted <u>Psychosocial factors</u>	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Low	Manufacturing and production plants	(not office) work and were not engaged in >4 tasks. n=413 151 were female and 262 were male	Physical exposure were collected by a trained ergonomist using individualized field exposure assessment (job title, tasks, and working hours) and video recording (10 minutes per task). A time-weighted average of each exposure variable was calculated for each participant. Psychosocial factors were collected at baseline using the job content questionnaire. Job content scales were generated and used to calculate job strain and iso-strain indices for each individual.	Symptoms, illness, or injury of the upper extremities was first assessed with a survey. The survey was followed-up every 4 months. Participants who met criteria for pain in the hand/wrist region was examined by a licensed physical therapist using maneuvers and diagnosis criteria for 11 work-related upper-extremity disorders of the hand/wrist.	Shift Swing/night/rotating shift: 1.00 Day shift: 11.91 (1.59 to 89.35) Job strain index Low job strain: 1.00 High job strain: 1.10 (1.46 to 2.64) Iso strain index Low iso strain: 1.00 High iso strain: 1.15 (0.40 to 3.35) <u>Force measures</u> Visual analog scale for hand fatigue Low: 1.00 Medium: 1.18 (0.63 to 5.19) High: 1.87 (0.63 to 5.52) % time light pinch Low: 1.00 Medium: 1.86 (0.67 to 5.19) High: 1.20 (0.44 to 3.24) % time heavy pinch Low: 1.00 Medium: 1.87 (0.74 to 4.72) High:1.70 (0.60 to 4.83) % time light power grip Low: 1.00 Medium: 0.18 (0.07 to 0.45) High: 0.13 (0.05 to 0.36)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					% time heavy power grip Low: 1.00 Medium: 1.01 (0.34 to 2.96) High: 0.45 (0.16 to 1.25) % time heavy pinch or power grip Low: 1.00 Medium: 1.43 (0.54 to 3.78) High: 1.02 (0.38 to 2.73) % time all pinch or power grip Low: 1.00 Medium: 0.95 (0.38 to 2.34) High: 0.46 (0.16 to 1.32) Tool weight Low: 1.00 Medium: 0.06 (0.01 to 2.28) High: 0.47 (0.18 to 1.21) Normalized peak force Low: 1.00 Medium: 0.82 (0.32 to 2.08) High: 4.68 (1.71 to 12.77) <u>Repetition measures</u> <u>Hand activity level (HAL) scale</u> Low: 1.00 Medium: 0.78 (0.21 to 2.87) High: 0.81 (0.28 to 2.34)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Efforts/minute Low: 1.00 High: 0.05 (0.01 to 0.40) Speed of work Low: 1.00 Medium: 0.22 (0.05 to 1.00) High: 0.45 (0.18 to 1.14) Reps/min: heavy pinch or power grip Low: 1.00 Medium: 1.40 (0.54 to 3.59) High: 1.29 (0.47 to 3.49) Reps/min: total (all grips) Low: 1.00 Medium: 1.40 (0.57 to 3.43) High: 0.93 (0.36 to 2.41) <u>Postures and composite exposure measures</u> Hand posture (0–5) Low: 1.00 Medium: 3.04 (1.09 to 8.48) High: 0.95 (0.36 to 2.50) HAL TLV (HAL scale) Low: 1.00 Medium: 2.24 (0.86 to 5.85) High: 3.99 (1.40 to 11.33) HAL TVL (Video: total repetitions)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low: 1.00 Medium: 5.84 (2.51 to 13.62) High: 4.49 (1.41 to 14.31) HAL TLV score (Video: heavy pinch or power grip) Low: 1.00 Medium: 5.84 (2.51 to 13.58) High: 4.49 (1.41 to 14.31) Strain index score (case cut-off) Low: 1.00 High: 4.97 (1.82 to 13.58) Strain index score Low: 1.00 High: 4.69 (0.67 to 32.56)	
Harris-Adamson et al 2013 [92] USA **Risk of bias** Moderate	Prospective cohort Pooled cohort from 6 different studies with varying follow-up – mean follow-up time not given General working population 2001 to 2010	Participants were full-time workers in industries primarily engaged in manufacturing, production, service, and construction. Subjects who met the study case definition for CTS at baseline were excluded from analyses	**Psychosocial risk factors** Data was collected at baseline or within 6 months of being newly hired, with scales from the Job Content Questionnaire (JCQ). The JCQ psychological job demand and	**CTS of the dominant hand** The case definition for CTS required symptoms that met study criteria (below) and median neuropathy based on an electrodiagnostic study	Work-related factors and carpal tunnel syndrome. Adjusting for gender, age, and BMI. HR (95% CI). <u>Job strain</u> Low job strain (low demand and high control): 1.00 Active (high demand and high control): 1.480 (0.83 to 2.66) Passive (low demand and low control): 1.23 (0.67 to 2.27) High job strain (high demand and low control): 1.86 (1.11 to 3.14)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		n=3515 1860 (53%) were male and 1654 (47%) were female	decision latitude scales were each dichotomised by splitting the distributions at their respective median values.	consistent with median nerve mononeuropathy at the wrist. Symptom information was collected by survey or interview, and the symptom criteria were tingling, numbness, burning, and/or pain in one or more of the first three digits. Electrophysiologic measures obtained across the wrist included median nerve sensory latency, median nerve motor latency and ulnar nerve sensory latency.	<u>Social support</u> Low support: 1.00 High support: 0.54 (0.31 to 0.95)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Harris-Adamson et al 2015 [83] USA **Risk of bias** Low	Prospective cohort Pooled cohort from 6 different studies with varying follow-up – mean follow-up time not given General working population 2001 to 2010	Participants were full-time workers in industries primarily engaged in manufacturing, production, service, and construction. Subjects who met the study case definition for CTS at baseline were excluded from analyses n=2474 1200 (48%) were male and 1274 (52%) were female	**Workplace factors** Measures of workplace biomechanical exposures were collected at the task level for all participants and based on a trained analyst's observation applied to complete each task, videotape analysis of the task, and interviews of participants or their supervisors. Estimates of the highest hand force requirements for a task as estimated by the worker (worker-rated peak hand force) and the analyst (analyst-	**Carpal tunnel syndrome (CTS)** The case definition for CTS required (1) symptoms of tingling, numbness, burning or pain in the thumb, index finger or long finger and (2) electrodiagnostic studies results demonstrating median mononeuropathy at the wrist	Individual time-weighted average biomechanical exposures and carpal tunnel syndrome. HR (95% CI). <u>Force measures</u> Peak hand force: analyst rated* Lower tertile: 1.00 Middle tertile: 1.16 (0.82 to 1.64) Upper tertile: 1.65 (1.11 to 2.46) <u>Repetition measures</u> HAL scale: analyst rated† Lower tertile: 1.00 Middle tertile: 1.36 (0.94 to 1.95) Upper tertile: 1.21 (0.85 to 1.73) Total hand repetition rate: video analysis† Lower tertile: 1.00 Middle tertile: 0.94 (0.66 to 1.35) Upper tertile: 0.77 (0.52 to 1.15) Forceful hand repetition rate: video analysis‡ Lower tertile: 1.00 Middle tertile: 1.16 (0.81 to 1.66) Upper tertile: 1.26 (0.87 to 1.84) <u>Duty cycle</u> % duration all hand exertions: video analysis† Lower tertile: 1.00	Individual time-weighted average biomechanical exposures and carpal tunnel syndrome. Adjusted for age, gender, body mass index, and study site. HR (95% CI). *Adjusted for total repetition rate, % duration all exertions, % time ≥30° wrist flexion. †Adjusted for peak force, % time ≥30° wrist flexion. ‡Adjusted for % time ≥30° wrist flexion. §Adjusted for peak force, total repetition rate, % duration all exertions. Adjusted for peak force, total repetition rate, % duration all exertions, % time ≥30° wrist flexion. HAL, hand-activity level. <u>Force measures</u> Peak hand force: analyst rated* Lower tertile: 1.00 Middle tertile: 1.59 (1.09 to 2.34) Upper tertile:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			rated peak hand force) using the Borg CR-10 rating scale. The repetitiveness of tasks was estimated by the analyst using the HAL scale.		Middle tertile: 1.20 (0.81 to 1.77) Upper tertile: 1.29 (0.87 to 1.91) % duration forceful hand exertions: video analysis Lower tertile: 1.00 Middle tertile: 1.12 (0.78 to 1.62) Upper tertile: 1.48 (1.03 to 2.13) <u>Posture measures</u> % time ≥30°wrist extension: video analysis§ Lower half: 1.00 Upper half: 0.90 (0.66 to 1.23) % time ≥30°wrist flexion: video analysis§ Lower half: 1.00 Upper half: 0.90 (0.66 to 1.23)	2.17 (1.38 to 3.43) <u>Repetition measures</u> HAL scale: analyst rated† Lower tertile: 1.00 Middle tertile: 1.54 (1.02 to 2.32) Upper tertile: 1.32 (0.87 to 2.02) Total hand repetition rate: video analysis† Lower tertile: 1.00 Middle tertile: 1.12 (0.76 to 1.65) Upper tertile: 0.94 (0.59 to 1.5) Forceful hand repetition rate: video analysis‡ Lower tertile: 1.00 Middle tertile: 1.53 (1.05 to 2.25) Upper tertile: 1.84 (1.19 to 2.86) <u>Duty cycle</u> % duration all hand exertions: video analysis† Lower tertile: 1.00 Middle tertile: 1.12 (0.75 to 1.67)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Upper tertile: 1.13 (0.75 to 1.68) % duration forceful hand exertions: video analysis Lower tertile: 1.00 Middle tertile: 1.46 (0.98 to 2.17) Upper tertile: 2.05 (1.34 to 3.15) <u>Posture measures</u> % time ≥30°wrist extension: video analysis§ Lower half: 1.00 Upper half: 0.87 (0.59 to 1.29) % time ≥30°wrist flexion: video analysis Lower half: 1.00 Upper half: 0.83 (0.60 to 1.15)
Harris-Adamson et al 2016 [91] USA **Risk of bias**	Prospective cohort 3.5 years Industry workers 2001 to 2010	Participants were employed at a company where workers performed hand-intensive activities. Participants were	**Biomechanical and workplace psychosocial factors** Electrodiagnostic studies (EDS) of median and ulnar	**CTS of the dominant hand** CTS case status required (1) symptoms of tingling, numbness,	Association between workplace factors and incidence of dominant-hand CTS. HR (95% CI). <u>Biomechanical exposure</u> *(*adjusted for age, gender, BMI, study site and dissimilar biomechanical exposures*)*	Association between workplace factors and incidence of dominant-hand CTS. HR (95% CI). <u>Biomechanical exposure</u> *(*adjusted for age, gender, BMI, study site, dissimilar

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Low		excluded if they met the case criteria for CTS or possible polyneuropathy at baseline. n=1605 888 (55%) were male and 717 (45%) were female	nerve function across the wrist were administered to either (1) all participants at baseline and annually or (2) to those reporting upper limb symptoms. Information on work psychosocial factors was collected with scales from the Job Content Questionnaire.	burning or pain in the thumb, index finger or long finger and (2) temperature-adjusted (32°C) EDS results demonstrating median mononeuropathy at the wrist.	Peak force (CR-10) Lower half (≤3): 1.00 Upper half (>3): 1.38 (0.85 to 2.26) Total repetition rate Lower half (≤16.4): 1.00 Upper half (>16.4): 1.03 (0.61 to 1.74) % time all exertions Lower half (≤68%): 1.00 Upper half (>68%): 1.18 (0.75 to 1.88) HAL Scale Lower half (≤4.4): 1.00 Upper half (>4.4): 1.90 (1.17 to 3.10) Forceful repetition rate Lower half (≤4.9): 1.00 Upper half (>4.9): 1.41 (0.87 to 2.30) % time forceful exertions Lower half (≤19%): 1.00 Upper half (>19%): 2.17 (1.36 to 3.46) ACGIH TLV for HAL Lower half (≤0.56): 1.00 Upper half (>0.56): 1.85 (1.20 to 2.86) <u>Work psychosocial exposure</u> (adjusted for age, gender, BMI and study site). Psychological demand	biomechanical exposures, and job strain ratio) Peak force (CR-10) Lower half (≤3): 1.00 Upper half (>3): 1.30 (0.79 to 2.13) Total repetition rate Lower half (≤16.4): 1.00 Upper half (>16.4): 0.96 (0.57 to 1.62) % time all exertions Lower half (≤68%): 1.00 Upper half (>68%): 1.19 (0.75 to 1.89) HAL Scale Lower half (≤4.4): 1.00 Upper half (>4.4): 1.82 (1.12 to 2.97) Forceful repetition rate Lower half (≤4.9): 1.00 Upper half (>4.9): 1.26 (0.75 to 2.12) % time forceful exertions Lower half (≤19%): 1.00 Upper half (>19%): 2.03 (1.26 to 3.26)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Lower half (<31): 1.00 Upper half (≥31): 1.35 (0.91 to 2.01) Decision latitude Lower half (<60): 1.00 Upper half (≥60): 0.83 (0.55 to 1.26) Job strain Low strain: 1.00 Passive strain: 1.27 (0.74 to 2.16) Active strain: 1.11 (0.57 to 2.16) High strain: 1.51 (0.90 to 2.54) Job strain ratio Lower half (<0.53): 1.00 Upper half (≥0.53): 1.82 (1.23 to 2.71)	ACGIH TLV for HAL Lower half (≤0.56): 1.00 Upper half (>0.56): 1.71 (1.10 to 2.66) Work psychosocial exposure (adjusted for age, gender, BMI, study site, and % time forceful hand exertions Psychological demand Lower half (<31): 1.00 Upper half (≥31): 1.21 (0.80 to 1.83) Decision latitude Lower half (<60): 1.00 Upper half (≥60): 0.88 (0.58 to 1.35) Job strain Low strain: 1.00 Passive strain: 1.19 (0.68 to 2.09) Active strain: 1.11 (0.56 to 2.20) High strain: 1.11 (0.56 to 2.20) Job strain ratio

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Lower half (<0.53): 1.00 Upper half (≥0.53): 1.65 (1.07 to 2.54)
Heilskov-Hansen et al 2016 [86] Denmark **Risk of bias** Low	Retrospective Cohort Follow-up time not stated Painters 1994 to 2010	Participants were members of the painters' union who filled in a questionnaire sent by postal mail. Persons with a CTS event before start of follow-up or start as a painter were excluded. n=4957 3124 (%) were men and 1833 were (%) women	**Work-related exposure** <u>Exposure intensity:</u> Assessment was based on a self-record of task distribution and sex-specific task exposure matrices based on technical measurements of task-specific movements and postures of the wrist. <u>Exposure duration:</u> Information on start date and seniority as a painter was obtained from the questionnaire.	**CTS diagnose and CTS surgery** Information on CTS diagnoses and CTS surgery and the date of diagnosis and surgery were extracted from the Danish National Patient Register.	Work exposure and CTS. Unadjusted. Incidence rate ratio. IRR (95% CI) **CTS diagnoses** <u>Wrist exposures (intensity)</u> Median velocity of flexion/extension of the wrist (per 1°/s) Total: 1.41 (1.12 to 1.79) Men: 1.12 (0.74 to 1.71) Women: 1.46 (1.15 to 1.86) Mean power frequency (per 0.01 Hz) Total: 0.85 (0.65 to 1.10) Men: 1.55 (0.54 to 4.44) Women: 1.54 (1.21 to 1.95) Non-neutral wrist postures (per % time) Total: 0.99 (0.89 to 1.11) Men: 1.00 (0.85 to 1.17) Women: 0.84 (0.70 to 1.01) **CTS surgery** <u>Wrist exposures (intensity)</u> Median velocity of flexion/extension of the wrist (per 1°/s) Total: 1.52 (1.15 to 2.01) Men: 1.19 (0.70 to 2.02)	Work exposure and CTS. Adjusted for effects of working proportion during the previous year, sex, age, body mass index, fractures near the wrist and comorbidity. Incidence rate ratio. IRR (95% CI) **CTS diagnoses** <u>Wrist exposures (intensity)</u> Median velocity of flexion/extension of the wrist (per 1°/s) Total: 1.37 (1.10 to 1.71) Men: 1.15 (0.75 to 1.77) Women: 1.45 (1.13 to 1.84) Mean power frequency (per 0.01 Hz) Total: 1.53 (1.21 to 1.92) Men: 1.49 (0.51 to 4.35) Women: 1.52 (1.20 to 1.92)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Women: 1.53 (1.15 to 2.02) Mean power frequency (per 0.01 Hz) Total: 0.81 (0.59 to 1.11) Men: 2.22 (0.59 to 8.30) Women: 1.53 (1.14 to 2.05) Non-neutral wrist postures (per % time) Total: 1.00 (0.87 to 1.15) Men: 0.95 (0.77 to 1.17) Women: 0.89 (0.71 to 1.11)	Non-neutral wrist postures (per % time) Total: 0.93 (0.82 to 1.05) Men: 1.01 (0.86 to 1.19) Women: 0.82 (0.68 to 0.98) **CTS surgery** <u>Wrist exposures (intensity)</u> Median velocity of flexion/extension of the wrist (per 1°/s) Total: 1.44 (1.11 to 1.88) Men: 1.22 (0.70 to 2.10) Women: 1.51 (1.13 to 2.01) Mean power frequency (per 0.01 Hz) Total: 1.55 (1.18 to 2.05) Men: 2.04 (0.54 to 7.74) Women: 1.56 (1.17 to 2.08) Non-neutral wrist postures (per % time) Total: 0.92 (0.78 to 1.07) Men: 0.97 (0.78 to 1.21) Women: 0.85 (0.68 to 1.07)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Herin et al 2012 [58] France **Risk of Bias** Moderate	Prospective cohort General working population 5-year follow-up Followed from 1990 to 1995	The study population was randomly selected from exhaustive lists of subjects under the supervision of volunteer occupational physicians. For each physician, the sample selection was stratified by sex and the 4 years of birth considered and the main occupational status according to national rates of national employment statistics, resulting in a representative sample of French subjects n=1355 469 (42%) were women and 786 were (58%) men	**Psychosocial work factors** Exposures were assessed using a checklist of work conditions filled in by the subjects and supervised by the physician. The questionnaire included 30 questions about different kinds of physical activities at work and the psychosocial work environment.	**Shoulder pain** Shoulder pain status was based on the presence of self-reported symptoms combined with clinical examination. Chronic shoulder pain was defined as shoulder pain present for at least 6 months and clinical signs. Incident chronic shoulder pain was defined as onset of a new episode in 1995.		Associations between sociodemographic, individual, and occupational factors in 1990 and the incidence of chronic shoulder pain from 1990–1995. Adjusted for gender, age, social class) and individual risk factors (body mass index, BMI, and participation in sporting activities. Odds ratio; OR (95% CI) High psychological demand: 1.23 (1.08 to 1.39) Low decision latitude: 1.21 (1.04 to 1.41) Heavy loads: 1.07 (0.90 to 1.28) Movement: 1.06 (0.90 to 1.28) Posture: 1.37 (1.19 to 1.58)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Herin et al 2014 [30] France **Risk of Bias** Moderate	Prospective cohort General working population 5-year follow-up Followed from 1990 to 1995	The study population was randomly selected from exhaustive lists of subjects under the supervision of 400 volunteer occupational physicians in 7 French regions. For each physician, the sample selection was stratified by sex and the 4 years of birth and the main occupational status according to national rates of national employment statistics, resulting in a representative sample of French subjects n=1355	**Work exposure** Exposures were assessed using a checklist of work conditions filled in by the subjects and supervised by the physician. The questionnaire included 30 questions about various kinds of physical activities at work and the psychosocial work environment	**Neck/shoulder pain** Musculoskeletal pain status was based on the presence of self-reported symptoms combined with clinical examination. In the present study, case subjects with chronic MSP were defined as subjects who, on the day of the medical examination, declared neck, shoulder, elbow or wrist, hand present for at least 6 months and who presented with positive clinical signs (eg, active or passive functional		Associations between sociodemographic, individual, and occupational factors in 1990 on the onset of each 4 regional musculoskeletal pain in 1995. Adjusted for sociodemographic factors (gender, age, social class) and individual risk factors (body mass index (BMI), smoking status, and participation in sporting activities). Hazard ratio; HR (95% CI) **Neck/shoulder pain** <u>Male</u> Psychological demand (high/low): 1.11 (0.87 to 1.43) Decision latitude (low/high): 0.93 (0.68 to 1.27) Heavy loads (high/low): 0.93 (0.67 to 1.29) Movements (high/low): 0.88 (0.68 to 1.15) Posture (high/low): 1.26 (0.95 to 1.68) <u>Female</u>

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		469 (42%) were women and 786 were (58%) men		limitations, stiffness, tenderness).		Psychological demand (high/low): 1.20 (0.94 to 1.54) Decision latitude (low/high): 1.28 (0.96 to 1.72) Heavy loads (high/low): 1.32 (0.93 to 1.88) Movements (high/low): 1.38 (1.03 to 1.84) Posture (high/low): 1.34 (0.99 to 1.82)
Hulkkonen et al 2020 [76] Finland **Risk of Bias** Low	Prospective cohort 1966 to 2016 General working population Mean follow-up time was 18.3 years	The study population consisted of the Northern Finland Birth Cohort of 1966 (included those who were working ≥3 days a week in a paid job). n=6326 3260 were male and 3066 were female	**Work exposure** Data was collected via postal questionnaire and during a clinical examination. The answers to were divided into two categories: none/light, and moderate/heavy exposure.	**Carpal tunnel syndrome (CTS)** The data on hospitalizations due to CTS were obtained from the Care Register for Health Care, a national register that covers both public and private hospitals. The diagnoses are coded according to ICD, with CTS	Association between occupational exposure and hospitalizations due to CTS. HR (95% CI) <u>Men</u> Exposure to heat None or light: 1 Moderate or high: 2.21 (1.35 to 3.62) Exposure to cold None 1 Moderate or high: 1.74 (1.05 to 2.90) Exposure to temperature changes None or light: 1 Moderate or high: 1.77 (1.11 to 2.82) <u>Women</u> Exposure to heat	Association between occupational exposure and hospitalizations due to CTS. Adjusted for occupational class, gender, BMI, and all occupational variables. HR (95% CI) <u>Men</u> Exposure to cold None or light: 1 Moderate or high: 0.93 (0.51 to 1.68) Exposure to heat None or light: 1 Moderate or high: 1.45 (0.84 to 2.48)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				as the primary diagnosis.	None or light: 1 Moderate or high: 1.79 (1.20 to 2.67) Exposure to cold None or light: 1 Moderate or high: 1.17 (0.65 to 2.11) Exposure to temperature changes None or light: 1 Moderate or high: 1.46 (1.01 to 2.11) <u>Both genders</u> Exposure to heat None or light: 1 Moderate or high: 1.94 (1.43 to 2.65) Exposure to cold None or light: 1 Moderate or high: 1.45 (0.99 to 2.12) Exposure to temperature changes None or light: 1 Moderate or high: 1.57 (1.18 to 2.09)	Exposure to temperature changes None or light: 1 Moderate or high: 0.86 (0.48 to 1.52) <u>Women</u> Exposure to heat None or light: 1 Moderate or high: 1.32 (0.85 to 2.04) Exposure to temperature changes None or light: 1 Moderate or high: 1.08 (0.72 to 1.60) <u>Both genders</u> Exposure to heat None or light: 1 Moderate or high: 1.38 (0.99 to 1.93) Exposure to temperature changes None or light: 1 Moderate or high: 1.00 (0.72 to 1.37) Association between occupational exposure and

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						hospitalizations due to CTS, in the subsample (n=3824). sex, body mass index, smoking and vibration to hands. HR (95% CI) <u>Both genders</u> Lifting <15 kg No: 1 Yes: 1.40 (0.86 to 2.61) Lifting >15 kg No: 1 Yes: 0.92 (0.59 to 1.42) Work requiring arm elevation No: 1 Yes: 0.94 (0.65 to 1.36) Work demanding repetitive movements No: 1 Yes: 1.52 (0.89 to 2.61)
Huysmans et al 2012 [31] The Netherlands	Prospective cohort Follow-up 2 years Office workers	Subjects were recruited from five organizations, which included public and private organizations.	**Workplace factors** A long list of potential risk factors,	**Neck–shoulder symptom** Pain symptoms were assessed by using a	Risk factors associated with neck–shoulder symptoms. Rate ratios; RR (95% CI) Repetitive movements with hands (excluding computer use):	Risk factors associated with **neck–shoulder** symptoms. Adjusted for Gender, Age, Disabling neck–shoulder symptoms

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of Bias Moderate	Time period not stated	The main work tasks of the participants were computer-related tasks, attending meetings, making phone calls, and giving presentations n=1324 53% were female and 47% were male	containing work and leisure time exposure, psychosocial factors, and individual characteristics, was assessed by a web-based questionnaire.	validated, modified version of the Nordic Questionnaire.	Never: 1.0 Sometimes/often/always: 2.0 (1.5 to 2.7) Work continuation during formal breaks No: 1.0 Yes: 1.2 (1.0 to 1.4) Task variation (range 0–12) 0–3 (high): 1.0 4–12 (low): 1.6 (1.3 to 1.9) Cognitive demands 0–13 (low): 1.0 14–15: 1.4 (1.1 to 1.7) 16–20 (high): 1.6 (1.2 to 1.9) Firmly squeezing with hands Never/sometimes: 1.0 Often/always: 1.7 (0.9 to 3.2) Carrying loads, 5 kg Never: 1.0 Sometimes/often/always: 1.2 (1.0 to 1.5) Pushing or pulling Never: 1.0 Sometimes/often/always: 0.8 (0.5 to 1.4)	within past year and more. Rate ratios; RR (95% CI) Repetitive movements with hands (excluding computer use): Never: 1.0 Sometimes/often/always: 1.5 (1.1 to 1.9) Work continuation during formal breaks No: 1.0 Yes: 1.2 (1.0 to 1.4) Task variation (range 0–12) 0–3 (high): 1.0 4–12 (low): 1.3 (1.1 to 1.6) Cognitive demands 0–13 (low): 1.0 14–15: 1.1 (0.9 to 1.3) 16–20 (high): 1.1 (0.9 to 1.4) Firmly squeezing with hands Never/sometimes: 1.0 Often/always: 1.2 (0.7 to 2.2)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Working with hands above shoulder height Never: 1.0 Sometimes/often/always: 1.3 (1.0 to 1.6) Psychosocial factors Effort 0–3 (low): 1.0 4–8: 1.3 (1.0 to 1.6) 9–20 (high): 1.8 (1.4 to 2.3) Reward 17–20 (high): 1.0 0–16 (low): 1.4 (1.2 to 1.7) Decision authority 0–3 (high): 1.0 4–9 (low): 1.4 (1.2 to 1.7) Job contract (h/w) <25: 1.0 25 to <33: 0.8 (0.6 to 1.1) 33–40: 0.8 (0.6 to 1.0)	Carrying loads, 5 kg Never: 1.0 Sometimes/often/always: 1.0 (0.8 to 1.3) Pushing or pulling Never: — Sometimes/often/always: — Working with hands above shoulder height Never: 1.0 Sometimes/often/always: 0.9 (0.7 to 1.1) Psychosocial factors Effort 0–3 (low) 4–8: 1.1 (0.9 to 1.4) 9–20 (high): 1.2 (0.9 to 1.6) Reward 17–20 (high): 1.0 0–16 (low): 1.1 (0.9 to 1.3) Decision authority 0–3 (high): 1.0 4–9 (low): 1.1 (0.9 to 1.3) Job contract (h/w)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						<25: 1.0 25 to <33: 0.9 (0.6 to 1.2) 33–40: 1.0 (0.7 to 1.3)
Jackson et al 2019 [74] Sweden **Risk of Bias** Moderate	Prospective cohort Construction workers 13 years follow-up 2001–2013	Participants were construction workers who participated in a national occupational health surveillance programme (1971–1993). n=229 707 All participants were male	**Biomechanical exposure** Worker job titles were classified into 21 occupational groups defined by occupational health service experts at the time of the surveillance programs. Biomechanical exposure levels were assigned to occupational groups using a job exposure matrix (JEM) that contained 12 exposure factors. Two experts rated the average exposure intensity or frequency over a	**Surgery for radial nerve entrapment (RNE)** The Swedish national registry of outpatient surgical records was searched to determine cases, defined by surgical release of RNE (Swedish code ACC52).		Association between biomechanical exposure scores and RNE decompression surgery (n=92) in exposed versus unexposed worker. Adjusted for BMI, smoking, age, and time of surgery. Risk ratio; RR (95% CI) Grip Score: 1.78 (0.97 to 3.28) Repetitive Flexion and Extension Score: 1.31 (0.83 to 2.05) Static Work and Elbow Leaning Score: 1.36 (0.84 to 2.19) Grip Force Low: 1 Moderate: 1.07 (0.66 to 1.76) High: 1.64 (1.06 to 2.54)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			working day across all job titles comprising each occupational group and for each JEM factor. Exposure estimates were assigned to individuals based on the JEM ratings for the occupational group corresponding to the job title reported at the last health examination.			Upper Extremity Load Low: 1 Moderate: 1.38 (0.88 to 2.16) High: 2.16 (1.40 to 3.32) Frequency of repetitive elbow flexion and extension work Low: 1 Moderate: 0.94 (0.57 to 1.56) High: 1.66 (1.16 to 2.37) Frequency of repetitive wrist flexion and extension work Low: 1 Moderate: 0.87 (0.52 to 1.47) High: 1.56 (1.07 to 2.27) Frequency of hand-held tool use, Low: 1 Moderate: 1.43 (0.69 to 2.00) High: 1.92 (1.22 to 3.02) Frequency of static work, Low: 1

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Moderate: 1.50 (1.01 to 2.22) High: 1.12 (0.71 to 1.77) Frequency of full wrist extension, Low: 1 Moderate: 1.29 (0.92 to 1.82) High: — Frequency of full elbow extension, Low: 1 Moderate: 1.56 (1.04 to 2.33) High: 1.59 (0.82 to 3.10) Frequency of using a handheld tool in a fixed position, Low: 1 Moderate: 0.31 (0.08 to 1.13) High: 1.38 (1.03 to 1.85) Frequency of leaning on elbows. Rare: 1 Often: 0.69 (0.47 to 1.02)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Jackson et al 2019 [69] Sweden **Risk of Bias** Moderate	Prospective cohort Construction workers 13 years follow-up 2001–2013	Participants were construction workers who participated in a national occupational health surveillance programme (1971–1993). n=229 689 All participants were male	**Biomechanical exposure** Biomechanical exposure estimates were assigned at the occupational group level using a job exposure matrix (JEM). Two experts reviewed ergonomic assessments conducted in the 1970s for each job title and determined a rating for each occupational group and exposure factor. Ratings reflected the average exposure intensity or frequency over a working day.	**Surgically treated ulnar nerve entrapment (UNE)** UNE case status was defined on the basis of a surgical release of UNE (code ACC53) and case data were obtained from a national registry of out-patient surgical records. In Sweden, ulnaris decompression surgery is typically performed in outpatient care. No information about diagnostic procedures or non-surgical treatment was available in the database.		Association between biomechanical exposure scores and surgically treated UNE (n=555) in exposed versus unexposed worker. Adjusted for BMI, smoking, age, and time of surgery. Risk ratio; RR, 95% CI Grip Score: 1.40 (1.18 to 1.63) Repetitive Flexion and Extension Score: 1.01 (0.84 to 1.18) Static Work and Elbow Leaning Score: 1.24 (1.05 to 1.43) Grip Force Low: 1 Moderate: 1.15 (0.90 to 1.47) High: 1.54 (1.24 to 1.92) Upper Extremity Load Low: 1 Moderate: 1.27 (1.00 to 1.16) High: 1.63 (1.30 to 2.06)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Frequency of repetitive elbow flexion and extension work Low: 1 Moderate: 1.36 (1.10 to 1.68) High: 1.18 (0.97 to 1.43) Frequency of repetitive wrist flexion and extension work Low: 1 Moderate: 0.77 (0.63 to 0.94) High: 0.99 (0.85 to 1.15) Frequency of hand-held tool use Low: 1 Moderate: 1.58 (1.13 to 2.22) High: 1.37 (1.09 to 1.71) Frequency of static work Low: 1 Moderate: 1.36 (1.12 to 1.65) High: 1.06 (0.85 to 1.32) Frequency of full wrist extension

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Low: 1 Moderate: 0.95 (0.82 to 1.11) High: — Frequency of full elbow extension Low: 1 Moderate: 0.90 (0.75 to 1.07) High: 0.74 (0.52 to 1.05) Frequency of using a handheld tool in a fixed position Low: 1 Moderate: 1.21 (0.78 to 1.86) High: 1.22 (0.99 to 1.50) Frequency of leaning on elbows. Rare: 1 Often: 0.81 (0.60 to 0.95)
Jun et al 2021 [40] Australia and South Korea	Prospective cohort Follow-up: 1 years Office workers	Participants were recruited from multiple organizations in both cities through advertisements,	**Workplace factors** Psychosocial factors were assessed with the	**Neck pain** Interfering neck pain was defined as symptoms severe enough to (1) interfere	Association between Risk Factors and Development of Interfering Neck Pain. HR (95% CI) Mouse location Located in front of and close to the body: 1	Association between Risk Factors and Development of Interfering Neck Pain. Adjusted for several factors. HR (95% CI) Mouse location

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of Bias Moderate		social media, word of mouth, and email contact. The majority of volunteers were university educational personnel or faculty members from a university. Exclusion of participants reporting pain over this broader body region (i.e., shoulders, thorax, and lower back) at baseline. n=214 118 were female and 96	job content questionnaire. Postural behavior measure was recorded as the proportion of time (%) participants maintained a predefined neutral body posture during a 60-min period. Workplace ergonomic factors were measured using an observational workstation checklist. Measurements recorded the size or location of the computer peripherals and the worker's body posture relative to the environment.	with daily activities (e.g., disturbed sleep, inability to sustain long periods of reading, computing, or driving, reduced social contact, and restricted housework) or (2) have taken sick leave or sought health care advice or self-management (e.g., consultation with health professional, self-massage, medication, and exercise).	Located away from body: 1.61 (1.17 to 2.22) Neutral thorax posture (% time): 0.99 (0.98 to 0.99) Job strain (*z*-score*): 1.00 (0.84 to 1.19) Social support: (*z*-score†): 1.28 (0.59 to 2.77) *higher *z*-score for job strain indicates less job strain on workers due to the negative value of the raw score; †higher *z*-score indicates higher score of each factor	Located in front of and close to the body: 1 Located away from body: 1.86 (0.85 to 4.05) Neutral thorax posture (% time): 1.02 (1.02 to 1.02) Job strain (*z*-score*): 0.64 (0.57 to 0.71) Social support: (*z*-score†): 1.86 (1.07 to 3.23) *higher *z*-score for job strain indicates less job strain on workers due to the negative value of the raw score; †higher *z*-score indicates higher score of each factor

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Kapellusch et al 2014 [88] USA **Risk of bias** Low	Prospective cohort Pooled data of cohorts from six centers, median follow-up 6.4 years Manufacturing and service workers 2001 to 2010	Participants were full-time male workers aged ≥18 and employed by 54 predominantly manufacturing and service companies. n=2751 1351 were male and 1400 were female	**Mechanical workload** Normalized Peak force (PF) used were defined by the ACGIH and measured using the Borg category ratio 0–10 (CR-10) rating scale. Hand activity level (HAL) was measured using Latko et al's 0–10 verbal anchor scale. Threshold limit values (TLV) was calculated using the time weighted average for PF och HAL. And grouped according to the ACGIH suggested limits: (i) below AL (score <0.56), (ii) between Action level (AL) and TLV, and (iii)	**Carpal tunnel syndrome (CTS)** The CTS case definition included symptoms (tingling, numbness, burning, and/or pain in one or more of the median nerve innervated digits) plus abnormal EDS Electrodiagnostic studies (EDS) of median nerve conduction velocity were performed at baseline and either annually or in response to CTS symptoms during follow-up	Association between peak force (PF), hand-activity level (HAL), PF+HAL, threshold limit value (TLV) for HAL score, and TLV for HAL categories and incident carpal tunnel syndrome. Unadjusted. HR (95% CI). PF: 1.10 (1.01 to 1.19) HAL: 1.10 (0.99 to 1.21) PF+HAL PF: 1.08 (1.00 to 1.18) HAL: 1.08 (0.97 to 1.19) TLV for HAL (continuous): 1.26 (1.06 to 1.50) TLV for HAL (categorical) <AL: 1.00 ≥AL+<TLV: 1.57 (1.09 to 2.27) ≥TLV: 1.36 (0.95 to 1.96)	Association between peak force (PF), hand-activity level (HAL), PF+HAL, threshold limit value (TLV) for HAL score, and TLV for HAL categories and incident carpal tunnel syndrome. Adjusted for body mass index, age, gender, age by gender interaction, predisposing medical conditions. HR (95% CI). PF: 1.15 (1.06 to 1.25) HAL: 1.07 (0.97 to 1.18) PF+HAL PF: 1.14 (1.05 to 1.25) HAL: 1.04 (0.93 to 1.15) TLV for HAL (continuous): 1.32 (1.11 to 1.57) TLV for HAL (categorical) <AL: 1.00 ≥AL+<TLV: 1.73 (1.19 to 2.50) ≥TLV: 1.48 (1.02 to 2.13)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			above TLV (score >0.78).			
Kapellusch et al 2021 [89] USA **Risk of Bias** Low	Prospective cohort 2001 to 2010 General working population Follow-up an average of 2.5 years (maximum 6 years)	Participants derived from the National Institute For Occupational Safety and Health (NIOSH) CTS consortium conducted prospective cohort studies of DUE MSDs. n=1372 41.8% were male and 58.2% were female	**Cumulative Revised Strain Index (RSI) scores** The RSI quantifies hand/wrist physical exposure using five factors: (i) intensity of exertion, (ii) hand/wrist posture during exertion, which combined with intensity of exertion represents the compressive and tensile forces on muscle-tendon units, (iii) duration per exertion (iv) frequency of exertion which when combined with intensity, duration and posture, reflects	**Carpal tunnel syndrome (CTS)** The CTS case definition required both symptoms and an abnormal electrodiagnostic test consistent with CTS.	Association between cumulative RSI scores and Carpal Tunnel Syndrome. Adjusted for age, gender, and BMI. HR (95% CI) <u>Continuous Cumulative RSI (Simple Linear)</u> per unit CUSI score: 1.019 (1.00 to 1.04) <u>Continuous Cumulative RSI (Linear Spline Terms)</u> per unit score ≤27.0: 1.033 (1.01 to 1.06) per unit score >27.0: 0.952 (0.86 to 1.05) 0.15 <u>Categorical Cumulative RSI with Low vs. High</u> RSI ≤10.0: 1.00 RSI >10.0: 1.45 (1.11 to 1.91) <u>Categorical Cumulative RSI with Low vs. Medium vs. High</u> RSI ≤8.5: 1.00 8.5<RSI ≤15.0: 1.42 (0.96 to 2.09) RSI >15.0: 1.79 (1.19 to 2.69)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			strain on the muscle-tendon units (v) duration of task per day which reflects the dose of daily exposure.			
Katsifaraki et al 2020 [53] Norway **Risk of Bias** Low	Prospective cohort Follow-up one day Nurses 2014 to 2015	Participants were randomly selected members of the Norwegian Nurses Organisation. Inclusion criteria were working as a nurse, working in more than 50% position, having a shift schedule that included night work, being between 18 and 63 years old, not being pregnant, not breast-feeding, and not on sick leave for more than 2	**Shift work** Working hours were rated daily electronically on smartphone. Participants indicated whether they had been working within the previous 24 hours, as well as the start and end times of that shift. Shift type was categorised into three categories: morning shift (starting time 05:00–12:00), evening shift	**Pain complaints** Subjective pain complaints were rated daily electronically on smartphone. Pain complaints during the previous 24 hours were rated on a Likert-type Scale with categories 0 (not troubled by pain), 1 (a little troubled by pain), 2 (somewhat troubled by pain) and 3 (very troubled by pain).	Association between shift type and Pain complaints. HR (95% CI) <u>Neck, shoulder, and upper back pain</u> Shift type (night vs morning): 0.84 (0.54 to 1.32)	Association between shift type and Pain complaints. Adjusted for age, use of medication to sleep, work and lifestyle factors, baseline sleep problems and baseline pain. HR (95% CI) <u>Neck, shoulder, and upper back pain</u> Shift type (night vs morning): 0.84 (0.54 to 1.32)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		weeks during the last 6 months. n=679 90.6% were female	(starting time 12:01–18:00) and night shift (starting time 18:01–04:59).			
Koch et al 2017 [49] Germany **Risk of Bias** Moderate	Prospective cohort 1 years Childcare workers 2014 to 2015	Participants were qualified childcare workers of all different facilities. n=106 90.6% women and 9.4% men	**Effort-reward imbalance (ERI)** Psychosocial factors were recorded using the ERI questionnaire (23-item version) and evaluated using two scales (effort: six items, reward: eleven items). The ERI ratio score was determined. according to the definition using a formula that takes into account the different numbers of items in order to calculate the	**Neck or Shoulder pain** Musculoskeletal symptoms were recorded using the Nordic questionnaire. The prevalence of chronic pain in the shoulder or neck was defined as the presence of pain on at least eight days in the past twelve months, as well as pain within seven days of filling in the questionnaire	Associations between Effort-reward imbalance and development of musculoskeletal symptoms, adjusted for age and musculoskeletal symptoms at baseline. Odds ratios; OR (95% CI) <u>Neck</u> ERI >1 vs ≤1: 4.3 (1.25 to 5.0) Control high vs low: n/a <u>Shoulder</u> ERI >1 vs ≤1: 1.5 (0.40 to 5.58) Control high vs low: 4.5 (1.15 to 17.42)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			total on the effort scale as a ratio to the reward scale. An effort-reward imbalance was defined as an ERI ratio score of more than 1.			
Koch et al 2017 [64] Norway **Risk of Bias** Moderate	Prospective cohort 6 months follow-up Construction workers and health care workers. 2014 to 2015	The subjects for this study were recruited from four construction companies and two local health care providers. Exclusion criteria for the study were inadequate skills in reading and writing Norwegian; a diagnosis of cardiovascular disease or known allergic reaction to plaster, tape, and bandages; or being pregnant. n=113	**Arm inclination** Arm inclination relative to the vertical was measured with an accelerometer placed on the dominant upper arm for up to four full days at baseline	**Shoulder pain** The intensity of the shoulder pain of both arms was rated on a four-point scale at baseline and after 6 months. Only pain intensity in the shoulder of the participant's dominant arm was included in this study.	Table 2. Linear mixed models with arm-inclination exposure at work (% of total time at work) and shoulder pain (excluded participants reporting pain at baseline). β (95% CI) Arm inclination >30◦: 0.01 (–0.05 to 0.06) Arm inclination >60◦: 0.00 (–0.09 to 0.09) Arm inclination >90◦: –0.07 (–0.34 to 0.21) Arm inclination >120◦: 0.12 (–0.82 to 1.05)	Table 2. Linear mixed models with arm-inclination exposure at work (% of total time at work) and shoulder pain (excluded participants reporting pain at baseline). Adjusted for age, BMI, gender, working sector, social climate, quantitative job demands, decision control, pacing control, PSI, arm inclination leisure. β (95% CI) Arm inclination >30◦: –0.01 (–0.08 to 0.07) Arm inclination >60◦: –0.03 (–0.15 to 0.09) Arm inclination >90◦:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		68 (60%) men and 45 (40%) women				–0.23 (–0.66 to 0.19) Arm inclination >120◦: –0.03 (–1.30 to 1.24)
Krause et al 2010 [50] USA **Risk of Bias** Low	Prospective cohort 12 months follow-up Call center operators 2014 to 2015	Participants were employees at two customer service center sites of a large health maintenance organization. Inclusion criteria were computer-based customer service work for ≥20 hours per week and no have an active workers' compensation claim involving the neck, shoulders, or upper extremities. n=165 158 (96%) female and 7 (4%) male	**Effort–reward imbalance (ERI)** ERI was measured by a standard questionnaire with 6 items for extrinsic efforts and 11 items for rewards; intrinsic effort (over-commitment) was not measured	**Neck/shoulder pain** Pain was assessed with a self-administered questionnaire that asked about the worst pain during the preceding seven days using a 0–10 point scale (0=no pain; 10=unbearable pain)	Effort–reward imbalance (ERI) and one-year change in neck–shoulder pain**.** Standardized beta coefficients (95% CI) Efforts: –0.43 (–1.08 to 0.21) Rewards: 1.97 (–0.11 to 4.04) ERI ratio: 0.40 (–0.92 to 0.11) ERI ratio >1: –0.48 (–2.08 to 1.10)	Effort–reward imbalance (ERI) and one-year change in neck–shoulder pain**.** Adjusted for age, gender, intervention group, computer hours/week at both work and home, months of computer use ≥20 hours/week in previous jobs and current call center job; mean pre-intervention pain score for neck–shoulder region, ethnicity, education, marital status, body mass index, current smoking, leisure time physical activity, driving hours/ week, co-morbidity index, surgery on neck/upper extremities, low-back disorders, hand discordance regarding mouse use, typing speed in words/minute, and job title. Standardized beta coefficients (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Efforts: 0.09 (0.58 to 0.76) Rewards: –0.11 (–2.27 to 2.05) ERI ratio: –0.06 (–0.48 to 0.60) ERI ratio >1: 0.3 (–1.43 to 1.49)
Kääria et al 2012 [45] Finland **Risk of Bias** Moderate	Prospective cohort Follow-up period varied from 5 to 7 years General working population 2000 to 2007	This study was based on data derived from the Helsinki Health Participants were middle-aged employees of the City of Helsinki. The main employment sectors include public administration, social and health care, education and cultural services, public transportation, and environmental and technical maintenance.	**Psychosocial factors** Risk factors were assessed questionnaires. Karasek's job demand-control inventory was used in assessing job demands and control. Workplace bullying was defined as follows: 'Mental violence or workplace bullying refers to isolation of a work team member,	**Chronic neck pain** Neck pain was assessed with a survey. Acute and chronic pain according to "Study of Pain" (IASP, 1986) Responses to questions were categorized into no NP, acute NP (duration ≤ 3 months) and chronic NP (duration >3 months).	Determinants of new onset chronic NP during follow-up. Adjusted for age. OR (95% CI) <u>Women</u> *Job demands* 1 (low): 1.00 2: 0.97 (0.77 to 1.22) 3: 0.91 (0.72 to 1.15) 4 (high): 0.99 (0.78 to 1.26) *Job control* 1 (high): 1.00 2: 1.07 (0.85 to 1.35) 3: 1.02 (0.81 to 1.29) 4 (low): 0.90 (0.70 to 1.15) *Workplace bullying* No: 1.00 Yes, now: 1.95 (1.36 to 2.80) Yes, earlier, at this workplace but not now: 1.78 (1.38 to 2.28)	Determinants of new onset chronic NP during follow-up. Adjusted for age, physical workload, emotional exhaustion, bullying, GHQ, sleep problems, acute NP, low back pain and body mass index. OR (95% CI) <u>Women</u> *Workplace bullying* No: 1.00 Yes, now: 1.62 (1.11 to 2.35) Yes, earlier, at this workplace but not now: 1.58 (1.22 to 2.04 Yes, earlier, at different workplace: 1.79 (1.32 to 2.43)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		Only participants without chronic NP at the baseline were included. n=5277 4220 (80%) women and 1057 (20%) men	underestimation of his/her work performance, threatening, talking behind the back or other pressurizing'.	Acute pain short-term pain, lasting a maximum of 3 months, and chronic pain that has persisted for more than 3 months.	Yes, earlier, at different workplace: 1.98 (1.47 to 2.67) <u>Men</u> *Job demands* 1 (low): 1.00 2: 0.86 (0.49 to 1.49) 3: 0.89 (0.50 to 1.59) 4 (high): 0.82 (0.45 to 1.49) *Job control* 1 (high): 1.00 2: 0.80 (0.46 to 1.38) 3: 0.59 (0.33 to 1.05) 4 (low): 0.70 (0.38 to 1.30) *Workplace bullying* No: 1.00 Yes, now: 1.55 (0.63 to 3.78) Yes, earlier, at this workplace but not now: 0.91 (0.38 to 2.18) Yes, earlier, at different workplace: 1.13 (0.40 to 3.26)	
Lamy et al 2014 [67] France **Risk of Bias** Low	Prospektive cohort 2-year follow-up Hospital workers 2006 to 2008	Participants derived from the ORSOSA study, a national, longitudinal, multicentre study among seven	**Psychosocial and organizational work environment** were assessed with the French validated 22-item Nursing Work	**Incident shoulder pain (SP)** was recorded with a self-administrated questionnaire derived from		Shoulder pain relation to exposures in, work-unit-level psychosocial and organizational environment (NWI-EO). Adjusted for age, body mass index, work unit speciality, working time,

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		French teaching hospitals. n=1896 (1172 registered nurses and 724 assistant nurses) All participants were women	Index-Extended Organization (NWI-EO).	Kuorinka's general Standardized Nordic Questionnaire. The following question was asked: "At any time during the last 7 days have you had trouble ache, pain, or discomfort?" Focusing on pain or discomfort that persists in time for ≥4 days and/or that increases during a lateral movement of the arm away from the midline of the body (abduction).		work schedule, leisure-time physical activity, and tobacco consumption. Odds Ratio; OR (95% CI) Support from nursing management staff RN: 1.02 (0.94 to 1.12) RA: 1.04 (0.91 to 1.18) Adequate staffing RN: 0.98 (0.90 to 1.07) RA: 0.98 (0.89 to 1.08) Organization encouraging the exchange of information regarding patient care RN: 1.12 (0.96 to 1.31) RA: 0.97 (0.78 to 1.21) Interruptions during nursing tasks RN: 0.90 (0.77 to 1.05) Relationships with hierarchical superiors within the healthcare team RN: 1.15 (0.95 to 1.38) RA: 1.05 (0.93 to 1.17)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						Ability to take holidays or paid leave RN: 1.15 (0.95 to 1.38) RA: 1.05 (0.93 to 1.17) Effort–reward imbalance (worker level) Perceived effort RN: 0.94 (0.80 to 1.11) RA: 1.06 (1.00 to 1.12) Perceived lack of esteem and respect RN: 0.97 (0.90 to 1.05) RA: 0.92 (0.81 to 1.03) Perceived lack of career opportunity and salary RN: 1.04 (0.96 to 1.13) RA: 1.03 (0.94 to 1.13) Perceived lack of job security and stability RN: 1.15 (1.02 to 1.29) RA: 1.04 (0.91 to 1.18) RN=registered nurse; NA=nursing assistant
Lund et al 2019 [87] Denmark	Prospective cohort	Participants derived from the national Danish Civil Registration	**Work-related wrist movements**	**Carpal tunnel syndrome (CTS),**	Association between 1-year exposure levels (intensity duration) and Carpal Tunnel Syndrome. Crude. Incidence rate (IR) (95% CI)	Association between 1-year exposure levels (intensity duration) and Carpal Tunnel Syndrome

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of Bias Low	Follow-up not stated General working population 1992 to 2014	System. Information on occupational title, industry and education were related to an established job matrix of 33 jobs with measurements. n=1 015 418 57% were woman and 43% were men	Electro-goniometric measurements of wrist movements were performed for 30 jobs (eg, office work, childcare, laundry work and slaughterhouse work). We measured wrist angular velocity, mean power frequency (MPF) and range of motion (ROM).	**diagnoses or surgery** Cases were identified in the Danish National Patient Register by primary CTS diagnosis or CTS operation. Diagnoses were coded by the International Classification of Diseases (ICD)	<u>Wrist angular velocity</u> 0–<20th percentile (0.01≤–<6.09): 1.00 20th≤–40th percentile (6.09≤–7.28): 1.40 (1.26 to 1.56) 40th≤–60th percentile (7.28≤–11.1): 1.87 (1.68 to 2.08) 60th≤–80th percentile (11.1≤–14.5): 2.27 (2.05 to 2.52) 80th≤–≤100th percentile (14.5≤–≤37.6): 2.50 (2.26 to 2.77) <u>Mean power frequency</u> 0–<20th percentile (<0.001≤–<0.23): 1.00 20th≤–40th percentile (0.23≤–0.24): 0.99 (0.91 to 1.08) 40th≤–60th percentile (0.24≤–0.27): 1.21 (1.10 to 1.32) 60th≤–80th percentile (0.27≤–0.29): 1.61 (1.49 to 1.74) 80th≤–≤100th percentile (0.29≤–0.45): 1.75 (1.62 to 1.90) <u>Range of motion</u> 0–<20th percentile (0.05≤–<48.7): 1.00 20th≤–40th percentile (48.7≤–49.6): 0.87 (0.80 to 0.95) 40th≤–60th percentile (49.6≤–52.8): 1.04 (0.95 to 1.13) 60th≤–80th percentile (52.8≤–59.6): 1.61 (1.48 to 1.74)	Adjusted for sex, age, calendar year, pregnancy, wrist-near fracture, hypothyroidism, rheumatoid arthritis, diabetes mellitus and obesity. Incidence rate (IR) (95% CI) <u>Wrist angular velocity</u> 0–<20th percentile (0.01≤–<6.09): 1.00 20th≤–40th percentile (6.09≤–7.28): 1.40 (1.26 to 1.56) 40th≤–60th percentile (7.28≤–11.1): 1.87 (1.68 to 2.08) 60th≤–80th percentile (11.1≤–14.5): 2.27 (2.05 to 2.52) 80th≤–≤100th percentile (14.5≤–≤37.6): 2.50 (2.26 to 2.77) <u>Mean power frequency</u> 0–<20th percentile (<0.001≤–<0.23): 1.00 20th≤–40th percentile (0.23≤–0.24): 0.78 (0.72 to 0.86)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					80th≤−≤100th percentile (59.6≤−65.1): 1.28 (1.18 to 1.39)	40th≤−60th percentile (0.24≤−0.27): 1.51 (1.37 to 1.66) 60th≤−80th percentile (0.27≤−0.29): 1.33 (1.23 to 1.44) 80th≤−≤100th percentile (0.29≤−0.45): 1.83 (1.68 to 1.98) <u>Range of motion</u> 0−<20th percentile (0.05≤−<48.7): 1.00 20th≤−40th percentile (48.7≤−49.6): 0.62 (0.57 to 0.68) 40th≤−60th percentile (49.6≤−52.8): 1.33 (1.21 to 1.45) 60th≤−80th percentile (52.8≤−59.6): 1.44 (1.33 to 1.55) 80th≤−≤100th percentile (59.6≤−65.1): 0.97 (0.90 to 1.06)
Merkus et al 2021 [32] Norway **Risk of Bias**	Prospective cohort 2-year follow-up	Participants were selected to the study based on availability and logistics, as well as their job title	**Objective exposure assessment** At baseline, upper arm elevation and	**Neck/shoulder pain** Pain intensity in the neck and in the dominant	Association of arm elevation, trapezius activity, and neck/shoulder load with neck/shoulder pain. β (SE) p-value <u>Arm elevation</u> <30° (vs >30°): 0.37 (0.15) 0.015	Association of arm elevation, trapezius activity, and neck/shoulder load with neck/shoulder pain. Adjusted for gender,

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Moderate	Construction and healthcare Workers 2014 to 2017	(to obtain a broad range of biomechanical exposures found in each sector). n=121 73 (60%) were men	upper trapezius muscle activity were monitored bilaterally for a full working day using accelerometry and normalized surface electromyography (%MVE). A composite neck/shoulder load metric was developed from synchronized recordings of arm elevation and trapezius activity.	shoulder (NSPi) during the past four weeks was reported by the workers on a 4-point scale from 0 'no pain' to 3 'severe pain'. One question considered pain in the neck, and another considered pain in the dominant shoulder.	<30° (vs >30°)*time: −0.07 (0.04) 0.089 30–60° (vs <30° and >60°): −0.31 (0.20) 0.120 30–60° (vs <30° and >60°)*time: 0.03 (0.05) 0.539 > 60° (vs <60°): −0.07 (0.13) 0.610 > 60° (vs <60°)*time: −0.06 (0.05) 0.243 <u>Trapezius activity</u> <0.5%MVE (vs >0.5%MVE): –0.26 (0.13) 0.041 <0.5%MVE (vs >0.5%MVE)*time: 0.03 (0.04) 0.327 0.5–7.0%MVE (vs <0.5% & >7.0%MVE): 0.30 (0.22) 0.173 0.5–7.0%MVE (vs <0.5% & >7.0%MVE)*time: –0.13 (0.06) 0.040 >7.0%MVE (vs <7.0%MVE): –0.04 (0.14) 0.774 >7.0%MVE (vs <7.0%MVE)*time: 0.09 (0.04) 0.019 <u>Neck/shoulder load</u> Restitution (*vs* shoulder load): –0.28 (0.10) 0.008 Restitution (*vs* shoulder load)*time: 0.02 (0.03) 0.498 Low load (vs restitution, medium, high load): 0.48 (0.21) 0.026 Low load (vs restitution, medium, high load)*time: −0.07 (0.06) 0.260	sector, NSP duration in the 12 months preceding baseline, social climate, social climate*time, control of work pacing, control of work pacing*time. β (SE) <u>Arm elevation</u> <30° (vs >30°): 0.20 (0.13) 0.126 <30° (vs >30°)*time: −0.06 (0.04) 0.097 30–60° (vs <30° and >60°): −0.22 (0.16) 0.161 30–60° (vs <30° and >60°)*time: 0.03 (0.05) 0.534 >60° (vs <60°): 0.03 (0.11) 0.820 >60° (vs <60°)*time: 0.03 (0.03) 0.324 <u>Trapezius activity</u> <0.5%MVE (vs >0.5%MVE −0.21 (0.10) 0.045 <0.5%MVE (vs >0.5%MVE)*time: 0.05 (0.03) 0.113 0.5–7.0%MVE (vs <0.5% & >7.0%MVE): 0.32 (0.18) 0.072

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Medium load (vs restitution, low, high load): −0.12 (0.31) 0.697 Medium load (vs restitution, low, high load)*time: −0.07 (0.10) 0.445 High load (vs restitution, low, medium load): −0.09 (0.20) 0.661 High load (vs restitution, low, medium load)*time: 0.12 (0.06) 0.047	0.5–7.0%MVE (vs <0.5% & >7.0%MVE)*time: −0.13 (0.06) 0.037 >7.0%MVE (vs <7.0%MVE): −0.11 (0.11) 0.330 >7.0%MVE (vs <7.0%MVE)*time: 0.07 (0.04) 0.067 <u>Neck/shoulder load</u> Restitution (*vs* shoulder load): −0.17 (0.09) 0.053 Restitution (*vs* shoulder load)*time: 0 0.03 (0.03) 0.223 Low load (vs restitution, medium, high load): 0.40 (0.18) 0.027 Low load (vs restitution, medium, high load)*time: –0.09 (0.06) 0.132 Medium load (vs restitution, low, high load): −0.17 (0.25) 0.510 *Medium* load (vs restitution, low, high load)*time: −0.02 (0.09) 0.874 High load (vs restitution, low, medium load): −0.06 (0.16) 0.536

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						High load (vs restitution, low, medium load)*time: 0.07 (0.06) 0.276
Meyers et al 2021 [59] USA **Risk of Bias** Low	Prospective cohort Follow-up time was 2 years Manufacturing and healthcare 2002 to 2005	Participants derived from a cohort of manufacturing and healthcare workers recruited from three research sites. All study participants were full-time workers and had at least 3 months of work experience. We excluded participants with missing health outcome variables or who met the case definition criteria for RCS at baseline. n=393	**Work exposure** Trained analysts (e.g., ergonomists, industrial hygienists) conducted biomechanical exposure assessments that included force ratings and determining vibration exposure (yes/no) by job task (Borg, 1982). Each job task was video recorded at 30 frames/s from two angles (17 min for single task jobs and 12 min per task for multi-task jobs).	**Rotator Cuff Syndrome (RCS***)* Physical therapists conducted clinical examinations of both arms and hands on all participants. The case definition for dominant arm RCS case included a combination of (1) shoulder pain during a clinical examination induced by at least one provocative test; and (2) meeting both self-reported shoulder	Associations between work exposures and incident rotator cuff syndrome. Hazard Ratios; HR (95% CI) Supervisor support: 1.52 (0.97 to 2.38) Mental demands: 1.69 (0.84 to 3.40) JCQ scales - High vs. low psychological Job demands: 1.04 (0.98 to 1.11) Resource control: 0.68 (0.36 to 1.31) Skill discretion: 0.97 (0.91 to 1.03) Decision authority: 0.98 (0.93 to 1.03) Task control: 1.14 (0.75 to 1.75) Task control (expanded version): 1.10 (0.71 to 1.72) High vs. low decision latitute job strain category: 0.83 (0.42 to 1.66) Job strain ratio (pd/dl): 7.42 (0.72 to 76.20) <u>Job strain categories</u> Low strain (Quartile 1): 1.00 Passive job (Quartile 2): 1.46 (0.57 to 3.73) Active job (Quartile 3): 1.74 (0.59 to 5.10) Job strain (Quartile 4): 1.64 (0.59 to 4.52)	Associations between biomechanical exposures and incident rotator cuff syndrome. Adjusted for age, education, BMI, Forceful Element Repetition Rate (TWA), Site, Supervisor, Support, Years worked at employer, Job strain ratio and Mental demands. Hazard Ratios; HR (95% CI) *Forceful Exertion* Peak forceful exertion - analyst rated: 0.97 (0.46 to 2.04) TWA forceful exertion - analyst rated: 0.60 (0.23 to 1.59) *Repetition Rates (/min)* TWA total repetition rate (/min): 1.00 (0.97 to 1.04) TWA forceful repetition rate (/min): 1.06 (0.98 to 1.14)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		44% were female and 66% were male	A questionnaire to collected information on psychosocial factors.	symptom criteria: (a) in the past 12 months, they experienced any shoulder symptoms, and (b) any shoulder pain in the past 7 days	*Forceful Exertion* Peak forceful exertion - analyst rated: 1.02 (0.57 to 1.85) TWA forceful exertion - analyst rated: 1.20 (0.72 to 1.99) *Repetition Rates (/min)* TWA total repetition rate (/min): 1.02 (0.99 to 1.05) Forceful element repetition rate (TWA): 1.06 (1.00 to 1.13) *Duty Cycle (% time)* Total duty cycle (% time): 1.01 (0.99 to 1.03) Forceful duty cycle (% time): 1.01 (0.99 to 1.02) *Upper arm posture variables (% time)* Abduction ≥30°: 0.99 (0.97 to 1.02) Flexion ≥45°: 0.99 (0.97 to 1.01) Abduction ≥60°: 0.99 (0.94 to 1.03) Flexion ≥90°: 0.99 (0.93 to 1.04)	*Duty Cycle (% time)* Total duty cycle (% time): 1.00 (0.98 to 1.02) Forceful duty cycle (% time): 1.00 (0.97 to 1.03) *Upper arm posture variables (% time)* Abduction ≥30°: 0.98 (0.95 to 1.01) Flexion ≥45°: 0.98 (0.95 to 1.00) Abduction ≥60°: 0.97 (0.93 to 1.03) Flexion ≥90°: 0.97 (0.91 to 1.03)
Miettinen et al 2021 [70] Finland **Risk of Bias**	Prospective cohort The mean follow-up time was 21.3±1.8 years	The study population consisted of the Northern Finland Birth Cohort of 1966. In 1997, the cohort population	**Work exposure** Occupational risk factors were evaluated by a postal questionnaire	**Hospitalization due to Ulnar nerve entrapment (UNE)**	Association between work exposure and hospitalization due to ulnar nerve entrapment. Crude. Hazard ratio; HR (95% CI) <u>Lifting ≤15 kg</u> No: 1	Association between work exposure and hospitalization due to ulnar nerve entrapment. Adjusted for variables with P-value ≤0.10 Hazard ratio; HR (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Low	General working population 1996 to 2018	turned 31 years, and 8719 individuals participated in a follow-up study. n=3833 Proportion of gender not stated		The data on hospitalizations due to UNE were provided by the Care Register for Health Care. The diagnoses are coded according to the ICD, and all ulnar entrapment neuropathies are coded under the same code. The diagnoses were obtained from hospital data including both out and inpatient services, with UNE as the primary or subsidiary diagnosis.	Yes: 1.27 (1.08 to 4.80) <u>Lifting >15 kg</u> No: 1 Yes: 2.52 (1.31 to 4.83) <u>Work requiring arm elevation</u> No: 1 Yes: 3.19 (1.67 to 6.07) <u>Work demanding repetitive movements</u> No: 1 Yes: 1.85 (0.72 to 4.74) <u>Exposure to heat</u> None or light: 1 Moderate or high: 1.47 (0.81 to 2.66) <u>Exposure to cold</u> None or light: 1 Moderate or high: 1.96 (1.19 to 3.49) <u>Exposure to temperature changes</u> None or light: 1 Moderate or high: 2.40 (1.47 to 3.92)	<u>Exposure to temperature changes</u> None or light: 1 Moderate or high: 1.72 (1.00 to 2.93)
Murinova et al 2021 [79]	Retrospective cohort	Participants derived from database of the Department of	**Heavy manual work (HMW)**	**Dupuytren's disease (DD)**	Association between DD and HMW. Odds Ratio; OR (95% CI) Heavy manual work (HMW):	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Slovak Republic **Risk of Bias** Moderate	Follow-up time between 1 to 30 years Manual labour 2017 and 2019	Occupational Medicine and Clinical Toxicology. The one group included workers engaged in the pressing of magnesite bricks and were exposed to HMW. The control group included subjects without any risk exposure. n=515 All participants were male	HMW was quantified through hygienic monitoring of the workplace. Physical exertion in the occupational environment was defined as one or more tasks that separately or together could overload the employee´s musculoskeletal system. This type of work involved prolonged, heavy, physical labour that required strength and energy, and included lifting, lowering, pulling, pushing, or carrying a load.	Clinically diagnosed DD was made by occupational physicians. A subject was considered to have DD if an incomplete extension of the phalanx, a permanent flexion deformity or fibrotic nodules in the palm were present. All the occupational physicians were well trained to perform examinations of the upper extremities, including the hands.	3.10 (1.21 to 7.91)	
Petit et al 2015 [77] France	Prospective cohort 5-years follow-up	Participants were temporary and part-time workers who underwent a	**Work-related factors**	**Carpal tunnel syndrome (CTS) symtoms**	Associations Between Work-related biomechanical, psychosocial, and organizational risk factors for carpal	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Low	General working population 2002–2010	regularly scheduled mandatory health examination by an occupational physician in charge of the medical surveillance of a group of companies. Subjects were selected at random, following a two-stage sampling procedure. n=1532 884 (58%) were men and 648 (42%) were women	Work-related factors during a typical workday in the preceding 12-month period were assessed at baseline using a self-administered questionnaire. Psychosocial work factors were assessed using the validated French version of Karasek's «Job Content Questionnaire» and the median scores of the national French SUMER study. The biomechanical factors were assessed as a whole (without hand by hand analysis).	The presence of non-specific wrist pain during the preceding 12 months and the preceding 7 days was identified using the Nordic style questionnaire. In cases of upper-limb symptoms occurring during the preceding 12 months, a physical examination was performed by the OP using a standardized clinical procedure. The case definition of CTS used in this study was based on symptoms only (“symptomatic	tunnel syndrome (CTS) symptoms. Adjusted for gender. OR (95% CI) <u>Factors related to the work organization (yes/no)</u> Paced work: 1.0 (0.4 to 2.7) Work pace dependent on automatic rate: 2.3 (1.1 to 4.7) Work pace dependent on other technical organization: 1.1 (0.6 to 2.2) Work pace dependent on customers' demands: 0.8 (0.5 to 1.4) Work pace dependent on the colleagues' work: 1.7 (1.0 to 3.0) Work pace dependent on quantified targets: 1.4 (0.8 to 2.4) Work pace dependent on permanent controls: 0.8 (0.4 to 1.5) Work with temporary workers: 1.6 (0.9 to 2.7) Overtime hours 1.3 (0.8 to 2.2) Variable weekly workload: 1.2 (0.7 to 2.0) No prior knowledge of the workload: 0.9 (0.3 to 2.5) Payment on a piecework basis: 2.3 (1.3 to 4.0) Job/task rotation (≥1 job rotation per week):	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				CTS"), whether physical examination signs were positive or not.	1.1 (0.6 to 1.9) <u>Working postures and biomechanical constraints (yes/no)</u> Exposure to cold temperature (≥4 h/day): 3.1 (1.3 to 7.2) Holding tools/objects in a pinch grip (≥2h/day): 2.1 (1.4 to 4.4) Extreme wrist bending posture (≥2 h/day): 1.9 (1.1 to 3.2) Pressing with palm base (≥2 h/day): 3.1 (1.4 to 6.9) High hand force (VAS >5): 1.7 (0.9 to 3.2) High repetitiveness (≥4 h/day): 1.8 (1.1 to 3.1) Full pronosupination movements (≥2 h/day): 1.2 (0.5 to 2.7) Holding loads or objects weighing more than 4 kg (≥2 h/day): 0.9 (0.4 to 1.9) <u>Psychosocial factors at work (yes/no)</u> High psychological demand: 0.8 (0.4 to 1.3) Low skill discretion: 1.3 (0.7 to 2.2) Low decision authority: 1.4 (0.8 to 2.4) Low supervisor support: 1.2 (0.7 to 2.0) Low coworker support: 1.0 (0.5 to 2.1)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Petit et al 2018 [34] France **Risk of bias** Low	Prospective cohort 5-years follow-up General working population 2002–2010	Participants were temporary and part-time workers who underwent a regularly scheduled mandatory health examination by an occupational physician in charge of the medical surveillance of a group of companies. Subjects were selected at random, following a two-stage sampling procedure. n=1532 914 (60.5%) were men and 596 (39.5%) were women	**Psychosocial and organisational factors** Workers completed two self-administered questionnaires (baseline and follow-up) about their working conditions during a typical working day during the 12 preceding months.	**Neck pain** Musculoskeletal symptoms were assessed with the Nordic questionnaire.	Incidence of neck pain (NP) according to individual- and work-related risk factors. n incidence (% incidence) Men **Organizational factors** *Temporary employment* No: 839 (10.3) Yes: 74(10.8) *Variable weekly working time* No: 396 (8.1) Yes: 517 (12.2) *Less than 10-min break possible within every 60 min that highly repetitive movements are performed* No: 883 (10.5) Yes: 29 (6.9) *Work with temporary workers* No: 650 (11.2) Yes: 264 (8.3) *Job/task rotation (≥1 job rotation per week)* No: 532 (10.7) Yes: 334 (9.3) *Paced work* No: 795 (9.9) Yes: 103 (12.6) *Work pace dependent on automatic rate* No: 791 (9.7) Yes: 103 (14.6)	Table 4 Multivariate model of risk factors for incident neck pain (NP) in the working male population. OR (CI 95%) **Organizational factors** Work pace dependent on demand of guests No: 1 Yes: 1.8 (1.1 to 2.8) Work pace dependent on permanent hierarchical controls or surveillance No: 1 Yes: 2.1 (1.3 to 3.3) **Biomechanical factors** Bending forward (≥4 h/day) No: 1 Yes: 2.3 (0.99 to 5.3) **Psychosocial factors** Low coworker support No: 1 Yes: 1.8 (1.1 to 3.0) Table 5 Multivariate model of risk factors for incident neck pain (NP) in

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Work pace dependent on other technical organization No: 660 (9.7) Yes: 235 (12.3) *Work pace dependent on the colleagues' work* No: 612 (9.0) Yes: 282 (12.8) *Work pace dependent on demand of guests* No: 508 (7.9) Yes: 394 (13.5) *Work pace dependent on permanent hierarchical controls or surveillance* No: 679 (8.3) Yes: 218 (16.5) **Biomechanical factors** *Working seated (≥4 h/day)* No: 720 (10.0) Yes: 191 (11.5) *Bending forward (≥4 h/day)* No: 869 (9.8) Yes: 41 (19.5) *Forward neck flexion (≥4 h/day)* No: 750 (9.9) Yes: 163 (12.9) *Backward neck flexion (≥2 h/day)* No: 832 (10.7) Yes: 75 (8.0) *Sustained or repeated arm posture in abduction (≥2 h/day)*	<u>the working female population</u> Paced work No: 1 Yes: 2.0 (0.9 to 4.3) Sustained or repeated arm posture in abduction (≥2 h/day) No: 1 Yes: 1.7 (1.0 to 3.0)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No: 727 (10.9) Yes: 184 (8.7) **Psychosocial factors** *High psychological demand* No: 479 (8.8) Yes: 429(12.1) *Low decision authority* No: 659 (10.8) Yes: 251 (9.6) *Low skill discretion* No: 477 (11.5) Yes: 431 (9.1) *Low supervisor support* No: 542 (10.0) Yes: 360 (10.8) *Low coworker support* No: 729 (9.2) Yes: 173 (14.5) <u>Women</u> **Organizational factors** *Temporary employment* No: 527 (13.9) Yes: 65 (21.5) *Variable weekly working time* No: 301 (15.3) Yes: 287 (14.3) *Less than 10-min break possible within every 60 min that highly repetitive movements are performed*	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No: 550 (14.4) Yes: 39 (20.5) *Work with temporary workers* No: 423 (13.0) Yes: 169 (18.9) *Job/task rotation (≥1 job rotation per week)* No: 372 (12.6) Yes: 190 (16.3) *Paced work* No: 526 (13.9) Yes: 46 (23.9) *Work pace dependent on automatic rate* No: 528 (14.2) Yes: 45 (20.0) *Work pace dependent on other technical organization* No: 507 (14.0) Yes: 65 (20.0) *Work pace dependent on the colleagues' work* No: 437 (14.0) Yes: 136 (16.9) *Work pace dependent on demand of guests* No: 321 (15.3) Yes: 263 (14.1) *Work pace dependent on permanent hierarchical controls or surveillance* No: 451 (14.0) Yes: 126 (17.5)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Biomechanical factors *Working seated (≥4 h/day)* No: 348 (14.9) Yes: 242 (14.5) *Bending forward (≥4 h/day)* No: 555 (14.8) Yes: 37 (13.5) *Forward neck flexion (≥4 h/day)* No: 414 (13.5) Yes: 179 (17.3) *Backward neck flexion (≥2 h/day)* No: 570 (14.2) Yes: 22 (27.3) *Sustained or repeated arm posture in abduction (≥2 h/day)* No: 482 (12.7) Yes: 111 (23.4) **Psychosocial factors** *High psychological demand* No: 318 (12.9) Yes: 273 (16.5) *Low decision authority* No: 370 (13.2) Yes: 222 (17.1) *Low skill discretion* No: 232 (15.1) Yes: 359 (14.5) *Low supervisor support* No: 385 (13.0) Yes: 196 (18.4)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low coworker support No: 469 (14.3) Yes: 113 (17.7)	
Rodriguez Diez-Caballero et al 2020 [56] Spain **Risk of Bias** Moderate	Retrospective study/case-control Car factory 2009 and 2014	Participants were a group of 73 cases of shoulder occupational chronic injuries officially recognized by the regulatory health authorities. Cases n=73 and control group n=94 90.4% male of the total; 93% in the cases group and 88% in the control group	**Work exposure** Objective assessment method for biomechanical job factors using the standardised measurements provided by the Spanish INSS Guide and the O*Net network, in combination with data provided by the Safety and Health services.	**Shoulder chronic tendinous pathology** Diagnoses according to the Spanish National classification of occupational diseases, all shoulder disorders are included into the same 2D0101 diagnosis code as “tendinous chronic pathology of the rotator cuff (subacromial impingement syndrome, calcifying and chronic tendinitis and		Associations between occupational physical activity and Neck and Shoulder chronic tendinous pathology. Adjusted for age, gender, smoking and BMI. Odds ratio; OR (95% CI) <u>Awkward Postures (yes/no)</u> Shoulder Flex/Abd: 0.20 (0.02 to 1.73) Shoulder High Position: 0.20 (0.02 to 1.73) Elbow Pronation/supination: 13.07 (1.60 to 105.7) Repetitive Movements (yes/no): 0.29 (0.15 to 0.56) <u>Manual Handling of Loads (yes/no):</u> <u>3.68 (2.77 to 4.89)</u> <3kg: 0.42 (1.66 to 43.14) 3–15 kg: 1.96 (1.01 to 3.78)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				rotator cuff tears)". All these pathologies are also included in the code M25.811 of ICD-10.		>15 kg: 9.6 (4.27 to 21.55) <u>Use of Hand Tools (yes/no):</u> <u>13.50 (5.24 to 34.78)</u> <1 kg: 0.42 (0.35 to 0.56) 1–3 kg: 1.46 (0.77 to 2.73) >3kg: 9.03 (3.75 to 21.73) <u>Mechanical Pressure (yes/no):</u> <u>20.15 (2.56 to 158.04)</u> Pressure on fingers: 0.74 (0.32 to 1.71) Pressure on palm of hand: 6696 (411.75 to 108.892) Pressure on hand: 2.64 (2.15 to 3.25)
Roquelaure et al 2020 [84] France **Risk of Bias** Low	Prospective cohort Follow-up 5 years General working population 2002 to 2010	Participants were sample of randomly selected workers in the French Pays de la Loire region, who received routinely scheduled surveillance examinations. Workers with CTS at baseline,	**Work exposure** Workers completed a self-administered questionnaire about their working conditions during a typical working day over the 12 preceding months.	**Carpal tunnel syndrome (CTS*)*** All workers reporting upper-limb symptoms occurring during the preceding 12 months in the questionnaire were examined	Associations between occupational activity and *symptomatic* CTS. <u>Men (n=804): No CTS/CTS (786/18)</u> Work pace dependent on automatic rate, no. (%) No CTS: 131 (16.7) CTS: 5 (27.8) Work pace dependent on demand of customers, no. (%) No CTS: 353 (44.9) CTS: 10 (55.6)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		craftsmen, salesmen, and managers and workers in the agriculture sector were excluded. n=1367 804 men and 563 women	Psychosocial risk factors were assessed according to the validated French version of the Karasek Job Content Questionnaire. Biomechanical risk factors were assessed using pictures to facilitate the workers' understanding.	by the OP using a standardized clinical procedure that strictly applied the methodology and clinical Case definition of "symptomatic CTS" was based on the presence of positive symptom criteria only.	Wrist bending posture ($2 hours/day), no. (%) No CTS: 263 (33.5) CTS: 10 (55.6) Decision authority, mean (SD) No CTS: 37.0 (6.8) CTS: 34.2 (6.0) Skill discretion, mean (SD) No CTS: 35.0 (6.2) CTS: 33.1 (5.3) Psychological demand, mean (SD) No CTS: 21.4 (3.6) CTS: 21.9 (5.1) Supervisor social support, mean (SD) No CTS: 11.5 (2.3) CTS: 10.7 (2.2) Coworker social support, mean (SD) No CTS: 12.6 (1.7) CTS: 12.6 (1.9) <u>Women (n=563): No CTS/CTS (530/33)</u> Work pace dependent on automatic rate, no. (%) No CTS: 51 (9.6) CTS: 5 (15.2)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Work pace dependent on demand of customers, no. (%) No CTS: 256 (48.3) CTS: 13 (39.4) *Wrist bending posture, no. (%)* Never or almost never No CTS: 291 (54.9) CTS: 15 (45.5) Rarely (less than 2 h a day) No CTS: 76 (14.3) CTS: 7 (21.2) Often (2–4 h a day) No CTS: 90 (17.0) CTS: 6 (18.2) Most of the time (more than 4 h a day) No CTS: 73 (13.8) CTS: 5 (15.2) *Holding tools/objects in a pinch grip, no. (%)* Never or almost never No CTS: 409 (77.2) CTS: 18 (54.6) Rarely (less than 2 h a day) No CTS: 34 (6.4) CTS: 5 (15.2) Often (2-4 h a day) No CTS: 41 (7.7) CTS: 4 (12.1) Most of the time (more than 4 h a day) No CTS: 46 (8.7)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					CTS: 6 (18.2) Decision authority, mean (SD) No CTS: 35.2 (7.4) CTS: 35.4 (8.0) Skill discretion, mean (SD) No CTS: 33.2 (6.4) CTS: 32.8 (6.6) Psychological demand, mean (SD) No CTS: 21.6 (3.4) CTS: 21.5 (3.3) Supervisor social support, mean (SD) No CTS: 11.7 (2.1) CTS: 11.5 (2.3) Coworker social support, mean (SD) No CTS: 12.7 (1.8) CTS: 12.3 (1.6) <u>All (n=1367): No CTS/CTS (1316/51)</u> *Work pace dependent on automatic rate, no. (%)* No CTS: 182 (13.8) CTS: 10 (19.6) Work pace dependent on demand of customers, no. (%) No CTS: 609 (46.3) CTS: 23 (45.1)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Wrist bending posture, no. (%) Never or almost never No CTS: 658 (50.0) CTS: 20 (39.2) Rarely (less than 2 h a day) No CTS: 232 (17.6) CTS: 10 (19.6) Often (2–4 h a day) No CTS: 265 (20.1) CTS: 13 (25.5) Most of the time (more than 4 h a day) No CTS: 100 (7.6) CTS: 8 (15.7) *Holding tools/objects in a pinch grip, no. (%)* Never or almost never No CTS: 31 (60.8) CTS: 927 (70.4) Rarely (less than 2 h a day) No CTS: 148 (11.3) CTS: 6 (11.8) Often (2–4 h a day) No CTS: 141 (10.7) CTS: 6 (11.8) Most of the time (more than 4 h a day) No CTS: 100 (7.6) CTS: 8 (15.7) Decision authority, mean (SD) No CTS: 36.3 (7.1)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					CTS: 35.0 (7.3) Skill discretion, mean (SD) No CTS: 34.3 (6.4) CTS: 32.9 (6.1) Psychological demand, mean (SD) No CTS: 21.5 (3.6) CTS: 21.6 (4.0) Supervisor social support, mean (SD) No CTS: 11.6 (2.2) CTS: 11.2 (2.3) Coworker social support, mean (SD) No CTS: 12.6 (1.8) CTS: 12.4 (1.7)	
Sadeghian et al 2013 [33] Iran **Risk of Bias** Moderate	Prospective cohort Follow-up 12 months Nurses and office workers	Participants were nurses and computer-using office workers aged 20–59 years, who were employed at the participating hospitals and universities, and had been working in their current job for 12 months.	**Occupational exposure** Risk factors were assessed with a baseline questionnaire (farsi translation of the English language CUPID questionnaire).	**Neck and shoulder pain** A questionnaire, which asked about pain in the past month in the neck and/or either shoulder <u>Incident pain</u> Subjects who were free from	Associations of risk factors at baseline with incidence of new neck/shoulder pain at follow-up. Adjusted for sex, age, and occupation. Prevalence rate ratios; PRR (95% CI) Work with hands above shoulder height >1 hour/d: 1.4 (1.0 to 1.9) Lifting weights of >25 kg by hand: 1.3 (0.8 to 2.1) Incentive: 1.4 (1.0 to 2.0) Time pressure: 1.0 (0.6 to 1.6) Lack of choice: 1.0 (0.6 to 1.5)	Associations of risk factors at baseline with incidence of new neck/shoulder pain at follow-up. Adjusted for many risk factors. Prevalence rate ratios; PRR (95% CI) Work with hands above shoulder height >1 hour/d: 1.2 (0.9 to 1.8) Lifting weights of >25 kg by hand: 1.3 (0.8 to 2.1)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		n=383 97 (25%) men and 286 (75%) women		pain in the past month at baseline and presence of new pain at follow-up.	Lack of support: 0.9 (0.5 to 1.4) Perceived job insecurity: 1.1 (0.8 to 1.6)	Incentives: 1.4 (1.0 to 2.0) Time pressure: 1.0 (0.6 to 1.7) Lack of choice: 0.9 (0.6 to 1.4) Lack of support: 0.8 (0.5 to 1.3) Perceived job insecurity: 1.0 (0.7 to 1.4)
Seidler et al 2011 [57] Germany **Risk of Bias** Moderate	Case-control General working population 2003–2008	Patients were recruited in radiology practices. Participating radiologists were asked to identify all male patients between 25 and 65 years. Control subjects were randomly selected from a random sample of male residents aged 25–65 years drawn by the Cases=483 Controls=300	**Mechanical exposure** Data were gathered in a structured personal interview Major occupations were a priori categorized on the basis of the two-digit STBA job-title codes. Cumulative duration all weights >20 kg lifted or carried at work were	**Supraspinatus tendon partial or total tear** Partial or total supraspinatus tendon tears as diagnosed by MRI and radiologists had to state the date of initial radiographic diagnosis of supraspinatus tendon lesion. MRI had been conducted due to shoulder pain as indicated by the patients.	Physical workload and supraspinatus tendon tears. Adjusted for age and region. OR (95% CI) <u>Cumulative lifting and carrying of loads C20 kg [h]</u> No lifting/carrying of loads C20 kg 1.0 0–\9.6 h: 1.4 (0.8 to 2.4) 9.6–\77 h: 2.0 (1.2 to 3.3) 77–9.038 h: 3.3 (2.1 to 5.2) <u>Cumulative work above shoulder level [h]</u> No work above shoulder level 1.0 0–\610 h: 1.7 (1.0 to 2.8) 610–\3,195 h: 2.6 (1.6 to 4.2) 3,195–64,057 h: 4.1 (2.6 to 6.4)	Physical workload and supraspinatus tendon tears. Adjusted for age, region, lifting/carrying of loads C20 kg, work above shoulder level, handheld vibration, apparatus gymnastics/shot put/javelin/hammer throwing/wrestling and tennis. OR (95% CI) <u>Cumulative lifting and carrying of loads C20 kg [h]</u> No lifting/carrying of loads C20 kg 1.0 0–\9.6 h: 0.9 (0.5 to 1.7) 9.6–\77 h: 1.2 (0.6 to 2.1) 77–9.038 h: 1.8 (1.0 to 3.2)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		All participants were male	multiplied by the corresponding durations.			Cumulative work above shoulder level [h] No work above shoulder level 1.0 0–\610 h: 1.7 (1.0 to 2.8) 610–\3.195 h: 2.6 (1.6 to 4.2) 3,195–64.057 h: 4.1 (2.6 to 6.4)
Sihawong et al 2016 [35] Thailand **Risk of bias** Moderate	Prospective cohort study 12-month follow-up Office workers	Participants were a convenience sample of office workers recruited from nine large-scale enterprises. Individuals were included in the study if they were 18−55 years of age and working full time. n=615 75% were female and 25% were male	**Occupational exposure** A self-administered questionnaire was used to gather data on individual, physical, and psychosocial factors. Psychosocial factors were measured by the Job Content Questionnaire (Thai version)	**Neck pain** The areas of the neck were defined according to the picture of the body from the standardized Nordic questionnaire. Nonspecific neck is neck pain (with or without radiation) without any specific systematic disease being detected as the underlying		Association of risk factors and rate of chronic neck pain. Adjusted for age, gender, initial pain intensity, and initial disability level. Odds ratio; OR (95% CI) Frequent neck extension during the work day Yes: 3.31 (1.10 to 10.02) No: 1.00 Psychological job demands (JCQ): 1.16 (1.02 to 1.31)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				cause of the complaints. Chronic neck pain was defined as ongoing neck pain for greater than 3 months over the past 6 months), i.e., reporting incident neck pain for at least 3 months in any 6 months during the 1-year follow up.		
Sterud et al 2014 [36] Norway **Risk of bias** Low	Prospective cohort 3-year follow-up General working population 2007 to 2010	Participants were randomly drawn from the Norwegian population. Eligible respondents were 18–66 years old. n=6745	**Psychosocial and mechanical exposure** Data were collected by personal telephone interviews.	**Neck/ shoulder pain** The outcome measure was the reported intensity of neck/ shoulder pain during the 4 weeks prior to answering the questionnaire: ‘‘Have you, over	Neck/shoulder pain and work-related exposures. Adjusted for neck/shoulder pain at baseline, gender, and age. OR (95% CI) <u>Job demands</u> Low: 1.00 Medium: 0.95 (0.75 to 1.23) High: 1.17 (0.99 to 1.39) Continuous: 1.03 (0.99 to 1.10) <u>Job control</u> High: 1.00	Neck/shoulder pain and work-related exposures. Adjusted for educational level, occupation, psychological distress, and work-related factors. OR (95% CI) <u>Job demands</u> Low: 1.00 Medium: 1.05 (0.82 to 1.35) High: 1.29 (1.08 to1.54

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		47 % were women and 52.5% were men		the past month, been severely afflicted by, somewhat afflicted by, a little afflicted by or not afflicted at all by pain in your neck and/or shoulders?''	Medium: 0.97 (0.79 to 1.08) Low: 1.17 (0.91 to 1.35) Continuous: 1.08 (0.96 to 1.14 <u>Supportive leadership</u> High: 1.00 Medium: 1.04 (0.88 to 1.25) Low: 1.34 (1.05 to 1.70) Continuous: 1.09 (1.01 to 1.19) <u>Role-conflict</u> Low: 1.00 Medium: 0.97 (0.83 to 1.17) High: 1.17 (0.93 to 1.53) Continuous: 1.02 (0.94 to 1.14 <u>Awkward lifting</u> No: 1.00 1/4 of the time: 1.59 (1.31 to 2.16) Continuous: 1.38 (1.15 to 1.54) <u>Upper body forward bend</u> No: 1.00 1/4 of the time: 1.40 (1.08 to 1.81) Continuous: 1.24 (1.08 to 1.42) <u>Hands above shoulders</u> No: 1.00 1/4 of the time: 1.35 (1.18 to 2.01) Continuous: 1.19 (1.10 to 1.44) <u>Neck flexion</u>	Continuous: 1.08 (1.02 to 1.15) <u>Job control</u> High: 1.00 Medium: 0.91 (0.77 to 1.07) Low: 1.02 (0.83 to 1.25) Continuous: 1.01 (0.93 to 1.10) <u>Supportive leadership</u> High: 1.00 Medium: 1.02 (0.86 to 1.22) Low: 1.28 (1.00 to 1.63) Continuous: 1.08 (0.99 to 1.17) <u>Role-conflict</u> Low: 1.00 Medium: 1.02 (0.86 to 1.22) High: 1.24 (0.96 to 1.59) Continuous: 1.06 (0.96 to 1.17) <u>Awkward lifting</u> No: 1.00a 1/4 of the time: 1.43 (1.08 to 1.90) Continuous:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No: 1.00 1/4 of the time: 1.30 (1.05 to 1.62) Continuous: 1.15 (1.02 to 1.26 <u>Hand-/arm repetition</u> No: 1.00 1/4 of the time: 1.02 (0.91 to 1.20) Continuous: 1.01 (0.64 to 1.02	1.21 (1.03 to 1.42) <u>Upper body forward bend</u> No: 1.00b 1/4 of the time: 1.07 (0.79 to 1.44) Continuous: 1.09 (0.93 to 1.28) <u>Hands above shoulders</u> No: 1.00c 1/4 of the time: 1.19 (0.87 to 1.63) Continuous: 1.12 (0.96 to 1.31) <u>Neck flexion</u> No: 1.00 1/4 of the time: 1.25 (1.00 to 1.55) Continuous: 1.11 (1.00 to 1.24) <u>Hand-/arm repetition</u> No: 1.00 1/4 of the time: 1.03 (0.90 to 1.19) Continuous: 1.01 (0.96 to 1.07)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Svendsen et al 2012 [71] Denmark **Risk of Bias** Low	Case control General working population 2001–2008	Cases derived were drawn from the Danish National Patient among patients referred for confirmatory nerve conductions studies (NCS) for suspected ulnar neuropathy. Controls were randomly sampled in the Danish National Health Service Register, individually matched on sex, age (+/-2½ years), and primary health care provider. n: Cases (ulnar neuropathy)=324 Cases (ulnar neuropathy-like symptoms)=396	**Occupational biomechanical exposures** Occupational biomechanical exposures in the year before the NCS year were assessed by combining self-reported job titles with quantitative job exposures extracted from a job exposure matrix (JEM) based on five experts' ratings	**Ulnar neuropathy** A referral diagnosis of mononeuropathy of upper limb [group G56] and a discharge diagnosis of either ulnar neuropathy (ICD-10 code G56.2) or no neuropathy (ICD-10 codes Z).	Prognosis of ulnar neuropathy and ulnar neuropathy-like symptoms in relation to occupational biomechanical exposures. Unadjusted OR (95% CI) <u>*Ulnar neuropathy*</u> *Force-score* 0 points: 1.00 >0–<1 point: 2.13 (1.30 to 3.49) ≥1 poin:t 3.73 (2.38 to 5.83) Trend‡: 1.92 (1.54 to 2.40) *Repetition-time* 0 h/day: 1.00 >0–<2.5 h/day: 0.92 (0.57 to 1.47) ≥2.5 h/day: 2.41 (1.58 to 3.68) Trend‡: 1.49 (1.21 to 1.84) *Nonneutral-posture-time* <1 h/day: 1.00 ≥1–<2 h/day: 1.51 (0.99 to 2.29) ≥2 h/day: 2.02 (1.32 to 3.10) Trend‡: 1.42 (1.15 to 1.76 <u>*Ulnar neuropathy-like symptoms*</u> *Force-score* 0 points: 1.00 >0–<1 point: 1.05 (0.73 to 1.52) ≥1 point: 1.99 (1.38 to 2.85) Trend‡: 1.40 (1.17 to 1.68) *Repetition-time* 0 h/day: 1.00 >0–<2.5 h/day: 1.32 (0.91 to 1.93) ≥2.5 h/day: 2.27 (1.56 to 3.32)	Prognosis of ulnar neuropathy and ulnar neuropathy-like symptoms in relation to occupational biomechanical exposures. Adjusted for BMI, smoking, alcohol consumption, side-specific fractures, full anaesthesia, use of crutches, hand–arm intensive sports, weight loss ≥10 kg and occupational. OR (95% CI) <u>*Ulnar neuropathy*</u> *Force-score* 0 points: 1.00 >0–<1 point: 2.73 (1.42 to 5.25) ≥1 point: 3.85 (2.04 to 7.24) Trend‡: 11.81 (1.35 to 2.43) *Repetition-time* 0 h/day: 1.00 >0–<2.5 h/day: 0.47 (0.25 to 0.90) ≥2.5 h/day: 0.94 (0.43 to 2.06) Trend‡: 0.91 (0.63 to 1.29) *Nonneutral-posture-time*

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		Women and men almost similarly distributed			Trend‡: 1.48 (1.23 to 1.78) *Nonneutral-posture-time* <1 h/day: 1.00 ≥1–<2 h/day: 1.90 (1.31 to 2.74) ≥2 h/day: 1.57 (1.10 to 2.23) Trend‡: 1.29 (1.08 to 1.53) ‡Trend analyses for an increment of one exposure category.	<1 h/day: 1.00 ≥1–<2 h/day: 0.94 (0.54 to 1.63) ≥2 h/day: 1.06 (0.53 to 2.12) Trend‡: 1.08 (0.78 to 1.49) <u>*Ulnar neuropathy-like symptoms*</u> *Force-score* 0 points: 1.00 >0–<1 point: 0.79 (0.48 to 1.29) ≥1 point: 1.02 (0.61 to 1.69) Trend‡: 1.09 (0.85 to 1.39) *Repetition-time* 0 h/day: 1.00 >0–<2.5 h/day: 1.33 (0.82 to 2.14) ≥2.5 h/day: 1.89 (1.01 to 3.52) Trend‡: 1.26 (0.95 to 1.67) *Nonneutral-posture-time* <1 h/day: 1.00 ≥1–<2 h/day: 1.65 (1.08 to 2.50) ≥2 h/day: 0.97 (0.59 to 1.60) Trend‡: 1.10 (0.71 to 1.65)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
						‡Trend analyses for an increment of one exposure category.
Svendsen et al 2013 [60] Denmark **Risk of Bias** Low	Prospective cohort 280 125 person-years of follow-up among 37 402 persons General working population 1993–2008	The participants derived from nine original studies that have contributed to the Musculoskeletal Research Database (MRD) at the Danish Ramazzini Centre. n=37 402 21 557 women and 15 845 men	**Mechanical exposures** A shoulder JEM that allocated exposure estimates to each participant by combining self-reported baseline information on occupational title with exposures from the JEM. All questionnaires asked about psychosocial work factors based on the Karasek-Theorell three-factor model.	**Surgery for subacromial impingement syndrome** The outcome included surgery performed under a main diagnosis in the International Classification of Diseases, 10th revision, groups M75.1–M75.9	Risk of surgery for subacromial impingement syndrome in relation to specific occupational mechanical exposures and psychosocial work factors. Adjusted for age. Hazard ratio; HR <u>Forceful work (force-score)</u> <1.5 points: 1 ·· ≥1.5–<2.5 points: 1.52 ≥2.5 points: 2.22 1.74 <u>Arm elevation >90º</u> 0 hours/day: 1 >0–<1 hour/day: 1.60 ≥1 hour/day: 1.98 <u>Repetitive work</u> Moderately repetitive work <2 hours/day: 1 Moderately repetitive work ≥2–<4 hours/day: 1.20 Moderately repetitive work ≥4 hours/day: 1.41 Highly repetitive work: 1.87 <u>Shoulder load</u> Low: 1 Medium: 1.63 High: 2.18 <u>Job demands</u> Low: 1 ··	Risk of surgery for subacromial impingement syndrome in relation to occupational biomechanical exposures and shoulder load. Adjusted for job demands, job control, social support at work, sex, smoking status, body mass index, and age. HR (95% CI) <u>Forceful work (force-score)</u> <1.5 points: 1 ·· ≥1.5–<2.5 points: 1.52 (1.11 to 2.07) ≥2.5 points: 1.74 (1.16 to 2.64) <u>Arm elevation >90º</u> 0 hours/day: 1 ·· >0–<1 hour/day: 1.53 (1.14 to 2.05) ≥1 hour/day: 1.61 (1.06 to 2.45) <u>Repetitive work</u> Moderately repetitive work <2 hours/day: 1 ··

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					High: 1.21 Job control High: 1 ·· Low: 1.42 Social support at work From leaders and colleagues: 1 From leaders, only: 0.78 From colleagues, only: 1.16 No social support: 1.10	Moderately repetitive work ≥2–<4 hours/day: 1.20 (0.78 to 1.83) Moderately repetitive work ≥4 hours/day: 1.34 (0.88 to 2.05) Highly repetitive work: 1.76 (1.05 to 2.96) Shoulder load Low 1: 1 Medium: 1.64 (1.19 to 2.26) High: 1.96 (1.33 to 2.89) Job demands Low: 1 High: 1.13 (0.94 to 1.36) Job control High: 1 Low: 1.22 (1.00 to 1.50) Social support at work From leaders and colleagues: 1 From leaders, only: 0.70 (0.49 to 0.99) From colleagues, only: 1.02 (0.80 to 1.29) No social support: 0.91 (0.71 to 1.17)
Violante et al 2016	Prospective cohort	Participants were full-time employees of	**Hand activity level (HAL), normalized Peak**	**Carpal tunnel syndrome (CTS)**	Association between peak force (PF), hand-activity level (HAL) and CTS. Unadjusted. HR (95% CI).	Association between peak force (PF), hand-activity level (HAL) and CTS.

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
[85] Italy **Risk of Bias** Low	10-year follow-up Industrial and service workers 2000 to 2011	seven industrial (tiles, small appliance, large appliances, garment, and shoes – two companies – manufacturing) and service (nursery and early childhood centers) organizations (the OCTOPUS cohort). n=3131 1099 (35%) were males and 2032 (65%) females 126 incident cases (symptoms + ncv)	**force (nPF), Threshold limit values (TLV), and Action limit (AL)** Data was assessed according to the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) method by a team of trained professionals (ergonomists and industrial hygienists) who rated all jobs. company. Assessment was performed at task level, based mainly on observation (with videotapes whenever possible) and was complemented,	Two different case definitions of CTS: (i) presence of CTS symptoms in the 30 days before the interview; and (ii) presence of CTS symptoms and slowing of sensory conduction velocity of the median nerve from wrist to palm. Symptoms of CTS were assessed by a trained physician using a structured questionnaire. Experienced electro-diagnostic technicians performed nerve	<u>CTS symptoms</u> *ACGIH TLV® categories* Below the AL: 1.00 Between AL and TLV: 2.37 (1.59 to 3.54) Above TLV: 2.11 (1.35 to 3.28) *HAL* 1.0–3.0: 1.00 3.1–5.0: 2.29 (1.54 to 3.39) 5.1–8.5: 2.72 (1.56 to 4.74) *Normalized Peak force* 1.0–3.0: 1.00 3.1–5.0: 1.50 (1.26 to 1.78) 5.1–7.0: 0.93 (0.56 to 1.52) <u>CTS confirmed by NCS</u> *ACGIH TLV® categories* Below the AL: 1.00 Between AL and TLV: 2.24 (1.22 to 4.10) Above TLV: 2.02 (1.17 to 3.49) *HAL* 1.0–3.0: 1.00 3.1–5.0: 2.15 (1.40 to 3.31) 5.1–8.5: 2.18 (0.91 to 5.25) *Normalized Peak force* 1.0–3.0: 1.00 3.1–5.0: 1.76 (1.09 to 2.86) 5.1–7.0: 1.53 (0.85 to 2.77)	Adjusted for sex, age, body mass index, predisposing diseases and ACGIH categories. HR (95% CI). <u>CTS symptoms</u> *ACGIH TLV® categories* Below the AL: 1.00 Between AL and TLV: 2.18 (1.86 to 2.56) Above TLV: 2.07 (1.52 to 2.81) *HAL* 1.0–3.0: 1.00 3.1–5.0: 2.24 (1.80 to 2.79) 5.1–8.5: 2.31 (1.80 to 2.96) *Normalized Peak force* 1.0–3.0: 1.00 3.1–5.0: 1.19 (0.98 to 1.44) 5.1–7.0: 0.89 (0.58 to 1.38) <u>CTS confirmed by NCS</u> *ACGIH TLV® categories* Below the AL: 1.00 Between AL and TLV: 1.93 (1.38 to 2.71) Above TLV:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			where available, by standard production times and data.	conduction studies (NCS).		1.95 (1.27 to 3.00) *HAL* 1.0–3.0: 1.00 3.1–5.0: 1.97 (1.63 to 2.38) 5.1–8.5: 1.79 (1.06 to 3.03) *Normalized Peak force* 1.0–3.0: 1.00 3.1–5.0: 1.60 (0.94 to 2.71) 5.1–7.0: 1.70 (1.08 to 2.69)
Yung et al 2020 [37] France **Risk of Bias** Low	Prospective cohort Exact follow-up time not stated General working population 2012 and 2017	Participants derived from the CONSTANCES population study that consists of a randomly selected representative sample of the French adult population (18- to 69-year-olds). Participants were recruited over a several year periods and attended an interview and	**Workplace physical exposures** A JEM was created for 27 physical risk factors relevant to MSD using self-reported physical exposure data obtained from currently employed workers in the first 81 425 CONSTANCES participants	**Musculoskeletal pain** Pain was self-reported. Definition: >5 ratings on a 0–10 self-reported ordinal scale in the previous 7 days) and/or chronic musculoskeletal pain (pain occurring 30 or more days within the previous year)	Associations between JEM-assigned exposure estimates and *musculoskeletal pain.* Adjusted for age and sex. Prevalence ratios; PR (95% CI). <u>Hand pain</u> Repetition: 1.22 (1.20 to 1.24) Handle objects 1–4 kg: 1.21 (1.19 to 1.23) Handle objects >4 kg: 1.20 (1.18 to 1.22) Carry loads <10 kg: 1.21 (1.19 to 1.24) Carry loads 10–25 kg: 1.25 (1.22 to 1.28) Carry loads >25 kg: 1.24 (1.21 to 1.27) Bend elbow: 1.30 (1.27 to 1.34) Rotate forearm: 1.35 (1.31 to 1.40)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		examination by a study physician at one of 17 Health Screening Centers located in different regions of France. n=38 730 Male 17 329 (44.74%) were male and 21 401 (55.26%) were female		at six body locations.	Bend wrist: 1.30 (1.27 to 1.34) Press base of hand: 1.41 (1.35 to 1.47) Finger pinch: 1.15 (1.12 to 1.18) <u>Elbow pain</u> Repetition: 1.27 (1.24 to 1.31) Handle objects 1–4 kg: 1.19 (1.16 to 1.21) Handle objects >4 kg: 1.22 (1.19 to 1.24) Carry loads <10 kg: 1.24 (1.21 to 1.27) Carry loads 10–25 kg: 1.28 (1.24 to 1.31) Carry loads >25 kg: 1.27 (1.23 to 1.31) Bend elbow: 1.34 (1.30 to 1.38) Rotate forearm: 1.35 (1.30 to 1.41) Bend wrist: 1.34 (1.29 to 1.38) <u>Shoulder pain</u> Repetition: 1.16 (1.14 to 1.18) Handle objects 1–4 kg: 1.11 (1.09 to 1.13) Handle objects >4 kg: 1.12 (1.11 to 1.14) Carry loads <10 kg: 1.14 (1.12 to 1.16) Carry loads 10–25 kg: 1.16 (1.14 to 1.19) Carry loads >25 kg: 1.17 (1.14 to 1.19) Arms above shoulder: 1.18 (1.14 to 1.21) Reach behind: 1.12 (1.08 to 1.16) Arms abducted: 1.20 (1.17 to 1.23)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Rotate forearm: 1.20 (1.16 to 1.24) <u>Neck pain</u> Repetition: 1.11 (1.09 to 1.13) Bend trunk: 1.05 (1.02 to 1.07) Bend neck: 1.06 (1.04 to 1.08) Associations between self-reported exposure estimates and *musculoskeletal pain.* Adjusted for age and sex. Prevalence ratios; PR (95% CI). <u>Hand pain</u> Repetition: 1.24 (1.21 to 1.26) Handle objects 1–4 kg: 1.21 (1.19 to 1.23) Handle objects >4 kg: 1.24 (1.22 to 1.26) Carry loads <10 kg: 1.25 (1.23 to 1.28) Carry loads 10–25 kg: 1.29 (1.26 to 1.31) Carry loads >25 kg: 1.31 (1.28 to 1.34) Bend elbow: 1.36 (1.33 to 1.39) Rotate forearm: 1.39 (1.35 to 1.43) Bend wrist: 1.43 (1.40 to 1.47) Press base of hand: 1.40 (1.35 to 1.45) Finger pinch: 1.28 (1.25 to 1.31) <u>Elbow pain</u> Repetition: 1.29 (1.26 to 1.33) Handle objects 1–4 kg:	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					1.23 (1.21 to 1.26) Handle objects >4 kg: 1.26 (1.24 to 1.29) Carry loads <10 kg: 1.28 (1.25 to 1.31) Carry loads 10–25 kg: 1.31 (1.28 to 1.35) Carry loads >25 kg: 1.32 (1.29 to 1.36) Bend elbow: 1.49 (1.45 to 1.53) Rotate forearm: 1.41 (1.36 to 1.46) Bend wrist: 1.41 (1.37 to 1.46) <u>Shoulder pain</u> Repetition: 1.18 (1.16 to 1.20) Handle objects 1–4 kg: 1.15 (1.14 to 1.17) Handle objects >4 kg: 1.17 (1.15 to 1.19) Carry loads <10 kg: 1.17 (1.16 to 1.19) Carry loads 10–25 kg: 1.20 (1.18 to 1.23) Carry loads >25 kg: 1.23 (1.20 to 1.25) Arms above shoulder: 1.31 (1.28 to 1.34) Reach behind: 1.27 (1.23 to 1.31) Arms abducted: 1.29 (1.26 to 1.31) Rotate forearm: 1.26 (1.22 to 1.29) **Neck pain** Repetition: 1.14 (1.13 to 1.16) Bend trunk: 1.15 (1.13 to 1.17) Bend neck: 1.26 (1.24 to 1.28)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Yung et al 2020 [78] USA/France **Risk of Bias** Low	Prospective cohort Follow-up time of two years General working population 2001 and 2010	Workers were recruited across six study sites. All study participants were full-time employees, >18 years of age, recruited from jobs that involved hand-intensive activities, and employed in manufacturing, production, service, and construction industries. n=2393 Female workers (60.4%)	**Occupational physical risk factors** Work exposure assessments were performed for each individual, consisting of interviews to identify primary work tasks, video recordings of workers performing typical work tasks, and worker and analyst-rated estimation of hand forces required to perform each task. Job exposure matrixes (JEMs) were constructed. One from self-reported data obtained from CONSTANCES and one using physical	**Carpal tunnel syndrome (CTS)** All study participants underwent physical examinations, which included median and ulnar nerve electrodiagnostic tests. Incident CTS was defined as (i): symptoms of tingling, numbness, burning or pain in the thumb, index finger or long finger, and (ii) abnormal electrodiagnostic tests consistent with median neuropathy at the wrist.		Associations between JEM-assigned exposure estimates* and *CTS.* Adjusted for age, gender, body mass index (BMI), and research site. Hazard ratios; HR (95% CI). * Continuous exposure (per 1-unit increase) <u>CONSTANCES JEM</u> Repetition: 1.27 (0.91 to 1.77) Handle objects 1–4kg: 1.15 (0.95 to 1.39) Handle objects >4kg: 1.12 (0.91 to 1.37) Carry loads <10kg: 1.14 (0.92 to 1.41) Carry loads 10–25kg: 1.08 (0.87 to 1.35) Carry loads >25kg: 1.13 (0.87 to 1.47) Rotate forearm: 1.44 (1.10 to 1.89) Bend wrist: 1.39 (0.92 to 2.09) Finger pinch: 2.05 (1.38 to 3.06) Consortium (individual-level measures)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			job demand data obtained from O*NET. A consortium variable was created assigning JEM exposure estimates to individual workers.			Peak hand force (analyst rated): 1.16 (1.09 to 1.25) Hand activity level (analyst rated): 1.08 (0.96 to 1.22) ACGIH TLV (analyst rated): 1.42 (1.25 to 1.63) Repetition per minute for all exertions: 1.01 (1.00 to 1.02) Repetition per minute for forceful exertions: 1.02 (1.01 to 1.02) Duty cycle of all exertions: 1.00 (1.00 to 1.01) Duty cycle of forceful exertions: 1.01 (1.01 to 1.02) % time ≥50 ° wrist extension: 1.00 (0.99 to 1.00) % time ≥30 ° wrist flexion: 1.02 (1.00 to 1.04)

ACGIH = American Conference of Governmental Industrial Hygienists; **AL** = action limit; **BMI** = body mass index; **CI** = confidence interval; **CUPID** = Cultural and Psychosocial Influences on Disability; **CTS** = Carpal tunnel syndrome; **EPI** = Epicondylitis; **MSD** = Musculoskeletal disorders; **TLR** = TLV Ratio; **TLV** = Threshold Limit Value; **VIBRISKS** = Risks of Occupational Vibration Injuries"

Tvärsnittsstudier/Cross-sectional studies

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Arcury et al 2014 [97] USA **Risk of bias** Moderate	Cross-sectional Manual occupations 2010	Participants were included if they self-identified as Latino or Hispanic, worked 35 hr or more per week in a manual labor job, and 18 years or older. n=234 All participants were female	**Workplace exposure** Data collection included an interviewer-administered survey questionnaire completed in participants' homes. Heavy load and awkward posture were measured with an established physical workload instrument. Psychological demand, skill variety, and decision latitude were assessed with items from the Job Content Questionnaire	**Carpal tunnel syndrome, Epicondylitis, Rotator cuff syndrome** A combination of symptoms, based on the Katz hand diagram, and nerve conduction abnormalities was used to define carpal tunnel syndrome. Epicondylitis was defined as self-reported pain at either epicondyle area on 2 or more days in the previous month and findings on the physical exam.	Associations of Work Organization With Musculoskeletal Injuries. Odds ratios; OR (95% CI) **Carpal tunnel syndrome** Psychological demand: 1.23 (0.94 to 1.59) Skill variety: 0.55 (0.39 to 0.79) Decision latitude: 0.72 (0.54 to 0.96) Perceived supervisor control: 0.88 (0.49 to 1.58) Work safety climate: 1.00 (0.91 to 1.08) **Rotator cuff syndrome** Psychological demand: 1.49 (1.01 to 2.20) Skill variety: 0.89 (0.55 to 1.42) Decision latitude: 0.71 (0.47 to 1.07) Perceived supervisor control: 0.53 (0.26 to 1.08) Work safety climate: 0.93 (0.85 to 1.03) **Epicondylitis** Psychological demand: 1.76 (0.85 to 3.60) Skill variety: 0.83 (0.45 to 1.53) Decision latitude: 0.36 (0.15 to 0.85) Perceived supervisor control:	Multivariate Associations of Work Organization With Musculoskeletal Injuries. Odds ratios; OR (95% CI) **Carpal tunnel syndrome** Psychological demand: 0.76 (0.51 to 1.12) Skill variety: 0.56 (0.36 to 0.88) Decision latitude: 0.93 (0.62 to 1.38) **Rotator cuff syndrome** Psychological demand: 0.80 (0.49 to 1.32) Skill variety: 1.26 (0.66 to 2.39) Decision latitude: 0.71 (0.39 to 1.27)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				Rotator cuff syndrome was defined as self-reported pain at the shoulder on 2 or more days in the previous month and findings on the physical exam.	0.84 (0.23 to 2.95) Work safety climate: 0.94 (0.82 to 1.07)	
Balogh et al 2019 [98] Sweden **Risk of bias** Low	Cross-sectional General working population Data collected from 1989 to 2013	Participants derived from a database that includes workers from 17 male and 35 female occupational groups in various occupations. 1107 were men and 4733 were women	**Work exposure** Physical exposure data was recorded by technical methods, such as inclinometry, bipolar surface electromyography and flexible biaxial electrogoniometers. Psychosocial work-environment factors were assessed by questionnaires	**Musculoskeletal pain/ disorders** Data were assess using the Nordic Questionnaire (a widely used questionnaire with questions on complaints from different body regions during the past twelve months and past seven days). Experienced physicians or	Crude associations between physical exposure on the right side and complaints during the past 7 days and diagnosed disorders in the neck and right upper limb. Prevalence rate PR; (95% CI) **Neck/shoulder** <u>Head</u> *Forward inclination (°) 90th percentile* Men: 0.96 (0.89 to 1.04) Women: 0.94 (0.90 to 0.99) *Velocity (°/s) 50th percentile* Men: 1.00 (0.92 to 1.09) Women: 1.11 (1.03 to 1.20) <u>Trapezius</u> *Activity (%MVE) 90th percentile* Men: 1.11 (0.90 to 1.36) Women: 1.23 (1.13 to 1.34)	Associations between physical exposure on the right side, and complaints during the past 7 days and diagnosed disorders in neck and right upper limb. Adjusted for age and psychosocial factors. Prevalence rate PR; (95% CI) **Neck/shoulder** <u>Head</u> *Forward inclination (°) 90th percentile* Men: 1.01 (0.91 to 1.11) Women: 0.98 (0.91 to 1.04) *Velocity (°/s) 50th percentile* Men: 1.05 (0.93 to 1.18) Women: 1.08 (0.98 to 1.19) <u>Trapezius</u>

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				physiotherapists performed a standardized clinical examination of the neck, and right shoulder, elbow, and hand in most of the occupational groups	 Upper arm *Elevation (°) 90th percentile* Men: 0.93 (0.75 to 1.15) Women: 0.97 (0.91 to 1.02) *Velocity (°/s) 50th percentile* Men: 1.01 (0.99 to 1.03) Women: 1.05 (1.03 to 1.07) Forearm extensors *Activity (%MVE) 90th percentile* Men: 0.97 (0.87 to 1.09) Women: 1.05 (0.99 to 1.10) Wrist *Palmar flexion (°) 50th percentile* Men: 0.94 (0.75 to 1.17) Women: 0.99 (0.95 to 1.03) *Velocity (°/s) 50th percentile* Men: 1.02 (0.95 to 1.10) Women: 1.09 (1.06 to 1.12) **Tension neck syndrome** Head *Inclination (°) p90* Men: 1.16 (0.98 to 1.38) Women: 1.20 (0.98 to 1.45) *Velocity (°/s) p50* Men: 1.16 (0.97 to 1.38) Women: 1.93 (1.51 to 2.46) Trapezius	*Activity (%MVE) 90th percentile* Men: 1.16 (0.89 to 1.50) Women: 1.15 (1.04 to 1.27) Upper arm *Elevation (°) 90th percentile* Men: 1.02 (0.77 to 1.33) Women: 0.99 (0.92 to 1.08) *Velocity (°/s) 50th percentile* Men: 1.01 (0.98 to 1.04) Women: 1.03 (1.01 to 1.06) Forearm extensors *Activity (%MVE) 90th percentile* Men: 1.05 (0.91 to 1.23) Women: 1.12 (1.04 to 1.19) Wrist *Palmar flexion (°) 50th percentile* Men: 1.18 (0.87 to 1.59) Women: 0.97 (0.92 to 1.02) *Velocity (°/s) 50th percentile* Men: 1.05 (0.95 to 1.16) Women: 1.06 (1.02 to 1.11) **Tension neck syndrome** Head *Inclination (°) p90* Men: 1.27 (0.99 to 1.63)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					(%MVE) p90 Men: 1.20 (0.87 to 1.66) Women: 2.00 (1.61 to 2.49) <u>Upper arm</u> *Elevation (°) p90* Men: 1.37 (0.83 to 2.25) Women: 1.07 (0.89 to 1.29) *Velocity (°/s) p50* Men: 1.03 (0.99 to 1.07) Women: 1.21 (1.15 to 1.28) <u>Forearm extensors</u> *(%MVE) p90* Men: 1.32 (1.09 to 1.61) Women: 1.34 (1.13 to 1.58) <u>Wrist</u> *Flexion (°) p50* Men: 4.51 (2.31 to 8.84) Women: 1.14 (1.01 to 1.28) *Velocity (°/s) p50* Men: 1.20 (1.05 to 1.38) Women: 1.29 (1.20 to 1.38) <u>Job demands</u> Men: 0.93 (0.48 to 1.79) Women: 1.53 (1.24 to 1.88) <u>Job control</u> Men: 0.70 (0.49 to 1.02) Women: 0.55 (0.47 to 0.65)	Women: 1.22 (0.95 to 1.57) *Velocity (°/s) p50* Men: 1.38 (0.99 to 1.93) Women: 1.97 (1.45 to 2.69) <u>Trapezius</u> *(%MVE) p90* Men: 1.27 (0.79 to 2.04) Women: 1.83 (1.35 to 2.47) <u>Upper arm</u> *Elevation (°) p90* Men: 2.21 (1.27 to 3.87) Women: 1.29 (0.98 to 1.69) *Velocity (°/s) p50* Men: 1.05 (0.98 to 1.11) Women: 1.20 (1.12 to 1.29) <u>Forearm extensors</u> *(%MVE) p90* Men: 1.68 (1.23 to 2.29) Women: 1.27 (1.01 to 1.59) <u>Wrist</u> *Flexion (°) p50* Men: 6.51 (2.69 to 15.8) Women: 1.04 (0.91 to 1.19) *Velocity (°/s) p50* Men: 1.34 (1.02 to 1.75) Women: 1.21 (1.09 to 1.35) **Rotator cuff tendonitis**

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Job support Men: 0.64 (0.33 to 1.25) Women: 0.68 (0.55 to 0.83) **Rotator cuff tendonitis** Head *Inclination (°) p90* Men: 1.07 (0.84 to 1.37) Women: 0.96 (0.75 to 1.22) *Velocity (°/s) p50* Men: 1.24 (0.96 to 1.60) Women: 1.77 (1.28 to 2.46) Trapezius *(%MVE) p90* Men: 1.49 (0.89 to 2.49) Women: 1.86 (1.33 to 2.59) Upper arm *Elevation (°) p90* Men: 0.87 (0.44 to 1.69) Women: 1.29 (0.97 to 1.71) *Velocity (°/s) p50* Men: 1.06 (1.01 to 1.11) Women: 1.13 (1.05 to 1.22) Forearm extensors *(%MVE) p90* Men: 1.34 (1.01 to 1.78) Women: 1.34 (1.08 to 1.66)	Head *Inclination (°) p90* Men: 1.19 (0.85 to 1.67) Women: 0.94 (0.69 to 1.29) *Velocity (°/s) p50* Men: 1.35 (0.92 to 1.99) Women: 1.41 (0.93 to 2.14) Trapezius *(%MVE) p90* Men: 1.22 (0.62 to 2.38) Women: 1.60 (1.04 to 2.46) Upper arm *Elevation (°) p90* Men: 0.85 (0.44 to 1.64) Women: 1.52 (1.04 to 2.23) *Velocity (°/s) p50* Men: 1.07 (0.99 to 1.17) Women: 1.07 (0.98 to 1.17) Forearm extensors *(%MVE) p90* Men: 1.52 (0.93 to 2.49) Women: 1.15 (0.88 to 1.50) Wrist *Flexion (°) p50* Men: 2.07 (0.84 to 5.09) Women: 1.25 (1.01 to 1.55) *Velocity (°/s) p50* Men: 1.53 (1.04 to 2.26)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Wrist *Flexion (°) p50* Men: 1.49 (0.72 to 3.08) Women: 1.37 (1.14 to 1.64) *Velocity (°/s) p50* Men: 1.27 (1.05 to 1.55) Women: 1.34 (1.20 to 1.50) Job demands Men: 1.74 (1.03 to 2.95) Women: 1.47 (1.09 to 1.99) Job control Men: 0.78 (0.49 to 1.25) Women: 0.58 (0.45 to 0.75) Job support Men: 0.51 (0.26 to 1.03) Women: 0.68 (0.51 to 0.91) **Carpal tunnel syndrome** Head *Inclination (°) p90* Men: 2.41 (1.51 to 3.86) Women: 2.49 (1.60 to 3.86) *Velocity (°/s) p50* Men: 2.11 (1.68 to 2.66) Women: 12.24 (1.27 to 3.95) Trapezius *(%MVE) p90* Men: 3.83 (2.60 to 5.78)	Women: 1.23 (1.05 to 1.45) **Carpal tunnel syndrome** Head *Inclination (°) p90* Men: 2.14 (1.16 to 3.93) Women: 1.60 (0.93 to 2.76) *Velocity (°/s) p50* Men: 1.74 (1.17 to 2.58) Women: 1.75 (0.83 to 3.72) Trapezius *(%MVE) p90* Men: 1.76 (1.12 to 2.78) Women: 2.56 (1.33 to 4.93) Upper arm *Elevation (°) p90* Men: 1.26 (0.58 to 2.76) Women: 1.07 (0.60 to 1.92) *Velocity (°/s) p50* Men: 1.10 (1.03 to 1.19) Women: 1.13 (0.95 to 1.34) Forearm extensors *(%MVE) p90* Men: 1.82 (1.06 to 3.12) Women: 1.29 (0.78 to 2.13) Wrist *Flexion (°) p50* Men: 3.55 (1.29 to 9.79)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Women: 3.99 (2.50 to 6.36) <u>Upper arm</u> *Elevation (°) p90* Men: 1.53 (0.54 to 4.31) Women: 1.56 (1.11 to 2.20) *Velocity (°/s) p50* Men: 1.17 (1.12 to 1.22) Women: 1.20 (1.07 to 1.35) <u>Forearm extensors</u> *(%MVE) p90* Men: 1.93 (1.43 to 2.56) Women: 1.56 (1.07 to 2.29) <u>Wrist</u> *Flexion (°) p50* Men: 3.44 (1.60 to 7.37) Women: 1.99 (1.50 to 2.65) *Velocity (°/s) p50* Men: 12.10 (1.72 to 2.56)) Women: 1.43 (1.20 to 1.70) <u>Job demands</u> Men: 3.18 (1.83 to 5.51) Women: 1.59 (1.01 to 2.48) <u>Job control</u> Men: 0.30 (0.13 to 0.68) Women: 0.55 (0.40 to 0.76 <u>Job support</u>	Women: 1.69 (1.17 to 2.44) *Velocity (°/s) p50* Men: 1.96 (1.23 to 3.13) Women: 1.33 (1.04 to 1.71

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Men: 0.26 (0.11 to 0.58) Women: 0.46 (0.29 to 0.74)	
Bergsten et al 2017 [99] **Risk of bias** Moderate	Cross-sectional Flight baggage handlers 2011	Participants were randomly selected baggage handlers working at six Swedish airports at either morning, afternoon, or night shifts. n=44 Gender not stated	**Mechanical exposure** Objective data on 'time in extreme' and 'time in neutral' upper arm postures were obtained for the full shift using accelerometers, and the baggage handlers registered the number of 'aircrafts handled' in a diary. During half of the shift, workers were recorded on video for subsequent task analysis of baggage handling. 'Influence' at work and 'support' from colleagues were measured by use	**Shoulder pain** Right and left shoulder pain intensity was rated just before and just after the shift (VAS scale 0–100 mm).	Univariate associations between biomechanical and psychosocial factors and 'daily pain' for the right and left shoulders. B (95% CI) <u>Right shoulder</u> Time with arms elevated >60°: −0.22 (−0.42 to −0.03) Time with arm elevation <20° (neutral): −0.25 (−0.75 to 0.25) <u>Left shoulder</u> Time with arms elevated >60°: −0.28 (0.56 to 0.00) Time with arm elevation <20° (neutral): −0.14 (−0.76 to 0.48)	Multivariate associations between biomechanical and psychosocial factors and 'daily pain' for the right and left shoulders. B (95% CI) <u>Right shoulder</u> Time in extreme: −0.29 (−0.63 to 0.05) Time in neutral: −0.43 (−0.94 to 0.09) <u>Left shoulder</u> Time in extreme: −0.03 (−0.37 to 0.32) Time in neutral: −0.11 (−0.74 to 0.52)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			of Copenhagen Psychosocial Questionnaire (COPSOQ).			
Chu et al 2021 [100] Taiwan **Risk of Bias** Moderate	Cross-sectional Electronics factory 2010	Participants were recruited from the annual medical examination of an electronics enterprise. n=931 Female 96 (33.8%) Male 188 (66.2%)	**Mechanical exposure** Work-related ergonomic risk factors were assessed by a checklist for upper limb disorder hazards in the workplace. Picture forms of different postures were used to facilitate participants' understanding.	**Subacromial impingement syndrome (SiS)** The definition of shoulder symptoms within 12 months preceding the survey was based on the Nordic questionnaire. Physical examination was performed by an occupational physician using a standardized clinical procedure.	Association between biomechanical work exposure and subacromial impingement syndrome (SiS). Exponerade bland de med SiS (%) / Exponerade bland de utan SiS (%). N SiS=19, N without SiS=81 <u>Repetition risk</u> Repeating the same motions every few seconds: 9 (47.4%)/49 (60.5%) A sequence of movements repeated more than twice per minute: 9 (47.4%)/49 (60.5%) More than 50% of the cycle time involved in performing the same sequence of motions: 11 (57.9%)/54 (66.7%) <u>Posture risk</u> Large range of joint movement such as side to side or up and down: 4 (21.0%)/17 (21.0%) Awkward or extreme joint positions: 4 (21.1%)/21 (25.9%)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Joints held in fixed positions: 9 (47.4%)/55 (67.9%) Stretching to reach items or controls: 8 (42.1%)/33 (40.7%) Twisting or rotating items or controls: 7 (36.8%)/60 (74.1%) Working overhead: 5 (26.3%)/27 (33.3%) <u>Force risk</u> Pushing, pulling, moving things (including with the fingers or thumb): 9 (47.4%)/48 (59.3%) Grasping/gripping: (57.9%)/48 (59.3%) Pinch grips i.e. holding or grasping objects between thumb and finger: 9 (47.4%)/38 (46.9%) Steadying or supporting items or work pieces: 5 (26.3%)/38 (46.9%) Shock and/or impact being transmitted to the body from tools or equipment: 3 (15.8%)/32 (36.9%) Objects creating localized pressure on any part of the upper limb: 6 (31.6%)/32 (39.5%)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Dale et al 2015 [101] USA **Risk of Bias** Moderate	Cross-sectional Hand-intensive industries 2001 and 2008	Participants derived from 6 separate studies of workplace risk factors for upper extremity musculoskeletal disorders. Subjects from all studies were adults, mainly employed in hand-intensive industries including manufacturing, production, service, construction, and health care. n=3452	**Job title–based exposures** Using a worker's job title, primary work tasks, and employer information, we assigned an SOC code (version 16.0) to each subject. SOC codes were assigned by using the job title selection feature provided by O*NET OnLine (http://www.onetonline.org/) and selecting the occupational code that bestmatched the primary tasks and employer information	**Carpal tunnel symptoms** Case definition of prevalent CTS was having hand symptoms and abnormal nerve study results in the dominant hand	Univariate associations between work exposure and CTS. Prevalence odds ratio; POR (95% CI) <u>Work-related physical exposures</u> High dynamic strength: 1.35 (0.79 to 2.30) High static strength: 1.15 (0.83 to 1.59) High handling and moving objects (>1.88): 1.52 (0.71 to 3.28) High wrist/finger speed (>5.44): 0.81 (0.49 to 1.36) High time in repetitive motion (>4.04): 1.51 (1.17 to 1.95) High time in using hand to hold objects (>4.58): 1.66 (1.14 to 2.42) <u>Combination Exposure Categories</u> *Repetitive motion-dynamic strength* Low repetition/low force: 1.00 Low repetition/high force: 1.19 (0.66 to 2.13) High repetition/low force: 1.43 (1.12 to 1.83) High repetition/high force: 2.05 (1.10 to 3.83) *Repetitive motion-static strength* Low repetition/low force: 1.00 Low repetition/high force:	Multivariate associations between work exposure and CTS. Adjusted for age, body mass index, sex, diabetes, rheumatoid arthritis, and study site. POR (95% CI) <u>Combination Exposure Categories</u> *Repetitive motion-dynamic strength* Low repetition/low force: 1.00 Low repetition/high force: 1.41 (0.68 to 2.92) High repetition/low force: 1.48 (1.02 to 2.159 High repetition/high force: 2.33 (1.12 to 4.85) *Repetitive motion-static strength* Low repetition/low force: 1.00 Low repetition/high force: 2.03 (1.02 to 4.06) High repetition/low: 2.27 (1.23 to 4.19) High repetition/high force: 2.95 (1.50 to 5.80) *Hand use-dynamic strength*

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					1.67 (0.93 to 3.02) High repetition/low force: 2.05 (1.24 to 3.41) High repetition/high force: 2.31 (1.35 to 3.95) *Hand use-dynamic strength* Low repetition/low force: 1.00 Low repetition/high force: 1.12 (0.56 to 2.21) High repetition/low force: 1.54 (1.08 to 2.20) High repetition/high force: 2.20 (1.27 to 3.82) *Hand use-static strength* Low repetition/low force: 1.00 Low repetition/high force: 0.89 (0.46 to 1.74) High repetition/low force: 1.43 (0.97 to 2.13) High repetition/high force: 1.74 (1.12 to 2.71)	Low repetition/low force: 1.00 Low repetition/high force: 1.35 (0.62 to 2.94) High repetition/low force: 1.88 (1.19 to 2.98) High repetition/high force: 2.90 (1.47 to 5.72) *Hand use-static strength* Low repetition/low force: 1.00 Low repetition/high force: 1.09 (0.57 to 2.09) High repetition/low force: 1.76 (1.07 to 2.90) High repetition/high force: 2.14 (1.26 to 3.63)
Descatha et al 2012 [102] France **Risk of Bias** Moderate	Cross-sectional 2002 to 2005 General working population	Subjects were randomly selected from workers undergoing a regularly scheduled mandatory health	**Work exposure** Work status and occupational risk factors were assessed with a self-administered questionnaire	**Dupuytren's disease** A subject was considered to have Dupuytren's disease if the	Association between Dupuytren's disease and occupational factors. Crude OR (95% CI) Manual work (use of hand tools): Never: 1 <2 h/day: 2.1 (0.3 to 14.8) ≥2 h/day: 6.4 (1.5 to 27.5)	Association between Dupuytren's disease and occupational factors. Adjusted for age and diabetes mellitus, five different models separately. OR (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		examination. The population in this study comprised men employed in the private sector All participants were men	including questions on the characteristics of the job and tasks in a typical working day in the preceding 12 months.	OP found incomplete extension of the phalanges, a permanent flexion deformity or fibrous nodules in one of the four fingers.		Manual work (use of hand tools): Never: 1 <2 h/day: 2.5 (0.3 to 17.8) ≥2 h/day: 7.7 (1.8 to 32.9)
El-Helaly et al 2017 [103] Saudi Arabia **Risk of bias** Moderate	Cross-sectional Laboratory technicians 2015	Participants were medical technicians who worked in the King Fahd hospital clinical laboratory n=279 188 (67.7%) were female and 91 (32.6%) were male	**Work exposure** Work history and ergonomic factors were assessed using a modified version of the Dutch Musculoskeletal Questionnaire (DMQ), including questions on work experience, job tasks, working area, work postures, arm /hand exertion, repetitive tasks, moving heavy loads, work with different	**Carpal tunnel syndrome (CTS**) The case definition of CTS in this study forming the CTS cases group, included all laboratory technicians had both ≥3 score (using Kamath and Stothard clinical questionnaire) and a positive NCV test in the form of median distal motor latency (8 cm) >4.5 ms and	Association between the prevalence of Carpal Tunnel Syndrome (CTS) and ergonomic factors at work. N (%) CTS non-cases (n=252)/CTS cases (n=27) Repetitive tasks many times per minute No: 92 (36.5%)/3 (11.1%) Yes: 160 (63.5%)/ 24 (88.9%) Moving heavy loads (more than 20 kg) No: 196 (77.8%)/ 19 (70.4%) Yes: 56 (22.2%) /8 (29.6%) Multivariate analysis (Crude OR) of the presence of Carpal Tunnel Syndrome (CTS) by the independent factors that showed p value ≤0.05. OR (95% CI)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			laboratory instruments and tools.	median sensory distal latency difference ≥3.6 ms (14 cm) recorded index finger to wrist.	Repetitive tasks No: 1.00 Yes: 4.60 (1.3 to 15.70)	
Fan et al 2015 [104] USA **Risk of bias** Low	Cross-sectional Production, agriculture, construction, and service sectors Data collected during 2001–2004	Participants were pooled from five different studies. n=2981 1572 were female and 1409 were male	**Work exposure** Data was collected from dominant hand for every individual at the task level. Hand force ratings (Borg CR-10 scale) were assessed by both workers and analysts. Duty cycle was quantified for all hand exertions and for forceful hand exertions alone, from videotape analysis. Forceful hand exertion was defined as ≥10 N pinch force or ≥ 45N of grip	**Carpal tunnel syndrome (CTS) in the dominant hand** The CTS case definition required: (i) dominant hand symptoms; and (ii) electrodiagnostic study results consistent with median nerve mono-neuropathy at the wrist The symptom criteria were numbness, tingling, burning, and/or pain in the thumb, index	Associations between work exposure and CTS in the dominant hand. Adjusted for age, gender, obesity, medical conditions, and research sites. Odd ratio; OR (95% CI). <u>Job demand</u> High: 1.11 (0.77 to 1.60) Low: 1.00 <u>Decision latitude</u> Low: 1.31 (0.91 to 1.88) High: 1.00 <u>Supervisor or co-worker support</u> Low: 0.93 (0.44 to 1.96) High: 1.00 <u>Work shift</u> Day: 1.79 (0.77 to 4.17) Swing: 1.51 (0.58 to 3.93) Rotating or night: 1.00. <u>Duty cycle</u>	Associations between Biomechanical Exposures at Job Level and CTS in the dominant hand. Adjusted for age, gender, obesity, medical conditions, research sites, and for exposure variables from other domains. Odd ratio; OR (95% CI). <u>Duty cycle</u> Forceful hand exertions, % time (video analysis) >32: 1.36 (0.93 to 1.99) >11 to ≤32: 1.60 (1.14 to 2.25) ≤11: 1.00 All hand exertions, % time (video analysis) >76: 0.91 (0.65 to 1.27) >60 to ≤76: 0.98 (0.71 to 1.36) ≤60: 1.00

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			force. Force was measured directly when possible or estimated using force matching or measured weights of handled tools or parts. Repetition was assessed by trained analysts using the ACGIH Hand Activity Level (HAL) rating scale. The composite ACGIH Threshold Limit Value (TLV) for HAL index was calculated using the analyst's peak force rating and analyst HAL rating. This index has a range from 0 to 1 with larger value indicating a higher risk for an upper extremity musculoskeletal disorder. Posture	finger or long finger.	Forceful hand exertions, % time (video analysis) >32: 1.50 (1.06 to 2.12) >11 to ≤32: 1.69 (1.23 to 2.32) ≤11: 1.00 All hand exertions, % time (video analysis) >76: 0.91 (0.66 to 1.26) >60 to ≤76: 1.08 (0.78 to 1.48) ≤60: 1.00 <u>Force</u> Worker rating (Borg CR-10) >4: 2.04 (1.45 to 2.88) >2.5 to ≤4: 1.23 (0.86 to 1.75) ≤2.5: 1.00 Analyst rating (Borg CR-10) >4: 1.32 (0.96 to 1.82) >2.5 to ≤4: 1.42 (1.04 to 1.96) ≤2.5: 1.00 <u>Repetition</u> Repetition of forceful hand exertions, per min (video) >10: 1.45 (1.03 to 2.04) >3 to ≤10: 1.21 (0.89 to 1.64) ≤3: 1.00 Repetition of all hand exertions, per min (video) >25: 1.33 (0.93 to 1.91 >13 to ≤25: 1.13 (0.82 to 1.57) ≤13: 1.00	<u>Force</u> Worker rating (Borg CR-10) >4: 2.05 (1.42 to 2.87) >2.5 to ≤4: 1.24 (0.86 to 1.78) ≤2.5: 1.00 Analyst rating (Borg CR-10) >4: 1.32 (0.95 to 1.84) >2.5 to ≤4: 1.44 (1.04 to 2.00) ≤2.5: 1.00 <u>Repetition</u> Repetition of forceful hand exertions, per min (video) >10: 1.45 (1.03 to 2.04) >3 to ≤10: 1.22 (0.90 to 1.66) ≤3: 1.00 Repetition of all hand exertions, per min (video) >25: 1.32 (0.95 to 1.83) >13 to ≤25: 1.11 (0.80 to 1.90) ≤13: 1.00 Analyst HAL rating >6: 1.32 (0.95 to 1.83) >4 to ≤6: 1.10 (0.78 to 1.55) ≤4: 1.00 <u>Posture</u>

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			was quantified from the analysis of the videotapes of participants doing their job tasks as the percent time spent in >30° wrist extension and the percent time spent in >30° wrist flexion. The occupational psychosocial factors was assessed by questionnaire.		Analyst HAL rating >6: 1.33 (0.96 to 1.82) >4 to ≤6: 1.12 (0.80 to 1.57) ≤4: 1.00 <u>Posture</u> Wrist extension ≥30°, % time (video analysis) >14: 1.03 (0.71 to 1.48) >1.5 to ≤14: 1.30 (0.91 to 1.86) ≤1.5: 1.00 Wrist flexion ≥30°, % time (video analysis) >3: 1.09 (0.8 to 1.49) >0 to ≤3: 1.25 (0.9 to 1.74) =0: 1.00 <u>Composite index</u> HAL-TLV (analyst HAL and force rating) >0.78: 1.74 (1.27 to 2.39) >0.56 to ≤0.78: 1.36 (0.91 to 2.02) ≤0.56: 1.00	Wrist extension ≥30°, % time (video analysis) >14: 1.07 (0.74 to 1.55) >1.5 to ≤14: 1.27 (0.89 to 1.82) ≤1.5: 1.00 Wrist flexion ≥30°, % time (video analysis) >3: 1.03 (0.75 to 1.54) >0 to ≤3: 1.24 (0.89 to 1.74) =0: 1.00 <u>Composite index</u> HAL-TLV (analyst HAL and force rating) >0.78: 1.40 (1.03 to 1.91) >0.56 ≤ 0.78: 1.54 (1.09 to 2.16) ≤0.56: 1.00
Grzywacs et al 2012 [105] USA **Risk of bias** Low	Cross-sectional Manual workers 2010	Participants derived from a community-based Sampling. Residents were screened for inclusion criteria:	**Work exposure** Data was collected by interviewer-administered survey questionnaire.	**Rotator cuff syndrome and Epicondylitis** Rotator cuff syndrome was defined as presence of	Bivariate Association of Work Organization Factors with Clinical Findings of Upper-Body Musculoskeletal Outcomes. Odds ratio; OR (95% CI) <u>Epicondylitis</u> Job control: 0.77 (0.61 to 0.97)	Multivariate Associations of Work Organization Factors with Clinical Findings of Upper-Body Musculoskeletal Outcomes. Adjusted for the effects of age, sex, and indigenous language. OR (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		self-identified as being Latino or Hispanic, worked 35 hours or more per week in a manual labor job, and were 18 years or older. Manual labor jobs were defined as employment in nonmanagerial jobs in industries such as landscaping, construction, restaurant work, hotel work, childcare, or manufacturing. n=742 423 (57.0%) were male and 319 (57%) women		pain with resisted abduction, internal rotation, external rotation, or forward flexion of the shoulder, or tenderness to palpation over the bicipital groove or lateral shoulder. Epicondylitis was defined as presence of pain at the lateral epicondyle with resisted active wrist extension, at the medial epicondyle with resisted active wrist flexion, or tenderness to palpation over the medial and lateral	Psychological demand: 1.25 (1.00 to 1.56) Abusive supervision: 1.10 (0.79 to 1.53) Poor safety commitment (yes vs no) 0.28 (0.84 to 1.96) <u>Rotator cuff syndrome</u> Job control: 0.79 (0.65 to 0.97) Psychological demand: 1.30 (1.07 to 1.59) Abusive supervision: 0.83 (0.62 to 1.10) Poor safety commitment (yes vs no): 1.66 (1.16 to 2.38)	<u>Epicondylitis</u> Job Control: 0.79 (0.59 to 1.05) Psychological demand: 1.23 (0.98 to 1.55) Abusive Supervision: 1.08 (0.75 to 1.55) Poor safety commitment (yes vs no): 0.98 (0.60 to 1.59) Rotator Cuff Syndrome Job Control: 0.81 (0.62 to 1.06) Psychological demand: 1.09 (0.85 to 1.39) Abusive Supervision: 0.79 (0.58 to 1.08) Poor safety commitment (yes vs no): 1.35 (0.90 to 2.03)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				epicondyle regions.		
Hallman et al 2015 [105] Denmark **Risk of bias** Moderate	Cross-sectional Blue collar Workers 2011 to 2012	Participants were blue-collar workers (e.g., construction workers, cleaners, garbage collectors, manufacturing workers, assembly workers, mobile plant operators and workers in the health service sector) recruited from seven workplaces. Inclusion criteria were to perform blue-collar work as their primary work for at least 20 h per week. n=202 Male (n=118) and female (n=84)	**Sitting time** Sitting time was assessed using two accelerometers; one placed at the medial front of the right thigh, midway between the hip and knee joints and the other placed at the trunk. Days were only included if they contained objective measurements for at least 4 h of work.	**Neck and shoulder pain** Self-reported information about neck and shoulder pain intensity was obtained by a modified version of the Standardized Nordic Questionnaire for musculoskeletal Symptoms. Workers were asked to rate their worst pain intensity during the previous month for the neck and shoulder regions separately.	Association between sitting time during work and high NSP intensity (>4 on scale 0–9). Adjusted for age and gender. Odds ratios; OR (95% CI) <u>Total sample</u> Low sitting: 0.49 (0.22 to 1.09) Moderate sitting: 1 High sitting 0.74 (0.35 to 1.57) <u>Males</u> Low sitting: 0.25 (0.07 to 0.85) Moderate sitting: 1 High sitting 0.68 (0.26 to 1.76) <u>Females</u> Low sitting: 0.92 (0.29 to 2.91) Moderate sitting: 1 High sitting 0.88 (0.27 to 2.91)	Association between sitting time during work and high NSP intensity (>4 on scale 0–9). Adjusted for age gender, BMI, smoking, seniority, influence at work and lifting and carrying at work. Odds ratios; OR (95% CI) <u>Total sample</u> Low sitting: 0.54 (0.23 to 1.25) Moderate sitting: 1 High sitting: 0.92 (0.41 to 2.06) <u>Males</u> Low sitting: 0.26 (0.07 to 0.96) Moderate sitting: 1 High sitting: 0.94 (0.31 to 2.85) <u>Females</u> Low sitting: 1.01 (0.28 to 3.59) Moderate sitting: 1 High sitting: 1.17 (0.32 to 4.33)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Hallman et al 2016 [107] Denmark **Risk of bias** Moderate	Cross-sectional Blue-collar workers 2012 to 2013	Participants derived from workplaces within three different occupational sectors (i.e., cleaning, transport and manufacturing) in Denmark. n=659; 296 (44.9%) were females	**Sitting time** The participants were asked to wear four accelerometers around the clock during four consecutive days, including at least two working days. During the measurement period, a paper diary was used by the participant to note working hours etc. The occurrence of sitting periods was identified from the accelerometer outputs	**Neck and shoulder pain** Self-reported information about neck and shoulder pain intensity was obtained using the Standardized Nordic Questionnaire for the analysis of musculoskeletal symptoms. Peak pain intensity in the neck–shoulder region during the previous 3 months was rated on a numeric rating scale (NRS).	Associations between temporal patterns (EVA derivatives) of occupational sitting and intense neck–shoulder pain (>4 on a 0–10 scale). Odds ratios; OR (95% CI) Brief bursts: 0.77 (0.64 to 0.92) Moderate periods: 1.17 (1.02 to 1.35) Prolonged periods: 0.99 (0.91 to 1.08)	Associations between temporal patterns (EVA derivatives) of occupational sitting and intense neck–shoulder pain (>4 on a 0–10 scale). Adjusted for age, gender, smoking, BMI, job seniority, lifting/carrying time at work, physical activity at work, physical activity during leisure, sitting with arms above 90° (either at work or at leisure depending on the modeled domain). Odds ratios; OR (95% CI) Brief bursts: 0.68 (0.48 to 0.98) Moderate periods: 1.32 (1.04 to 1.69) Prolonged periods: 0.92 (0.78 to 1.09)
Herquelot et al 2013 [108] France	Cross-sectional General working population	Participants were a representative of a French region's (Loire Valley) working	**Work exposure** To assess the combination of effort and manual	**Lateral epicondylitis** A standardized physical	Associations between work exposure and lateral epicondylitis. Odd ratio; OR (95% CI). <u>Men</u>	Associations between work exposure and lateral epicondylitis. Adjusted for individual characteristics, repetition, combined

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Moderate	Data collected during 2002–2005.	population. In France, at the time of this study, all salaried workers, including temporary and part-time workers, underwent a mandatory annual health examination by a qualified occupational physician (OP) in charge of the medical surveillance of a group of companies n=3710 58% were men	work, we defined a five-level variable by combining elbow flexion/extension, wrist bending and perceived physical exertion. Self-administered questionnaires Nordic Psychosocial constraints at work were assessed according to the Demand–Control–Support model, using the validated French version of the Job Content Questionnaire	examination, which applied the methodology and clinical tests of the Saltsa consensus for lateral epicondylitis: activity-dependent pain directly located around the lateral epicondyle for at least 4 days over the last week and local pain on resisted wrist bending at the examination [Sluiter et al., 2001]. The OPs performed these examinations to diagnose epicondylitis only for workers who reported elbow pain	Doing repetitive tasks, >4 hours/day No: 1.00 Yes: 1.59 (0.86 to 2.93) Elbow flexion/extension, >2 hours/day No: 1.00 Yes: 2.41 (1.38 to 4.22) Wrist bending, >2 hours/day No: 1.00 Yes: 2.27 (1.30 to 3.97) *Social support* High: 1.00 Low: 2.01 (1.15 to 3.5) *Job strain* No: 1.00 Yes: 1.53 (0.82 to 2.86) <u>Women</u> Doing repetitive tasks, >4 hours/day No: 1.00 Yes: 2.46 (1.30 to 4.65) Elbow flexion/extension, >2 hours/day No: 1.00 Yes: 2.65 (1.40 to 5.02) Wrist bending, >2 hours/day No: 1.00 Yes: 1.98 (1.04 to 3.75) *Social support*	physical work exposure including physical exertion, elbow flexion/extension and wrist bending, and social support. Odd ratio; OR (95% CI). <u>Men</u> Doing repetitive tasks No: 1.00. Yes: 1.05 (0.54 to 2.02) *Social support* High: 1.00 Low: 1.98 (1.11 to 3.52) <u>Women</u> Doing repetitive tasks No: 1.00 Yes: 1.80 (0.91 to 3.59) *Social support* High: 1.00 Low: 0.86 (0.44 to 1.69)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					High: 1.00 Low: 0.98 (0.51 to 1.91) *Job strain* No: 1.00 Yes: 1.88 (0.98 to 3.61)	
Le Manac'h et al 2011 [109] France **Risk of bias** Moderate	Cross-sectional General working population Data collected during 2002–2005.	Participants were a representative of a French region's (Loire Valley) working population. In France, at the time of this study, all salaried workers, including temporary and part-time workers, underwent a mandatory annual health examination by a qualified occupational physician (OP) in charge of the medical surveillance of a group of companies	**Work exposure** To assess the combination of effort and manual work, we defined a five-level variable by combining elbow flexion/extension, wrist bending and perceived physical exertion. Self-administered questionnaires Nordic Psychosocial constraints at work were assessed according to the Demand–Control–Support model, using the validated French	**De Quervain's disease (DQD)** Trained occupational physicians performed a standardized physical examination. DQD was diagnosed if (i) there was intermittent pain or tenderness localized over the radial side of the wrist, possibly radiating proximally to the forearm or distally to the thumb, and	Associations between work exposure and de Quervain's disease (DQD). Odd ratio; OR (95%CI). <u>Total (men and women)</u> *Factors related to work organization* Paced work (yes/no): 0.9 (0.3 to 2.5) Work pace dependent on automatic rate (yes/no): 0.7 (0.2 to 2.1) Work pace dependent on technical organization (yes/no): 2.7 (1.4 to 5.2) Work pace dependent on customers' demands (yes/no): 0.7 (0.4 to 1.3) Work pace dependent on the colleagues' work (yes/no): 1.2 (0.6 to 2.2) Work pace dependent on quantified targets(yes/no): 1.5 (0.8 to 2.8) Work with temporary workers (yes/no): 1.6 (0.9 to 2.9) High visual demand (yes/no): 1.5 (0.8 to 2.8) Overtime hours (yes/no): 1.1 (0.6 to 1.9)	Associations between work exposure and de Quervain's disease (DQD). Adjusted for personal factors and medical history, work history, factors related to work organization, postural and biomechanical constraints, and psychosocial factors at work. Odd ratio; OR (95% CI). <u>Total (men and women)</u> Work pace dependent on technical organization: 2.0 (1.0 to 4.0) High repetitiveness (≥4 hours per day): 1.8 (0.9 to 3.4) Repeated or sustained movement turning driving screw (>2 hours per day): 3.4 (1.7 to 7.1)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		n=3710 (45 subjects with DQD) 42% were women and 58% were men	version of the Job Content Questionnaire	present currently or for ≥4 days in the preceding 7 days and (ii) Finkelstein's test was positive, with distinct right/left difference.	No prior knowledge of the workload (yes/no): 0.9 (0.3 to 2.9) Work pace dependent on permanent controls (yes/no): 1.5 (0.8 to 2.8) *Working postures and biomechanical constraints* High repetitiveness (≥4 hours per day) (yes/no): 2.4 (1.3 to 4.4) Repeated or sustained movement turning driving screw (≥2 hours per day) (yes/no): 5.9 (3.0 to 11.5) Repeated or sustained wrist bending (≥2 hours per day) (yes/no): 3.8 (2.1 to 7.1) Holding tools or objects in a pinch grip (≥4 hours per day) (yes/no): 2.0 (0.9 to 4.5) Precise finger movements (≥2 hours per day) (yes/no): 2.8 (1.5 to 5.4) Pressing with the base of the palm (≥2 hours per day) (yes/no): 3.2 (1.4 to 7.4) Use of hand tools (≥2 hours per day) (yes/no): 1.5 (0.8 to 2.8) Exposure to cold temperatures (≥4 hours per day) (yes/no): 2.3 (0.9 to 5.9) *Psychosocial factors at work* High psychological demand (yes/no): 1.1 (0.6 to 2.0)	Repeated or sustained wrist bending (≥2 hours per day): 2.6 (1.3 to 5.3) <u>Women</u> High repetitiveness (≥4 hours per day): 2.5 (1.1 to 5.3) Repeated or sustained movement turning driving screw (≥2 hours per day): 3.2 (1.3 to 7.8) Repeated or sustained wrist bending (≥2 hours per day): 2.3 (1.0 to 5.1)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low skill discretion (yes/no): 1.1 (0.6 to 1.9) Low decision authority (yes/no): 1.3 (0.7 to 2.4) Low supervisor support (yes/no): 1.3 (0.7 to 2.3) Low co-worker support (yes/no): 1.5 (0.8 to 2.9) <u>Men</u> *Factors related to work organization* Paced work (yes/no): Not calculated Work pace dependent on automatic rate (yes/no): 0.7 (0.1 to 5.1) Work pace dependent on technical organization (yes/no): 4.0 (1.3 to 12.5) Work pace dependent on customers' demands (yes/no): 1.1 (0.4 to 3.3) Work pace dependent on the colleagues' work (yes/no): 1.0 (0.3 to 3.3) Work pace dependent on quantified targets(yes/no): 2.0 (0.6 to 6.5) Work with temporary workers (yes/no): 1.1 (0.3 to 3.4) High visual demand (yes/no): 6.8 (0.9 to 52.6) Overtime hours (yes/no): 3.0 (0.7 to 13.6)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					No prior knowledge of the workload (yes/no): 1.2 (0.3 to 5.3) Work pace dependent on permanent controls (yes/no): 2.7 (0.9 to 8.4) *Working postures and biomechanical constraints* High repetitiveness (≥4 hours per day) (yes/no): 1.1 (0.3 to 3.8) Repeated or sustained movement turning driving screw (≥2 hours per day) (yes/no): 6.3 (2.0 to 19.2) Repeated or sustained wrist bending (≥2 hours per day) (yes/no): 4.2 (1.3 to 13.7) Holding tools or objects in a pinch grip (≥4 hours per day) (yes/no): 1.1 (0.1 to 8.1) Precise finger movements (≥2 hours per day) (yes/no): 6.3 (1.4 to 28.6) Pressing with the base of the palm (≥2 hours per day) (yes/no): 2.4 (0.7 to 8.9) Use of hand tools (≥2 hours per day) (yes/no): 1.9 (0.6 to 6.3) Exposure to cold temperatures (≥4 hours per day) (yes/no): 6.1 (1.9 to 20.1) *Psychosocial factors at work* High psychological demand (yes/no): 2.1 (0.6 to 6.9)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low skill discretion (yes/no): 1.2 (0.4 to 3.6) Low decision authority (yes/no): 0.4 (0.1 to 1.9) Low supervisor support (yes/no): 1.8 (0.6 to 5.3) Low co-worker support (yes/no): 1.9 (0.6 to 6.2) <u>Women</u> *Factors related to work organization* Paced work (yes/no): 1.4 (0.5 to 3.9) Work pace dependent on automatic rate (yes/no): 0.7 (0.2 to 2.8) Work pace dependent on technical organization (yes/no): 2.2 (0.9 to 5.1) Work pace dependent on customers' demands (yes/no): 0.6 (0.3 to 1.2) Work pace dependent on the colleagues' work (yes/no): 1.3 (0.6 to 2.7) Work pace dependent on quantified targets(yes/no): 1.4 (0.7 to 2.8) Work with temporary workers (yes/no): 1.8 (0.9 to 3.7) High visual demand (yes/no): 1.0 (0.5 to 2.1) Overtime hours (yes/no): 0.8 (0.4 to 1.6) No prior knowledge of the workload (yes/no): 0.6 (0.1 to 4.5)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Work pace dependent on permanent controls (yes/no): 1.1 (0.5 to 2.5) *Working postures and biomechanical constraints* High repetitiveness (≥4 hours per day) (yes/no): 3.3 (1.6 to 6.7) Repeated or sustained movement turning driving screw (≥2 hours per day) (yes/no): 5.7 (2.5 to 13.1) Repeated or sustained wrist bending (≥2 hours per day) (yes/no): 3.7 (1.8 to 7.6) Holding tools or objects in a pinch grip (≥4 hours per day) (yes/no): 2.4 (1.0 to 5.9) Precise finger movements (≥2 hours per day) (yes/no): 2.2 (1.1 to 4.6) Pressing with the base of the palm (≥2 hours per day) (yes/no): 4.0 (1.4 to 11.8) Use of hand tools (≥2 hours per day) (yes/no): 1.4 (0.7 to 2.8) Exposure to cold temperatures (≥4 hours per day) (yes/no): 0.7 (0.1 to 4.9) *Psychosocial factors at work* High psychological demand (yes/no): 0.9 (0.4 to 1.8) Low skill discretion (yes/no): 1.0 (0.5 to 2.1)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low decision authority (yes/no): 1.9 (0.9 to 3.9) Low supervisor support (yes/no): 1.1 (0.5 to 2.3) Low co-worker support (yes/no): 1.3 (0.6 to 3.0)	
Nordlander et al 2013 [110] Sweden **Risk of bias** Low	Cross-sectional General working population 1986 to 2005	The study included twenty-four female occupational groups and nine male occupational groups engaged in industrial, office and other work (e.g. dentistry, hairdressing and cleaning). 761 were men and 1891 women	**Physical exposure** was recorded in a subsample subsample of workers in each group. In most groups, full workday recordings were used (excluding lunch break). Measurements were representative for each job. Psychosocial work environment was assessed by the Job Content Questionnaire.	**Musculoskeletal disorders in elbow and hand** Complaints during the past seven days were assessed using the Nordic Questionnaire. Diagnoses were confirmed by an experienced physician or physiotherapist performed that standardized physical examination	Exposure-response relationships between complaints/disordes and occupational exposures. Beta (95% CI). <u>Elbow/hand complaints on the right side (past 12 months)</u> *Wrist flexion p10, beta (%/°)* Women: 2.1 (0.3 to 2.7) Men: 0.5 (–4.7 to 3.6) *Wrist flexion p50, beta (%/°)* Women: 0.9 (0.5 to 1.3) Men: 1.3 (–0.1 to 2.4) *Wrist flexion p90, beta (%/°)* Women: 0.6 (0.3 to 0.9) Men: 0.7 (–0.2 to 1.7) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.9 (0.6 to 1.1) Men: 1.0 (0.5 to 1.3) *Muscular activity p10, beta (%/%MVE)* Women: 3.0 (–0.4 to 7.4) Men: 10 (5.7 to 17) x	Exposure-response relationships between complaints/disordes and occupational exposures. Final model. Beta (95% CI). significant interaction terms <u>Elbow/hand complaints on the right side (past 12 months)</u> *Wrist angular velocity p50c:* 0.6 (0.2 to 1.0) *Wrist flexion p90*: 0.4 (–0.1 to 0.8) *Wrist angular velocity p50:* 0.4 (–0.1 to 0.9) <u>Lateral epicondylitis</u> *Wrist flexion p10:* 0.3 (0.04 to 0.6) <u>Medial epicondylitis</u> *Wrist angular velocity p50:* 0.1 (0.1 to 0.2)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Muscular activity p90, beta (%/%MVE) Women: 1.0 (0.3 to 1.5) Men: 1.5 (0.04 to 2.2) *Muscular rest, beta (%/% time)* Women: –2.3 (–4.0 to 0.6) Men: –1.6 (–2.5 to –0.7) <u>Elbow/hand complaints on the right side (past 7 days)</u> *Wrist flexion p10, beta (%/°)* Women: 1.8 (0.3 to 2.2) Men: 0.6 (–2.3 to 2.8) *Wrist flexion p50, beta (%/°)* Women: 0.8 (0.4 to 1.0) Men: 1.1 (0.2 to 1.8) *Wrist flexion p90, beta (%/°)* Women: 0.5 (0.3 to 0.8) Men: 0.7 (0.04 to 1.3) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.6 (0.4 to 0.8) Men: 0.6 (0.3 to 1.0) *Muscular activity p10, beta (%/%MVE)* Women: 3.0 (–0.1 to 6.7) Men: 5.7 (2.4 to 11) *Muscular activity p90, beta (%/%MVE)* Women: 0.8 (0.1 to 1.3) Men: 1.2 (0.2 to 1.6) *Muscular rest, beta (%/% time)*	<u>Carpal tunnel syndrome</u> *Wrist angular velocity p50:* 0.2 (0.1 to 0.3) <u>Overused hand syndrome</u> *Wrist flexion p90:* –0.04 (–0.11 to 0.03) *Job strain:* –0.01 (–0.04 to 0.02)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Women: –2.4 (–3.7 to –0.04) Men: –0.9 (–1.6 to –0.2) <u>Lateral epicondylitis</u> *Wrist flexion p10, beta (%/°)* Women: 10.40 (0.01 to 0.6) Men: –0.20 (–0.6 to 0.3) *Wrist flexion p50, beta (%/°)* Women: 0.06 (–0.04 to 0.1) Men: –0.05 (–0.3 to 0.1) *Wrist flexion p90, beta (%/°)* Women: 0.08 (–0.02 to 0.2) Men: –0.08 (–0.2 to 0.07) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.02 (–0.03 to 0.09) Men: –0.05 (–0.1 to 0.02) *Muscular activity p10, beta (%/%MVE)* Women: –0.22 (–0.9 to 0.6) Men: –0.48 (–1.1 to –0.07) *Muscular activity p90, beta (%/%MVE)* Women: 0.03 (–0.1 to 0.2) Men: –0.11 (–0.3 to 0.06) *Muscular rest, beta (%/% time)* Women: 0.05 (–0.3 to 0.5) Men: 0.09 (–0.08 to 0.3) *High job demands, beta (%/% exposed)* Women: 0.04 (–0.05 to 0.1) Men: 0.01 (–0.05 to 0.07) 0.01	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low job control, beta (%/%) Women: 0.03 (–0.04 to 0.09) Men: 0.00 (–0.03 to 0.04) *Job strain, beta (%/% exposed)* Women: 0.03 (–0.03 to 0.10) Men: 0.00 (–0.06 to 0.07) 0.06 *Isostrain, beta (%/% exposed)* Women: 0.01 (–0.1 to 0.1) Men: –0.01 (–0.08 to 0.05) <u>Medial epicondylitis</u> *Wrist flexion p10, beta (%/°)* Women: 0.12 (–0.07 to 0.3) Men: 0.43 (–0.3 to 0.7) *Wrist flexion p50, beta (%/°)* Women: 0.06 (–0.02 to 0.1) Men: 0.23 (0.05 to 0.4) *Wrist flexion p90, beta (%/°)* Women: 0.03 (–0.03 to 0.10) Men: 0.13 (0.02 to 0.3) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.03 (–0.02 to 0.09) Men: 0.12 (0.03 to 0.2) *Muscular activity p10, beta (%/%MVE)* Women: –0.47 (–1.1 to 0.07) Men: 0.93 (–0.3 to 2.4) *Muscular activity p90, beta (%/%MVE)* Women: –0.04 (–0.2 to 0.08) Men: 0.15 (–0.04 to 0.3)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Muscular rest, beta (%/% time) Women: 0.21 (–0.1 to 0.5) Men: –0.11 (–0.3 to 0.08) *High job demands, beta (%/% exposed)* Women: 0.02 (–0.03 to 0.06) Men: 0.01 (–0.08 to 0.09) *Low job control, beta (%/%)* Women: 0.02 (–0.01 to 0.05) Men: 0.03 (–0.01 to 0.08) *Job-strain, beta (%/% exposed)* Women: 0.02 (–0.01 to 0.05) Men: 0.06 (–0.02 to 0.1) <u>Carpal tunnel syndrome</u> *Wrist flexion p10, beta (%/°)* Women: 0.27 (–0.3 to 0.6) Men: 0.18 (–1.0 to 1.0) *Wrist flexion p50, beta (%/°)* Women: 0.29 (0.1 to 0.4) Men: 0.24 (–0.06 to 0.5) *Wrist flexion p90, beta (%/°)* Women: 0.20 (0.07 to 0.3) Men: 0.20 (0.01 to 0.4) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.18 (0.07 to 0.3) Men: 0.25 (0.1 to 0.4) *Muscular activity p10, beta (%/%MVE)* Women: 0.35 (–1.2 to 1.7) Men: 3.2 (1.3 to 6.3)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Muscular activity p90, beta (%/%MVE) Women: 0.19 (–0.04 to 0.4) Men: 0.40 (0.04 to 0.7) *Muscular rest, beta (%/% time)* Women: –0.48 (–1.1 to 0.3) Men: –0.45 (–0.7 to –0.2) <u>Psychosocial exposure</u> *High job demands, beta (%/% exposed)* Women: 0.05 (–0.1 to 0.2) Men: 0.08 (–0.1 to 0.3) *Low job control, beta (%/%)* Women: 0.07 (–0.02 to 0.2) Men: 0.08 (–0.03 to 0.2) *Job strain, beta (%/% exposed)* Women: 0.06 (–0.04 to 0.2) Men: 0.19 (0.02 to 0.4) *Isostrain, beta (%/% exposed)* Women: 0.17 (0.02 to 0.3) Men: 0.18 (0.00 to 0.4) <u>Overused hand syndrome</u> *Wrist flexion p10, beta (%/°)* Women: 0.12 (–0.10 to 0.3) Men: –0.01 (–0.3 to 0.3) *Wrist flexion p50, beta (%/°)* Women: 0.07 (0.02 to 0.1) Men: 0.06 (–0.01 to 0.2) *Wrist flexion p90, beta (%/°)* Women: 0.07 (0.01 to 0.1)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Men: 0.03 (–0.02 to 0.1) *Wrist angular velocity p50, beta (%/(°/s))* Women: 0.03 (–0.01 to 0.01) Men: 0.04 (–0.02 to 0.1) *Muscular activity p10, beta (%/%MVE)* Women: –0.35 (–0.9 to –0.05) Men: 0.53 (–0.3 to 1.6) *Muscular activity p90, beta (%/%MVE)* Women: 0.00 (–0.7 to 0.09) Men: 0.04 (–0.01 to 0.1) *Muscular rest, beta (%/% time)* Women: 0.11 (–0.10 to 0.4) Men: –0.02 (–0.1 to 0.1) *High job demands, beta (%/% exposed)* Women: 0.04 (–0.01 to 0.08) Men: 0.02 (–0.03 to 0.06) *Low job control, beta (%/%)* Women: 0.03 (–0.01 to 0.06) Men: 0.02 (–0.01 to 0.04) *Isostrain, beta (%/% exposed):* Women: 0.04 (–0.02 to 0.09) Men: 0.02 (–0.03 to 0.07)	
Nordander et al 2016 [111] Sweden	Cross-sectional General working population	Participants derived from twenty-four female occupational	**Work exposure** In representative sub-groups, postures and	**Pain or discomfort in the neck and shoulders**	Exposure-response relationships between neck and shoulder symptoms and diagnosed neck or shoulder disorders. Beta; b (95% CI)	Exposure-response relationships between neck symptoms and diagnosed neck disorders, Multivariate models. Beta; b (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
Risk of bias Low	1986 to 2005	groups and nine male occupational groups engaged in industrial, office and other work (e.g. dentistry, hairdressing and cleaning. n=3141 817 were males and 2324 were female	velocities of the head and right upper arm (inclinometry), right wrist postures and velocities (electrogoniometry), and muscular activity (electromyography) in the right trapezius muscle and forearm extensors, were recorded. Psychosocial work environment was assessed by the Job Content Questionnaire.	Musculoskeletal disorders were assessed as complaints during the past seven days using the Nordic Questionnaire. An experienced physician or physiotherapist performed a standardized physical examination	<u>Neck complaints (last 7 days)</u> *Head* Inclination p90: –0.1 (–0.3 to 0.1) *Upper arm* Elevation, p99: –0.1 (–0.3 to 0.1) *Trapezius muscle* Activity, p10, b (% per %MVE): 0.4 (–1.4 to 2.4) Activity, p90; beta (% per %MVE): 0.1(–0.5 to 0.6) *Wrist* Flexion, p50: –0.1 (–0.3 to 0.2) Angular velocity, p50: 0.1 (–0.1 to 0.3) *Forearm extensor muscles* Activity, p10: 4.7 (2.1 to 6.9) <u>Tension neck</u> *Head* Inclination p90; beta (%;/): 0.2 (0.1 to 0.3) *Upper arm* Elevation, p99 beta (%;/): 0.4 (0.2 to 0.5) *Trapezius muscle* Activity, p10, beta (% per %MVE): 1.6 (0.1 to 3.4) Activity, p90; beta (% per %MVE): 0.9 (0.3 to 1.2) *Wrist* Flexion, p50; beta (%;/): 0.3 (0.0 to 0.5)	<u>Neck complaints last 7 days</u> Forearm extensor, p10: 4.7 (0.7 to 8.6) <u>Tension neck syndrome</u> Upper arm elevation, p99: 0.3 (0.0 to 0.5) <u>Cervical syndrome</u> Muscular activity in trapezius, p10: 0.8 (0.5 to 1.1) <u>Thoracic outlet syndrome</u> Head inclination, p90: 0.05 (0.00 to 0.09) Muscular activity in trapezius, p10: –0.7 (–2.1 to 0.6) <u>Shoulder complaints last 7 days</u> Head angular velocity, p50: 1.2 (–2.5 to 0.0) Forearm extensors, p10c: –3.0 (–9.3 to 3.3) Angular velocity, p50: 1.3 (0.3 to 2.4) <u>Frozen shoulder</u>

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Angular velocity, p50; b (%/(/s)): 0.3 (0.1 to 0.4) *Forearm extensor muscles* Activity, p10; beta (% per %MVE: 1.5 (–0.2 to 3.2) *Psychosocial exposure* Low job control; beta (% per % exposed): 0.2 (0.0 to 0.3) Job strain; beta (% per % exposed): 0.3 (0.1 to 0.4) Isostrain, beta (% per % exposed): 0.1 (–0.2 to 0.4) <u>Cervical syndrome</u> *Head* Inclination p90; beta (%;/): 0.01 (–0.02 to 0.05) *Upper arm* Elevation, p99; beta (%;/): 0.00 (–0.02 to 0.02) *Trapezius muscle* Activity, p10, beta (% per %MVE): 0.8 (0.2 to 1.3) Activity, p90; beta (% per %MVE): 0.1 (0.0 to 0.2) *Wrist* Flexion, p50; beta (%;/): 0.07 (0.00 to 0.12) Angular velocity, p50; beta (%/(/s)): 0.06 (0.01 to 0.11) *Forearm extensor muscles* Activity, p10; beta (% per %MVE):	Muscular activity in trapezius, p10: –0.2 (–0.5 to 0.0) Wrist flexion, p90: 0.03 (0.01 to 0.05) <u>Bicipital tendonitis</u> angular velocity, p50: 0.2 (0.1 to 0.2) <u>Supraspinatus tendonitis</u> Muscular activity in trapezius, p10: –5.4 (–10.1 to –0.8) Low job control: 0.00 (–0.04 to 0.05) <u>Infraspinatus tendonitis</u> Muscular activity in trapezius: 1.4 (0.8 to 2.1) Job strain: 0.07 (0.03 to 0.11

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					0.0 (–0.2 to 0.4) *Psychosocial exposure* High job demands; b (% per % exposed): 0.01 (–0.03 to 0.04) Low job control; b (% per % exposed: 0.01 (–0.01 to 0.04) Job strain; b (% per % exposed): 0.01 (–0.02 to 0.04) <u>Thoracic outlet syndrome</u> *Head* Inclination p90; beta (%;/): 0.02 (0.00 to 0.05) *Upper arm* Elevation, p99; beta (%;/): 0.01 (0.00 to 0.02) *Trapezius muscle* Activity, p10, beta (% per %MVE): 0.4 (0.0 to 0.8) Activity, p90; beta (% per %MVE): 0.1 (0.0 to 0.2) *Wrist* Flexion, p50; beta (%;/): 0.05 (0.0 to 0.09) Angular velocity, p50; BETA %/(/s): 0.03 (0.00 to 0.07) *Forearm extensor muscles* Activity, p10; beta (% per %MVE): (–0.2 to 0.4) *Psychosocial exposure* High job demands; b (% per % exposed): 0.00 (–0.02 to 0.02)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Low job control; b (% per % exposed: 0.00 (–0.01 to 0.02) Job strain; b (% per % exposed: 0.01 (–0.01 to 0.03) Isostrain, b (% per % exposed: 0.02 (0.00 to 0.05) <u>Shoulder complaints last 7 days</u> *Upper arm* Velocity, p50; beta (%/(°/s)): 0.1 (0.0 to 0.2) *Trapezius muscle* Activity, p10; beta (% per %MVE): 3.4 (1.1 to 5.6) Activity, p90; beta (% per %MVE): 0.6 (0.0 to 1.0) *Wrist* Flexion, p10; beta (%/°): 1.3 (0.1 to 1.7) Flexion, p50; beta (%/°): 0.4 (0.2 to 0.7) Flexion, p90; beta (%/°): 0.2 (0.0 to 0.5) Angular velocity, p50; beta (%/(°/s)): 0.4 (0.2 to 0.6) <u>Frozen shoulder</u> *Head* Velocity, p50; beta (%/(°/s)): 0.00 (–0.04 to 0.03 *Upper arm* Velocity, p50; beta (%/(°/s)):	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					0.00 (–0.01 to 0.01) *Trapezius muscle* Activity, p10; beta (% per %MVE): 0.3 (–0.1 to 0.7) Activity, p90; beta (% per %MVE): 0.07 (0.00 to 0.14) *Wrist* Flexion, p10; beta (%/°): 0.0 (0.1 to 0.1) Flexion, p50; beta (%/°): 0.05 (0.00 to 0.09) Flexion, p90; beta (%/°): 0.03 (0.00 to 0.07) Angular velocity, p50; beta (%/(°/s)): 0.02 (–0.01 to 0.05) *Forearm extensor muscles* Activity, p10; beta (% per %MVE): 0.2 (–0.1 to 0.6) *Psychosocial exposure* High job demands; beta (%/% exposed): 0.00 (–0.02 to 0.02) Low job control; beta (%/% exposed): –0.01 (–0.02 to 0.00) Job strain; beta (% per % exposed): –0.01 (–0.03 to 0.01) Isostrain; beta (% per % exposed): 0.01 (–0.02 to 0.03) <u>Bicipital tendinitis</u> *Head* Velocity, p50; beta (%/(°/s)): 0.1 (0.0 to 0.3)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Upper arm Velocity, p50; beta (%/(°/s)): 0.05 (0.02 to 0.08) *Trapezius muscle* Activity, p10; beta (% per %MVE): 1.5 (0.5 to 2.4) Activity, p90; beta (% per %MVE): 0.4 (0.1 to 0.6) *Wrist* Flexion, p10; beta (%/°): 0.2 (0.2 to 0.5) Flexion, p50; beta (%/°): 0.2 (0.0 to 0.3) Flexion, p90; beta (%/°): 0.0 (–0.1 to 0.1) Angular velocity, p50; beta (%/(°/s)): 0.16 (0.08 to 0.24) *Forearm extensor muscles* Activity, p10; beta (% per %MVE): 0.9 (–0.1 to 2.1) *Psychosocial exposure* High job demands; beta (%/% exposed): 0.05 (–0.03 to 0.13) Low job control; beta (%/% exposed): 0.07 (0.03 to 0.12) Job strain; beta (% per % exposed): 0.08 (0.02 to 0.14) Isostrain; beta (% per % exposed): 0.13 (0.05 to 0.20) <u>Supraspinatus tendinitis</u> *Head*	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Velocity, p50; beta (%/(°/s)): 0.0 (–0.1 to 0.1) *Upper arm* Velocity, p50; beta (%/(°/s)): 0.02 (–0.02 to 0.06) *Trapezius muscle* Activity, p10; beta (% per %MVE): 2.0 (0.9 to 3.1) Activity, p90; beta (% per %MVE): 0.4 (0.1 to 0.6) *Wrist* Flexion, p10; beta (%/°): 0.0 (–0.3 to 0.4) Flexion, p50; beta (%/°): 0.2 (0.0 to 0.3) Flexion, p90; beta (%/°): 0.0 (–0.1 to 0.1) Angular velocity, p50; beta (%/(°/s)): 0.2 (0.1 to 0.3) *Forearm extensor muscles* Activity, p10; beta (% per %MVE) 0.9 (–0.2 to 2.1) *Psychosocial exposure* High job demands; beta (%/% exposed): 0.04 (–0.05 to 0.13) Low job control; beta (%/% exposed): 0.08 (0.03 to 0.13) Job strain; beta (% per % exposed): 0.08 (0.01 to 0.15) Isostrain; beta (% per % exposed): 0.15 (0.07 to 0.23)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Infraspinatus tendinitis *Head* Velocity, p50; beta (%/(°/s)): 0.1 (0.0 to 0.2) *Upper arm* Velocity, p50; beta (%/(°/s)): 0.04 (0.01 to 0.07) *Trapezius muscle* Activity, p10; beta (% per %MVE): 1.8 (0.8 to 2.7) Activity, p90; beta (% per %MVE): 0.5 (0.2 to 0.7) *Wrist* Flexion, p10; beta (%/°): 0.1 (–0.2 to 0.4) Flexion, p50; beta (%/°): 0.2 (0.1 to 0.3) Flexion, p90; beta (%/°): 0.1 (0.0 to 0.1) Angular velocity, p50; beta (%/(°/s)): 0.2 (0.1 to 0.3) *Forearm extensor muscles* Activity, p10; beta (% per %MVE): 1.0 (0.0 to 1.9) *Psychosocial exposure* High job demands; beta (%/% exposed): 0.07 (0.00 to 0.14) Low job control; beta (%/% exposed): 0.06 (0.0 to 0.11) Job strain; beta (% per % exposed): 0.09 (0.03 to 0.14) Isostrain; beta (% per % exposed):	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					0.1 (0.0 to 0.2)	
Oakman et al 2021 [112] Belgium **Risk of Bias** Low	Cross-sectional Service and manufacturing sector 2017 to 2018	Participants derived from the manufacturing and service sector, and were: not pregnant, good knowledge of the Dutch language, employed for at least 50% of a working week, and not working on a fixed night shift. n=331 142 men and 189 women	**Work exposure** Physical activity was assessed using two accelerometers and worn for 3–4 consecutive working days. During this measuring period, participants were asked to keep a paper diary to describe their daily routines.	**Neck and shoulder pain** Pain was assessed using a modified version of the Standardized Nordic questionnaire.		Associations between occupational physical activity and Neck and shoulder pain. Adjusted for age, gender, smoking and BMI. Odds ratio; OR (95% CI) <u>Occupational physical activity (% of working hours)</u> Moderate-to-vigorous physical activity: (MVPA): 1.00 (0.96 to 1.03 Standing: 1.00 (0.99 to 1.02) Sitting: 0.99 (0.98 to 1.01)
Ricco et al 2017 [113] Italy **Risk of bias** Moderate	Cross sectional 2012 to 2013 Meat processing plants	Workers derived from 31 meat processing plants referring to one occupational health service. Inclusion criteria included being at least 18 years old, Italian speaking,	**Work exposure** Self-reported ergonomic exposures was assessed from the questionnaire. They were then asked to identify and characterize	**Carpal tunnel syndrome (CTS)** All patients received a full medical assessment in order to obtain a complete musculoskeletal	Occupational risk factors for carpal tunnel syndrome (CTS) in the meat processing industry workers. Odds ratios; OR (95% CI) Work in a cold environment (<18°C): 1.043 (0.590 to 1.843) Weightlifting (NIOSH lifting index >1): 0.937 (0.540 to 1.625)	Occupational risk factors for carpal tunnel syndrome (CTS) in the meat processing industry workers. Adjusted for Seniority, smoking history, previous trauma(s) of the upper limbs, previous diagnosis of thyroid disease. Odds ratios; OR (95% CI)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		working at least 24 h/week for at least 3 years of seniority in meat processing industry. n=434 46% were female and 54.4% were male	which tasks they performed during the working shift (i.e., cutting, eviscerating, washing, trimming, deboning, receiving, hanging, killing, plucking, packing, sanitation, chilling).	evaluation. Patients referring to symptoms were considered clinically possible cases of the CTS and further evaluations with ultrasonography and/or NCS were performed.	Forceful hand exertion (≥10 N pinch/≥45 N grip): 2.134 (1.187 to 3.838) Thumb pressing (activities requiring the prolonged application of force trough the thumb either on tools or objects): 0.975 (0.560 to 1.697) Forearm rotation (activities requiring supination/pronation of the forearm >45° from neutral position): 0.722 (0.397 to 1.314) Repeated trauma of the hand (repeated mechanical compression of the soft tissues in the hand following the use of tools or objects which press against the palm): 2.234 (1.191 to 4.189) Prolonged wrist bending (wrist flexion/ extension >30°): 1.849 (1.047 to 3.266) Forced positions of the wrist (deviation of wrist from neutral position): 0.625 (0.320 to 1.222)	Forceful hand exertion (≥10 N pinch/≥45 N grip): 3.548 (1.379 to 9.131) Repeated trauma of the hand (repeated mechanical compression of the soft tissues in the hand following the use of tools or objects which press against the palm): 3.602 (1.248 to 10.395) Prolonged wrist bending (wrist flexion/extension >30°): 1.740 (0.530 to 5.710) Forced positions of the wrist (deviation of wrist from neutral position): 0.321 (0.077 to 1.336) Repeated movements of the wrist (cycle time of less than 30" or more than 50% of the cycle time involved performing the same type of fundamental cycles): 2.561 (1.100 to 5.960)

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					Repeated movements of the wrist (cycle time of less than 30" or more than 50% of the cycle time involved performing the same type of fundamental cycles): 3.240 (1.611 to 6.518)	
Rigouin et al 2013 [114] France **Risk of bias** Moderate	Cross-sectional General working population Data collected during 2002–2005.	Participants were a representative of a French region's working population that underwent a mandatory annual health examination by a qualified occupational physician in charge of the medical surveillance of a group of companies n=3710 (113 subjects with CTS) 42% were women and 58% were men	**Work exposure** Self-administered questionnaires Nordic Psychosocial constraints at work were assessed according to the Demand–Control–Support model, using the validated French version of the Job Content Questionnaire	**Carpal tunnel syndrome** Clinically diagnosed cases of CTS were defined (1) as subjects who had symptoms on the day of the examination or for at least 4 days during the preceding 7 days including intermittent paresthesias or pain in at least two of the first three digits with (2) positive results for at least one of the following tests during the		Associations between work exposure and clinically diagnosed CTS. Adjusted for age, BMI, too little recovery time (<10 min break possible per hour) when highly repetitive movements are performed, postures with extreme wrist bending (≥2 h/day) associated with high perceived physical exertion and use of vibrating handtools (≥2 h/day). Odd ratio; OR (95% CI). <u>Men</u> Rotation during the job: 2.88 (1.52 to 5.46) Low skill discretion: 2.12 (1.09 to 4.13) Work pace dependent on quantified target:

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				physical examination		1.61 (0.84 to 3.09) <u>Women</u> Working with temporary workers: 2.27 (1.28 to 4.04) High psychosocial demand: 1.76 (0.99 to 3.12)
Roquelaure, et al 2011 [115] France **Risk of bias** Moderate	Cross-sectional General working population Data collected during 2002–2005.	Participants were representative of a French region's (Loire Valley) working population. In France, at the time of this study, all salaried workers, including temporary and part-time workers, underwent a mandatory annual health examination by a qualified occupational physician (OP) in charge of the	**Work exposure** Self-administered questionnaires Nordic Psychosocial constraints at work were assessed according to the Demand–Control–Support model, using the validated French version of the Job Content Questionnaire Posture and biomechanical constraints were quantified	**Rotator cuff syndrome** Clinical diagnosis by trained occupational physicians	Associations between work exposure and rotator cuff syndrome. Adjusted for age. Odd ratio; OR (95% CI). <u>Men</u> *Factors related to work organization* High repetitiveness of the task (≥4 hours/day): 2.3 (1.6 to 3.3) Paced work: 1.7 (1.1 to 2.8) Work pace dependent on automatic rate: 1.7 (1.0 to 2.7) Work pace dependent on other technical organization: 1.2 (0.8 to 1.7) Work pace dependent on customers' demand: 0.9 (0.6 to 1.3) Work pace dependent on the colleagues' work: 1.3 (0.9 to 1.9) Work pace dependent on quantified targets: 1.2 (0.8 to 1.7) Job/task rotation (≥1 job rotation per week): 1.2 (0.8 to 1.7)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		medical surveillance of a group of companies n=3710 (274 subjects with rotator cuff syndrome) 1549 (42%) women and 2161 (58%) were men	according to the European consensus criteria document (22), except for physical workload, which was assessed using a rating perceived exertion (20-RPE) Borg scale.		Work with temporary workers: 1.4 (1.0 to 2.1) High visual demand: 1.0 (0.6 to 1.5) Overtime hours: 0.8 (0.6 to 1.2) No prior knowledge of the daily workload: 0.9 (0.5 to 1.5) Work pace dependent on permanent controls: 1.1 (0.7 to 1.6) *Psychosocial factors at work* High psychological demand (score ≥22): 1.6 (1.1 to 2.3) Low skill discretion (score ≤34): 1.7 (1.2 to 2.5) Low decision authority (score ≤32): 0.9 (0.6 to 1.3) Low supervisor support (score ≤11): 1.4 (1.0–1.9) Low co-worker support (score ≤11) 1.0 (0.7 to 1.6) *Working postures and biomechanical constraints* Sustained or repeated arm posture in abduction (≥2 hours/day) No: 1.00 >60˚: 1.5 (0.8 to 2.7) >90˚: 3.2 (2.0 to 5.2) Both: 3.1 (1.8 to 5.5)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Holding the hand behind the trunk (≥2 hours/day): 1.2 (0.6 to 2.5) Use of hand tools Never: Ref <2 hours/day: 1.7 (1.0 to 3.0) 2–4 hours/day: 1.7(1.1 to 2.8) ≥4 hours/day: 1.8 (1.2 to 2.9) Exposure to cold temperature (≥4 hours/day): 0.8 (0.3 to 1.7) <u>Women</u> *Factors related to work organization* High repetitiveness of the task (≥4 hours/day): 2.2 (1.5 to 3.1) Paced work: 1.7 (1.0 to 3.0) Work pace dependent on automatic rate: 1.9 (1.1 to 3.3) Work pace dependent on other technical organization: 1.8 (1.1 to 2.9) Work pace dependent on customers' demand: 0.9 (0.6 to 1.3) Work pace dependent on the colleagues' work: 1.0 (0.6 to 1.5) Work pace dependent on quantified targets: 1.8 (1.2 to 2.6) Job/task rotation (≥1 job rotation per week: 1.6 (1.1 to 2.4) Work with temporary workers: 1.0 (0.7 to 1.5) High visual demand: 1.5 (1.0 to 2.3)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					Overtime hours: 0.8 (0.6 to 1.2) No prior knowledge of the daily workload: 0.6 (0.2 to 1.8) Work pace dependent on permanent controls: 1.6 (1.1 to 2.4) *Psychosocial factors at work* High psychological demand (score ≥22): 1.0 (0.7 to 1.5) Low skill discretion (score ≤34): 1.4 (0.9 to 2.1) Low decision authority (score ≤32): 1.8 (1.2 to 2.5) Low supervisor support (score ≤11): 1.6 (1.1 to 2.3) Low co-worker support (score ≤11): 1.3 (0.9 to 2.0) *Working postures and biomechanical constraints* Sustained or repeated arm posture in abduction (≥2 hours/day) No: 1.00 >60˚: 2.4 (1.4 to 4.2) >90˚: 1.7 (0.9 to 3.3) Both: 3.9 (2.0 to 7.7) Holding the hand behind the trunk (≥2 hours/day): 2.1 (1.0 to 4.2) Use of hand tools Never: 1.00 <2 hours/day: 0.9 (0.5 to 1.8)	

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
					2–4 hours/day: 1.5 (0.9 to 2.5) ≥4 hours/day: 2.0 (1.3 to 3.2) Exposure to cold temperature (≥4 hours/day): 1.3 (0.6 to 3.2)	
Rosenbaum et al 2014 [116] USA **Risk of bias** Moderate	Cross-sectional Poultry Processing	Participants were immigrant Latino poultry workers at plants of three different employers. Work in poultry processing was defined as any type of nonsupervisory work in a poultry processing plant with job categories from receiving through sanitation. n=286; 127 (44.4%) female and 159 (55.6%) male	**Work exposure** Data was assessed by a interviewer-administered survey that took place in participants' homes. Work organization was measured using three domains: job demands (heavy load, awkward posture, psychological demand), decision latitude (job control), and support (perceived supervisor power, work safety climate). Heavy lifting and awkward posture	**Rotator cuff syndrome** Rotator cuff syndrome was defined as self-reported pain at the shoulder on 2 or more days in the previous month and one of the following on examination: presence of pain with resisted abduction, internal rotation, external rotation, or forward flexion of the shoulder; or tenderness to palpation over the bicipital groove		Multivariate analysis of associations of rotator cuff syndrome and Work Organization. Adjusted for age, gender, years in poultry processing, education, language, task, work organization, and employer. Odds ratios (OR) 95% CI Heavy load: 1.26 (0.55 to 2.90) Posture: 1.04 (0.52 to 2.08) Abusive supervision: 0.70 (0.33 to 1.48) Safety climate: 0.99 (0.88 to 1.12) Job control: 2.00 (0.63 to 1.90) Psychological demand: 1.25 (0.73 to 2.15)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			were measured with a physical workload instrument	or lateral shoulder.		
Seidel et al 2021 [117] Germany **Risk of Bias** Low	Cross-sectional General working population June 2015 to May 2017	Participants derived from 44 companies in 21 different economic sectors. Once the participants had voluntarily granted written consent, experienced researchers blinded to subjects' health status collected 198 exposure profiles via interviews, observations, and direct measurements. n=500 18% were female and 82% were male	**Wrist and elbow exposures** Measurements of relevant tasks at each workplace (0.5 to almost 5 h per worker) were conducted, which were thought to be representative exposures for each job. HAL was quantified using kinematic data (mean power frequencies, angular velocities and micro-pauses) and combined with electromyographic data (root-mean-square values) in order to generate a measurement-	**Hand and elbow pain/diagnoses** Assessed by Nordic Questionnaire and physical examinations. Case definition for CTS: Intermittent paresthesias or pain in at least 2 of the fingers I (Pollex), II (Index) or III (Medius), as well as pain occurring in palm, wrist or with proximal radiation into the wrist. Symptoms were present	Associations between mTLV for HAL exposure categories and health outcomes of the wrist. Odds ratio; OR (95% CI) <u>Carpal tunnel syndrome</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 1.14 (0.28 to 4.69) ≥ AL to ≤ TLV (medium exposure): 1.86 (0.60 to 5.73) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 1.00 (0.32 to 3.19) ≥ AL to ≤ TLV (medium exposure): 1.53 (0.50 to 4.68) < AL (low exposure): 1.00 <u>Wrist complaints in the preceding month</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 1.15 (0.59 to 2.24) ≥ AL to ≤ TLV (medium exposure): 2.71 (1.61 to 4.54) < AL (low exposure): 1.00	Associations between mTLV for HAL exposure categories and health outcomes of the wrist. Adjusted for age, gender, BMI, smoking, regular sporting exercise, job satisfaction, comorbidity (number of additional work-related musculoskeletal disorders or complaints, continuous). Odds ratio; OR (95% CI) <u>Carpal tunnel syndrome</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 1.10 (0.18 to 6.86) ≥ AL to ≤ TLV (medium exposure): 1.93 (0.65 to 5.67) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 0.61 (0.16 to 2.37) ≥ AL to ≤ TLV (medium exposure): 2.11 (0.62 to 7.26)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			based TLV for HAL (mTLV for HAL). The multi-sensor system CUELA including inertial sensors, potentiometers and a 4- channel surface electromyography module was used.	currently and at least one of the following tests being pathological (flexion compression test/carpal compression test/Tinel's sign/Phalen's Test/Two-point discrimination test/resisted thumb abduction or motor loss with atrophy of the Musculus abductor pollicis brevis). Case definition for lateral (LE) or medial epicondylus (ME): At least intermittent and activity-dependent pain localized around lateral (LE) or	mTLV for HAL, wrist *Right* > TLV (high exposure): 1.45 (0.78 to 2.69) ≥ AL to ≤ TLV (medium exposure): 1.12 (0.63 to 1.97) < AL (low exposure): 1.00 <u>Lateral epicondylitis</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 0.88 (0.53 to 1.46) ≥ AL to ≤ TLV (medium exposure): 0.91 (0.29 to 2.89) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 0.22 (0.04 to 1.14) ≥ AL to ≤ TLV (medium exposure): 1.15 (0.49 to 2.71) < AL (low exposure): 1.00 <u>Elbow complaints in the preceding month</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 0.86 (0.55 to 1.35) ≥ AL to ≤ TLV (medium exposure): 1.41 (0.60 to 3.31) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 0.47 (0.08 to 2.70)	< AL (low exposure): 1.00 <u>Wrist complaints in the preceding month</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 0.98 (0.45 to 2.14) ≥ AL to ≤ TLV (medium exposure): 2.89 (1.63 to 5.11) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 1.41 (0.71 to 2.81) ≥ AL to ≤ TLV (medium exposure): 1.18 (0.63 to 2.20) < AL (low exposure): 1.00 <u>Lateral epicondylitis</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 1.14 (0.55 to 2.33) ≥ AL to ≤ TLV (medium exposure): 1.14 (0.55 to 2.33) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 0.14 (0.01 to 1.57) ≥ AL to ≤ TLV (medium exposure):

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
				medial epicondylus (ME). Pain was present at the day of physical examination and local pain occurred on resisted/isometric wrist extension (lateral)/flexion (medial) or during positive Drop-Chair-Test in pronation /during palpation or examination of muscle pattern.	≥ AL to ≤ TLV (medium exposure): 1.99 (1.08 to 3.67) < AL (low exposure): 1.00	1.08 (0.44 to 2.68) < AL (low exposure): 1.00 <u>Elbow complaints in the preceding month</u> mTLV for HAL, wrist *Left* > TLV (high exposure): 0.48 (0.27 to 0.86) ≥ AL to ≤ TLV (medium exposure): 1.29 (0.49 to 3.41) < AL (low exposure): 1.00 mTLV for HAL, wrist *Right* > TLV (high exposure): 0.46 (0.06 to 3.61) ≥ AL to ≤ TLV (medium exposure): 1.52 (0.68 to 3.42) < AL (low exposure): 1.00
Walker-Bone et al 2015 [118] UK **Risk of Bias** Moderate	Cross-sectional 1998 to 2000 General working population	The study population comprised all men and women aged 25-64 years who were (i) registered with one of two general practices (ii) still living at the most recent	**Mechanical workplace and psychosocial workplace factors** were assessed by questionnaire.	**Lateral and medial epicondylitis** Elbow pain was assessed by questionnaire. All respondents reporting elbow pain in the past week were invited to	Occupational factors associated with epicondylitis. Odds ratios; OR (95% CI) <u>Lateral epicondylitis</u> Bending/straightening elbow (referent): 1.0 Bending straightening elbow >1 h/day: 2.5 (1.2 to 5.5) *Choice of work* Often (referent): 1.0	Occupational factors associated with epicondylitis. Adjusted for vitality, white/blue collar, age in four age bands and sex. Odds ratios; OR (95% CI) <u>Lateral epicondylitis</u> Bending/straightening elbow (referent): 1.0

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
		address listed in the practice's records; and (iii) not suffering from illness or recent bereavement that, in the opinion of their general practitioner. n=6038; 3342 (55%) were females		undergo interview and physical examination.	Sometimes: 1.5 (0.6 to 3.7) Seldom/never: 1.8 (0.7 to 4.3) <u>Medial epicondylitis</u> Bending/straightening elbow (referent): 1.0 Bending straightening elbow >1 h/day: 5.1 (1.8 to 14.3) *Choice of work* Often (referent): 1.0 Sometimes: 0.6 (0.2 to 1.9) Seldom/never: 0.7 (0.3 to 2.0)	Bending straightening elbow >1 h/day: 2.5 (1.2 to 5.3) *Choice of work* Often (referent): 1.0 Sometimes: 1.4 (0.6 to 3.6) Seldom/never: 1.7 (0.7 to 4.0) <u>Medial epicondylitis</u> Bending/straightening elbow (referent): 1.0 Bending straightening elbow >1 h/day: 5.3 (1.9 to 14.9) *Choice of work* Often (referent): 1.0 Sometimes: 0.6 (0.2 to 1.9) Seldom/never: 0.7 (0.3 to 2.0)
Werner et al 2015 119 USA **Risk of bias** Moderate	Cross-sectional Industrial and clerical work sites Time not stated	Participants derived from 7 settings (4 industrial and 3 clerical work sites). n=501 (36 subjects with UN) 71% were female and 29% were male	**Work exposure** Jobs were videotaped and rated for the degree of repetition, average and peak hand contact stress, average and peak force, and average and peak posture of	**Ulnar Neuropathy (UN)** All subjects completed a symptom questionnaire, including a hand diagram. The hand diagram was rated for the possibility of		Associations between work exposure and Ulnar Neuropathy. Adjusted for demographic, ergonomic, and job content variables. Odd ratio; OR (95% CI). Elbow position: 0.31 (0.11 to 0.84) Hand repetition: 1.38 (0.88 to 2.15)

Author Year Reference Country Risk of Bias	Design Time to follow-up Setting Performed (yrs)	Participants Women/men	Occupational factor (-s)	Outcome	Association between occupational factor and health problems; adjusted for 3 or less confounders	Association between occupational factor and health problems; adjusted for more than 3 confounders
			the shoulder, elbow, forearm, and wrist/hand. The ratings were performed using a 0–10 visual analog scale for each stressor, with verbal anchors on the 10-cm scale	an ulnar mononeuropathy using a classification protocol.		

AL = action limit; **BMI** = body mass index; **CI** = confidence interval; **CTS** = Carpal tunnel syndrome; **EVA** = exposure variation analysis; **HAL** = Hand activity level; **MVE** = maximal voluntary electric activity; **mTLV** = measurement-based TLV; **OP** = occupational physicians; **SOC** = Standard Occupational Classification; **TLV** = Threshold Limit Value; **VIBRISKS** = Risks of Occupational Vibration Injuries

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